Cancer in Ireland 1994-2004: A comprehensive report

A report of cancer incidence, mortality, treatment and survival in the North and South of Ireland: 1994-2004

Cliffs of Moher, Co. Clare, Ireland

D.W. Donnelly, A.T. Gavin and H. Comber

April 2009

This report should be cited as:
Donnelly DW, Gavin AT and Comber H. Cancer in Ireland 1994-2004: A comprehensive report. Northern Ireland Cancer Registry/National Cancer Registry, Ireland; 2009

National Cancer Registry Ireland

N. Ireland Cancer Registry

Contents

Foreword

This third all-Ireland cancer statistics report is a welcome addition to the series, which have been produced jointly by the Northern Ireland Cancer Registry and National Cancer Registry over the past ten years. As a result of this collaboration, supported by the National Cancer Institute (NCI), we are developing greater understandings of the patterns and causation of cancer, which will help to shape research and service delivery priorities that can benefit the people of the whole Island of Ireland. This is but one example of the value that is being derived from the unique partnership that is the All-Ireland NCI Consortium.

The detailed information on treatment and survival is particularly opportune and welcome. The development of the National Cancer Control Programme and the Northern Ireland Cancer Network (NICaN) will require detailed information on all elements of cancer patient care and outcomes. While the information is valuable in itself, comparative data from the two health services adds an additional dimension not available from within either jurisdiction. Detailed comparison of the performance of the two health services in prevention, early detection, treatment and aftercare helps put our achievements and future challenges into clearer perspective.

The report clearly shows that, despite different models of funding and provision, the similarities in cancer patterns between Ireland and Northern Ireland greatly outweigh the differences. This provides us with unique research opportunities to combine the data from the two registries to build on existing work to gain further insights into cancer aetiology, health services research and health economics.

Dr Tony Holohan
Chief Medical Officer, Department of Health and Children

I welcome this important report and wish to congratulate the registries on this collaboration, and the authors on a high quality report. Information is vital for the planning and evaluation of services and by comparing and contrasting how the health services North and South manage models of prevention through to treatment and care, we can record our achievements and plot out our future challenges.

Cancer is an important disease that causes a quarter of all deaths, and whilst the demonstrable improvements in survival are welcome, there is still much more to achieve and we can learn from each other in this respect. As outlined in our Cancer Control Plan we must ensure that we do everything we can to ensure that those whose lives are touched by cancer have access to skilled and appropriate treatment delivered promptly and with humanity. We must also ensure that we act as far as possible to prevent avoidable cancers, including those caused by smoking and other lifestyle issues.

The volume of data produced in the report is significant. Indeed the excellent summary is supplemented by a 350-page analysis of the main cancer sites. We must take note of the recommendations and the implications these will have in how we direct our collective services and research capital to combat ever more effectively the human suffering caused by cancer in its various manifestations.

I look forward to future reports and collaboration.

Dr Michael McBride
Chief Medical Officer, Department of Health, Social Services & Public Safety Northern Ireland

Acknowledgements

This report would not have been possible without the dedicated efforts of cancer registry staff and the many people from various organisations who facilitate and guide this work. The Departments of Health and Children (ROI) and the Department of Health, Social Services and Public Safety (NI) have funded this report and provide funding and support on an ongoing basis for the work of their respective registries. This work would not have been possible without the secondment of David Donnelly from the Northern Ireland Statistics and Research Agency (NISRA) to the Northern Ireland Cancer Registry.

Anna Gavin,
Director,
Northern Ireland Cancer Registry

Harry Comber,
Director
National Cancer Registry, Ireland

Chapter 01:

Introduction

Cancer is a major public health issue in Ireland and is a considerable burden on the individuals who develop the disease, the families and friends of cancer patients and on the health services that treat and care for such patients. However in many ways cancer is an extremely misunderstood disease with the common perception that it is unavoidable and is almost always fatal, both misconceptions adding to the stress those with a connection to the disease must feel. Fortunately over the last several decades a much greater understanding of how cancer develops suggests that a high proportion of cancers in the population could be prevented simply be leading healthier lifestyles while continuous improvements in available screening, treatments and diagnostic methods mean that at the beginning of the twenty-first century, approximately half of the people diagnosed with cancer in Europe survive at least five-years.[1] While some measure of hope rests with that statement, the fact that the terms "half of" and "five-years" are used rather than the terms "100%" and "completely cured" demonstrate that there is a long way to go in the fight against cancer.

However this fight is not just one of treatment and cure, but also one of prevention. Unfortunately the number of cancer cases diagnosed globally each year is rising with an increase of 50% expected between 2000 and 2020[2]. This is due almost exclusively to the combination of cancer being a disease that occurs primarily among the elderly[2], and to the increases in life expectancy throughout the world. Age, however, is not the only factor causing the increase in cancer levels with lifestyle choices also leading to a general decline in the health of the population resulting in increased susceptibility to cancer.[3,4] Since other hereditary and environmental factors also play a part it is clear that the challenge in reducing the number of diagnoses of cancer as a result of prevention, through education and environmental and social change, is every bit as challenging as the development of new treatments.

There are thus extensive issues surrounding the global burden of cancer that involve people from many different backgrounds throughout the world from medical researchers and charities to health service professionals and health policy makers. They tackle the crucial issues of prevention, treatment and care but their activities would be for naught without ways of monitoring their successes and failures within a population wide context. This role is performed by organisations known as cancer registries that collect comprehensive information on all new cases of cancer occurring in a defined population. Most also collect information on cancer deaths in the same population and store this information securely and permanently for the purpose of data analysis. Their primary goal is one of education and information provision, the former assisting the general public to make informed decisions about lifestyles, symptoms, the benefits of screening and the issues of treatment, the latter so that informed decisions can be made by policy makers in the fight against cancer.

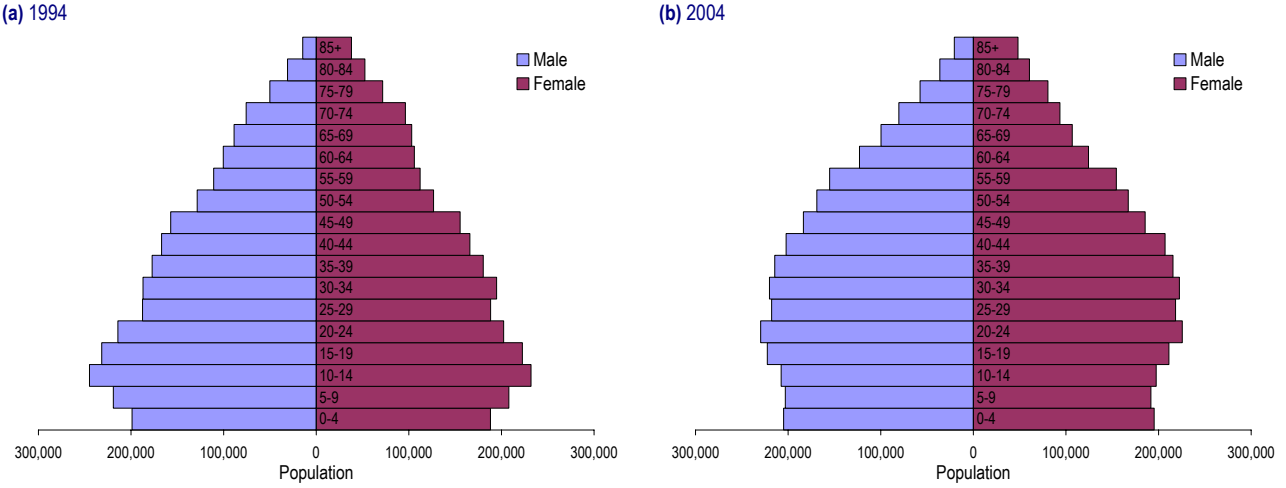
Many countries throughout the world have at least one cancer registry serving their population. Some countries have more than one covering the whole population (e.g. United Kingdom) while other countries monitor cancer levels in the entire country using a few registries that cover only a small percentage of the population (e.g. France). In Ireland there are two cancer registries; the Northern Ireland Cancer Registry (NICR) and the National Cancer Registry of Ireland (NCRI). Both of these were established in 1994 and cover the population of Northern Ireland (NI) and the Republic of Ireland (ROI) respectively. They are both population based cancer registries and regularly produce reports on their catchment areas, provide online statistics for users of cancer data and have significant research programs leading to the production of scientific papers in internationally recognized journals. Additionally both registries use internationally agreed standards, so figures on rates of occurrence or survival for different countries can be compared. Consequently they both feed into international collaborations such as EUROCARE[1], which is a European wide study of cancer survival, and IARC (International Agency on Research for Cancer) compendiums such as "Cancer Incidence in Five Continents".[5]

1.1: Cancer in Ireland

The fight against cancer in Ireland faces many challenges in the years ahead, many of which are common across the globe but differing demographics, lifestyles, poverty levels and health services in different countries mean that the emphasis and resources are directed towards different areas.

In Ireland the most rapidly changing factor affecting cancer levels is the changing population size and age distribution. In Ireland the 2004 population was 5,754,036, a 10.0% increase since 1994 (12.8% in Republic of Ireland, 4.1% in Northern Ireland). In addition the average age of the population in Ireland is increasing with a rise in the percentage of the population aged 60 and over from 15.8% to 16.2% and a decrease in the percentage of the population aged under 15 from 24.7% to 20.9% between 1994 and 2004[6,7] (Fig. 1.1). With the recent increase in the number of countries in the European Union (EU) also expected to result in a further increase in the population due to immigration, the annual number of cancer cases is set to rise.

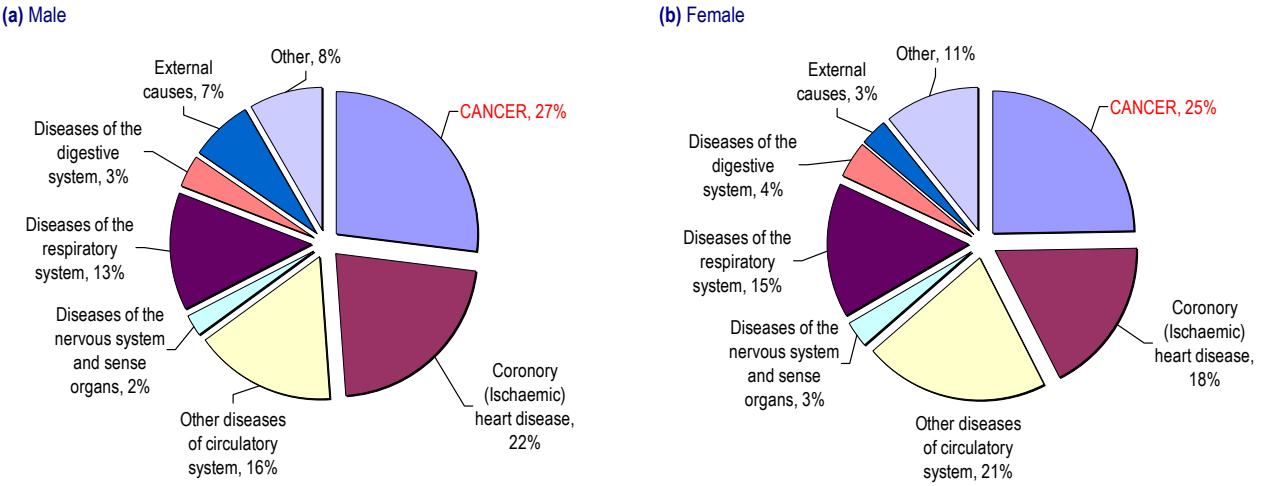
Figure 1.1: Population of Ireland by sex and five-year age group: 1994 & 2004



Source: NISRA[6]/DOHC[7]

The burden this will have on the health services of Northern Ireland and Republic of Ireland cannot be underestimated, as one in three members of the population will develop a cancer by the time they reach 75 years of age. In addition cancer was responsible for approximately one quarter of all deaths occurring in Ireland between 2001 and 2004 during which it was the most common cause of death leading coronary heart disease, stroke and other diseases of the circulatory and respiratory systems[8,9] (Fig. 1.2). However, new treatments are continuously being made available through the health services in Ireland, which improve survival possibilities for people with cancer. In addition screening programs, even though they are more common in Northern Ireland than Republic of Ireland, assist in the early detection of various cancers, which is an important factor in the ability to treat the disease effectively. Both allow us to be optimistic that increases in cancer mortality due to demographic change can be combated.

Figure 1.2: Common causes of death in Ireland: 2001-2004



Source: NISRA[8]/CSO[9]

Outside of demographic factors, risk factors for cancer can be broken down into genetic factors and lifestyle choices. While little can be done with regard to the first, lifestyle factors are controllable by individuals. Health services in Northern Ireland and Republic of Ireland undertake and promote measures to reduce the development of cancer as a result of these factors. Two particular factors that have the most potential to reduce the level of preventable cancers are tobacco control and maintaining a healthy body weight through diet and exercise. Smoking bans in work and public places and extensive anti-tobacco legislation will help in the control of

tobacco related cancers, particularly lung cancer, although with one quarter of adults in Ireland still smoking much has yet to be done. Obesity is increasingly recognised as a risk factor for cancer development and five fruit/vegetable portions per day messages and fitness campaigns may thus impact upon diet and obesity related cancers, however, the connection between these factors and cancer has still to penetrate the public consciousness. Other risk factors include excessive alcohol consumption, unprotected sexual activity and over exposure to the sun. More still needs done to increase public understanding of the link between these lifestyle choices and cancer (along with other health problems) thereby helping the control of this disease through prevention.

1.2: Third All-Ireland Report

The levels of cancer are constantly affected by changing demographics, new developments in treatment and care, screening programs and public health awareness, with variations in these factors by geographic area, so it is necessary to carefully monitor cancer levels in all of Ireland as well as separately. With that in mind NICR and NCRI introduce the third all-Ireland cancer statistics report entitled "Cancer in Ireland: A comprehensive report", which like the first two reports (released in 2001[10] and 2004[11]) aims to give a comprehensive review of cancer in Ireland. It is aimed at both the general public and health professionals and covers a range of cancer related topics including:

- Incidence and mortality: the number of cases and deaths due to cancer each year and how the numbers vary by age and gender;
- Treatment: percentages of patients receiving different types of treatment for specific cancers and years;
- Survival: rates of patients surviving cancer for different lengths of time and how surviving a given length of time increases chances of long-term survival;
- Prevalence: estimates of the numbers of people living in Ireland who have been diagnosed with the disease;
- Trends in cancer incidence and mortality;
- Geographic variations in incidence and mortality;
- International comparisons of incidence and survival;
- Factors influencing treatment and survival.

The report covers the period of time from 1994-2004, which at the time of report production was the most up to date data available for all of Ireland. In addition the report specifically focuses on malignant cancer, which is one of four cancer behaviours, the other three being benign, insitu and uncertain. With the exception of insitu and uncertain brain tumours however these are fairly easy to treat and are rarely fatal. Only malignant cancers are thus included in this report.

Overall the report will give one of the most detailed and comprehensive looks at cancer in Ireland and the process of its registration thus far. We hope that it will help inform medical and health policy makers in the decisions they face and will also in some small way educate the general public in how they can help protect themselves against cancer by living a healthier lifestyle, checking for symptoms and availing of screening programs available to them.

Chapter 02:

All cancers (C00-C96)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there was an average of 29,423 cases of malignant cancer diagnosed each year with the number of male cases in Ireland 6.8% higher than female cases.*
  - *Between 2000 and 2004 in Ireland 26.9% of cancers were non-melanoma skin cancers, which are rarely fatal and are usually omitted from cancer totals. Excluding non-melanoma skin cancer there were 21,509 cases of cancer diagnosed each year.*
  - *During 1994-2004 there were 212,860 people diagnosed with cancer (excluding NMSC) with 3.4% having two or more tumours during the 11 year period, resulting in 220,261 tumours diagnosed.*
  - *Incidence rates for all cancers combined increased by 1.5% per year among males during 1999-2004 while female incidence rates increased by 0.6% each year during 1994-2004.*
  - *During 2000-2004 there were 5,955 male and 5,363 female deaths from malignant cancer in Ireland.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates for all cancers during 2000-2004 were lower in Northern Ireland than in Republic of Ireland by 11.7% for males and 8.2% for females.*
  - *In Northern Ireland during 1994-2004 incidence rates were almost completely static, however in Republic of Ireland incidence rates increased for males by 1.9% each year between 1999 and 2004, with no significant change prior to this point, while female incidence rates increased by 0.9% each year between 1994 and 2004.*
  - *Mortality rates were 4.2% lower among males and 3.6% lower among females in Northern Ireland than Republic of Ireland during 2000-2004.*

- *RISKS AND PREVENTION*
  - *The major risk factors associated with different types of cancer are*
    - *Tobacco/Smoking;*
    - *Lack of balanced diet or physical activity, particularly if it leads to obesity;*
    - *Alcohol consumption;*
    - *Over-exposure to ultraviolet radiation from sunshine or sunbeds;*
    - *Exposure to certain chemicals and gases such as asbestos, benzene or radon gas;*
    - *Exposure to ionising radiation;*
    - *Infections such as human papillomavirus (HPV);*
    - *Certain treatments such as exposure to oestrogen through Hormone Replacement Therapy (HRT);*
    - *Late or lack of reproduction or lack of breast feeding in females;*
    - *History of cancer in the family.*
  - *While most people with a particular risk factor for cancer will not contract the disease, the possibility of developing cancer can increase as exposure to a risk factor increases.*

2.1: Incidence

The burden of cancer in Ireland can be measured using cancer registration data in several ways. The most valuable with regard to allocation of health service resources and monitoring of prevention strategies are cancer incidence levels. This refers to the number of cases of cancer diagnosed within a population during a specific period of time. Breaking it down by various factors related to cancer can provide a very revealing and informative picture of the cancer situation in both countries within Ireland.

During 2000-2004 there was an average of 29,423 cases of malignant cancer diagnosed each year with the number of male cases in Ireland 6.8% higher than female cases. This pattern differed in each country with a similar number of male and female cases each year in Northern Ireland but more male than female cases per year in Republic of Ireland. European age-standardised incidence rates (EASIR) however were higher for males than females by 25.1% (p<0.001) in Northern Ireland and by 30.0% (p<0.001) in Republic of Ireland. (Tab. 2.1)

Incidence rates for all cancers during 2000-2004 were lower in Northern Ireland than in Republic of Ireland by 11.7% (p<0.001) for males and 8.2% (p<0.001) for females. Consequently the cumulative risk of developing the disease before the age of 75 in Republic of Ireland was slightly higher than in Northern Ireland although in general the odds of developing the disease were approximately 1 in 3 throughout Ireland. (Tab. 2.1)

Table 2.1: Summary statistics for incidence of all cancers: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	4,507	4,514	9,021	10,689	9,713	20,402	15,196	14,227	29,423
Median age at diagnosis	70	69	69	69	67	68	69	68	69
Cumulative risk (Aged 0 to 74)	35.1%	29.2%	31.8%	38.8%	31.5%	35.0%	37.6%	30.8%	34.0%
Crude rate per 100,000 persons	544.0	520.2	531.8	549.2	493.2	521.1	547.7	501.5	524.3
EASIR ± 95% CI	548.2 ±7.2	438.1 ±6.0	480.2 ±4.5	620.7 ±5.2	477.4 ±4.3	536.8 ±3.3	597.1 ±4.2	464.2 ±3.5	518.0 ±2.7
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-11.7% ±1.4	-8.2% ±1.5	-10.5% ±1.0

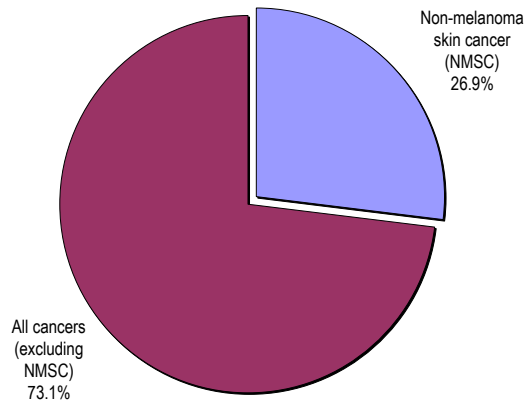
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

2.1.1: Non-melanoma skin cancer

Of the 29,423 cancers diagnosed each year between 2000 and 2004 in Ireland 26.9% were a specific type of cancer known as non-melanoma skin cancer (NMSC) that takes the form of lesions on the skin. While it is considered a malignant cancer it is also rarely fatal and many cancer registries do not fully record incidence of this cancer. While NICR and NCRI do have good quality data on this disease it is customary to omit it from the cancer total and consider it as a separate entity. (Fig. 2.1)

Excluding non-melanoma skin cancer there were 21,509 cases of cancer diagnosed each year in Ireland between 2000 and 2004. All malignant cancer totals in this report refer to this value from chapter 3 onwards.

Figure 2.1: Malignant cancer in Ireland and non-melanoma skin cancer: 2000-2004



2.1.2: Multiple tumours

Analysis of incidence in this report is conducted on tumours diagnosed, but some people develop more than one tumour in their lifetime. During the time span of this report (1994-2004) there were 212,860 people diagnosed with cancer (excluding NMSC) with 3.4% having two or more tumours during the 11-year period, resulting in 220,261 tumours diagnosed. If NMSC is included this increased to 281,922 patients with 7.2% having two or more tumours resulting in 303,631 tumours diagnosed during 1994-2004. (Tab. 2.2)

Table 2.2: Multiple tumours affecting the same person: 1994-2004

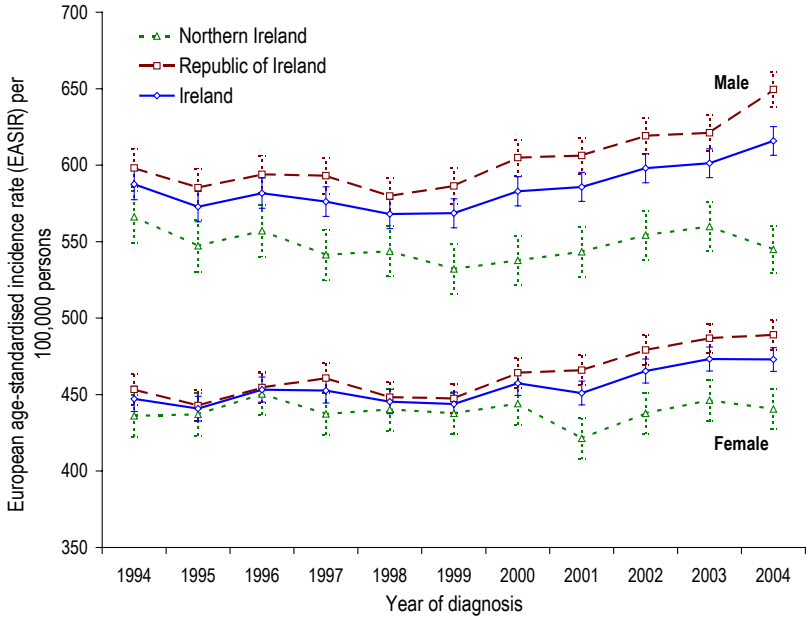
		Northern Ireland		Republic of Ireland		Ireland	
		Number of patients	Percentage of patients	Number of patients	Percentage of patients	Number of patients	Percentage of patients
Including NMSC	1 tumour	83,324	93.3%	178,410	92.6%	261,734	92.8%
	2 tumours	5,602	6.3%	13,144	6.8%	18,746	6.6%
	3 or more tumours	403	0.5%	1,039	0.5%	1,442	0.5%
	Total patients	89,329	100.0%	192,593	100.0%	281,922	100.0%
Excluding NMSC	1 tumour	66,764	96.6%	138,906	96.6%	205,670	96.6%
	2 tumours	2,292	3.3%	4,690	3.3%	6,982	3.3%
	3 or more tumours	77	0.1%	131	0.1%	208	0.1%
	Total patients	69,133	100.0%	143,727	100.0%	212,860	100.0%

NMSC: Non-melanoma skin cancer

2.1.3: Trends

Incidence of cancer in Ireland increased dramatically during 1994-2004 with an annual increase of 313.7 male and 270.8 female cases each year. Just over 80% of the increase in male cases and 83.6% of the increase in female cases occurred in Republic of Ireland. The main cause of this change was population growth during the period and to a lesser extent ageing of the population. Removing these factors through examination of European age-standardised rates (EASIR) illustrates that all cancers combined increased by 1.5% (p=0.001) per year among males during 1999-2004 with static rates prior to this period as far back as 1994. Among females EASIRs increased by 0.6% (p=0.002) each year during the 1994-2004 period. (Fig. 2.2; Tab. 2.3)

Figure 2.2: Trends in European age-standardised incidence rates (EASIR) for all cancers by sex and country: 1994-2004



In Northern Ireland during 1994-2004 EASIRs were almost completely static with annual percentage changes of -0.1% among males and 0.0% among females. The change in EASIRs in Ireland as a whole was thus driven by changes in Republic of Ireland which saw EASIRs rise for males by 1.9% (p=0.008) each year between 1999 and 2004, with no significant change prior to this point. Female EASIRs increased by 0.9% each year between 1994 and 2004. (Fig. 2.2; Tab. 2.3)

Table 2.3: Number of cases and European age-standardised incidence rates (EASIR) for all cancers by year of diagnosis, sex and country: 1994-2004

	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
Year	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	4,140	566.2 ±17.3	9,063	598.2 ±12.4	13,203	587.5 ±10.1	4,132	436.0 ±14.0	8,163	453.3 ±10.2	12,295	447.2 ±8.2
1995	4,047	547.3 ±16.9	8,983	585.3 ±12.2	13,030	572.9 ±9.9	4,182	437.1 ±13.9	8,072	442.8 ±10.0	12,254	440.8 ±8.1
1996	4,195	557.2 ±16.9	9,198	594.0 ±12.2	13,393	581.7 ±9.9	4,404	450.5 ±14.0	8,393	454.7 ±10.1	12,797	453.3 ±8.2
1997	4,121	541.4 ±16.5	9,349	593.1 ±12.0	13,470	576.2 ±9.7	4,333	437.3 ±13.7	8,619	460.8 ±10.0	12,952	452.6 ±8.1
1998	4,201	543.7 ±16.4	9,300	579.8 ±11.8	13,501	568.1 ±9.6	4,350	440.3 ±13.7	8,585	448.2 ±9.8	12,935	445.4 ±7.9
1999	4,166	532.2 ±16.1	9,488	586.4 ±11.8	13,654	568.6 ±9.5	4,362	437.8 ±13.6	8,650	447.5 ±9.7	13,012	443.7 ±7.9
2000	4,257	537.8 ±16.1	9,958	604.9 ±11.8	14,215	582.9 ±9.6	4,418	444.1 ±13.6	9,116	464.3 ±9.8	13,534	457.3 ±7.9
2001	4,378	543.4 ±16.1	10,194	606.3 ±11.7	14,572	585.7 ±9.5	4,295	421.4 ±13.2	9,296	466.0 ±9.7	13,591	451.0 ±7.8
2002	4,552	554.3 ±16.1	10,647	619.3 ±11.7	15,199	598.0 ±9.5	4,552	437.8 ±13.3	9,683	479.1 ±9.8	14,235	465.5 ±7.9
2003	4,690	559.9 ±16.0	10,923	621.2 ±11.6	15,613	601.2 ±9.4	4,649	446.3 ±13.4	10,097	486.8 ±9.7	14,746	473.2 ±7.9
2004	4,660	544.9 ±15.6	11,723	649.6 ±11.7	16,383	615.8 ±9.4	4,656	440.6 ±13.2	10,371	489.1 ±9.6	15,027	472.9 ±7.8

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

2.2: Mortality

During 2000-2004 there were 11,318 deaths from malignant cancer in Ireland, with 5,955 among males and 5,363 among females, an 11.0% difference. Adjusting for the different size and age structure of the male and female populations in Ireland, mortality rates (European age-standardised) were 43.3% higher among males than females. The odds of dying from the disease before the age of 75, assuming the absence of other causes of death, were 1 in 7 for males and 1 in 9 for females. Half of the deaths from cancer in Ireland occurred before the age of 72 for males and 73 for females. (Tab. 2.4)

Mortality from cancer was higher in Republic of Ireland than Northern Ireland with European age-standardised mortality rates 4.2% ($p<0.001$) lower among males and 3.6% ($p=0.006$) lower among females in Northern Ireland than Republic of Ireland. (Tab. 2.4)

Table 2.4: Summary statistics for deaths from all cancers: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	1,886	1,792	3,678	4,069	3,571	7,640	5,955	5,363	11,318
Median age at death	73	74	73	72	73	73	72	73	73
Cumulative risk (Aged 0 to 74)	15.0%	11.4%	13.0%	15.2%	11.6%	13.3%	15.1%	11.6%	13.2%
Crude rate per 100,000 persons	227.6	206.5	216.8	209.1	181.4	195.1	214.6	189.0	201.7
EASMR ± 95% CI	227.4 ±4.6	159.4 ±3.5	186.3 ±2.8	237.4 ±3.3	165.3 ±2.5	194.8 ±2.0	234.0 ±2.7	163.3 ±2.0	191.9 ±1.6
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-4.2%±2.4	-3.6%±2.6	-4.3%±1.7

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

Only a small proportion of the deaths from cancer which occurred between 2000 and 2004 were a result of non-melanoma skin cancer with an annual average of 7 male and 8 female NMSC deaths per year in Northern Ireland and 27 male and 15 female NMSC deaths per year in Republic of Ireland. Despite this small number these deaths are subsequently excluded from analysis of cancer mortality in order to retain consistency with analysis of cancer incidence.

2.3: Discussion

Cancer is a very common disease in Ireland with approximately 29,500 cases of malignant cancer diagnosed each year (21,509 excluding NMSC), the levels of which vary by various factors such as age, gender, country, site and cell type. There are however many other factors which cancer levels vary by, some of which have a causal nature (i.e. they induce or increase the risk of developing cancer). The area of research aimed at identifying links between factors and cancer (as well as other diseases) is called epidemiology.

The development of cancer is primarily a random occurrence being initiated by alterations to genes that regulate cell growth. Once started a complex process begins in which the cells that have altered genes continue to multiply forming a tumour, which can ultimately

Table 2.5: Risk factors for major cancers

	Smoking & Tobacco	Obesity	Physical exercise	Healthy diet	Excessive alcohol use	Sun exposure	HPV infection	Oral contraceptives	Breast feeding	Nulliparity or late childbirth	Ionising radiation	Family history
Head & Neck	R			P	R	R	R					
Oesophagus	R	R		P	R		R					
Stomach	R			P							R	R
Colorectal		R	P	P	R							R
Liver	R				R							
Pancreas	R			P								R
Lung	R											
Melanoma						R						
Breast		R	P	P	R				P	R	R	R
Cervix	R			P			R	R				
Uterus		R						P		R		R
Ovary		R	P	P				P	P	R		R
Prostate											R	R
Testes												R
Kidney	R	R		P								R
Bladder	R			P								
Brain											R	
Lymphoma												
Myeloma												
Leukaemia	R											

R – Risk factor; P – Protective factor

invade the surrounding tissue and cause damage to vital organs in the body. The initial alterations which start the process, despite being random, can be promoted or hindered by other factors, with these factors related to certain types of cancer.

Tobacco is the greatest risk factor in the development of many cancers (lung, larynx, oesophagus, stomach, pancreas, kidney, liver and bladder); the biggest being lung cancer where it is estimated that almost 90% of cases of this disease are related to cigarette smoke.[12]

Other factors that can influence the development of certain types of cancer include history of cancer in the family, lack of balanced diet, lack of physical activity, obesity, alcohol consumption, exposure to ultraviolet radiation from sunshine or sunbeds, exposure to certain chemicals and gases such as asbestos, benzene or radon gas, exposure to ionising radiation, infections such as human papillomavirus (HPV), treatments such as exposure to oestrogen through Hormone Replacement Therapy (HRT), late or lack of reproduction in females and lack of breast feeding in females.[13,14] While most people with a particular risk factor for cancer will not contract the disease, the possibility of developing cancer can increase as exposure to a risk factor increases. (Tab. 2.5)

Chapter 03:

All cancers (excluding NMSC; C00-C96 ex. C44)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 10,999 male and 10,510 female cases diagnosed each year.*
  - *The most common male cancers were prostate, colorectal and lung, among women they were breast, colorectal and lung.*
  - *Incidence rates increased for males by 1.8% per year during 1999-2004 and for females by 0.8% per year during 1994-2004.*
  - *Incidence rates were highest in counties/councils with large urban areas and in areas of deprivation..*
  - *During 2000-2004 there was an average of 5,921 male and 5,340 female deaths per year from cancer.*
  - *Mortality rates decreased between 1994 and 2004 by 1.4% per year for males and 1.0% per year for females.*

- *TREATMENT*
  - *During 2001 surgery was the most common form of treatment for stomach, colorectal, breast, cervical and ovarian cancer, with hormone therapy most commonly used for prostate cancer and radiotherapy the most common for oesophageal and lung cancer.*
  - *From 1996 to 2001 chemotherapy and radiotherapy use increased for oesophageal, stomach, colorectal, lung and breast cancer with chemotherapy use also increasing for cervical cancer and radiotherapy use increasing for prostate cancer. Surgery use increased for breast and ovarian cancers and decreased for oesophageal, lung and prostate cancers. Hormone therapy use decreased for breast cancer and increased for prostate cancer.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year relative survival for patients diagnosed in 2000-2004 was estimated to be 46.8% for males and 51.6% for females.*
  - *Five-year relative survival for patients diagnosed in 2000-2004 ranged from 5.4% for pancreatic cancer to 96.9% for testicular cancer for males, and from 6.8% for pancreatic cancer to 91.6% for melanoma for females.*
  - *Five-year relative survival improved by 3.9% for males and 1.9% for females between 1994-1996 and 1997-1999.*
  - *Five year survival was best at earlier disease stage and better in younger than older people.*
  - *94,062 people diagnosed with cancer (ex. NMSC) during 1994-2004 were alive at the end of 2004..*

- *NORTH/SOUTH COMPARISONS*
  - *During 2000-2004 male and female incidence rates were lower in Northern Ireland by 10.0% and 2.2% respectively. The difference for males was a result of higher levels of prostate cancer in Republic of Ireland.*
  - *Incidence rates were lower in Northern Ireland than in Republic of Ireland for pancreatic, bladder, brain cancer and leukaemia among both sexes, for colorectal and prostate cancers among males and melanoma, breast and cervical cancer among females. They were higher in Northern Ireland than in the Republic of Ireland for male lung and female uterine cancers.*
  - *During 2001 Northern Ireland had a higher proportion of oesophageal, cervical and prostate cancer patients receiving no tumour directed treatment, while the proportion was higher in Republic of Ireland for colon cancer.*
  - *Five-year survival for males diagnosed in 2000-2004 was 5.2% higher in the Republic of Ireland than Northern Ireland. There was no significant difference between the two countries for females or for males when prostate cancer is excluded.*
  - *Five-year survival from male prostate and bladder cancers was higher in Republic of Ireland than Northern Ireland. Among females five-year survival from pancreatic cancer, leukaemia and bladder cancer was higher in the Republic of Ireland, while survival from malignant melanoma was better in Northern Ireland.*
  - *Cancer death rates were 3.9% lower for males and 3.6% lower for females in Northern Ireland during 2000-2004.*
  - *At the end of 2004 the number of people living with cancer (ex. NMSC) diagnosed since 2000 per 100.000 people was 3.7% greater in Northern Ireland than the Republic of Ireland.*

3.1: Incidence

During 2000-2004 there were on average 21,509 cases of cancer (excluding NMSC) diagnosed each year in Ireland with slightly more male than female cases (Male: 10,999; Female: 10,510). However while male cases exceeded female cases in Republic of Ireland by 9.0%, the reverse was true in Northern Ireland where the number of male cases was 4.3% lower than female cases. This however was a factor of the different age and gender distribution of each country and European age-standardised incidence rates (EASIR) were higher for males in both countries – by 16.8% in Northern Ireland and by 26.8% in Republic of Ireland ($p<0.001$). Excluding NMSC the odds of developing cancer before the age of 75 were approximately 1 in 4. (Tab. 3.1)

Male EASIRs were 10.0% ($p<0.001$) lower in Northern Ireland than in the Republic of Ireland than during 2000-2004, while female EASIRs were 2.2% ($p=0.017$) lower in Northern Ireland. This was likely linked to differences between the two countries in incidence rates of specific types of cancer, in particular male prostate cancer which when excluded from the overall cancer total results in no significant difference between incidence rates of male cancer between the two countries. (Tab. 3.1)

Table 3.1: Summary statistics for incidence of all cancers (excluding NMSC): 2000-2004

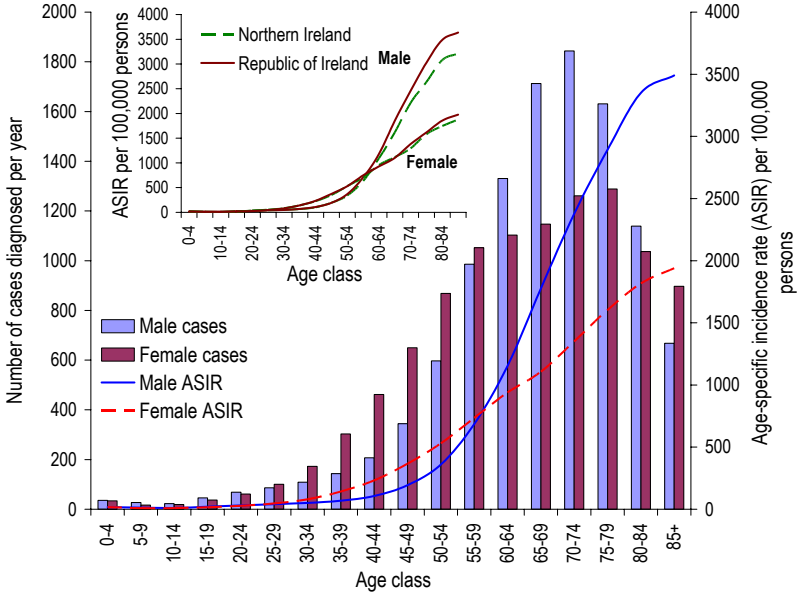
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	3,303	3,452	6,756	7,696	7,058	14,753	10,999	10,510	21,509
Median age at diagnosis	69	67	68	69	66	68	69	66	68
Cumulative risk (Aged 0 to 74)	27.6%	24.2%	25.6%	30.0%	24.6%	27.2%	29.2%	24.5%	26.7%
Crude rate per 100,000 persons	398.7	397.9	398.3	395.4	358.4	376.8	396.4	370.5	383.3
EASIR ± 95% CI	401.9 ±6.1	344.1 ±5.3	364.0 ±4.0	446.4 ±4.5	352.0 ±3.8	390.0 ±2.8	431.8 ±3.6	349.3 ±3.1	381.2 ±2.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-10.0% ±1.6	-2.2% ±1.8	-6.7% ±1.2

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

3.1.1: Age distribution

Cancer was more common with increasing age in Ireland during 2000-2004 with a median age at diagnosis of 68 years. The annual number of cases peaked in the 70-74 age class for males with 16.8% of all cases and in the 75-79 age class for females with 12.3% of all cases. There were on average 156 new cases of cancer diagnosed annually in children (aged 0 to 14), which was 0.7% of all cancers registered. (Fig. 3.1)

Figure 3.1: Number of cases of all cancers (excluding NMSC) diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



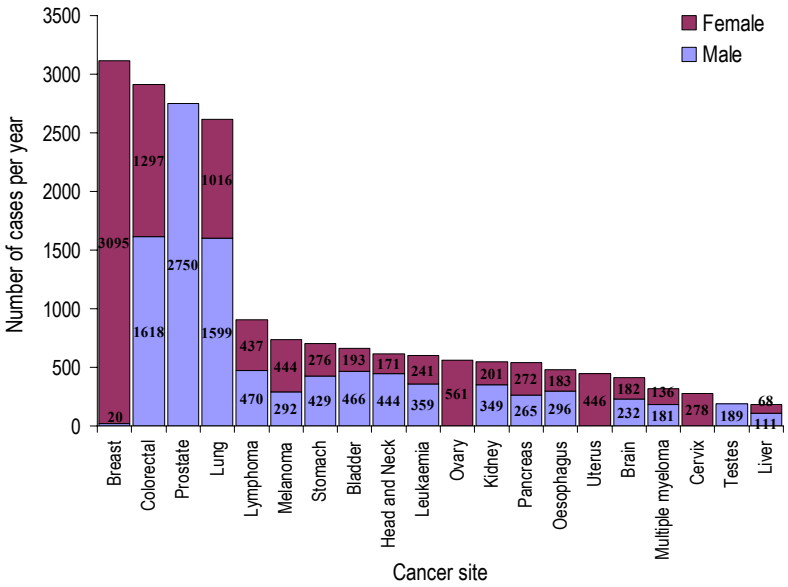
In Ireland age-specific incidence rates (ASIR) increased with increasing age to a maximum of 3,490.6 male and 1,938.4 female cases per 100,000 males and females aged 85 and over in the population. For the majority of age groups these rates were greater in Republic of Ireland than in Northern Ireland. (Fig. 3.1)

3.1.2: Cancer site

Cancer occurs in many different parts of the body, some more common than others, with non-melanoma skin cancer the most common form. Excluding this type the top cancers in descending order during 2000-2004 were breast, colorectal, prostate, lung and lymphoma. Some of these diseases are gender specific but among those cancers common to both there was considerable variation between males and females with male cases exceeding female cases for each of the top twenty cancers diagnosed during 2000-2004, except for pancreatic cancer and malignant melanoma. However the most common female cancer (breast cancer) had more

cases diagnosed than the most common male cancer (prostate cancer), while females had three gender specific cancers (cervix, uterus, ovary) among the top twenty cancers as opposed to two male specific cancers (prostate, testes). (Fig. 3.2)

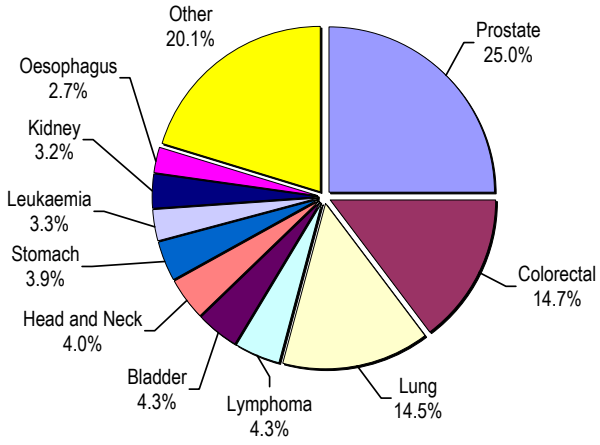
Figure 3.2: Number of cancer (excluding NMSC) cases per year in Ireland by sex and cancer site: 2000-2004



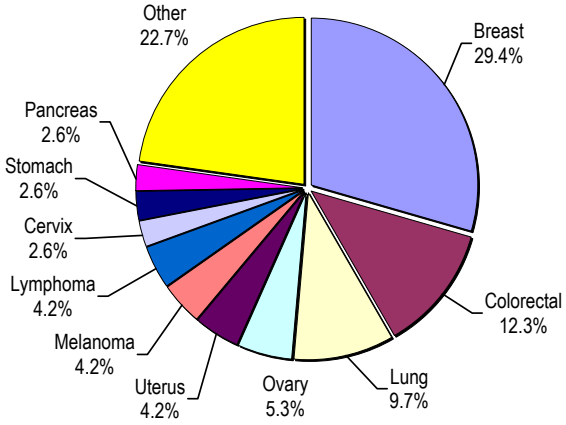
Among men the most common cancers were prostate cancer, colorectal cancer, lung cancer and lymphoma, while among women they were breast cancer, colorectal cancer, lung cancer and ovarian cancer. The top male and female cancers (breast and prostate) made up approximately one quarter of all cancers (excluding NMSC) for their sex; with the number of female breast cancer cases more than double the number of female cases of colorectal cancer, the next most frequent female cancer. Additionally there were over 1,500 more cases per year of prostate cancer among males than of male colorectal cancer, the second most common male cancer. (Fig. 3.3)

Figure 3.3: Top 10 most common cancers (excluding NMSC) diagnosed in Ireland by sex: 2000-2004

(a) Male



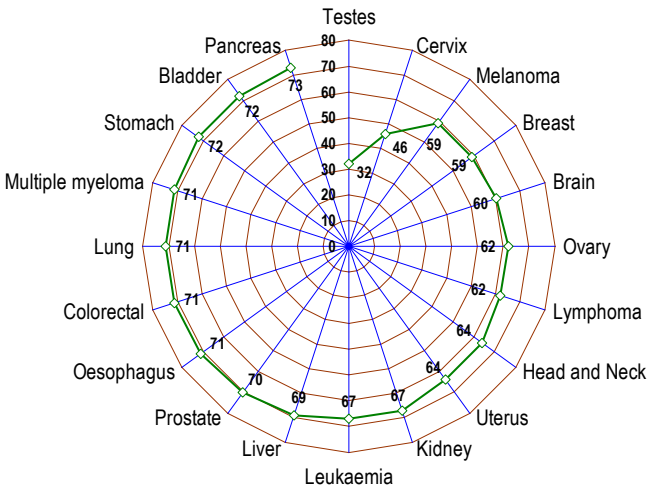
(b) Female



Median age at diagnosis by cancer site

Age at diagnosis varied considerably with cancer site during 2000-2004. Overall the median age at diagnosis was 68 years of age with males having a slightly higher age at diagnosis than females (Male: 69; Female 66). However the median age ranged from 32 years of age for testicular cancer to 73 years of age for pancreatic cancer. Only testicular cancer and cervical cancer had a median age of diagnosis under 50 years. Breast cancer, the most common female cancer, had a median age at diagnosis of 59 years compared to a median age of 70 years for prostate cancer, the most common male cancer. (Fig. 3.4)

Figure 3.4: Median age at diagnosis by cancer site: 2000-2004

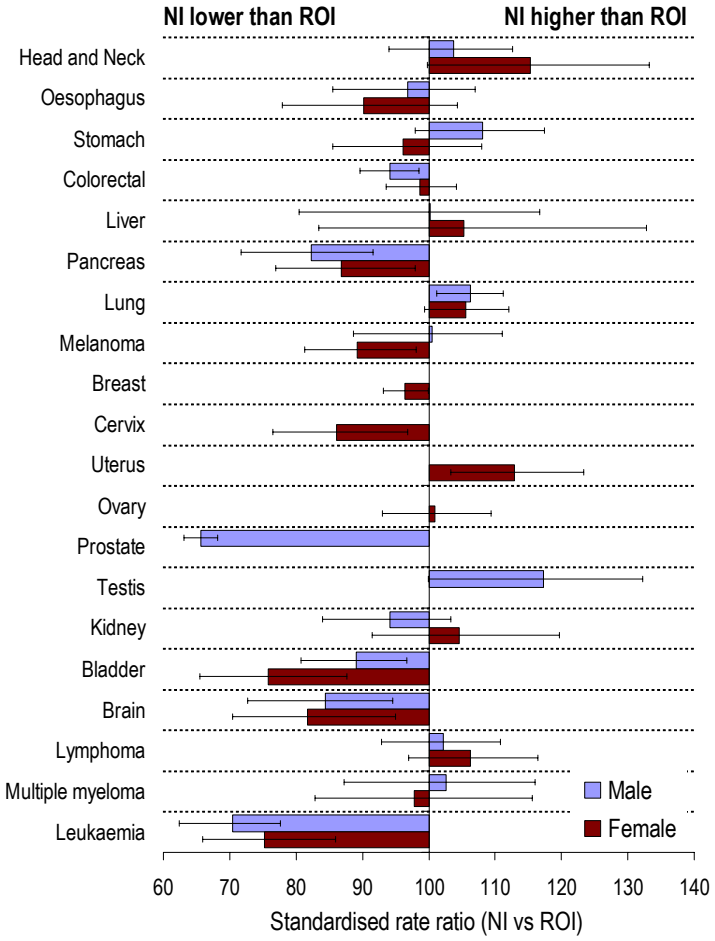


Country comparisons of cancer site

The proximity of the two countries in Ireland would suggest that there shouldn't be too much variation in levels of different cancers between the two countries. However some significant differences in incidence rates (EASIR) exist with rates lower in Northern Ireland than Republic of Ireland for pancreatic cancer, bladder cancer, cancer of the brain, leukaemia, male colorectal cancer, female breast cancer, female melanoma, prostate cancer and cervical cancer, while rates were significantly higher in Northern Ireland for male lung cancer and cancer of the uterus. (Fig. 3.5)

Some of the differences in incidence rates are easily or at least partially explainable, such as more extensive PSA testing in Republic of Ireland causing elevated prostate cancer levels or possible coding differences between the two countries in the case of bladder cancer, but others such as the difference in brain cancer and male colorectal cancer remain unexplained. (Fig. 3.5)

Figure 3.5: Standardised rate ratios comparing European age-standardised rates in Northern Ireland to those in Republic of Ireland for the top twenty cancer sites: 2000-2004

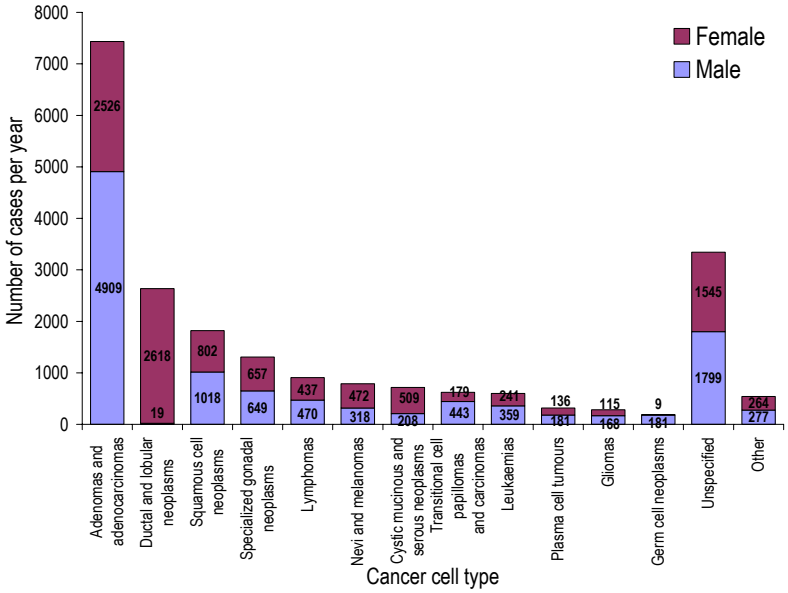


3.1.3: Cancer cell type

Cancer also varied by cell type during 2000-2004 with 34.6% of cancers (ex. NMSC) diagnosed in Ireland classified as adenocarcinomas, which are cancers that begin in the cells that line internal organs and have gland like properties. The number of male cases of this type was almost double that of female cases. Ductal and lobular neoplasms, which are mostly female breast cancers, made up 12.3% of all cancer cases (ex. NMSC). (Fig. 3.6)

The percentage of cases that had an unspecified cell type however was high during 2000-2004 at 15.5% (ex. NMSC), mainly as a result of no examination of the tissue being carried out. This percentage was higher in Northern Ireland than Republic of Ireland with 19.4% unspecified compared to 13.8%. (Fig. 3.6)

Figure 3.6: Number of cases of cancer (excluding NMSC) per year in Ireland by sex and cell type: 2000-2004



3.1.4: Trends

The number of cancers (ex. NMSC) diagnosed in Ireland during 2000-2004 increased by an average of 255 male and 217 female cases each year between 1994 and 2004. The majority of this increase occurred in Republic of Ireland, probably as a result of the larger population and a higher rate of population growth, with annual increases of 216 male and 174 female cases. (Tab. 3.2)

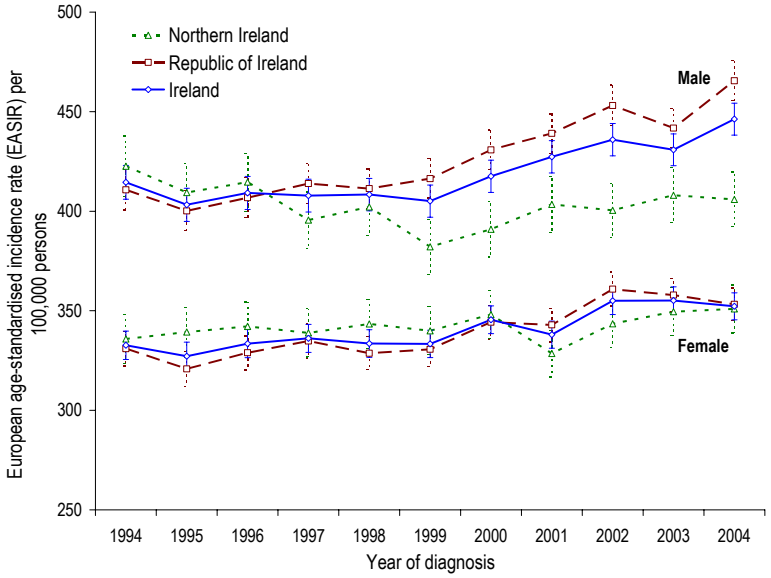
Table 3.2: Number of cases and European age-standardised incidence rates for all cancers (excluding NMSC) by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	3,096	422.6 ±15.0	6,251	410.8 ±10.3	9,347	414.5 ±8.5	3,104	335.9 ±12.4	5,849	330.9 ±8.8	8,953	332.7 ±7.2
1995	3,039	409.4 ±14.6	6,174	400.2 ±10.1	9,213	403.2 ±8.3	3,157	339.3 ±12.4	5,750	320.8 ±8.6	8,907	327.2 ±7.1
1996	3,131	414.6 ±14.6	6,317	406.8 ±10.1	9,448	409.2 ±8.3	3,255	342.2 ±12.3	5,982	328.9 ±8.6	9,237	333.5 ±7.1
1997	3,017	395.6 ±14.2	6,535	413.9 ±10.1	9,552	407.8 ±8.2	3,277	338.9 ±12.1	6,162	334.8 ±8.6	9,439	336.1 ±7.0
1998	3,115	402.2 ±14.1	6,625	411.4 ±9.9	9,740	408.4 ±8.1	3,303	343.4 ±12.2	6,199	328.7 ±8.4	9,502	333.6 ±6.9
1999	2,989	382.1 ±13.7	6,751	416.4 ±9.9	9,740	405.1 ±8.1	3,317	339.9 ±12.1	6,320	330.6 ±8.4	9,637	333.3 ±6.9
2000	3,096	391.0 ±13.8	7,109	430.8 ±10.0	10,205	417.5 ±8.1	3,376	348.1 ±12.2	6,660	344.2 ±8.5	10,036	345.5 ±7.0
2001	3,251	403.4 ±13.9	7,397	439.1 ±10.0	10,648	427.3 ±8.1	3,268	328.5 ±11.7	6,751	342.9 ±8.4	10,019	338.0 ±6.8
2002	3,284	400.4 ±13.7	7,801	453.1 ±10.0	11,085	435.9 ±8.1	3,472	343.5 ±11.9	7,205	360.9 ±8.5	10,677	355.0 ±6.9
2003	3,418	408.0 ±13.7	7,773	441.7 ±9.8	11,191	430.9 ±8.0	3,541	349.5 ±12.0	7,291	357.9 ±8.4	10,832	355.2 ±6.9
2004	3,468	405.9 ±13.5	8,399	465.5 ±9.9	11,867	446.2 ±8.0	3,605	350.9 ±11.9	7,381	353.2 ±8.2	10,986	352.2 ±6.8

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Male incidence rates (EASIR) were static in Ireland between 1994 and 1999, however since 1999 they increased by an average of 1.8% (p=0.012) each year up to 2004. In each individual country however the trend exhibited a different pattern. In Republic of Ireland there was an annual increase of 1.4% (p<0.001) in EASIRs between 1994 and 2004 with no indication of a change in the direction of the trend. In Northern Ireland however EASIRs decreased for males between 1994 and 1999 by 1.6% (p=0.012) each year, however after 1999 there was no significant change. (Fig. 3.7, Tab. 3.2)

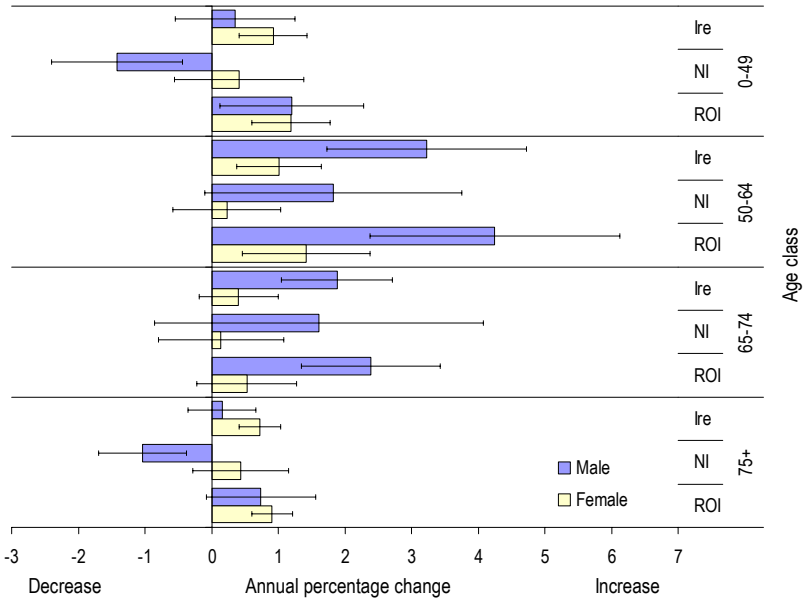
Figure 3.7: Trends in European age-standardised incidence rates (EASIR) for all cancers (excluding NMSC) by sex and country: 1994-2004



Female rates increased between 1994 and 2004 in Ireland by 0.8% (p<0.001) each year. An increase was also observed in Republic of Ireland with an annual percentage change of 1.1% (p<0.001). In Northern Ireland however there was no significant change between 1994 and 2004. (Fig. 3.7, Tab. 3.2)

In men cancer rates (EASIRs) increased each year by 3.2% per year (p=0.002) and 1.9% per year (p=0.001) among those aged 50-64 and 65-74 respectively during 1997-2004. Rates however were static for males aged 0-49 and 75+ during 1994-2004 and for those aged 50-64 and 65-74 prior to 1997. There was no significant difference in trend for males aged 50-64 and 65-74 between Northern Ireland and Republic of Ireland. However while rates decreased for males aged 0-49 and 75+ in Northern Ireland between 1994 and 2004 they increased in Republic of Ireland for 0-49 year olds and exhibited no significant change for those aged 75 and over. (Fig. 3.8)

Figure 3.8: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for all cancers (excluding NMSC) by sex, country and age: 1994-2004



Among females cancer rates (EASIRs) increased between 1994 and 2004 for those

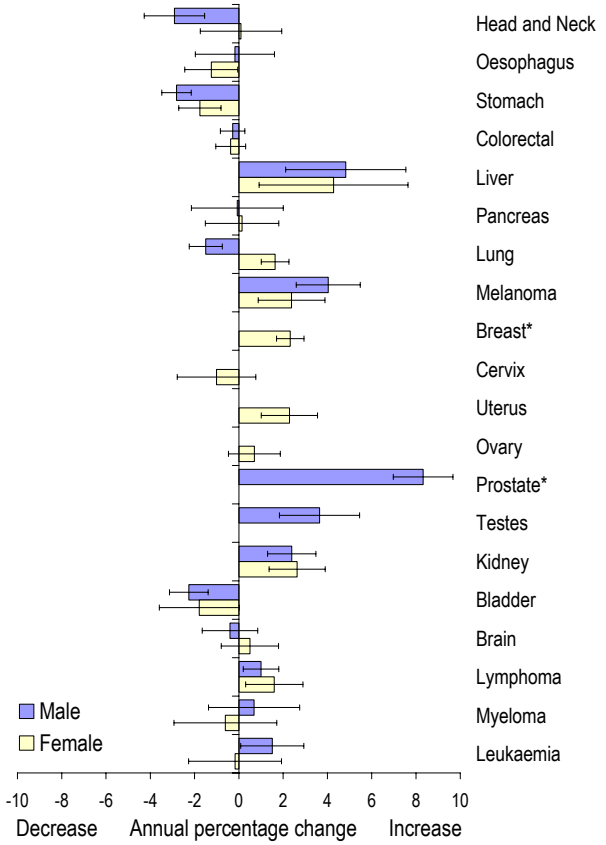
aged 0-49 by 0.9% (p=0.003) per year, 1.0% (p=0.006) per year for those aged 50-64 and 0.7% (p<0.001) per year for those aged 75 and over. There was no significant change for females aged 65-74. Trends for females did not differ significantly between the two countries for any age group. (Fig. 3.8)

Trends by cancer site

Trends in European age-standardised incidence rates (EASIR) varied considerably by cancer site reflecting changes in lifestyles, environment, diagnostic procedures and screening programmes. (Fig. 3.9)

For males incidence rates increased significantly between 1994 and 2004 for liver cancer, melanoma, prostate cancer (1997-2004 only), testicular cancer, kidney cancer, lymphoma and leukaemia. The largest increase was for prostate cancer which can be attributed to the increase in PSA testing as a diagnostic method. In fact the increasing trend in overall male cancer incidence rates was driven by increases in prostate cancer. If prostate cancer is removed from the analysis incidence rates from all male cancers combined (ex. NMSC) fell during 1994-2000 by 1.7% (p<0.001) per year in Northern Ireland and 0.4% per year (p=0.004) in Republic of Ireland. Decreases in male incidence rates were observed for cancer of the head and neck, stomach cancer, lung cancer and bladder cancer. These decreases can mostly be attributed to the decline of smoking among males. (Fig. 1.11)

Figure 3.9: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for all cancers (excluding NMSC) by sex and cancer site: 1994-2004



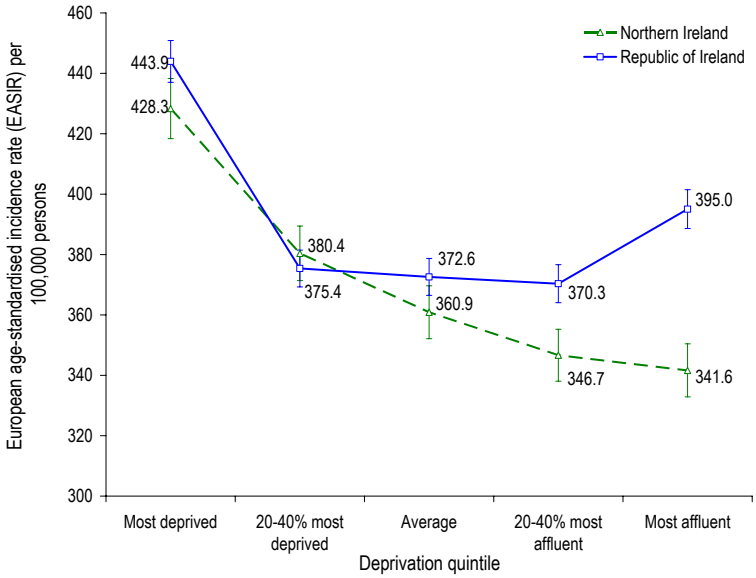
* Trend for 1997-2004 period only

Among females rates of new cases diagnosed increased significantly between 1994 and 2004 for liver cancer, lung cancer, melanoma, breast cancer (1997-2004 only), cancer of the uterus, kidney cancer and lymphoma. Significant decreases in incidence rates for females were only observed for oesophageal cancer and stomach cancer. It is likely some of the increase in breast cancer is linked with increased detection due to breast cancer screening. (Fig. 1.11)

3.1.5: Socio-economic factors

During 2000-2004 incidence rates from all cancers (excluding NMSC) were higher in areas of deprivation than affluence with European age-standardised incidence rates (EASIR) among the 20% most deprived population in Northern Ireland 25.4% (p<0.001) higher than EASIRs among the 20% most affluent population. In Republic of Ireland the difference was 12.4% (p<0.001). The exact relationship between incidence and deprivation however was slightly different in each country. While in Northern Ireland incidence rates decreased steadily with increasing affluence, in Republic of Ireland the relationship was U-shaped with those in the second, third and fourth deprivation quintile having the lowest incidence rates. (Fig. 3.10)

Figure 3.10: European age-standardised incidence rates (EASIR) for all cancers (excluding NMSC) by country specific deprivation quintile: 2000-2004



Cancer rates among the most affluent populations were higher in in Republic of Ireland than in Northern Ireland. Rates in the most affluent band in Northern Ireland were 13.5% lower than those in the equivalent Republic of Ireland population. It is likely however that at least some of the difference between countries is a result of differences in how deprivation is measured. (Fig. 3.10)

Socio-economic variations by cancer site

The relationship between incidence rates and deprivation differed depending upon cancer site during 2000-2004. However these relationships were primarily driven by lifestyle factors with smoking levels in particular causing the higher incidence rates of many cancers in deprived areas. Those cancers which have higher rates in more affluent areas were those either with higher uptake rates for screening (breast cancer), PSA testing (prostate cancer) or more frequent holidays in sunnier climates (melanoma). (Tab. 3.3)

Table 3.3: Summary of relationship between cancer sites and deprivation: 2000-2004

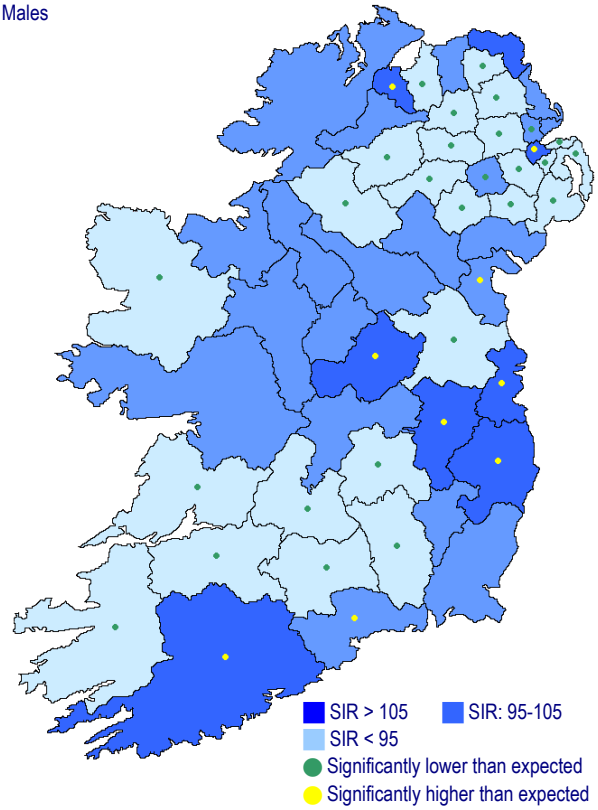
	Cancer site
Incidence rates higher in deprived than affluent areas	Head & Neck, Oesophagus, Stomach, Colorectal, Lung, Cervix, Kidney, Bladder
No significant relationship	Uterus, Ovary, Testes, Lymphoma, Leukaemia
Incidence rates higher in affluent than deprived areas	Melanoma, Breast, Prostate

3.1.6: Geographic variations

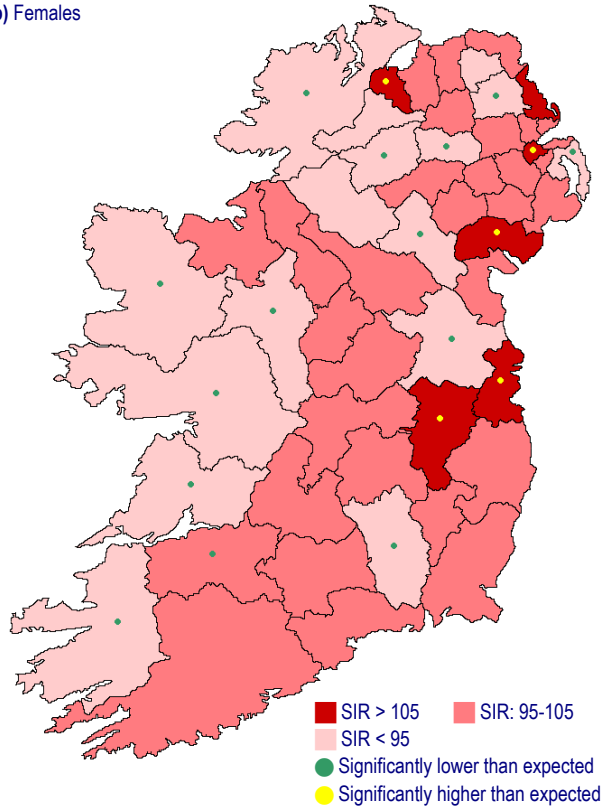
Among males incidence rates of all cancers (excluding NMSC) during 1994-2004 were higher than the average incidence rates for all of Ireland in nine district councils/counties: Dublin, Belfast, Derry, Cork, Kildare, Wicklow, Westmeath, Waterford and Louth. Significantly lower than average male incidence rates occurred in 27 district councils/counties, many of which were in central and southern Northern Ireland and in the south west of Republic of Ireland excluding Cork and Waterford. Among females incidence rates were higher than expected in Dublin, Belfast, Derry, Kildare and Newry & Mourne, while significantly lower than average female incidence rates occurred in 14 district councils/counties with many of these in the west of Ireland. (Fig. 3.11)

Figure 3.11: Significant differences in county/council standardised incidence ratios for all cancers (excluding NMSC) compared to Ireland as a whole: 1994-2004

(a) Males



(b) Females



Geographic variations by cancer site

The relationship between incidence rates and geographic area differed depending upon cancer site for similar reasons that resulted in the variation by socio-economic factors, i.e. lifestyle, uptake of screening etc. These variations are summarised in table 3.4 with the major urban areas of Belfast and Dublin in particular, and to a lesser extent Derry and Cork, frequently having higher incidence rates of various types of cancer compared to Ireland as a whole. (Tab. 3.4)

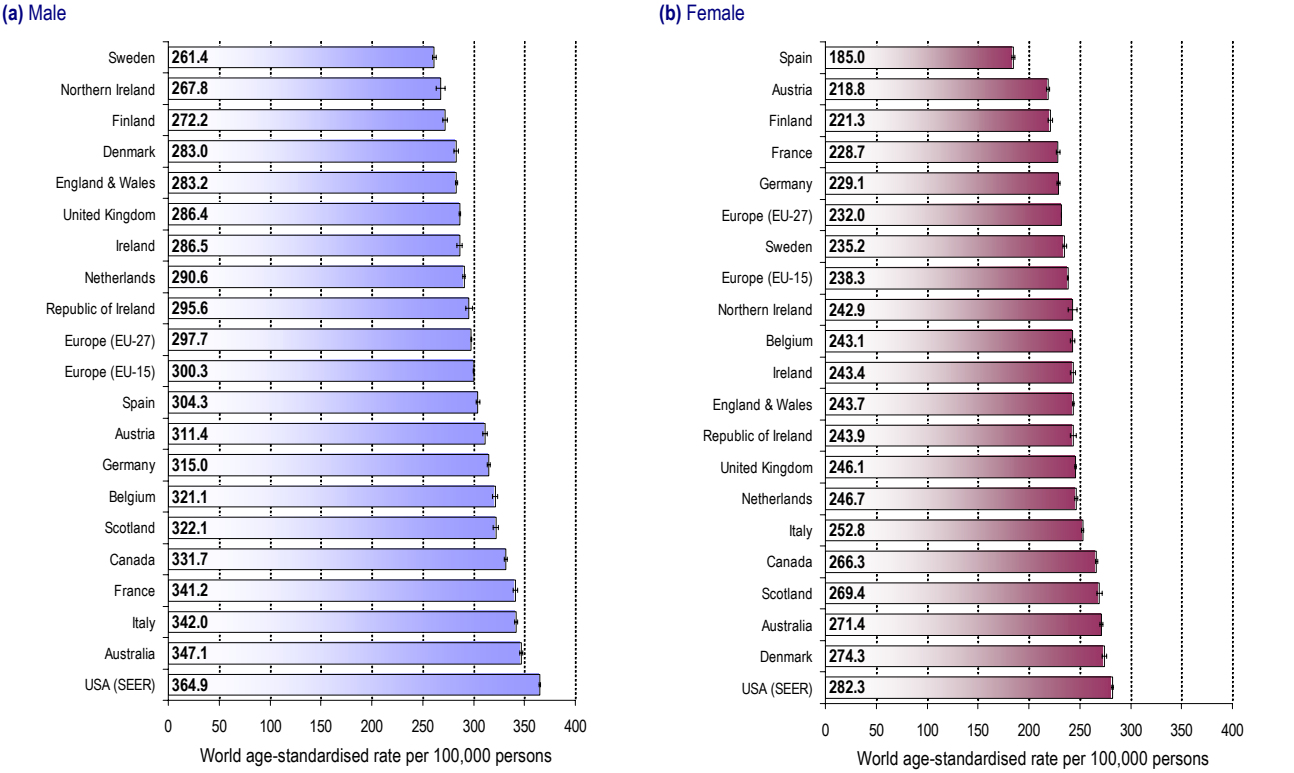
Table 3.4: District councils/counties with significantly higher incidence rates than Ireland by sex and cancer site: 1994-2004

Cancer site	Geographic areas with significantly higher incidence rates than Ireland	
	Male	**Female**
Head & Neck	**Belfast**, Cookstown, Derry, **Dublin**, Galway, Longford	**Belfast**, Coleraine, Derry
Oesophagus	**Belfast**	Carlow, Cork, Kildare
Stomach	**Belfast**, Derry, **Dublin**, Limavady, Newry & Mourne	**Belfast**, Cavan, **Dublin**, Louth, Monaghan, Newry & Mourne
Colorectal	Cork, Derry, **Dublin**, Newry & Mourne,	Cork, Donegal, Newry & Mourne
Liver	**Belfast**, Cork, **Dublin**, Waterford	**Belfast**
Pancreas	Cork, Leitrim	Cork, Mayo
Lung	**Belfast**, Carrickfergus, Derry, **Dublin**, Kildare, Louth	**Belfast**, Derry, **Dublin**
Melanoma	Cork, **Dublin**, North Down	Cork, **Dublin**, South Tipperary, Waterford
Breast		**Dublin**, Kildare, North Down
Cervix		**Belfast**, Carrickfergus, **Dublin**, Leitrim, Wicklow
Uterus		Antrim, Kildare
Ovary		Dungannon
Prostate	Carlow, Cork, Donegal, **Dublin**, Galway, Kerry, Kildare, Offaly, Roscommon, Sligo, Waterford, Wicklow	
Testes	Cork, Derry	
Kidney	Coleraine, Offaly, Westmeath	None
Bladder	**Belfast**, Donegal, **Dublin**, Wicklow	**Dublin**
Brain	Cork	None
Lymphoma	**Belfast**, Craigavon	Armagh, Carrickfergus, Castlereagh, **Dublin**, Newry & Mourne
Myeloma	None	Cork
Leukaemia	Cork, Limerick, North Tipperary	Limerick, Louth

3.1.7: International comparisons

Among males rates for all cancers combined (ex. NMSC) were 4.6% ($p<0.001$) lower in Ireland than in the European Union (15 countries) with male rates in Northern Ireland 10.8% ($p<0.001$) lower than in the EU compared to 1.5% ($p=0.010$) lower in Republic of Ireland. This is likely due to variations in prostate cancer rates. Female rates were however 2.1% ($p<0.001$) higher in Ireland than in the European Union (15 countries) with a similar difference in observed in both Northern Ireland (2.0%) and Republic of Ireland (2.4%). Rates in Ireland were similar to those in the UK for both males and females but were lower than those in USA, Canada and Australia. (Fig. 3.12)

Figure 3.12: International comparisons of world age-standardised incidence rates for all cancers (excluding NMSC): 1998-2000



Source: IARC[15]

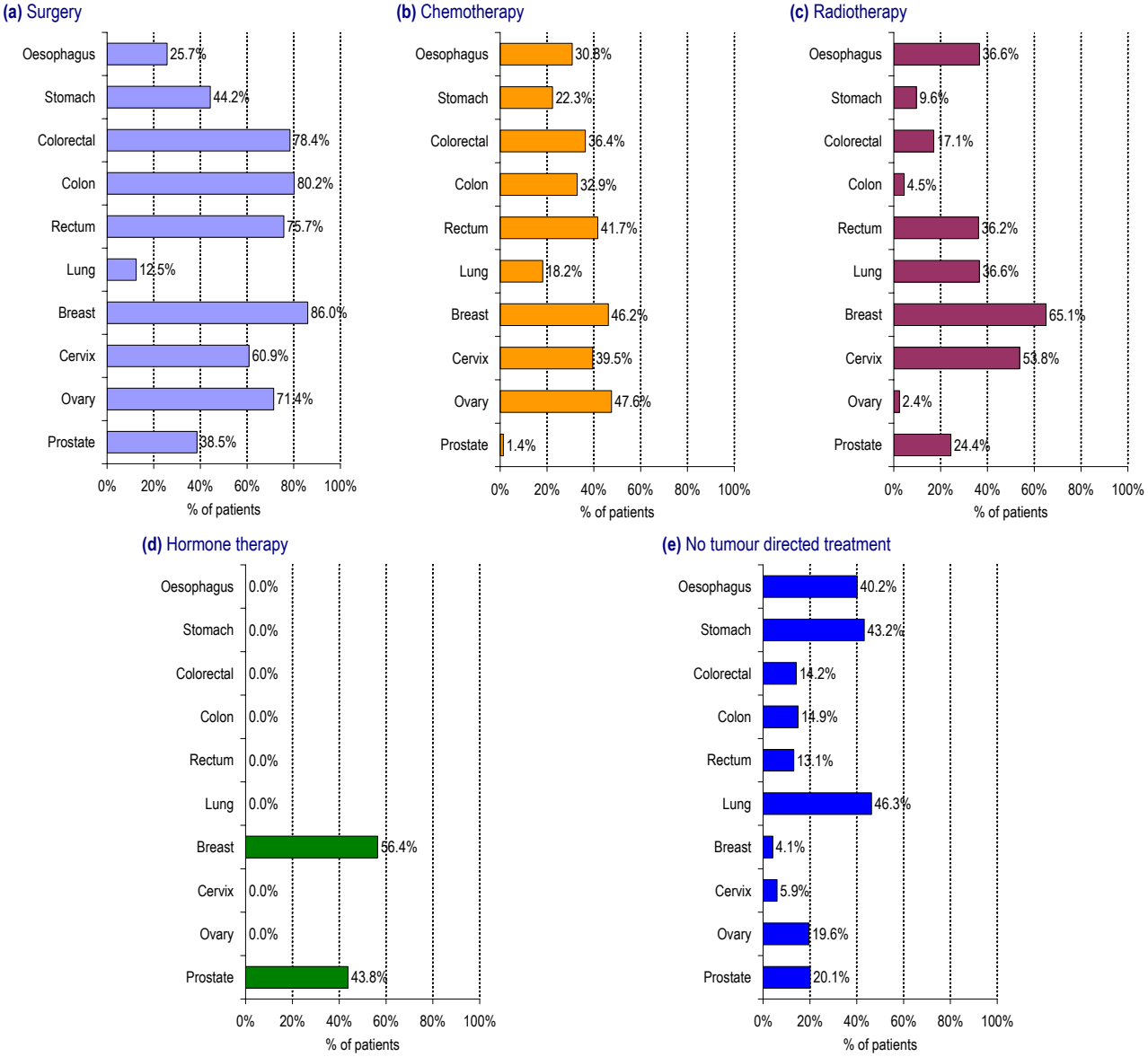
3.2: Treatment

Treatment information in Northern Ireland is only available in detail for selected years (1996 & 2001) and selected cancer sites (oesophagus, stomach, colorectal, lung, breast, cervix, ovary and prostate), thus information for all of Ireland is also restricted to these years and sites. Patients aged 15-99 with a diagnosis of one of these cancers as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment, are included in the following analysis.

3.2.1: Treatment by cancer site

During 2001 surgery was the most common form of treatment received by patients with stomach, colorectal, breast, cervical or ovarian cancer, with hormone therapy most commonly used for prostate cancer patients and radiotherapy the most common form of treatment for oesophageal and lung cancer patients. Hormone therapy was only used to treat prostate cancer and breast cancer, with chemotherapy only used for a very small proportion of prostate cancer patients and radiotherapy only used in a small number of colon and ovarian cancer cases. A high proportion of patients received some form of tumour directed treatment for most cancer types, particularly for breast and cervical cancers, however among patients with a low survival cancer (lung, oesophageal and stomach) almost half did not have a record of receiving any form of tumour directed treatment. (Fig. 3.13)

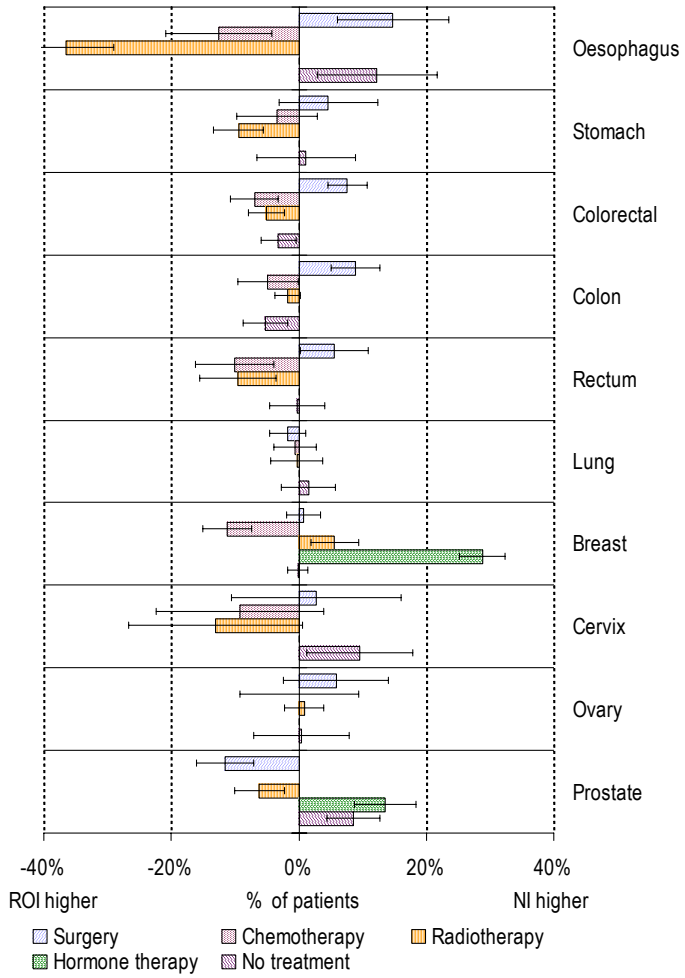
Figure 3.13: Tumour directed treatment received by cancer patients in Ireland for selected cancer sites: 2001



3.2.2: Treatment: North/South differences

While there were remarkable similarities in treatment of some cancers (e.g. lung cancer, ovarian cancer), treatment levels in Northern Ireland and Republic of Ireland differed for particular cancer sites and types of treatment. In some cases these differences may be a result of differences in approach to management of cancer patients, the stage at which patients were diagnosed, age of patient, general health of patient or the cell type affected by the cancer. However there is no direct evidence to suggest that these factors are the sole cause of any differences between the two countries.

Figure 3.14: Differences in proportions of patients receiving tumour directed treatment during 2001 between Northern Ireland and Republic of Ireland for selected cancer sites



The key differences between Northern Ireland and Republic of Ireland during 2001 for the cancer sites for which information was available were as follows:

- Oesophageal cancer: The use of surgery as a treatment was 14.8% higher in Northern Ireland than in Republic of Ireland, while the use of chemotherapy and radiotherapy was 12.6% and 36.5% lower respectively. The proportion of patients receiving no tumour directed treatment was 12.3% higher in Northern Ireland than Republic of Ireland.

- Stomach cancer: There was no significant difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving surgery or chemotherapy or receiving no tumour directed treatment after diagnosis. However the use of radiotherapy was 9.4% lower in Northern Ireland than in Republic of Ireland.

- Colorectal cancer: Use of surgery was 7.6% higher in Northern Ireland than Republic of Ireland. However chemotherapy and radiotherapy use were both lower in Northern Ireland, by 7.0% and 5.1% respectively. The differences in the use of radiotherapy were found mainly in the treatment of cancer of the rectum. Overall the proportion of patients receiving no tumour directed treatment was 3.2% lower in Northern Ireland than Republic of Ireland.

- Lung cancer: There was no significant difference in the proportions of patients receiving different treatment types between the two countries.

- Breast cancer: During 2001 5.6% more patients received radiotherapy and 28.8% more received hormone therapy in Northern Ireland than Republic of Ireland, while 11.2% fewer patients received chemotherapy in Northern Ireland.

- Cervical cancer: There was no conclusive difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving surgery, chemotherapy or radiotherapy although the proportion receiving no tumour directed treatment was 9.6% higher in Northern Ireland. This difference however may reflect incomplete data collection in Northern Ireland.

- Ovarian cancer: There were no significant differences between Northern Ireland and Republic of Ireland in the proportion of patients receiving surgery, chemotherapy or radiotherapy or in the proportion receiving no tumour directed treatment during 2001.

- Prostate cancer: The proportion of patients receiving surgery as a treatment was 11.5% lower in Northern Ireland than Republic of Ireland while radiotherapy use was 6.2% higher. Hormone therapy use was 13.5% higher in Northern Ireland, while the receipt of no tumour directed treatment was 8.5% higher. (Fig. 3.14)

To generalise, patients with cancer in Northern Ireland were less likely to have radiotherapy and/or chemotherapy and more likely to have surgery or no tumour directed treatment than those in Republic of Ireland. It should be noted that for some patients with advanced disease invasive treatments may not be in the best interest of the patient.

3.2.3: Changes in treatment levels over time

As a result of changes in cancer management in both Northern Ireland and Republic of Ireland, treatment levels for particular cancer sites and types of treatment changed quite dramatically between 1996 and 2001 in Ireland. The key changes for the cancer sites for which information was available were as follows:

- Oesophageal cancer: The use of chemotherapy and radiotherapy increased by 14.7% and 8.8% respectively, while surgery use decreased by 8.3%. The proportion of patients receiving no tumour directed treatment decreased by 7.6%. The increase in chemotherapy use occurred in both countries (NI: 13.0%, ROI: 15.9%). The increase in radiotherapy use however was only present in Republic of Ireland (14.3%), as were the decreases in surgery use (11.3%) and the proportion of patients receiving no tumour directed treatment (11.3%).

- Stomach cancer: The use of chemotherapy and radiotherapy increased by 12.4% and 5.4% respectively, with no significant change in surgery levels or the proportion of patients receiving no tumour directed treatment. While the increase in the use of chemotherapy between 1996 and 2001 was present in both Northern Ireland (6.9%) and Republic of Ireland (15.6%), the increase in the use of radiotherapy was only present in Republic of Ireland where an 8.7% increase occurred.

- Colorectal cancer: Use of chemotherapy and radiotherapy increased by 13.4% and 7.7% respectively while the proportion receiving no tumour directed treatment decreased by 2.9%. The increase in radiotherapy was driven solely by its increased use in treating cancer of the rectum. Chemotherapy and radiotherapy increases of similar sizes were present in both Northern Ireland and Republic of Ireland.

- Lung cancer: Chemotherapy and radiotherapy use increased by 5.2% and 4.2% respectively while surgery use decreased by 2.7%. Changes in the percentage of patients receiving radiotherapy, surgery or no tumour directed treatment were only significant in Republic of Ireland; however chemotherapy use did increase significantly in both countries.

- Breast cancer: For breast cancer patients the use of surgery as a treatment increased by 3.4%, chemotherapy use increased by 16.0% and radiotherapy use increased by 14.8%, while hormone therapy use decreased by 11.4%. The increase in use of radiotherapy was observed in both Northern Ireland (12.2%) and Republic of Ireland (16.4%), as was the increase in the use of chemotherapy (NI: 14.8%; ROI: 16.0%), the increase in the use of surgery (NI: 5.4%; ROI: 2.5%) and the decrease in treatment using hormone therapy (NI: 5.7%; ROI: 13.1%). The decreased use of hormone therapy may reflect better targeting of treatment as this treatment works best for those who are oestrogen receptor positive.

- Cervical cancer: The use of chemotherapy increased in Ireland by 33.4% with no significant change in use of surgery or radiotherapy. The proportion of patients receiving no tumour directed treatment decreased by 5.0%. The increase in the use of chemotherapy was apparent in both Northern Ireland (23.1%) and Republic of Ireland (37.6%).

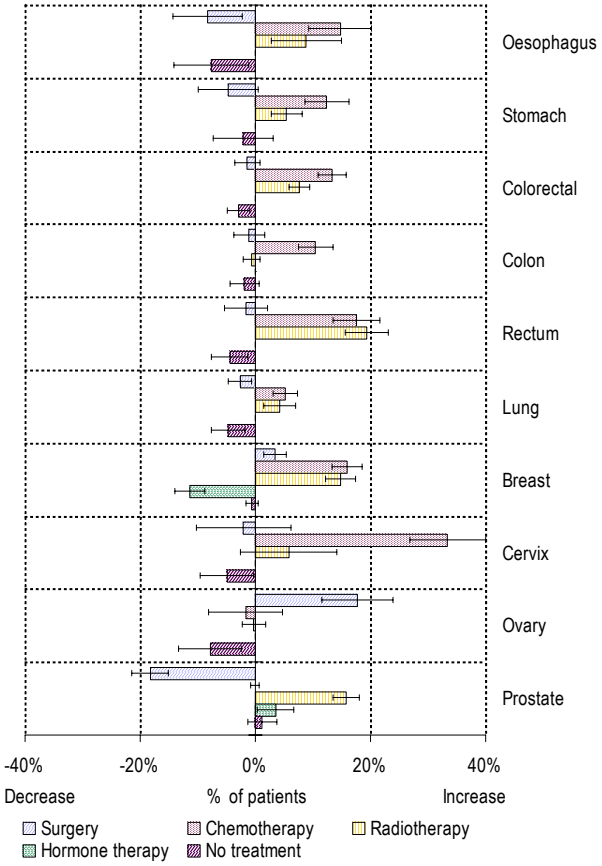
- Ovarian cancer: Compared to 1996 the use of surgery increased in Ireland by 17.7%, although this was driven by improvements in Republic of Ireland only, where there was a 25.7% increase in surgery use. Consequently, the proportion of patients receiving no tumour directed treatment decreased by 7.8%, again driven by the changes in Republic of Ireland (11.8%).

- Prostate cancer: Use of radiotherapy and hormone therapy in 2001 was 15.8% and 3.5% higher respectively compared to their use in 1996 while surgery use was 18.3% lower. There was no change in the proportion of patients receiving no tumour directed treatment although an increase of 5.7% was observed in Northern Ireland. The increase in use of radiotherapy was observed in both Northern Ireland (13.0%) and Republic of Ireland (16.4%), as was the decrease in treatment using surgery (NI: 23.3%; ROI: 17.0%), however the increase in the use of hormone treatment only occurred in Republic of Ireland with a 6.1% increase. (Fig. 3.15)

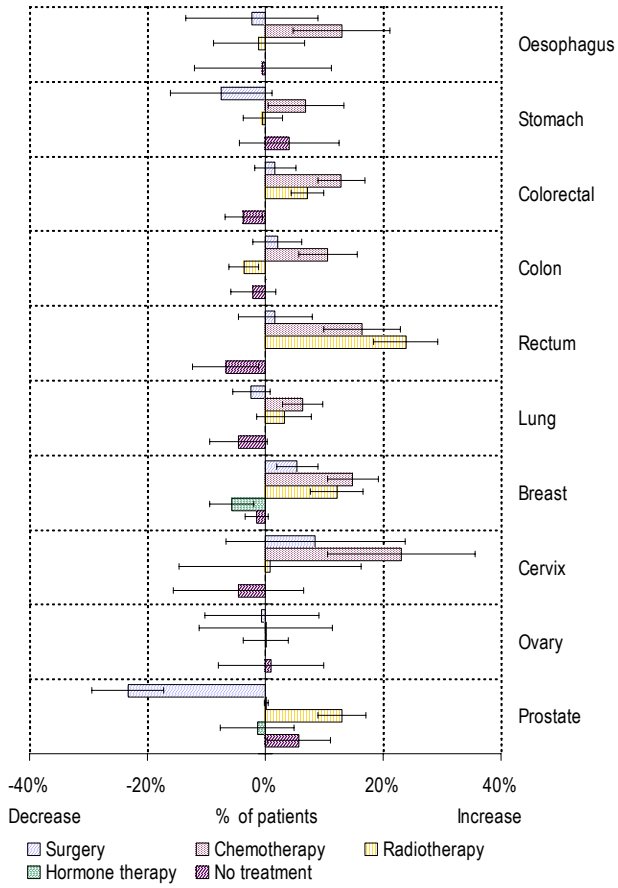
The similarities in changes in treatment of breast cancer and cervical cancer are reassuring. Changes between 1996 and 2001 in other cancers have been more marked in Republic of Ireland than Northern Ireland. This requires further study, however it must be remembered that differences may reflect differences in data collection, data availability or the greater number of cases available for analysis in Republic of Ireland which leads to easier detection of significant changes.

Figure 3.15: Changes in proportions of patients receiving tumour directed treatment in Ireland between 1996 and 2001 for selected cancer sites

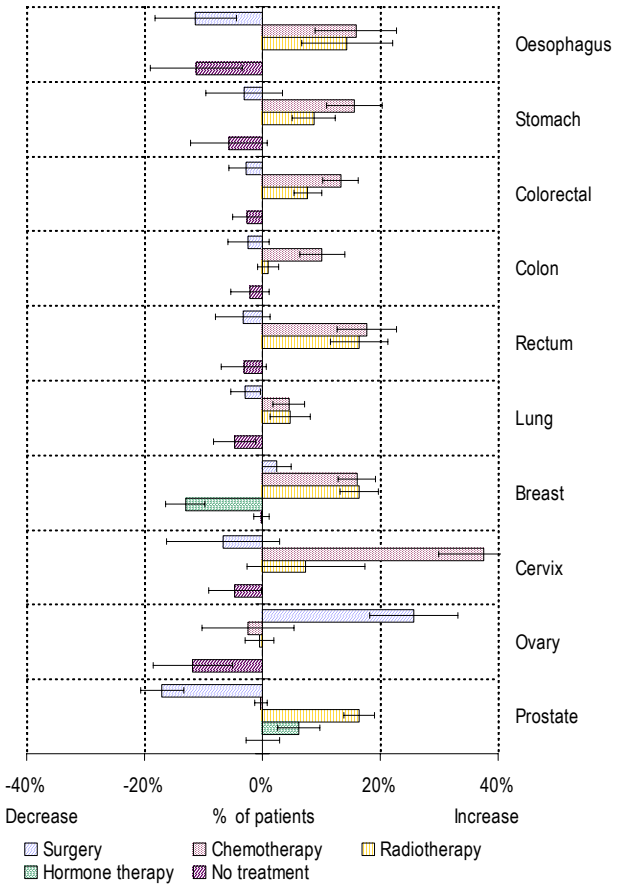
(a) Ireland



(b) Northern Ireland



(c) Republic of Ireland



3.3: Survival

Five year (age-standardised) relative survival for patients with cancer (excluding NMSC) diagnosed in Ireland during 2000-2004 was estimated to be 49.6%. However, five-year (age-standardised) relative survival was estimated to be 4.8% (p<0.001) higher for females than males diagnosed during the period. (Fig. 3.16, Tab. 3.5)

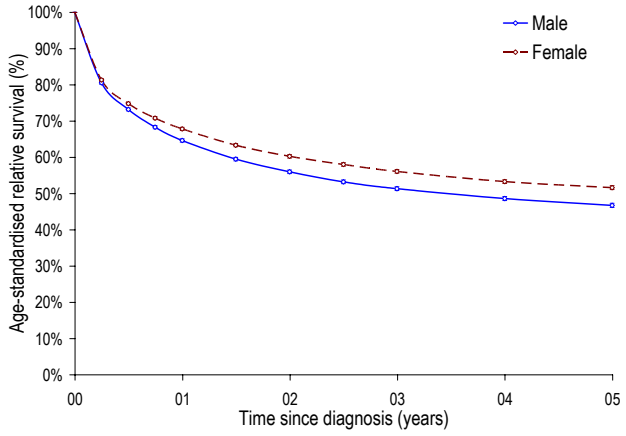
Table 3.5: Age-standardised relative survival for patients with cancer (excluding NMSC) by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	62.3% (61.5%, 63.1%)	67.5% (66.8%, 68.3%)	65.2% (64.7%, 65.8%)
	Republic of Ireland	65.7% (65.2%, 66.2%)	68.0% (67.5%, 68.6%)	67.1% (66.8%, 67.5%)
	Ireland	64.7% (64.2%, 65.1%)	67.9% (67.4%, 68.3%)	66.5% (66.2%, 66.8%)
5-year	Northern Ireland	43.2% (42.2%, 44.2%)	51.5% (50.6%, 52.4%)	47.9% (47.2%, 48.5%)
	Republic of Ireland	48.4% (47.7%, 49.1%)	51.7% (51.1%, 52.4%)	50.4% (50.0%, 50.9%)
	Ireland	46.8% (46.2%, 47.3%)	51.6% (51.1%, 52.2%)	49.6% (49.2%, 50.0%)

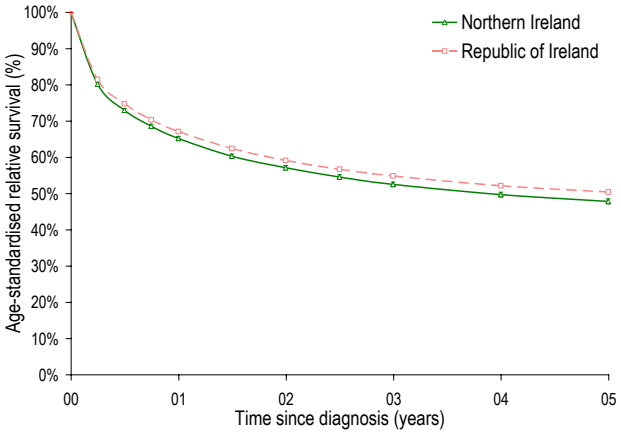
The difference in survival between males and females was apparent in both Northern Ireland and Republic of Ireland, although the difference between the two sexes was slightly larger in Northern Ireland. Additionally for males five-year (age-standardised) relative survival for patients diagnosed with cancer (excluding NMSC) during 2000-2004 was 5.2% (p<0.001) higher in Republic of Ireland than in Northern Ireland. There was no significant difference in survival between the two countries for females. The differences for males however were due to the higher levels of prostate cancer in Republic of Ireland where survival from this cancer was higher. Excluding prostate cancer there was no significant difference in five-year (age-standardised) relative survival between the two countries for males. (Fig. 3.16, Tab. 3.5)

Figure 3.16: Age-standardised relative survival for patients with cancer (excluding NMSC) by sex and country: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



3.3.1: Survival by cancer site

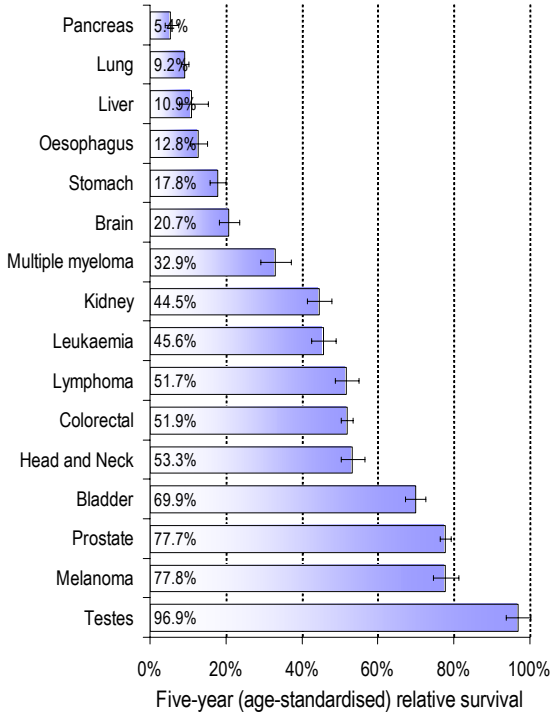
Survival varied considerably by cancer site with estimates of five-year (age-standardised) relative survival for male patients diagnosed in 2000-2004 ranging from 5.4% for pancreatic cancer to 96.9% for testicular cancer, while among females five-year (age-standardised) relative survival ranged from 6.8% for pancreatic cancer to 91.6% for malignant melanoma. Lung, liver, oesophageal, stomach and brain cancer also had very poor survival for both males and females, while five-year (age-standardised) relative survival from male prostate and female breast cancers was above 75%. (Fig. 3.17)

For most cancers five-year (age-standardised) relative survival appeared higher among females than males, although few of these differences were statistically significant. Cancers where survival was conclusively higher among females were: lung cancer, malignant melanoma, kidney cancer and brain cancer. Survival from prostate cancer (the most common male cancer) was similar to that from breast cancer (the most common female cancer) for patients diagnosed in 2000-2004. (Fig. 3.17)

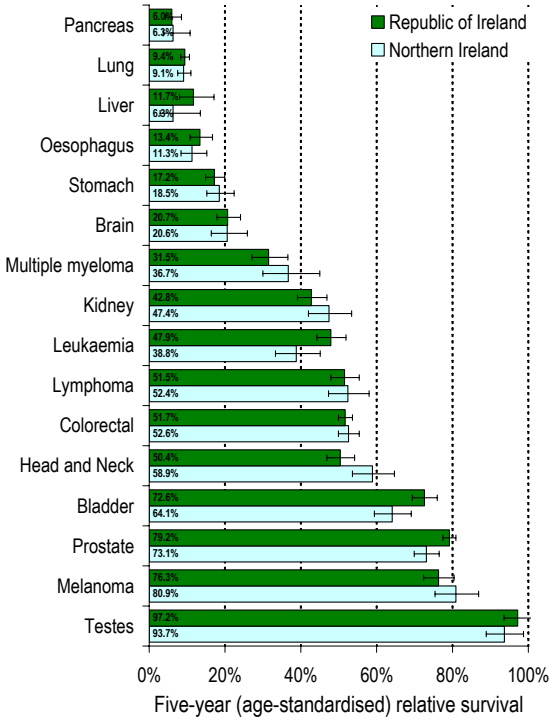
There was very little significant variation between Northern Ireland and Republic of Ireland in five-year (age-standardised) relative survival for most cancer sites for patients diagnosed in 2000-2004. However five-year (age-standardised) relative survival from male prostate and bladder cancers was higher in Republic of Ireland than in Northern Ireland. Among females five-year (age-standardised) relative survival from pancreatic cancer, leukaemia and bladder cancer was higher in Republic of Ireland, while survival from malignant melanoma was better in Northern Ireland. (Fig. 3.17)

Figure 3.17: Five-year (age-standardised) relative survival for patients with cancer (excluding NMSC) by sex and cancer site: 2000-2004 period analysis estimates

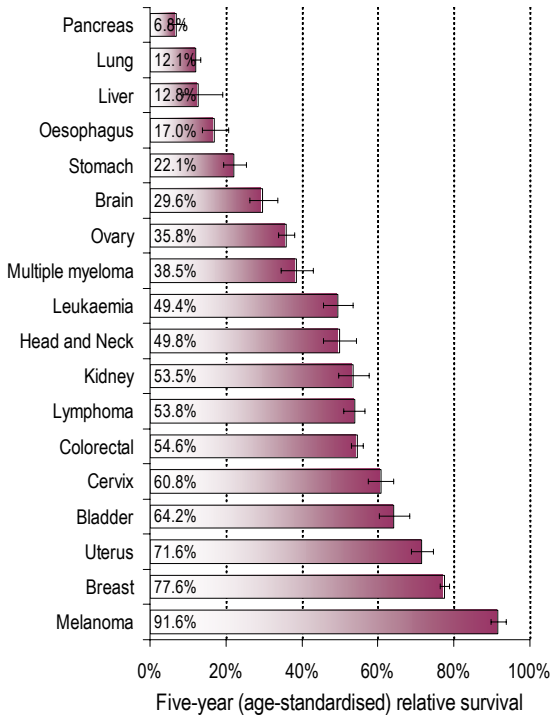
(a) Male – All Ireland



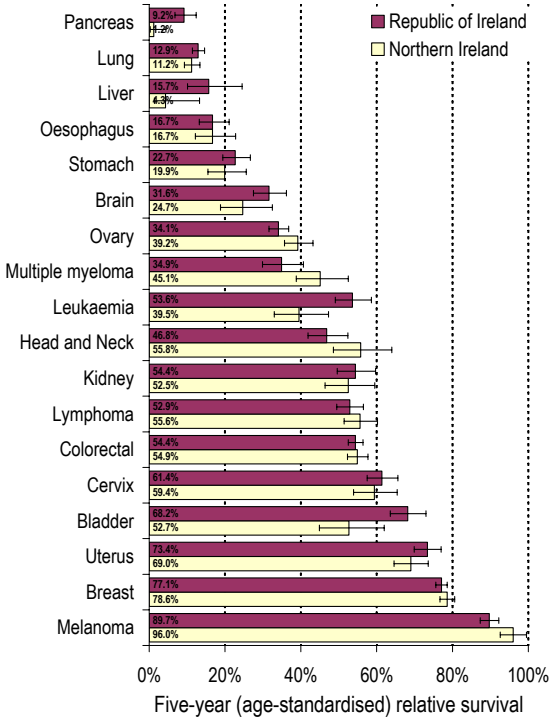
(b) Male – Northern Ireland and Republic of Ireland



(c) Female – All Ireland



(d) Female – Northern Ireland and Republic of Ireland



3.3.2: Changes in survival over time

Five-year (age-standardised) relative survival for patients diagnosed with cancer (excluding NMSC) in Ireland improved by 3.9% ($p<0.001$) for males and 1.9% ($p=0.008$) for females between 1994-1996 and 1997-1999. Improvements were significant for all persons in both countries with a 2.7% ($p=0.002$) increase in Northern Ireland and a 3.0% ($p<0.001$) increase in Republic of Ireland between the two three-year periods. These changes however were not apparent for each sex in each country with no significant change for males in Northern Ireland or females in Republic of Ireland. However five-year (age-standardised) relative survival for females with cancer (excluding NMSC) in Northern Ireland increased by 2.7% ($p=0.002$) between 1994-1996 and 1997-1999, while male five-year (age-standardised) relative survival increased in Republic of Ireland by 4.7% ($p<0.001$). (Tab. 3.6, Fig. 3.18)

Figure 3.18: Age-standardised relative survival for patients with cancer (excluding NMSC) by sex, country and period of diagnosis: 1994-1999

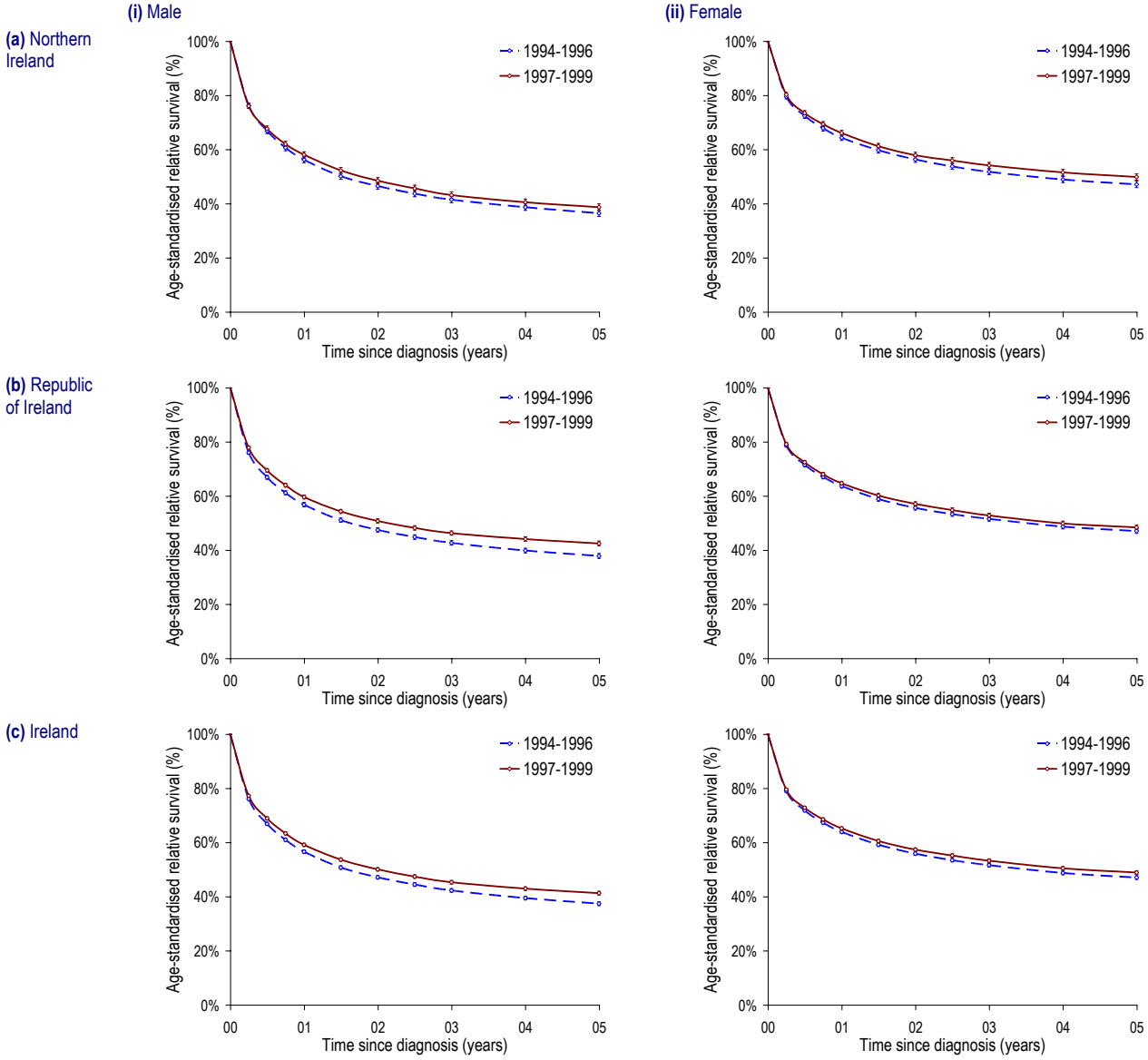


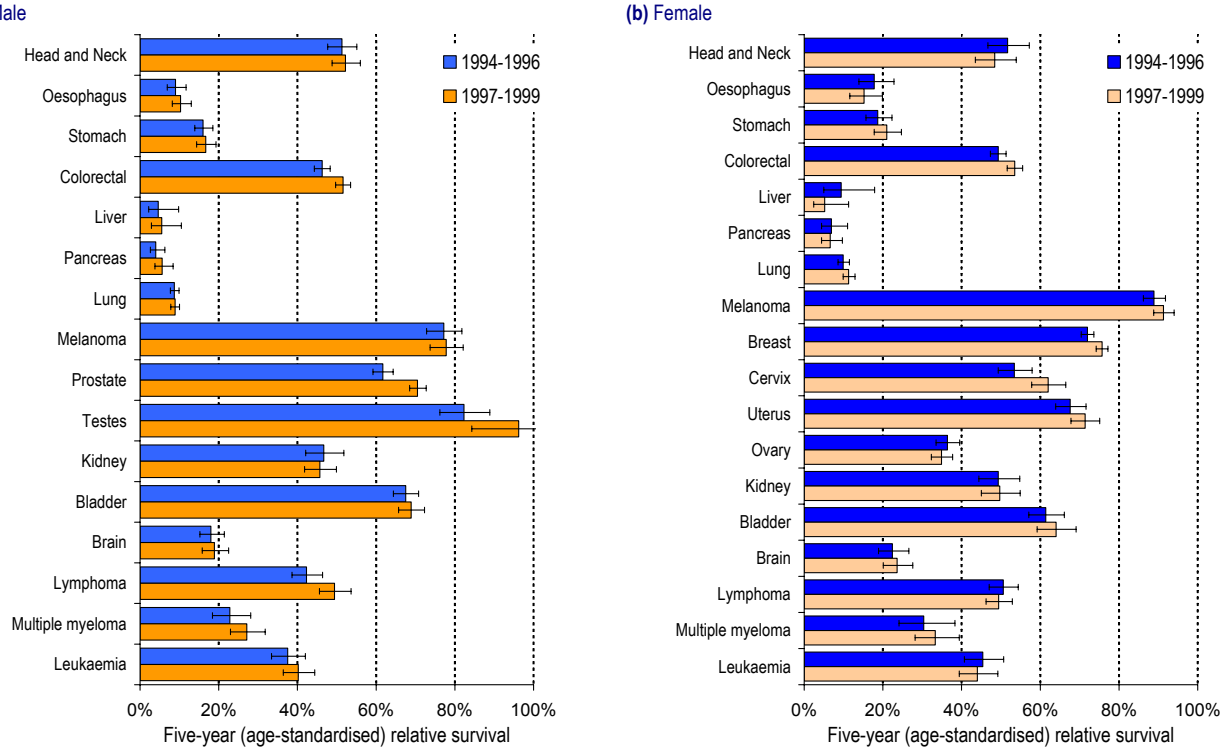
Table 3.6: Age-standardised relative survival for patients with cancer (excluding NMSC) by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	60.7% (60.0%, 61.5%)	62.6% (61.9%, 63.3%)	42.3% (41.5%, 43.2%)	45.0% (44.1%, 45.8%)
	Republic of Ireland	60.6% (60.1%, 61.1%)	62.5% (62.0%, 63.0%)	42.8% (42.2%, 43.5%)	45.8% (45.2%, 46.4%)
	Ireland	60.7% (60.2%, 61.1%)	62.5% (62.1%, 62.9%)	42.6% (42.1%, 43.1%)	45.5% (45.0%, 46.0%)
Male	Northern Ireland	56.3% (55.2%, 57.4%)	58.2% (57.1%, 59.2%)	36.5% (35.4%, 37.8%)	38.8% (37.6%, 40.0%)
	Republic of Ireland	56.9% (56.1%, 57.7%)	59.7% (59.0%, 60.5%)	37.9% (37.1%, 38.8%)	42.6% (41.7%, 43.4%)
	Ireland	56.7% (56.1%, 57.3%)	59.2% (58.6%, 59.8%)	37.5% (36.8%, 38.2%)	41.4% (40.7%, 42.1%)
Female	Northern Ireland	64.4% (63.4%, 65.4%)	66.2% (65.2%, 67.2%)	47.2% (46.0%, 48.4%)	49.9% (48.8%, 51.1%)
	Republic of Ireland	63.8% (63.0%, 64.5%)	64.8% (64.1%, 65.5%)	47.1% (46.3%, 48.0%)	48.5% (47.6%, 49.3%)
	Ireland	64.0% (63.4%, 64.6%)	65.3% (64.7%, 65.9%)	47.1% (46.4%, 47.8%)	49.0% (48.3%, 49.7%)

Examination of the improvement in survival for all cancers combined (ex. NMSC) by cancer site illustrates improvement in almost all cancers. Although some apparent improvements were not statistically significant (e.g. for cervical cancer and testicular cancer) three of the four most common cancers showed significant improvement. Five-year survival (ASRS) for patients diagnosed in 1997-1999 was higher than for those diagnosed in 1994-1996 by 5.3% for male colorectal cancer, 4.2% for female colorectal cancer, 3.7% for

female breast cancer and 8.8% for male prostate cancer, the latter at least in part due to lead-time bias with detection of an increased number of prostate cancers due to PSA testing. Survival did not worsen for any cancer site. (Fig. 3.19)

Figure 3.19: Five-year (age-standardised) relative survival for patients with cancer (excluding NMSC) in Ireland by sex, cancer site and period of diagnosis



3.3.3: Observed survival

While relative survival is an adjusted measure that reflects only deaths as a result of cancer, observed survival includes causes of death other than cancer and thus represents survival actually experienced by cancer patients. For those diagnosed with cancer (ex. NMSC) during 1997-1999 in Ireland, 32.6% of males and 44.8% of females survived five years. Observed survival improved in Ireland between 1994-1996 and 1997-1999 by 3.8% ($p<0.001$) for males and 2.2% ($p<0.001$) for females. Significant improvements occurred during this period among both males and females in Republic of Ireland and Northern Ireland. However five-year observed survival was 3.2% ($p<0.001$) higher in Republic of Ireland for males than in Northern Ireland, although there was no significant difference among females. (Tab. 3.7)

Table 3.7: Observed survival for patients with cancer (excluding NMSC) by sex, country and period of diagnosis: 1994-1999

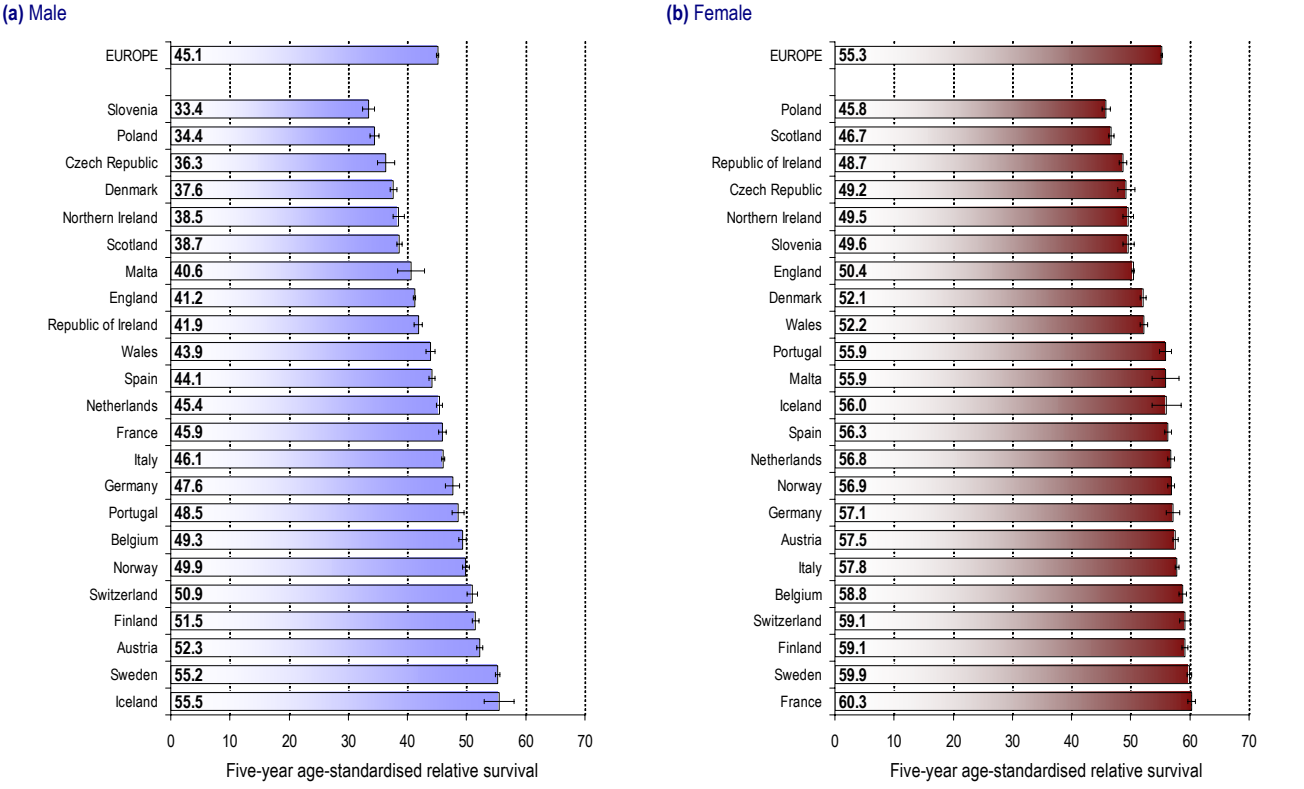
		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	58.4% (57.7%, 59.1%)	60.1% (59.4%, 60.9%)	35.5% (34.8%, 36.2%)	37.9% (37.2%, 38.7%)
	Republic of Ireland	58.5% (57.9%, 59.0%)	60.6% (60.1%, 61.1%)	35.6% (35.1%, 36.1%)	39.1% (38.6%, 39.6%)
	Ireland	58.4% (58.0%, 58.9%)	60.4% (60.0%, 60.8%)	35.6% (35.2%, 36.0%)	38.7% (38.3%, 39.1%)
Male	Northern Ireland	53.1% (52.1%, 54.2%)	54.7% (53.7%, 55.8%)	28.5% (27.5%, 29.4%)	30.4% (29.5%, 31.4%)
	Republic of Ireland	53.7% (52.9%, 54.4%)	56.5% (55.8%, 57.2%)	29.0% (28.3%, 29.6%)	33.6% (32.9%, 34.3%)
	Ireland	53.5% (52.9%, 54.1%)	55.9% (55.4%, 56.5%)	28.8% (28.3%, 29.4%)	32.6% (32.1%, 33.2%)
Female	Northern Ireland	63.5% (62.5%, 64.5%)	65.1% (64.1%, 66.1%)	42.3% (41.3%, 43.3%)	44.8% (43.8%, 45.8%)
	Republic of Ireland	63.5% (62.8%, 64.3%)	64.8% (64.1%, 65.5%)	42.7% (42.0%, 43.5%)	44.9% (44.1%, 45.6%)
	Ireland	63.5% (62.9%, 64.1%)	64.9% (64.3%, 65.5%)	42.6% (42.0%, 43.2%)	44.8% (44.2%, 45.4%)

3.3.4: European comparisons

Five-year (age-standardised) relative survival from cancer (excluding NMSC) for patients diagnosed in 1995-1999 in Republic of Ireland was 3.2% ($p<0.001$) lower for males and 6.6% ($p<0.001$) lower for females than the European average of 45.1% for males and 55.3% for females. In Northern Ireland five-year (age-standardised) relative survival was 6.6% ($p<0.001$) lower for males and

5.8% lower for females than the European average. These differences are however likely linked to variations in the proportions of difference cancer types in each country. (Fig. 3.20)

Figure 3.20: European comparisons of five-year age-standardised relative survival for patients with cancer (excluding NMSC): 1995-1999

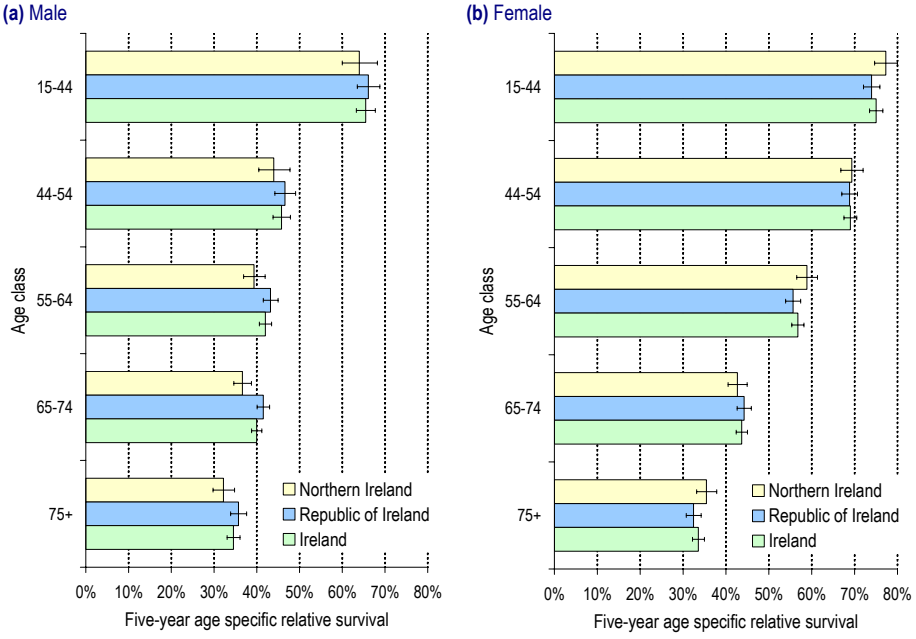


Source: EUROCARE-IV[16]

3.3.5: Survival and age

Five-year relative survival varied by age for patients diagnosed with cancer (ex. NMSC) in Ireland during 1997-1999 with five-year survival dropping by 30.9% ($p<0.001$) for males between ages 15-44 and ages 75+ and by 41.5% ($p<0.001$) for females. For males the difference between these age groups increases to 39.5% ($p<0.001$) if prostate cancer is excluded. These differences were also significant in both Republic of Ireland and Northern Ireland with similar differences in five-year survival between those aged 15-44 and 75+. There were no conclusive differences in survival between males and females for any particular age class or between Northern Ireland and Republic of Ireland with the exception of males aged 65-74 among whom five-year survival was 4.9% ($p=0.007$) lower in Northern Ireland. The fall off in survival with increasing age may relate to the type of cancers which occur more commonly with age and their survival but also to the presence of other diseases which may influence treatment choices or affect overall survival. (Fig. 3.21)

Figure 3.21: Five-year age-specific relative survival for patients with cancer (excluding NMSC) by sex and country: 1997-99



Five-year survival (ASRS) improved by 3.6% ($p<0.001$) for patients aged 15-64 and by 2.3% for patients aged 65 and over in Ireland between 1994-1996 and 1997-1999. Increases in five-year

survival (ASRS) were also apparent in Northern Ireland and Republic of Ireland for both of these age groups (Fig. 3.21). For patients aged 15-64 or patients aged 65 and over there was no significant difference in five-year survival (ASRS) for patients diagnosed in 1997-1999 between Northern Ireland and Republic of Ireland. (Tab. 3.8)

Table 3.8: Five-year age-standardised relative survival for patients with cancer (excluding NMSC) by country, age and period of diagnosis: 1994-1999

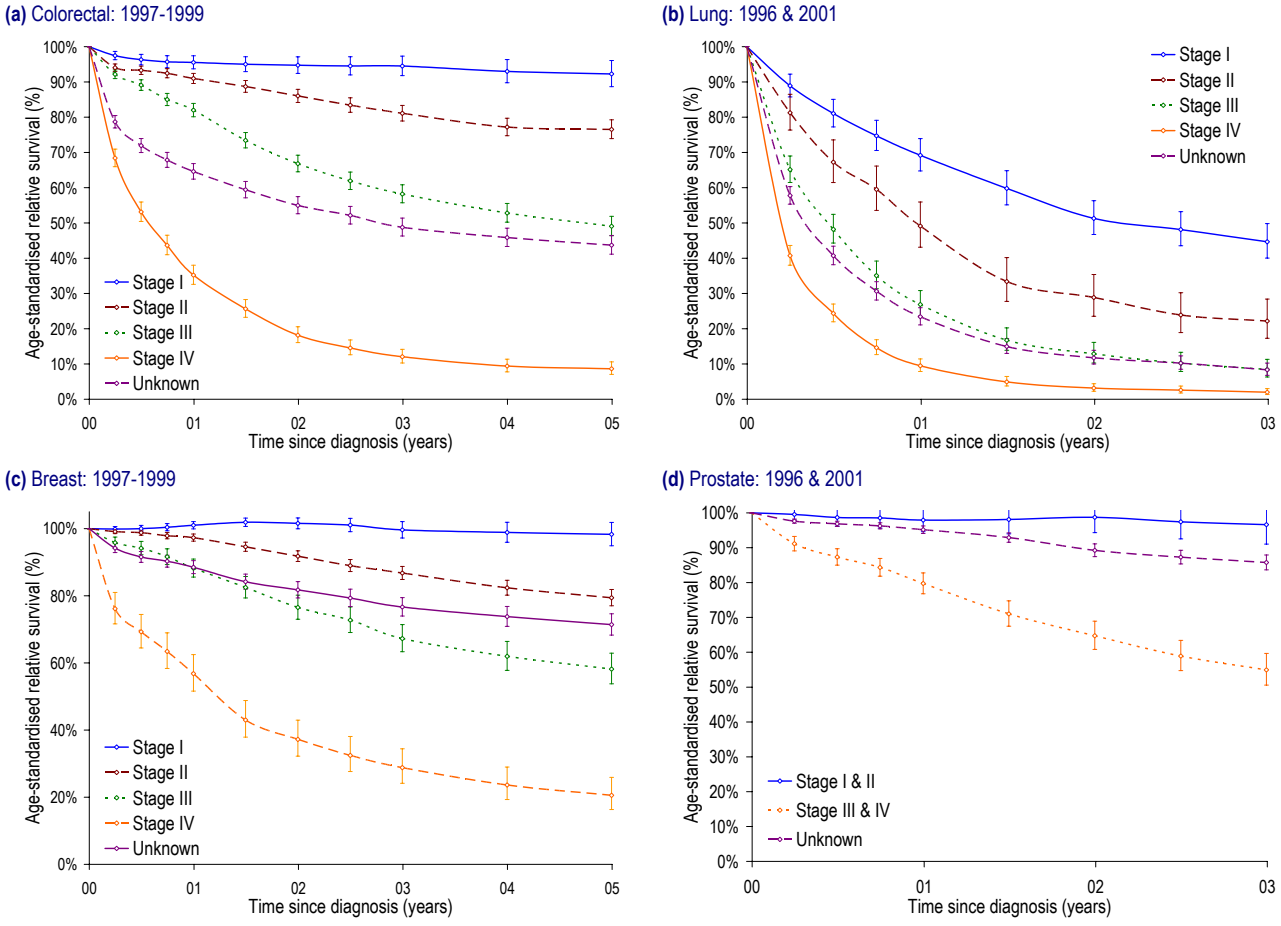
	Five-year age-standardised relative survival (95% CI)			
	15-64		65+	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	53.5% (52.3%, 54.8%)	56.4% (55.2%, 57.7%)	34.2% (33.1%, 35.4%)	36.7% (35.5%, 37.8%)
Republic of Ireland	52.0% (51.1%, 52.9%)	56.0% (55.1%, 56.8%)	36.2% (35.4%, 37.1%)	38.4% (37.6%, 39.3%)
Ireland	52.5% (51.8%, 53.2%)	56.1% (55.4%, 56.8%)	35.5% (34.8%, 36.2%)	37.8% (37.2%, 38.5%)

3.3.6: Survival and stage

Stage at diagnosis was probably the biggest factor influencing survival from cancer for patients diagnosed in Ireland. For example:

- For colorectal cancer five-year (age-standardised) relative survival ranged from 92.3% for patients diagnosed at stage I to 8.6% for patients diagnosed at stage IV. Survival for patients without a stage assigned was closest to that for patients diagnosed at stage III.
- For lung cancer patients diagnosed in 1996 and 2001 three-year (age-standardised) relative survival for patients diagnosed at stage I was 42.7% higher ($p<0.001$) than those diagnosed at stage IV, whose three-year (age-standardised) relative survival was only 2.0%. Survival for those with an unknown stage was closest to those diagnosed at stage III.
- For patients diagnosed in 1997-1999 five-year (age-standardised) relative survival from breast cancer ranged from 98.3% at stage I to 20.6% at stage IV. Five-year (age-standardised) relative survival for patients without a stage assigned was approximately half way between that for patients diagnosed at stage II and stage III, at 71.4%.
- For patients diagnosed in 1997-1999 survival from prostate cancer varied depending upon the stage at diagnosis, with three-year (age-standardised) relative survival from stage I & II disease 96.6% compared to 54.9% from stage III & IV disease. Three-year (age-standardised) relative survival for patients without a stage assigned was 85.8%. (Fig. 3.22)

Figure. 3.22: Age-standardised relative survival for colorectal, lung, breast and prostate cancers by stage



3.4: Mortality

During 2000-2004 there was an average of 5,921 male and 5,340 female deaths per year from cancer. For consistency with incidence data this excludes NMSC which due to being easily treatable contributes only 57 deaths per year, a small number compared to the number of cases diagnosed. In the absence of other deaths males had a 15.1% risk of dying from cancer before the age of 75 compared to 11.5% for females. (Tab. 3.9)

European age-standardised mortality rates (EASMRs) among males were 42.9% higher than among females (p<0.001) in 2000-2004, with a similar difference between males and females existing in both Northern Ireland and Republic of Ireland. However mortality was generally higher in Republic of Ireland, with male EASMRs 3.9% (p=0.001) and female EASMRs 3.6% (p=0.006) lower in Northern Ireland. (Tab. 3.9)

Table 3.9: Summary statistics for deaths from all cancers (excluding NMSC): 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	1,879	1,784	3,662	4,042	3,556	7,598	5,921	5,340	11,261
Median age at death	73	74	73	72	73	73	72	73	73
Cumulative risk (Aged 0 to 74)	15.0%	11.4%	13.0%	15.1%	11.6%	13.3%	15.1%	11.5%	13.2%
Crude rate per 100,000 persons	226.7	205.5	215.9	207.7	180.6	194.1	213.4	188.2	200.7
EASMR ± 95% CI	226.5 ±4.6	158.9 ±3.5	185.7 ±2.8	235.8 ±3.3	164.8 ±2.5	193.8 ±2.0	232.6 ±2.7	162.8 ±2.0	191.0 ±1.6
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-3.9% ±2.4	-3.6% ±2.6	-4.2% ±1.7

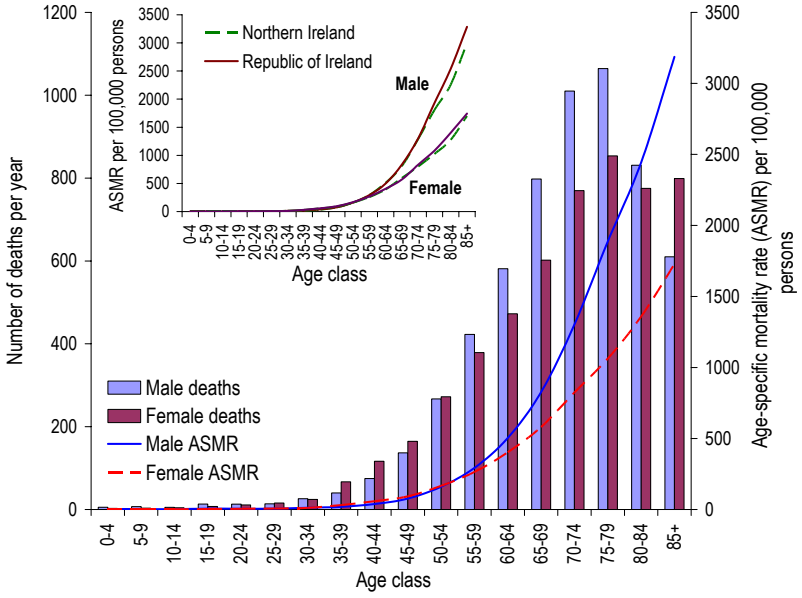
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

3.4.1: Age distribution

The median age at death from cancer during 2000-2004 was 73 years with the annual average number of deaths greatest in the 75-79 age group with 18.0% of all male and 16.0% of all female cases diagnosed. The largest age-specific mortality rate (ASMR) was however among those aged 85 and over with 3187.5 male and 1727.0 female deaths per 100,000 persons. The general pattern in ASMRs was similar in both Northern Ireland and Republic of Ireland although they were slightly higher in Republic of Ireland for older age groups. (Fig. 3.23)

Among children (aged 0 to 14) there were on average 29 deaths per year, which was 0.3% of all deaths due to cancer and approximately 2.4 deaths per 100,000 persons aged 0 to 14. (Fig. 3.23)

Figure 3.23: Number of deaths per year from all cancers (excluding NMSC) by sex and age with age-specific mortality rate (ASMR) per 100,000 persons: 2000-2004

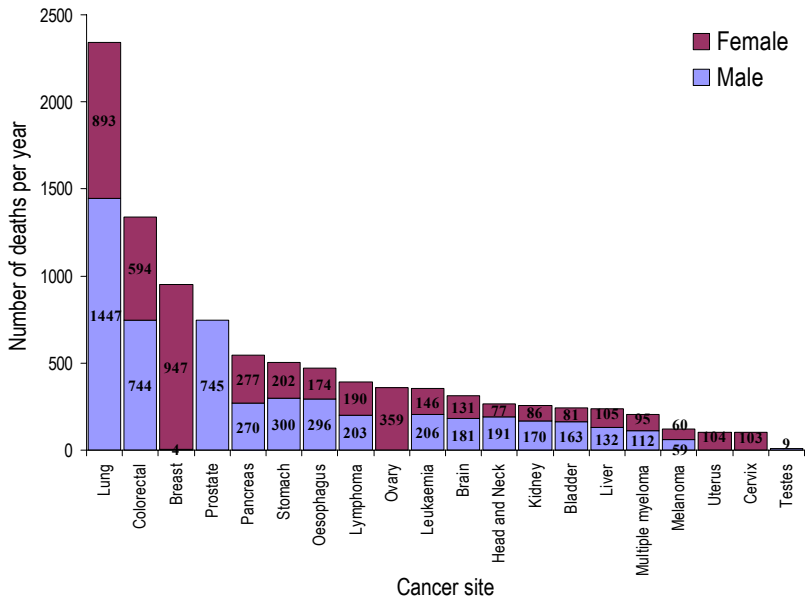


3.4.2: Cancer site

Lung cancer was by far the biggest cause of cancer death during 2000-2004, making up 20.8% of all cancer deaths (2,340 deaths per year). The next most common cancers causing fatality were colorectal cancer, breast cancer, prostate cancer and pancreatic cancer. Of the top twenty most common cancers testicular cancer had the least number of deaths per year (9 per year in 2000-2004) with bone and gallbladder cancers causing more deaths per year, although these cancers have lower incidence levels. Among the cancers present in both males and females the number of male deaths exceeded female deaths for each of the top twenty cancers

except for pancreatic cancer and malignant melanoma. However the most common female cancer, breast cancer, had more deaths each year than the most common male cancer (prostate cancer). (Fig. 3.24)

Figure 3.24: Number of cancer deaths per year in Ireland by sex and cancer site: 2000-2004



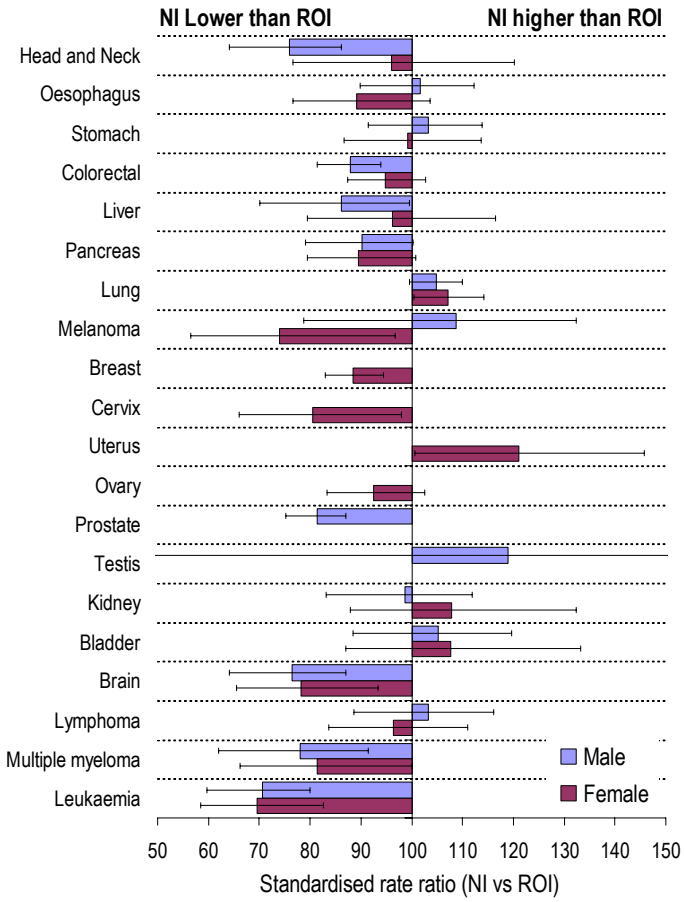
Given that some cancers are gender specific and both males and females have different lifestyles, the distribution of cancer type differs by sex. Among males the most common causes of cancer death were lung, prostate, colorectal, stomach and oesophageal cancer, while among females they were breast, lung, colorectal, ovary and pancreatic cancer. Among males the number of lung cancer deaths was almost double that of prostate cancers; however the number of lung cancer deaths was slightly lower than the number of breast cancer deaths among females. (Fig. 3.24)

Country comparisons of cancer site

Comparing cancer death rates (EASMR) for Northern Ireland and Republic of Ireland illustrates very similar patterns to those of incidence rates, although due to smaller numbers of deaths than cases some of the results are not statistically significant (e.g. higher death rates from male lung cancer and cancer of the uterus in Northern Ireland than Republic of Ireland; higher death rates from pancreatic cancer in Republic of Ireland than Northern Ireland). Changes from the pattern of incidence rates include similar cancer death rates between the two countries for bladder cancer, higher mortality rates in Republic of Ireland than Northern Ireland for multiple myeloma, male liver cancer and male head & neck cancer, and higher mortality rates of female lung cancer in Northern Ireland than Republic of Ireland.

There are explanations for the difference in the comparisons between Northern Ireland and Republic of Ireland for incidence and cancer death rates including difference in survival rates or differences in coding approaches. (Fig. 3.25)

Figure 3.25: Standardised rate ratios comparing European age-standardised mortality rates in Northern Ireland to those in Republic of Ireland for the top twenty cancer sites: 2000-2004

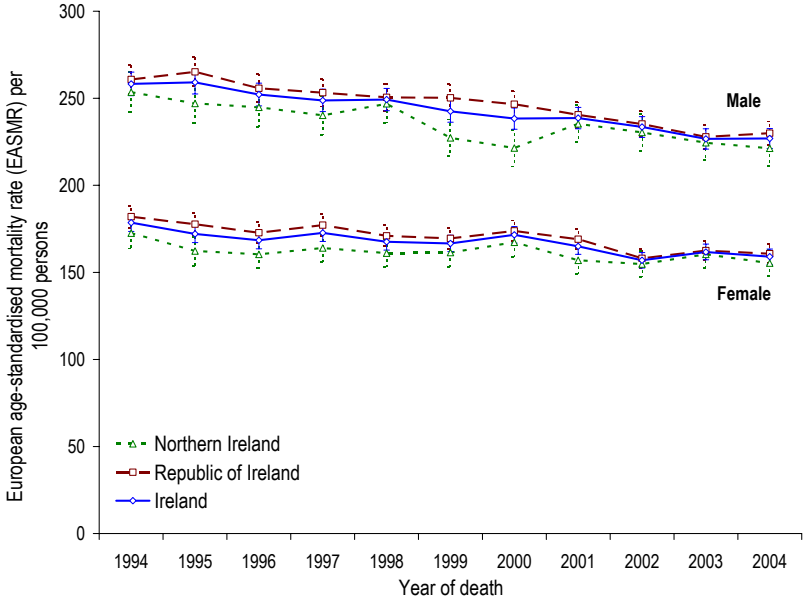


3.4.3: Trends

European age-standardised mortality rates (EASMR) for all persons decreased in Ireland between 1994 and 2004, the magnitude of which varied by sex and country. For males the annual percentage change was -1.4% ($p<0.001$) with the change slightly, but not significantly, greater in Republic of Ireland than Northern Ireland (NI: -1.3% $p<0.001$; ROI: -1.5% $p<0.001$). The difference between

countries was slightly greater, but still not significantly, for females with a decrease of 0.7% (p=0.018) in Northern Ireland and 1.2% (p<0.001) in ROI. Overall the annual decrease in female EASMRs in Ireland during 1994-2004 was 1.0% (p<0.001). (Fig. 3.26)

Figure 3.26: Trends in European age-standardised mortality rates (EASMR) from all cancers (excluding NMSC) by sex and country: 1994-2004



Despite the decreasing age-standardised rates as a result of demographic change the number of deaths increased in Ireland by an average of 15.4 male (NI: 7.0; ROI: 8.5) and 30.2 female (NI: 11.6; ROI: 18.6) deaths per year. (Fig. 3.24)

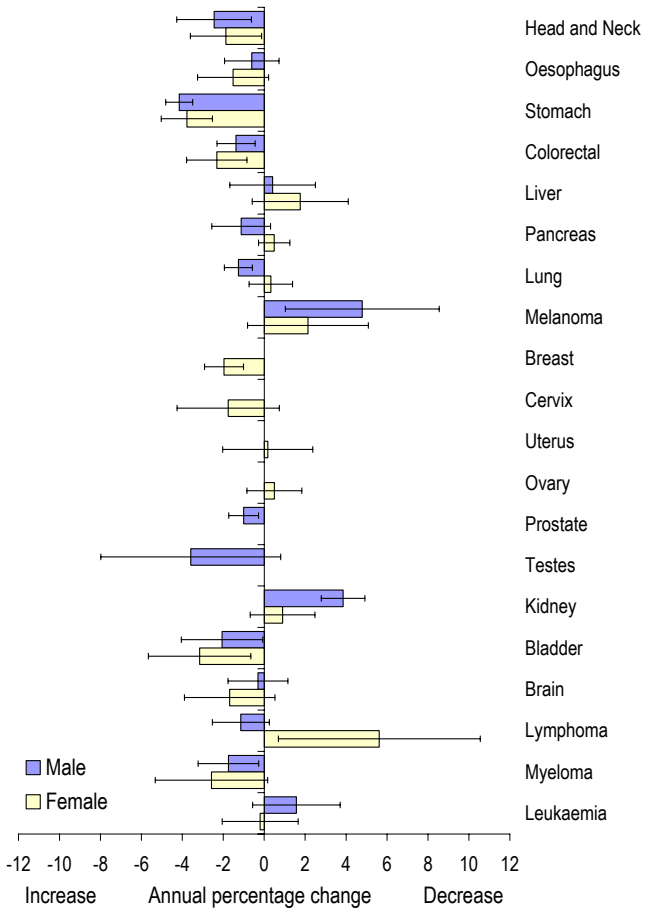
Trends by cancer site

Trends in European age-standardised mortality rates (EASIR) varied considerably by cancer site. Although for many cancer sites trends reflected those of incidence rates, changes in survival or the delayed impact of factors influencing changes in incidence rates resulted in difference patterns. Additionally the presence of a smaller number of deaths than cases sometimes resulted in trends not being statistically significant compared to significant results for incidence rates. (Fig. 3.27)

For males cancer death rates increased significantly between 1994 and 2004 for melanoma and kidney cancer with decreases in head and neck cancer, stomach cancer, colorectal cancer, lung cancer, prostate cancer, testicular cancer and multiple myeloma. The decreases in colorectal cancer and myeloma were not present in the examination of incidence rates, reflecting the improvements in survival.

Among females there were no significant increases in cancer death rates between 1994 and 2004 despite increases in incidence rates for several cancer sites. Mortality rates however decreased for head and neck cancer, stomach cancer, colorectal cancer and breast cancer. Only the decrease in stomach cancer was noticed in examination of incidence rates while incidence of breast cancer actually increased during 1994-2004, the difference in trend compared to mortality rates a result of improvements in survival. (Fig. 3.27)

Figure 3.27: Annual percentage change (APC) in European age-standardised morality rates (EASMR) for all cancers (excluding NMSC) by sex and cancer site: 1994-2004



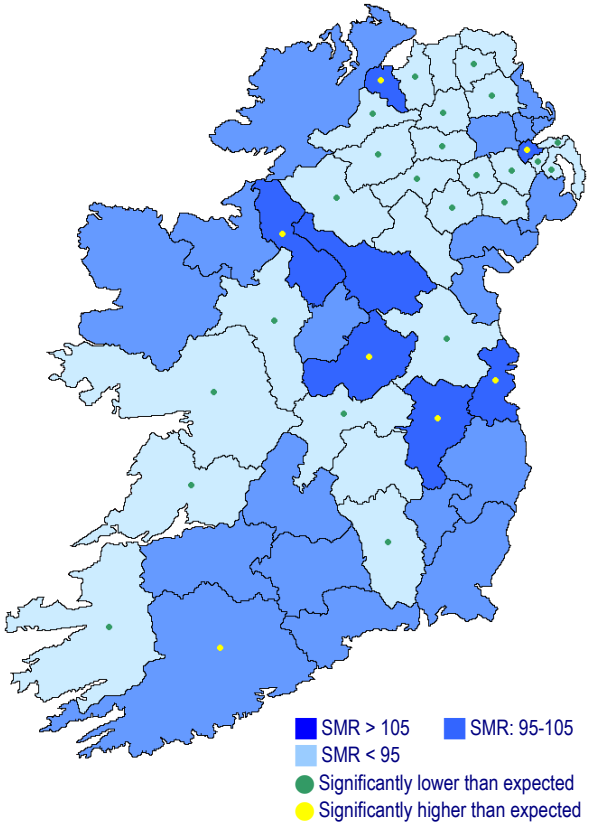
3.4.4: Geographic variations

During 1994-2004 the levels of cancer mortality varied throughout Ireland, with higher mortality rates of male and female cancer death in counties/councils that contain the four largest urban areas in Ireland, namely Dublin, Belfast, Cork and Derry. Male cancer death was also higher in Kildare, Leitrim and Westmeath while female mortality as a result of

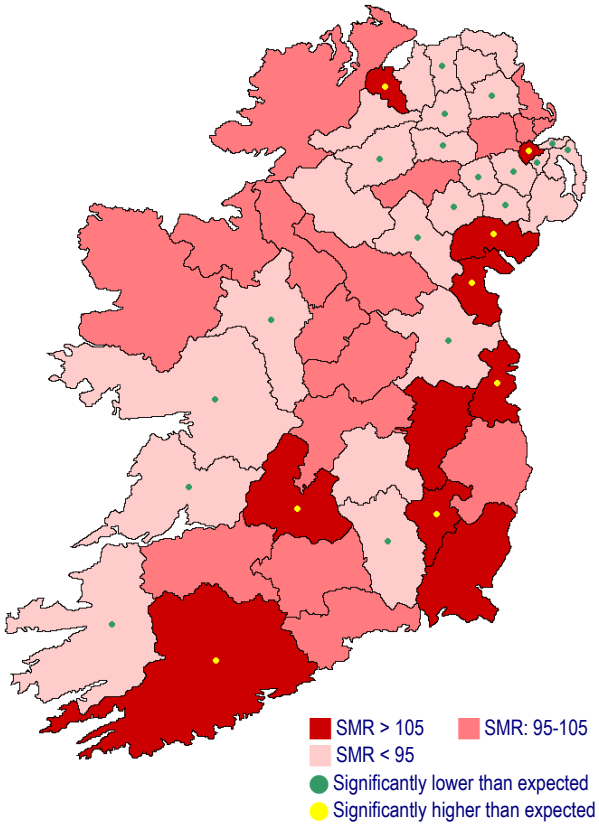
cancer was higher in Carlow, Newry & Mourne, Louth and North Tipperary. Due to the higher concentrations in urban areas, 23 counties/councils had lower mortality levels for males while 19 had lower mortality levels for females. The majority of these were in Northern Ireland. (Fig. 3.28)

Figure 3.28: Significant differences in county/council standardised mortality ratios for all cancers (excluding NMSC) compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female



3.5: Prevalence

At the end of 2004 there were 94,062 people living in Ireland who had been diagnosed with cancer (excluding NMSC) during 1994-2004, which was 42.7% of all cancers diagnosed during this period. Of these people 34,491 were originally diagnosed in 1994-1999, 30.6% of those diagnosed during these years. (Tab. 3.10)

Table 3.10: Prevalence of cancer (excluding NMSC) in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	12,387	35.5%	8,146	49.3%
	Female	17,125	46.7%	10,011	58.0%
	All persons	29,512	41.2%	18,157	53.8%
Republic of Ireland	Male	30,076	39.0%	20,407	53.0%
	Female	34,474	48.2%	21,007	59.5%
	All persons	64,550	43.4%	41,414	56.1%
Ireland	Male	42,463	37.9%	28,553	51.9%
	Female	51,599	47.7%	31,018	59.0%
	All persons	94,062	42.7%	59,571	55.4%

Among those diagnosed in 2000-2004 with cancer (excluding NMSC) there were 59,571 people still alive at the end of 2004, 55.4% of all those diagnosed since 2000. Of these 47.9% were male and 69.5% were resident in Republic of Ireland. (Tab. 3.10)

3.5.1: Cancer site

Prevalence of cancer varies considerably by cancer site and depends upon the incidence rates and observed survival for patients with that particular cancer. At the end of 2004 female breast cancer was the most common cancer among those diagnosed during 1994-2004 and still alive. The next most common were prostate cancer and colorectal cancer making up 15% and 14% respectively, meaning that breast cancer prevalence was 9% higher than the next most common cancer, a result of high incidence and good

survival. Despite high incidence levels, prevalence of lung cancer was relatively low due to the poor survival from the disease. (Tab. 3.11)

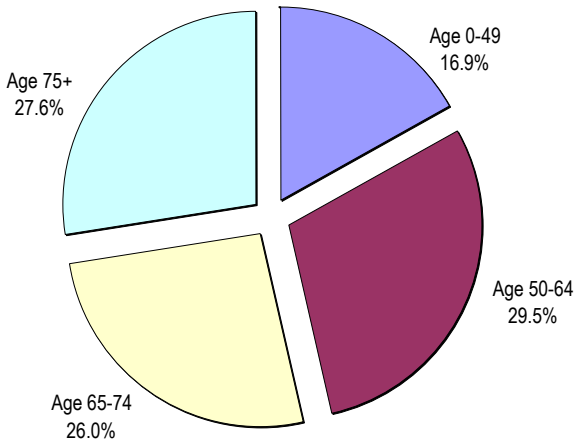
Table 3.11: Prevalence of cancer (excluding NMSC) in Ireland by country, sex and cancer site: Diagnosed in 1994-2004 and alive at the end of 2004

	Northern Ireland			Republic of Ireland			All-Ireland		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Head and Neck	806	319	1,125	1,509	517	2,026	2,315	836	3,151
Oesophagus	154	108	262	342	212	554	496	320	816
Stomach	293	181	474	540	398	938	833	579	1,412
Colorectal	2,301	2,186	4,487	4,925	4,068	8,993	7,226	6,254	13,480
Liver	40	23	63	101	60	161	141	83	224
Pancreas	41	43	84	135	148	283	176	191	367
Lung	638	468	1,106	1,184	933	2,117	1,822	1,401	3,223
Malignant melanoma	638	1,091	1,729	1,299	2,415	3,714	1,937	3,506	5,443
Breast	47	7,317	7,364	81	14,557	14,638	128	21,874	22,002
Cervix	-	593	593	-	1,335	1,335	-	1,928	1,928
Uterus	-	1,007	1,007	-	1,915	1,915	-	2,922	2,922
Ovary	-	850	850	-	1,611	1,611	-	2,461	2,461
Prostate	3,391	-	3,391	10,785	-	10,785	14,176	-	14,176
Testes	558	-	558	1,118	-	1,118	1,676	-	1,676
Kidney	483	334	817	979	650	1,629	1,462	984	2,446
Bladder	766	264	1,030	1,919	795	2,714	2,685	1,059	3,744
Brain and other CNS	142	149	291	410	368	778	552	517	1,069
Lymphoma	791	800	1,591	1,715	1,569	3,284	2,506	2,369	4,875
Multiple myeloma	193	160	353	348	274	622	541	434	975
Leukaemia	366	279	645	1,177	829	2,006	1,543	1,108	2,651
Non-melanoma skin	9,443	8,832	18,275	23,950	22,254	46,204	33,393	31,086	64,479
Other	739	953	1,692	1,509	1,820	3,329	2,248	2,773	5,021
All (excluding NMSC)	12,387	17,125	29,512	30,076	34,474	64,550	42,463	51,599	94,062
All (including NMSC)	21,830	25,957	47,787	54,026	56,728	110,754	75,856	82,685	158,541

3.5.2: Age distribution

The median age for a member of the population living with cancer (ex. NMSC) at the end of 2004 and diagnosed since 1994 was 66 years of age, with 29.5% aged 50-64 and 26.0% aged 65-74. A small proportion of people living with cancer were children (aged 0-14) with 509 boys and 426 girls diagnosed with cancer in 1994-2004 alive at the end of 2004. (Fig. 3.29)

Figure 3.29: Prevalence of cancer (excluding NMSC) in Ireland at the end of 2004 by age for patients diagnosed in 1994-2004



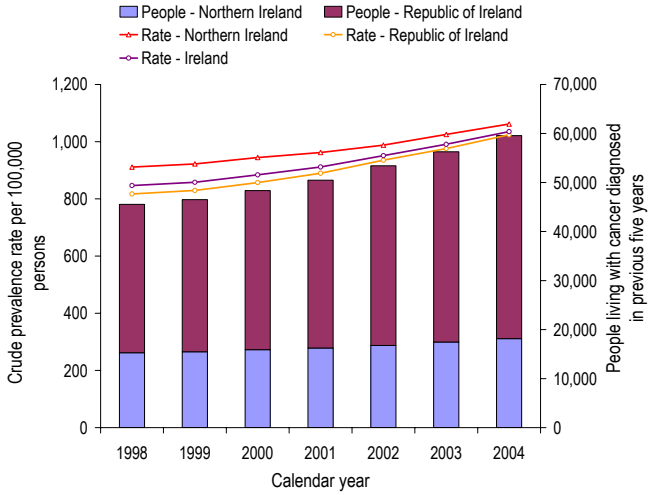
3.5.3: Trends

The number of people alive at the end of each year who have had a diagnosis of cancer (excluding NMSC) within the previous five years increased between 1998 and 2004 by an average of 2,379 per year. The majority of the increase occurred in Republic of Ireland where there was an increase of 1,900 people per year living with the disease compared to an annual increase of 479 people per year in Northern Ireland. (Fig. 3.30)

While some of this increase is due to improvements in survival and subsequent reduction in mortality rates the majority of this increase was likely due to changes in the population, particularly in Republic of Ireland. However crude rates also increased over the

seven years by 3.5% each year (p=<0.001), although crude rates do not remove the effect of the changing age profile of the population which contributes to increasing incidence rates. The increase in crude rates was slightly higher in Republic of Ireland than in Northern Ireland with significant increases of 4.0% (p<0.001) and 2.6% (p<0.001) per year. However at the end of 2004 the number of people living with cancer (excluding NMSC) diagnosed since 2000 per 100.000 people was 3.7% greater in Northern Ireland than Republic of Ireland. (Fig. 3.30)

Figure 3.30: Number of people (and crude rate per 100,000 persons) living with cancer (excluding NMSC) at the end of each calendar year, who were diagnosed within the previous five-years by calendar year and country



3.6: Discussion

Worldwide there are approximately 10 million cases of cancer diagnosed each year with 6 million deaths as a result of the disease.[17] Incidence rates are highest in developed countries primarily as a result of the link to tobacco although dietary factors are also believed to play a significant role. Consequently Europe and USA have some of the highest incidence rates of cancer, although Russia also has rates of a similar magnitude. Incidence rates are lowest in parts of Africa and Asia, although a high proportion of cancers in these regions are believed to be a result of chronic infection as opposed to lifestyle factors and lower life expectancy.

Incidence rates in general appear to be climbing, however in developed countries mortality rates show a small but steady decline as a result of reductions in tobacco use and improvements in treatment and diagnostic techniques. However, even in the most affluent countries only 50% of people diagnosed with the disease survive a minimum of five-years, with prognosis varying considerably with cancer site. Preventative measures and improvements in treatment have potential to reduce incidence rates and improve survival respectively. Both have resulted in a reduction in mortality rates in Ireland over the last decade but with incidence rates increasing cancer remains one of the biggest health issues in Ireland. Rates in countries with previously low cancer levels are increasing with increasing use of tobacco and the adoption of a western lifestyle.

Control of cancer is best achieved through preventative measures, particularly in the areas of tobacco control, dietary factors and alcohol consumption, with a high percentage of cancers potentially avoidable if the general population adopted healthier lifestyles. Prevention programmes exist in both countries with the aim of educating people as to the connection between lifestyle factors and cancer (as well as other diseases) with more proactive approaches such as smoking bans in work places in Ireland and vaccinations against the HPV virus in Northern Ireland now in effect.

Environmental factors such as ultraviolet (UV) and ionising radiation can also play a role in the development of cancer. With regard to UV exposure, prevention programmes (care in the sun) exist in both countries focusing on educating the public on the dangers of UV radiation from sun or sunbeds. While these have proven moderately successful many sections of the community retain misconceptions about safety in the sun and fail to take adequate precautions. Further effort in this area is thus required with parents and adolescents particularly in need of education as the skin damage which leads to melanoma in later life can result from sunburn in the first 20 years of life.

While the lack of understanding of the causes of brain cancer, lymphoma, myeloma and leukaemia is a major hindrance to the development of prevention strategies for these diseases although the link between brain cancer and leukaemia with ionising radiation warrants precautions being taken with regard to the presence of ionising radiation in the environment. These are already in place in Ireland and studies have been undertaken with regard to the possible link between cancers linked with ionising radiation and possible radioactivity in the Irish Sea. None have demonstrated a definite link and the incidence of brain cancer and leukaemia thus remains unexplained.

Eradication of cancer caused by lifestyle and environmental factors would still leave many cancers developing as a result of other causes (e.g. genetic factors). Early detection remains the best chance for mortality reduction among these cancers with the stage at which cancer is diagnosed a major factor in survival prospects. Diagnosis of cancer at an early stage however can sometimes be difficult due to the lack of symptoms, with many patients presenting at a late stage. Screening programmes also increase the possibility of early diagnosis and thereby reduce mortality as evidenced by the cervical cancer screening programme existing in Northern Ireland for women aged 20-65 organised on a population basis.

Three yearly population based screening for women aged 50-65 has been in place in Northern Ireland since 1993, and is due to be extended to women aged up to 69. A similar programme was introduced for approximately half of the population in Republic of Ireland in 2000, with roll out across the country continuing. A colorectal screening programme for people aged 60-69 is also being planned for introduction in Northern Ireland in 2009. It will increase the proportion of colorectal cancers diagnosed at an early stage and ultimately survival from the disease. While no plans exist in Republic of Ireland for colorectal screening, the experience in Northern Ireland will help inform future decisions with regard to its implementation. While possibilities for a stomach cancer screening programme exist its effectiveness is inconclusive while for prostate cancer the introduction of PSA testing has resulted in cancers being diagnosed at a point much closer to when the cancer first developed, although its effectiveness in reducing mortality rates is contested and an increase in false diagnosis of cancer is an unavoidable side effect. No effective population based screening processes exist for many other forms of cancer, particularly for lung cancer. Without the existence of an early diagnostic test for these cancers the onus is thus on the general population to ensure that they check any possible symptoms with a doctor.

Treatment of cancer is dictated by several factors including cancer site, tumour stage, general health, morphology, depth of tumour invasion and presence of metastasis. For most cancers surgery is the most effective form of treatment with chemotherapy, radiotherapy and hormone therapy applied to treat any residual disease or prevent recurrence. Not all cancer sites however respond to these treatments with hormone therapy used primarily for prostate and breast cancers, with chemotherapy rarely used for prostate cancer and surgery not applicable for haematological cancers. For some cancers (e.g. lung cancer) these treatments are rarely curative and are applied mainly for palliative purposes with overall survival from the disease very poor, while for other cancers (e.g. breast cancer) treatment can result in the patients ending up disease free with excellent survival particularly when the cancer is identified at an early stage.

Fortunately progress in the fight against cancer is being made, albeit slowly, as evidenced by the improvements in survival in Ireland and reduction in mortality rates. Treatments and new diagnostic techniques are constantly being developed and put into practice while new preventative measures have the potential to reduce incidence rates in the face of a growing and ageing population.

Chapter 04:

Childhood cancer (Ages 0-14; All cancers excluding NMSC)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there 86 cases of cancer among boys and 70 cases among girls diagnosed each year.*
  - *During 2000-2004 leukaemia was the most common form of childhood cancer making up 33.5% of cases. Brain cancer and lymphoma also contributed 16.3% and 13.4% of cases respectively.*
  - *There was no significant change in incidence rates during 1994-2004.*
  - *None of the district councils or counties in Ireland exhibited significantly higher standardised incidence ratios relative to Ireland as a whole during 1994-2004.*
  - *During 1998-2004 incidence rates were similar in Ireland to those of EU, UK, Canada and Australia but were lower than those in USA.*
  - *During 2000-2004 there was an average of 18 boy and 11 girl deaths in Ireland each year.*
  - *Mortality rates in Ireland did not change significantly for either boys or girls during 1994-2004.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year relative survival for children diagnosed with cancer in 2000-2004 was estimated to be 76.9%, with no significant variation between boys and girls.*
  - *There was no significant change in relative survival for boys or girls between 1994-1996 and 1997-1999.*
  - *At the end of 2004 there were 560 children aged 0-14 alive at the end of 2004 having been diagnosed with cancer during 2000-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates among boys were 19.9% lower in Northern Ireland than in Republic of Ireland, with no difference between the two countries in female incidence rates.*
  - *In Republic of Ireland there was no change in incidence rates for boys or girls between 1994 and 2004, however incidence rates among boys decreased in Northern Ireland by 3.8% each year while female rates remained unchanged.*
  - *There was no significant difference in five-year relative survival between Northern Ireland and Republic of Ireland for those diagnosed in 2000-2004.*
  - *There was no significant difference in mortality rates for boys and girls between Northern Ireland and Republic of Ireland.*
  - *The number of children diagnosed with cancer during 2000-2004 per 100,000 children and still alive at the end of 2004 was 17.4% lower in Northern Ireland than Republic of Ireland.*

4.1: Incidence

Cancer among children aged 0 to 14 made up 0.7% of all cancer cases (excluding NMSC) in Ireland during 2000-2004 with 86 cases per year among boys and 70 cases per year among girls. This translated to 13.9 cases per 100,000 boys and 13.0 cases per 100,000 girls among the child population of Ireland. The odds of developing the disease before the age of 14 were 1 in 477 for boys and 1 in 552 for girls. (Tab. 4.1)

There was no significant difference in European age-standardised incidence rates (EASIR) per 100,000 children for boys and girls despite a 14.8% difference in incidence rates. However childhood cancer rates among boys were 19.9% (p=0.027) lower in Northern Ireland than in Republic of Ireland, with no significant difference in female EASIRs. (Tab. 4.1)

Table 4.1: Summary statistics for incidence of childhood cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	22	19	41	64	51	115	86	70	156
% of all cancer cases (ex. NMSC)	0.7%	0.6%	0.6%	0.8%	0.7%	0.8%	0.8%	0.7%	0.7%
Median age at diagnosis	5	4	5	5	4	5	5	4	5
Cumulative risk (Aged 0 to 14)	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Crude rate per 100,000 persons	11.7	10.7	11.2	14.9	12.6	13.8	13.9	12.0	13.0
EASIR ± 95% CI	12.1 ±2.3	11.2 ±2.3	11.6 ±1.6	15.1 ±1.7	12.9 ±1.6	14.0 ±1.1	14.2 ±1.3	12.3 ±1.3	13.3 ±0.9
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-19.9% ±17.6	-13.3% ±20.7	-16.9% ±13.4

EASIR: European age-standardised incidence rate per 100,000 children; CI: Confidence interval

4.1.1: Cancer site

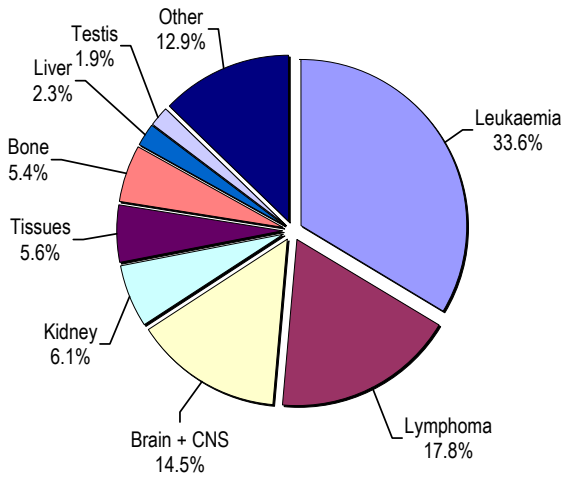
During 2000-2004 leukaemia was the most common type of childhood cancer making up 33.5% of all cases (excluding NMSC). Brain cancer and lymphoma were the other major type contributing 16.3% and 13.4% of cases respectively. Cancers which are rare among adults, such as bone cancer and cancer of the connective tissues were more common among children although the number of cases diagnosed annually was small. (Fig. 4.1)

Among boys the most common cancers during 2000-2004 in descending order were leukaemia, lymphoma, brain cancer and kidney cancer. Among girls they were leukaemia, brain cancer, kidney cancer and lymphoma. (Fig. 4.1)

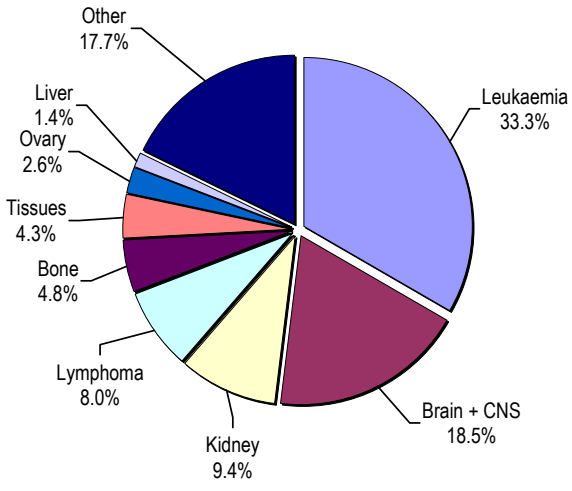
For two of the four most common cancers diagnosed among people of all age groups in Ireland during 2000-2004 (female breast cancer or prostate cancer) there were no childhood cases registered, while there were less than five cases of childhood lung cancer or colorectal cancer throughout 2000-2004.

Figure 4.1: Common childhood cancers diagnosed in Ireland by sex: 2000-2004

(a) Boys



(b) Girls



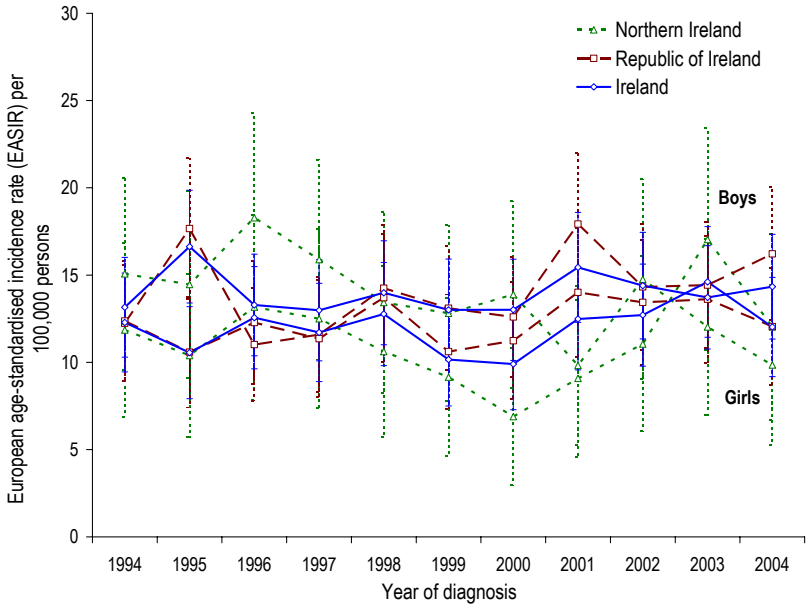
CNS: Central nervous system

4.1.2: Trends

There was no significant change in European age-standardised incidence rates (EASIR) of childhood cancer during 1994-2004. The absolute number of cases registered each year however changed by small amounts with an average decrease of 1 case among boys and an average increase of 2 cases among girls every five years. (Fig. 4.2; Tab. 4.2)

In Republic of Ireland there was also no conclusive change in EASIRs, however in Northern Ireland EASIRs among boys aged 0-14 decreased by 3.8% (p=0.020) each year while female rates remained unchanged. (Fig. 4.2; Tab. 4.2)

Figure 4.2: Trends in European age-standardised incidence rates (EASIR) for childhood cancer by sex and country: 1994-2004



The different incidence rate trends in each country during 1994-2004 translated to an average decrease of 1.2 cases of cancer per year among boys in Northern Ireland and an increase of 1.0 case per year in Republic of Ireland. Among girls the number of cases remained virtually static in Northern Ireland with an average annual increase of 0.5 cases per year in Republic of Ireland. (Fig. 4.2; Tab. 4.2)

Table 4.2: Number of cases and European age-standardised incidence rates (EASIR) for childhood cancer by year of diagnosis, sex and country: 1994-2004

	Boys						Girls					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
Year	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	29	15.1 ±5.5	54	12.2 ±3.3	83	13.2 ±2.9	22	11.9 ±5.0	52	12.4 ±3.4	74	12.3 ±2.8
1995	28	14.5 ±5.4	76	17.7 ±4.0	104	16.6 ±3.2	19	10.4 ±4.7	44	10.6 ±3.2	63	10.6 ±2.6
1996	36	18.3 ±6.0	46	11.0 ±3.2	82	13.3 ±2.9	24	13.2 ±5.3	48	12.3 ±3.5	72	12.6 ±2.9
1997	30	15.9 ±5.7	49	11.6 ±3.3	79	13.0 ±2.9	23	12.5 ±5.1	45	11.4 ±3.4	68	11.7 ±2.8
1998	26	13.4 ±5.2	60	14.2 ±3.6	86	14.0 ±3.0	18	10.6 ±4.9	55	13.7 ±3.7	73	12.8 ±3.0
1999	25	12.8 ±5.1	53	13.1 ±3.5	78	13.0 ±2.9	16	9.2 ±4.5	41	10.6 ±3.3	57	10.2 ±2.7
2000	26	13.9 ±5.4	52	12.6 ±3.4	78	13.0 ±2.9	12	6.9 ±3.9	44	11.2 ±3.3	56	9.9 ±2.6
2001	18	9.8 ±4.6	75	17.9 ±4.1	93	15.4 ±3.2	16	9.1 ±4.5	55	14.0 ±3.7	71	12.5 ±2.9
2002	26	14.8 ±5.7	60	14.3 ±3.6	86	14.4 ±3.1	19	11.1 ±5.0	54	13.4 ±3.6	73	12.7 ±2.9
2003	22	12.0 ±5.1	61	14.4 ±3.6	83	13.7 ±3.0	28	17.0 ±6.4	54	13.6 ±3.6	82	14.6 ±3.2
2004	18	9.8 ±4.6	70	16.2 ±3.8	88	14.3 ±3.0	20	12.0 ±5.3	49	12.0 ±3.4	69	12.0 ±2.8

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

4.1.3: Geographic variations

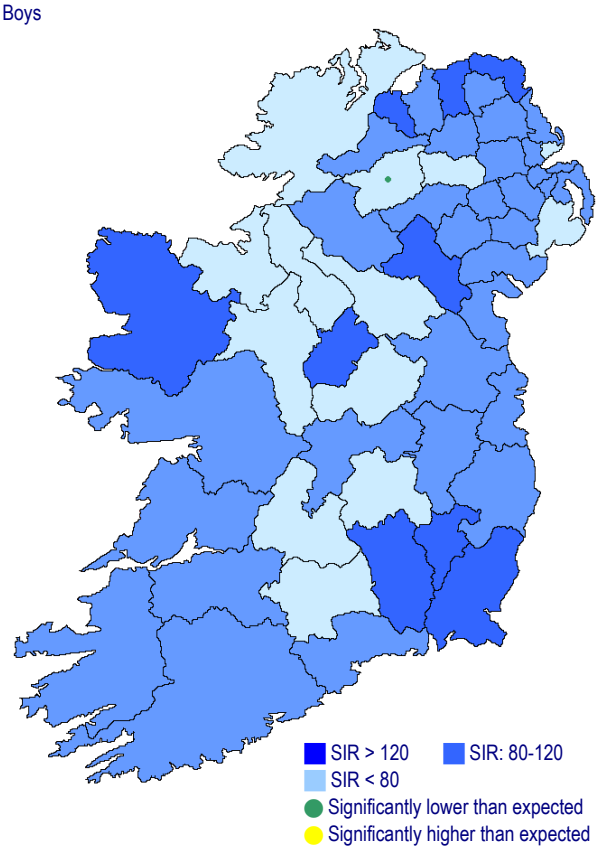
Due to the small number of cases of childhood cancer occurring each year few definite conclusions can be drawn with regard to geographic patterns. None of the district councils or counties in Ireland exhibited significantly higher standardised incidence ratios (SIRs) relative to Ireland as a whole despite some high values that exceeded 150 in Coleraine, Moyle and Mayo for boys and Longford for girls. However Omagh district council had significantly lower levels of childhood cancer than in Ireland as a whole for boys while Belfast and Moyle had lower than expected levels for girls. On average there were 4 boys and 2 girls diagnosed each year in Belfast and 15 boys and 14 girls diagnosed annually in Dublin. (Fig. 4.3)

4.1.4: International comparisons

During 1998-2000 incidence rates (world age-standardised) of childhood cancer (aged 0-14) were similar in Ireland to those of European Union measured using both 15 and 27 member countries. Rates were also similar to those in UK, Canada and Australia but were lower than those in USA by 11.7% (p=0.032) for boys and 17.4% (p=0.003) for girls. (Fig. 4.4)

Figure 4.3: Significant differences in county/council standardised incidence ratios for childhood cancer compared to Ireland as a whole: 1994-2004

(a) Boys



(b) Girls

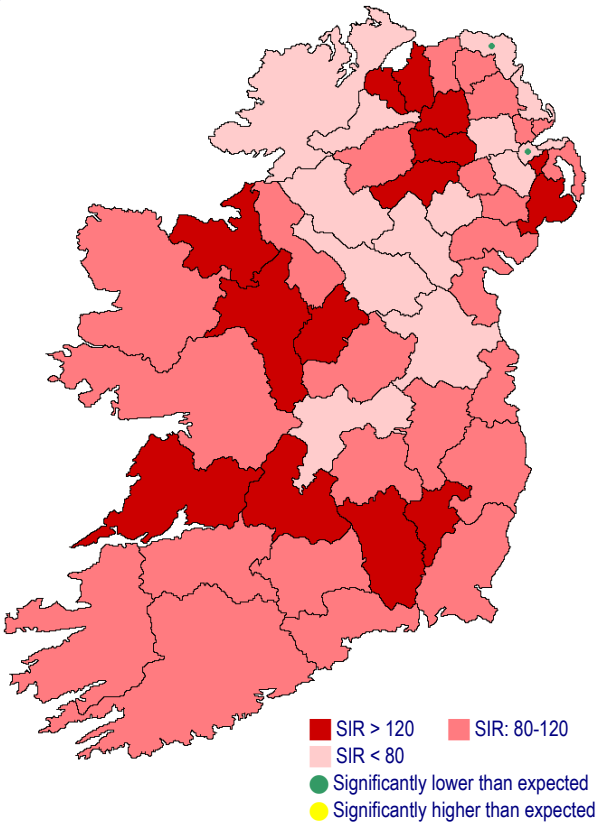
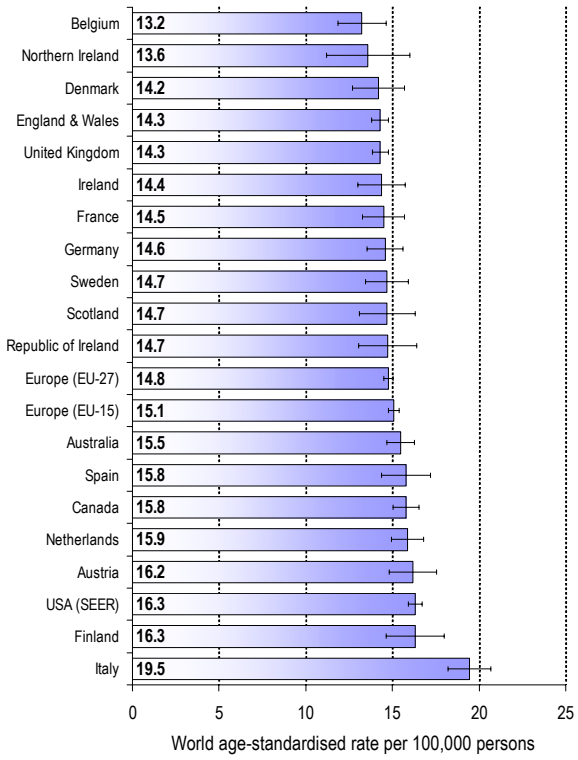
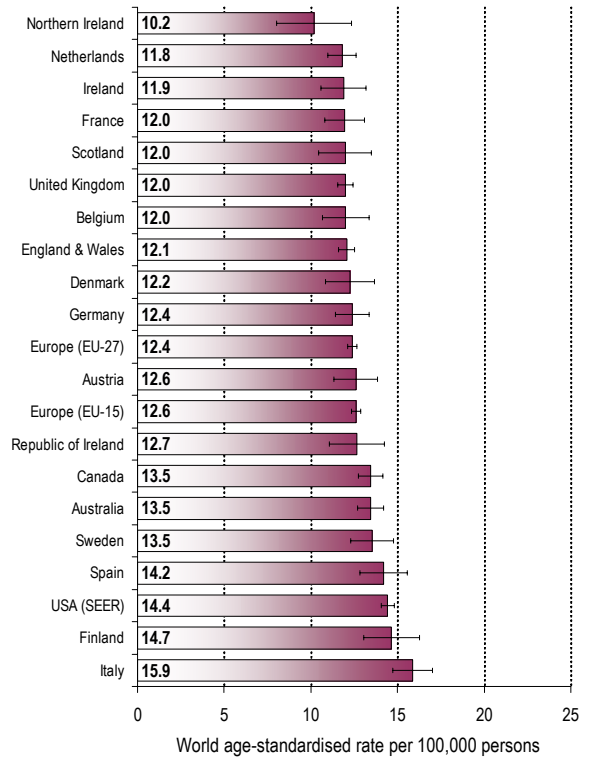


Figure 4.4: International comparisons of world age-standardised incidence rates for childhood cancer: 1998-2000

(a) Boys



(b) Girls



Source: IARC[18]

4.2: Survival

Survival from cancers (all types excluding NMSC) was good for children (aged 0-14) diagnosed in 2000-2004 with one-year relative survival estimated to be 89.8% and five-year relative survival estimated to be 76.9%. (Tab. 4.3)

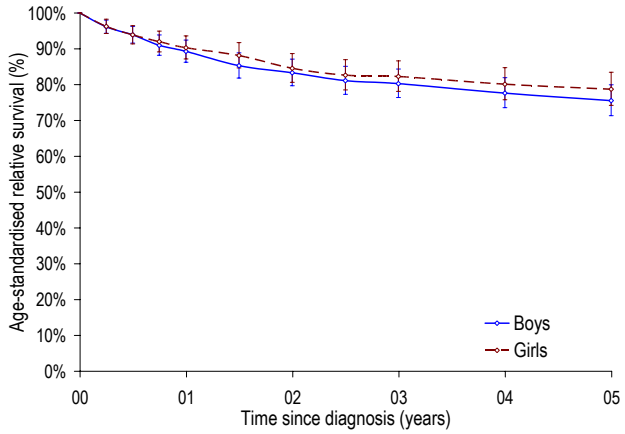
Table 4.3: Relative survival for childhood cancer by country and sex: 2000-2004 period analysis estimates

		Relative survival (95% CI)		
		Boys	Girls	All
1-year	Northern Ireland	86.0% (79.4%, 93.1%)	90.5% (87.1%, 93.9%)	87.7% (83.1%, 92.6%)
	Republic of Ireland	90.5% (87.1%, 93.9%)	90.6% (86.9%, 94.3%)	90.5% (88.0%, 93.0%)
	Ireland	89.3% (86.3%, 92.4%)	90.3% (87.2%, 93.6%)	89.8% (87.6%, 92.0%)
5-year	Northern Ireland	69.3% (61.1%, 78.6%)	77.9% (73.2%, 83.0%)	72.7% (66.6%, 79.4%)
	Republic of Ireland	77.9% (73.2%, 83.0%)	79.2% (74.1%, 84.7%)	78.5% (75.0%, 82.2%)
	Ireland	75.5% (71.3%, 80.0%)	78.7% (74.2%, 83.5%)	76.9% (73.8%, 80.2%)

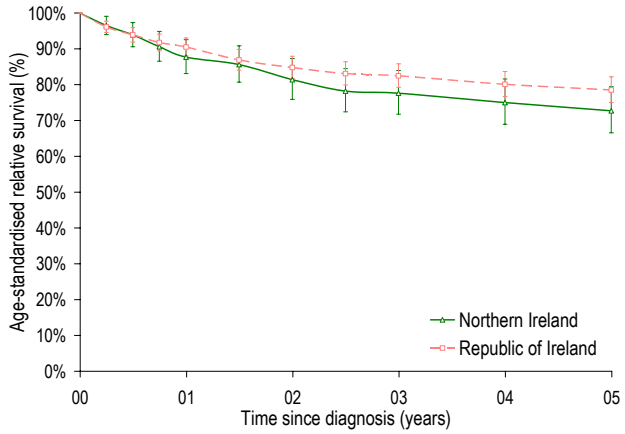
There was no significant variation in one or five-year relative survival by sex or between Northern Ireland and Republic of Ireland for those diagnosed in 2000-2004. (Fig. 4.5, Tab. 4.3)

Figure 4.5: Relative survival for childhood cancer by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



4.2.1: Changes in survival over time

There was no significant variation in one or five-year relative survival for boys or girls (aged 0-14) between those diagnosed with cancer (excluding NMSC) in 1994-1996 and 1997-1999. This was also the case in Northern Ireland and Republic of Ireland considered separately. (Fig. 4.6, Tab. 4.4)

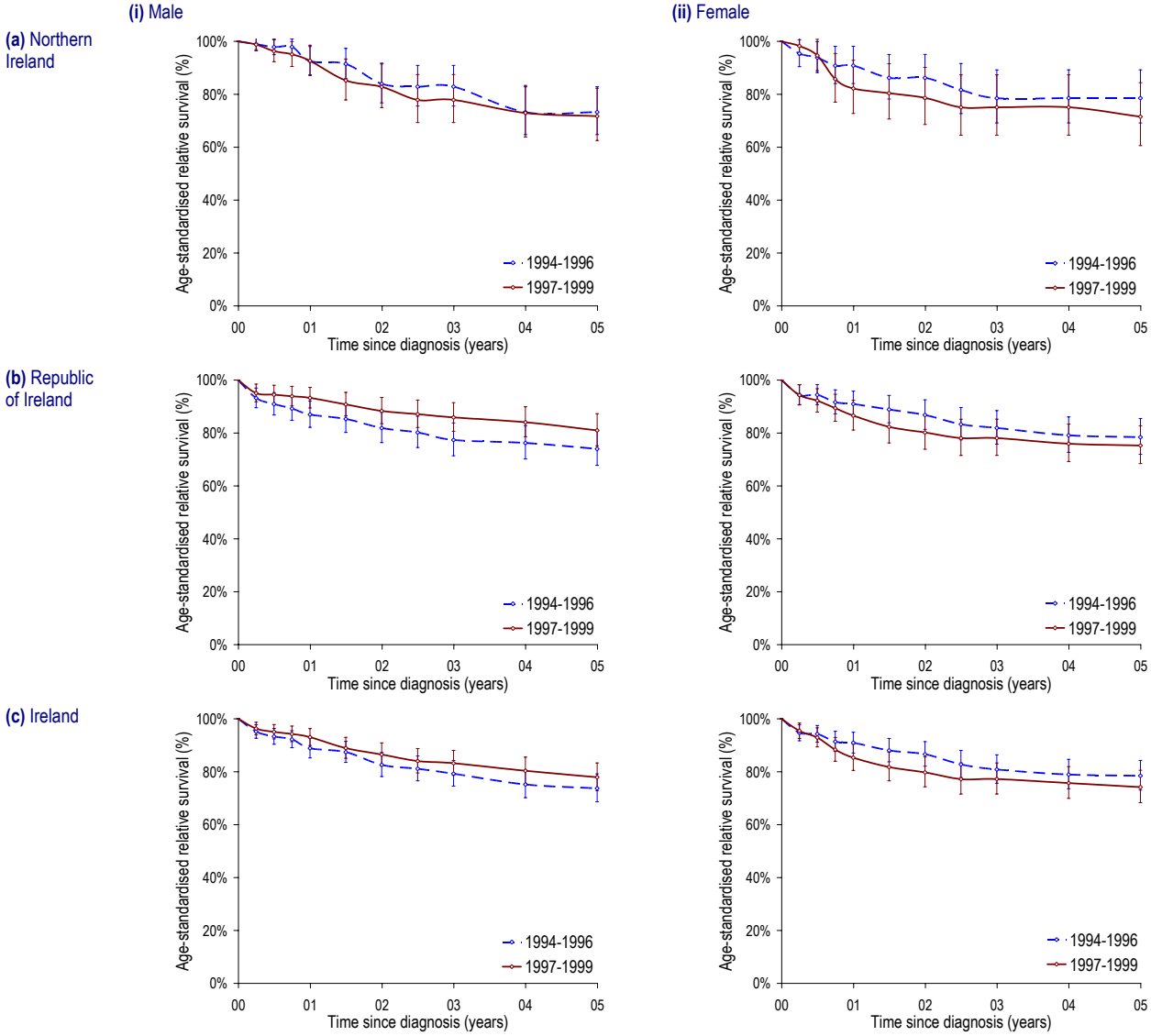
Table 4.4: Relative survival for childhood cancer by sex, country and period of diagnosis: 1994-1999

		Relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All children	Northern Ireland	91.8% (87.6%, 96.2%)	88.4% (83.2%, 93.9%)	75.4% (69.0%, 82.5%)	71.6% (64.5%, 79.6%)
	Republic of Ireland	88.8% (85.4%, 92.3%)	90.2% (86.9%, 93.6%)	76.0% (71.4%, 80.8%)	78.3% (73.8%, 83.1%)
	Ireland	89.8% (87.1%, 92.6%)	89.6% (86.8%, 92.5%)	75.8% (72.0%, 79.8%)	76.3% (72.4%, 80.3%)
Boys	Northern Ireland	92.5% (87.3%, 98.1%)	92.7% (87.1%, 98.5%)	73.2% (64.8%, 82.8%)	71.7% (62.5%, 82.3%)
	Republic of Ireland	87.0% (82.1%, 92.1%)	93.3% (89.5%, 97.2%)	74.0% (67.8%, 80.8%)	81.0% (75.2%, 87.3%)
	Ireland	88.9% (85.2%, 92.7%)	93.1% (89.9%, 96.3%)	73.7% (68.6%, 79.2%)	77.9% (72.9%, 83.3%)
Girls	Northern Ireland	90.8% (84.1%, 98.2%)	82.2% (72.7%, 92.9%)	78.6% (69.2%, 89.2%)	71.5% (60.6%, 84.4%)
	Republic of Ireland	91.0% (86.4%, 95.8%)	86.6% (81.1%, 92.4%)	78.4% (72.0%, 85.5%)	75.3% (68.5%, 82.8%)
	Ireland	90.9% (87.1%, 94.9%)	85.3% (80.5%, 90.4%)	78.5% (73.1%, 84.3%)	74.2% (68.3%, 80.6%)

4.2.2: Observed survival

Observed survival takes account of causes of death other than cancer and is thus lower than relative survival, however for children there are very few other causes of death, thus observed survival values are very similar to those derived for relative survival. For children (aged 0-14) diagnosed in 1997-1999 five-year observed survival was 77.8% for boys and 74.1% for girls. Variations by sex

Figure 4.6: Relative survival for childhood cancer by sex, country and period of diagnosis: 1994-1999



and country were not statistically significant while there were no significant changes in observed survival between 1994-1996 and 1997-1999. (Tab. 4.5)

Table 4.5: Observed survival for childhood cancer by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All children	Northern Ireland	91.8% (87.6%, 96.2%)	88.3% (83.1%, 93.9%)	75.3% (68.9%, 82.3%)	71.5% (64.4%, 79.5%)
	Republic of Ireland	88.7% (85.3%, 92.3%)	90.1% (86.8%, 93.5%)	75.9% (71.3%, 80.7%)	78.2% (73.7%, 83.0%)
	Ireland	89.7% (87.0%, 92.5%)	89.5% (86.7%, 92.5%)	75.7% (71.9%, 79.6%)	76.1% (72.3%, 80.2%)
Boys	Northern Ireland	92.5% (87.3%, 98.0%)	92.6% (87.1%, 98.5%)	73.1% (64.6%, 82.7%)	71.6% (62.4%, 82.1%)
	Republic of Ireland	86.9% (82.1%, 92.1%)	93.2% (89.4%, 97.2%)	73.9% (67.6%, 80.6%)	80.9% (75.0%, 87.2%)
	Ireland	88.8% (85.2%, 92.7%)	93.0% (89.9%, 96.3%)	73.6% (68.5%, 79.1%)	77.8% (72.7%, 83.2%)
Girls	Northern Ireland	90.8% (84.0%, 98.1%)	82.1% (72.7%, 92.8%)	78.5% (69.1%, 89.1%)	71.4% (60.5%, 84.3%)
	Republic of Ireland	90.9% (86.3%, 95.7%)	86.5% (81.1%, 92.3%)	78.3% (71.9%, 85.4%)	75.2% (68.4%, 82.7%)
	Ireland	90.9% (87.0%, 94.9%)	85.3% (80.5%, 90.4%)	78.4% (73.0%, 84.2%)	74.1% (68.2%, 80.5%)

4.3: Mortality

During 2000-2004 there was an average of 18 boy and 11 girl (aged 0-14) deaths from cancer (excluding NMSC) in Ireland each year. This was a very small percentage of the overall number of deaths from cancer each year (boys: 0.3%; girls: 0.2%). European age-standardised mortality rates were 63.5% (p=0.041) higher among boys than girls, although in Republic of Ireland there was no significant difference between the two sexes. However EASMRs did not vary significantly between Northern Ireland and Republic of Ireland. (Tab. 4.6)

Table 4.6: Summary statistics for deaths from childhood cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Boys	Girls	All persons	Boys	Girls	All persons	Boys	Girls	All persons
Number of deaths per year	6	3	9	12	8	20	18	11	29
% of all cancer deaths (ex. NMSC)	0.3%	0.1%	0.2%	0.3%	0.2%	0.3%	0.3%	0.2%	0.3%
Crude rate per 100,000 persons	3.4	1.5	2.5	2.7	2.0	2.4	2.9	1.8	2.4
EASMR ± 95% CI	3.5 ±1.2	1.4 ±0.8	2.5 ±0.7	2.7 ±0.7	2.0 ±0.6	2.3 ±0.5	2.9 ±0.6	1.8 ±0.5	2.4 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							27.4% ±57.0	-26.7% ±49.2	5.5% ±38.2

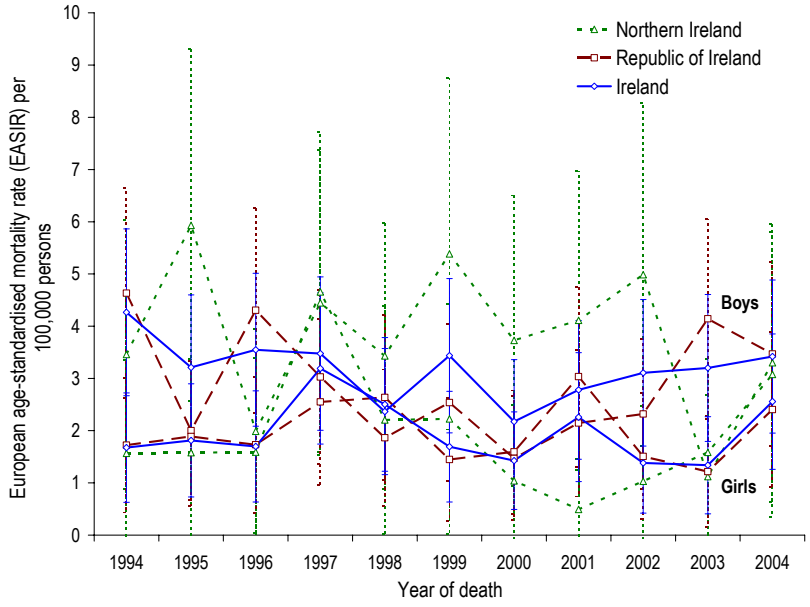
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

4.3.1: Trends

European age standardised mortality rates (EASMR) in Ireland for childhood (aged 0-14) cancer did not change significantly for either boys or girls during 1994-2004. Likewise there was no significant change in Northern Ireland or Republic of Ireland considered separately. (Fig. 4.7)

As a result of demographic change there were small variations in the annual number of deaths among boys in Ireland during 1994-2004, with an annual average decrease of 0.6 deaths per year. There was no change in the number of girl deaths each year. (Fig. 4.7)

Figure 4.7: Trends in European age-standardised mortality rates (EASMR) for childhood cancer by sex and country: 1994-2004



4.4: Prevalence

At the end of 2004 there were 935 children aged 0-14 alive at the end of 2004 having been diagnosed with cancer (ex. NMSC) during 1994-2004, 80.8% of all cases diagnosed among children (who were still children at the end of 2004). Considering those diagnosed in 2000-2004 there were 560 children alive at the end of 2004 having had a diagnosis of cancer. (Tab. 4.7)

Table 4.7: Prevalence of childhood cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Boys	138	72.3%	73	77.7%
	Girls	126	80.8%	72	88.9%
	All children	264	76.1%	145	82.9%
Republic of Ireland	Boys	371	81.7%	233	86.9%
	Girls	300	84.3%	182	86.7%
	All children	671	82.8%	415	86.8%
Ireland	Boys	509	78.9%	306	84.5%
	Girls	426	83.2%	254	87.3%
	All children	935	80.8%	560	85.8%

Of those alive at the end of 2004 145 survivors resided in Northern Ireland while 415 resided in Republic of Ireland. In terms of the number of children per 100,000 members of the population, prevalence of childhood cancer was 17.4% lower in Northern Ireland than Republic of Ireland. (Tab. 4.7)

4.5: Discussion

Cancer affects a small number of children in Ireland each year and the exact causes are as yet unknown. Some factors associated with a higher risk of cancer in children that have been identified include some medical conditions (such as Down's syndrome), problems with development in the womb, exposure to infections such as Epstein-Barr virus and exposure to radiation.[19] To date there is no evidence to suggest that exposure to electromagnetic fields increases the likelihood of children developing cancer.[19]

Leukaemia, lymphoma, brain cancer and kidney cancer make up the majority of childhood cancers, however without a clear indication as to the causes of these cancers prevention strategies are not possible.

Fortunately deaths among children from cancer have fallen since the 1960s due to improvements in survival as a result of the introduction of combination chemotherapy.[20] With new treatments constantly being developed further improvements in survival over the next couple of decades seem likely. The improved survival of these patients means that some will live to develop other diseases including second cancers, either sporadically or as a result of increased risk due to the treatment received for the original cancer. Persons who have had a cancer in childhood should be monitored for increased risk of treatment side effects, including second cancers, to ensure early diagnosis.

Chapter 05:

Cancer of the head and neck (C00-C14, C30-C32)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were on average 444 male and 171 female cases diagnosed each year between 2000 and 2004.*
  - *During 1994-2004 male incidence rates decreased by an average of 2.6% each year, with no change for females.*
  - *Incidence was higher among males during 1994-2004 in Belfast, Dublin, Longford, Cookstown, Derry and Galway. Among females incidence was higher in Coleraine, Derry and Belfast.*
  - *During 2000-2004 there was a strong relationship between deprivation and incidence of the disease.*
  - *Incidence was low compared to the European Union, USA, Australia and Canada for males and females.*
  - *There were on average 191 male and 77 female deaths each year during 2000-2004.*
  - *Mortality rates decreased among males and females in 1994-2004 by 2.5% and 2.0% per year respectively.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival for patients diagnosed in 2000-2004 was estimated to be 52.1%, with no significant variations by sex.*
  - *There was no change in survival for males or females between 1994-1996 and 1997-1999.*
  - *For patients diagnosed during 1997-1999 survival depended upon cancer site with five-year (age-standardised) relative survival for laryngeal cancer 63.4% compared to 46.0% for oral cancer.*
  - *At the end of 2004 3,151 people were living in Ireland having been diagnosed with the disease in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *There was no significant difference in incidence rates between Northern Ireland and Republic of Ireland during 1994-2004.*
  - *Five-year (age-standardised) relative survival was 8.9% higher for patients diagnosed in 2000-2004 in Northern Ireland than Republic of Ireland.*
  - *Mortality rates in Northern Ireland were 24.0% lower than in Republic of Ireland for males but were similar in both countries for females.*
  - *There was no significant trend in mortality rates in Northern Ireland during 1994-2004, however in Republic of Ireland male and female mortality rates decreased by 2.6% and 2.2% per year respectively.*
  - *At the end of 2004 the number of people per 100,000 members of the population who had been diagnosed with the disease in 2000-2004 was 31.2% higher in Northern Ireland than Republic of Ireland.*

5.1: Incidence

In Ireland there were on average 444 male and 171 female cases of cancer of the head and neck diagnosed each year between 2000 and 2004, making it the sixth most common male and sixteenth most common female cancer diagnosed. It made up 2.9% of all cancers in Ireland (excluding NMSC). In the absence of other disease males had a 1.5% risk of developing cancer of the head or neck before the age of 75, three times the risk for females. (Tab. 5.1)

Among males European age-standardised incidence rates (EASIR) for cancer of the head and neck during 2000-2004 were three times higher among males than females. While this difference was higher in Republic of Ireland than in Northern Ireland there was no significant difference in male EASIRs between Republic of Ireland and Northern Ireland, although some weak evidence of a difference among females was apparent with EASIRs 15.3% higher in Northern Ireland, a difference that was not statistically significant (p=0.074). (Tab. 5.1)

Table 5.1: Summary statistics for incidence of cancer of the head and neck: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	145	61	206	299	110	409	444	171	615
% of all cancer cases (ex. NMSC)	4.4%	1.8%	3.1%	3.9%	1.6%	2.8%	4.0%	1.6%	2.9%
Rank (ex. NMSC)	6	13	8	6	16	10	6	16	9
Median age at diagnosis	64	66	64	63	67	64	63	66	64
Cumulative risk (Aged 0 to 74)	1.5%	0.5%	1.0%	1.5%	0.4%	1.0%	1.5%	0.5%	1.0%
Crude rate per 100,000 persons	17.5	7.1	12.2	15.4	5.6	10.4	16.0	6.0	11.0
EASIR ± 95% CI	18.2 ±1.3	6.3 ±0.7	11.7 ±0.7	17.5 ±0.9	5.5 ±0.5	11.2 ±0.5	17.7 ±0.7	5.7 ±0.4	11.4 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							3.7% ±9.3	15.3% ±16.8	4.8% ±8.0

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

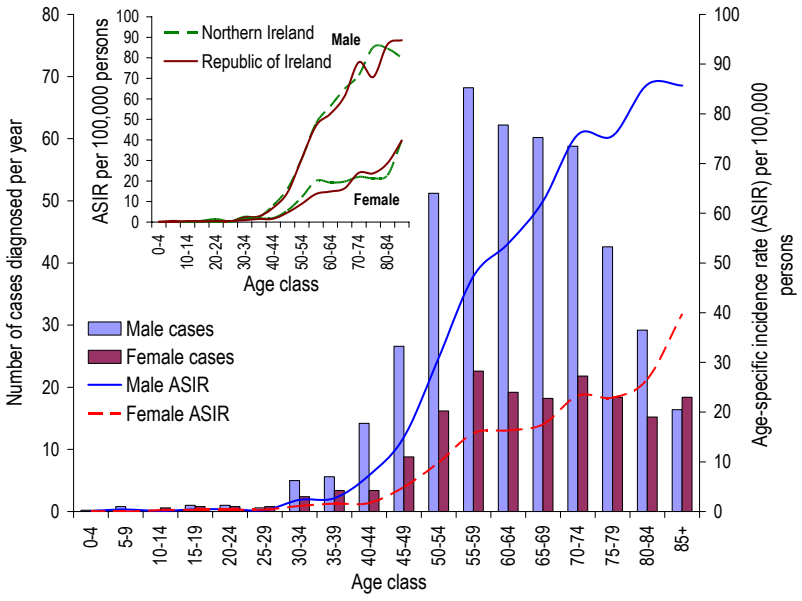
5.1.1: Age distribution

Half of the patients diagnosed with cancer of the head and neck in 2000-2004 were diagnosed with the disease before the age of 64, slightly younger than for most cancers. (Tab. 5.1)

The number of cases diagnosed each year was highest among males and females in the 55-59 age class with 68 male and 23 female cases per year. Age-specific incidence rates (ASIR) were highest among males aged 80-84 and females aged 85 and over. (Fig. 5.1)

There was on average one boy and one girl (aged 0-14) diagnosed with the disease each year during 2000-2004. (Fig. 5.1)

Figure 5.1: Number of cases of cancer of the head and neck diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

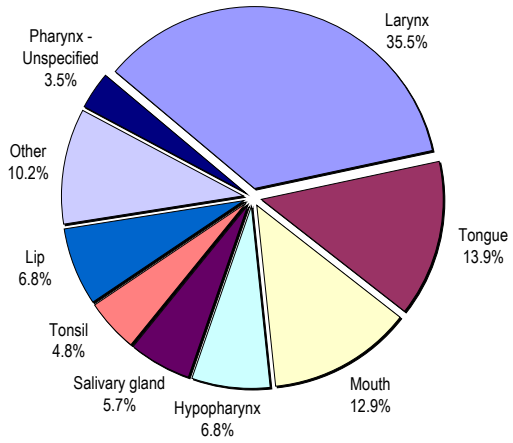


5.1.2: Cancer site

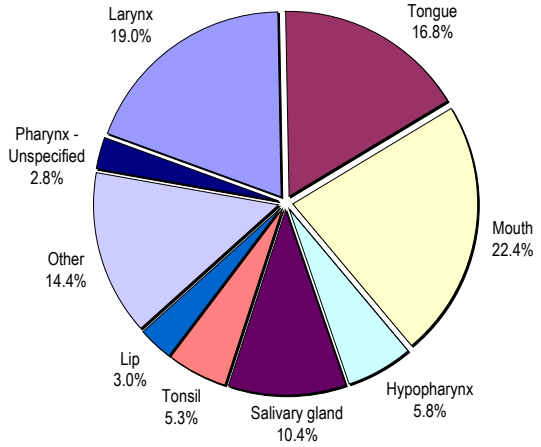
Cancer of the head and neck encompasses cancers of many different unique parts of the body. The most common head and neck cancer site diagnosed among males during 2000-2004 in Ireland was laryngeal cancer which made up 35.5% of male head and neck cancers, while cancer of the mouth was the most common among females making up 22.4% of female cancers of the head and neck. Only a small proportion of cancers of the pharynx had an unspecified type with a similar proportion in Northern Ireland and Republic of Ireland (NI: 3.8%; ROI: 3.0%). (Fig. 5.2)

Figure 5.2: Types of cancer of the head and neck diagnosed in Ireland: 2000-2004

(a) Male



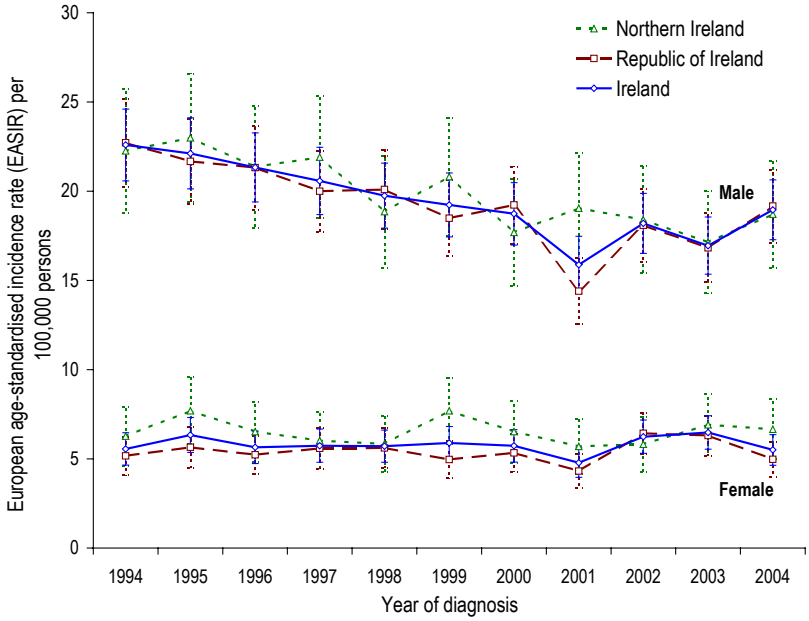
(b) Female



5.1.3: Trends

Among males European age-standardised incidence rates (EASIR) decreased by 2.6% (p=0.001) each year in Ireland during 1994-2004 with an accompanying decrease of 4.1 cases diagnosed each year. This pattern was seen throughout Ireland with an annual decrease in EASIRs of 2.5% (p<0.001) in Northern Ireland and 2.6% (p=0.01) in Republic of Ireland. The annual number of cases diagnosed in each country also decreased; by 1.5 per year in Northern Ireland and 2.5 per year in Republic of Ireland. (Fig. 5.3, Tab. 5.2)

Figure 5.3: Trends in European age-standardised incidence rates (EASIR) for cancer of the head and neck by sex and country: 1994-2004



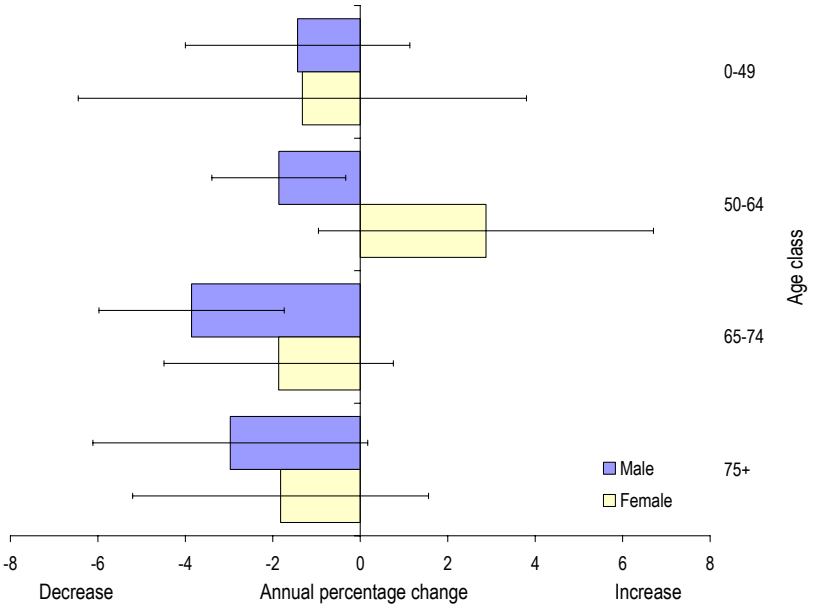
Female rates of head and neck cancer (EASIR) however did not change significantly during the period either in Ireland as a whole, or in each country. However while the number of cases diagnosed annually remained virtually static between 1994 and 2004 in Northern Ireland, there was an annual increase of 1.8 female

Table 5.2: Number of cases and European age-standardised incidence rates (EASIR) for cancer of the head and neck by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	161	22.3 ±3.5	336	22.7 ±2.5	497	22.6 ±2.0	62	6.3 ±1.7	96	5.2 ±1.1	158	5.6 ±0.9
1995	161	23.0 ±3.6	327	21.7 ±2.4	488	22.1 ±2.0	71	7.7 ±1.9	105	5.7 ±1.1	176	6.3 ±1.0
1996	154	21.4 ±3.4	323	21.3 ±2.4	477	21.3 ±1.9	64	6.5 ±1.7	95	5.2 ±1.1	159	5.6 ±0.9
1997	159	21.9 ±3.4	305	20.0 ±2.3	464	20.6 ±1.9	59	6.0 ±1.6	99	5.6 ±1.1	158	5.7 ±0.9
1998	142	18.9 ±3.1	318	20.1 ±2.2	460	19.8 ±1.8	59	5.8 ±1.6	108	5.6 ±1.1	167	5.7 ±0.9
1999	156	20.8 ±3.3	297	18.5 ±2.1	453	19.2 ±1.8	74	7.7 ±1.8	93	5.0 ±1.0	167	5.9 ±0.9
2000	136	17.7 ±3.0	311	19.2 ±2.2	447	18.7 ±1.7	59	6.5 ±1.7	106	5.3 ±1.1	165	5.7 ±0.9
2001	148	19.0 ±3.1	237	14.4 ±1.8	385	15.9 ±1.6	56	5.7 ±1.6	83	4.3 ±1.0	139	4.8 ±0.8
2002	147	18.4 ±3.0	309	18.1 ±2.0	456	18.2 ±1.7	59	5.8 ±1.6	129	6.4 ±1.1	188	6.2 ±0.9
2003	141	17.1 ±2.9	295	16.8 ±1.9	436	17.0 ±1.6	67	6.9 ±1.7	128	6.3 ±1.1	195	6.5 ±0.9
2004	153	18.7 ±3.0	343	19.2 ±2.0	496	19.0 ±1.7	65	6.7 ±1.7	104	5.0 ±1.0	169	5.5 ±0.9

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 5.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for cancer of the head and neck by sex and age: 1994-2004



cases per year in Republic of Ireland as a result of population growth. (Fig. 5.3, Tab. 5.2)

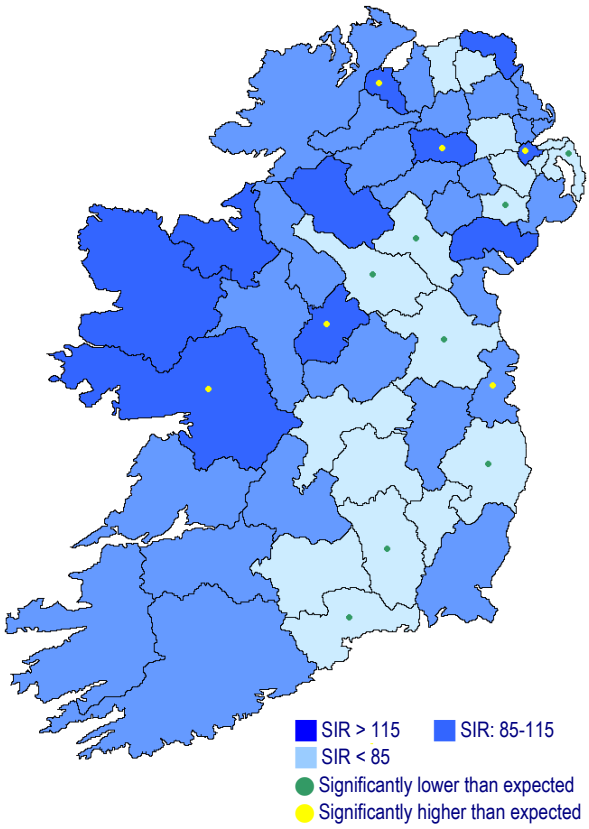
Trends in EASIRs of head and neck cancer in Ireland for different age groups were mostly inconclusive during 1994-2004 with no significant change for any female age group. However while the changes were not statistically significant the 0-49, 65-74 and 75+ age classes appeared to exhibit decreases in EASIRs while the 50-64 age class showed an increase. Among males there were decreases of 1.9% (p=0.024) and 3.9% (p=0.003) in the 50-64 and 65-74 age groups respectively while there were no significant changes among those aged 0-49 or 75 and over. (Fig. 5.4)

5.1.4: Geographic analysis

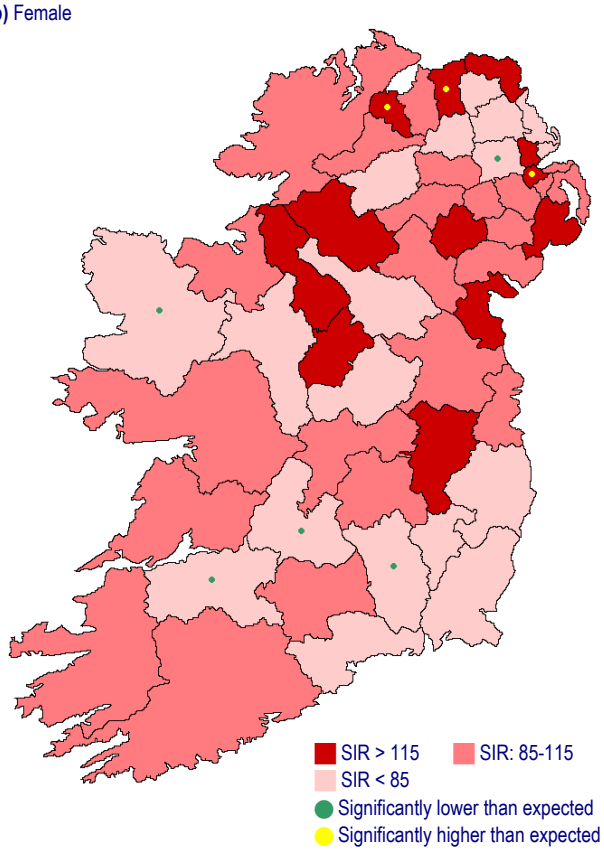
Compared to all of Ireland incidence of cancer of the head and neck was higher among males during 1994-2004 in Belfast, Dublin, Longford, Cookstown, Derry and Galway. Among females incidence was higher in Coleraine, Derry and Belfast. Nine of the counties/councils in Ireland had lower than expected (based on all of Ireland) levels of the disease among males compared to five among females. (Fig. 5.5)

Figure 5.5: Significant differences in county/council standardised incidence ratios for cancer of the head and neck compared to Ireland as a whole: 1994-2004

(a) Male



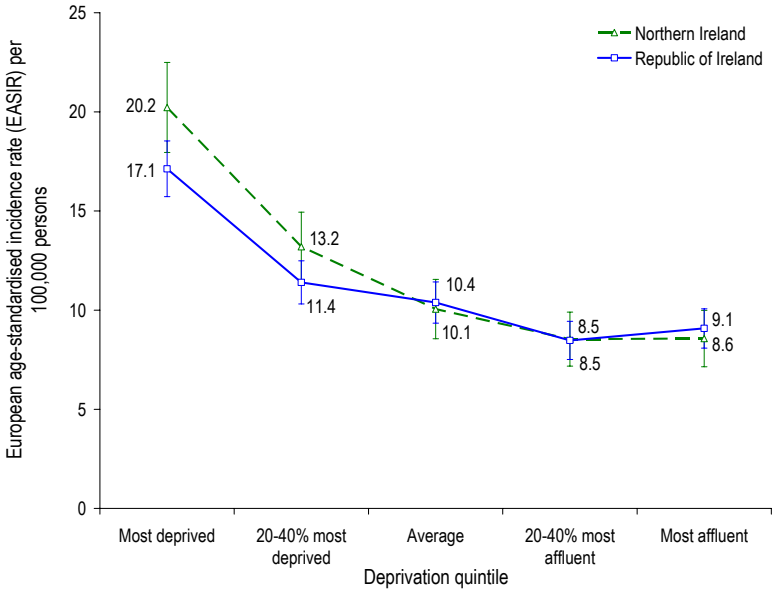
(b) Female



5.1.5: Socio-economic factors

During 2000-2004 there was a strong relationship between socio-economic factors (based upon area of residence) and incidence of cancer of the head and neck with European age-standardised incidence rates (EASIR) 2.4 times greater in deprived areas in Northern Ireland than in the most affluent areas. In Republic of Ireland the difference was smaller but still considerable with incidence 1.9 times greater among the 20% of the population resident in the most deprived areas compared to the 20% of the population resident in the most affluent areas. (Fig. 5.6)

Figure 5.6: European age-standardised incidence rates (EASIR) for cancer of the head and neck by country specific deprivation quintile: 2000-2004



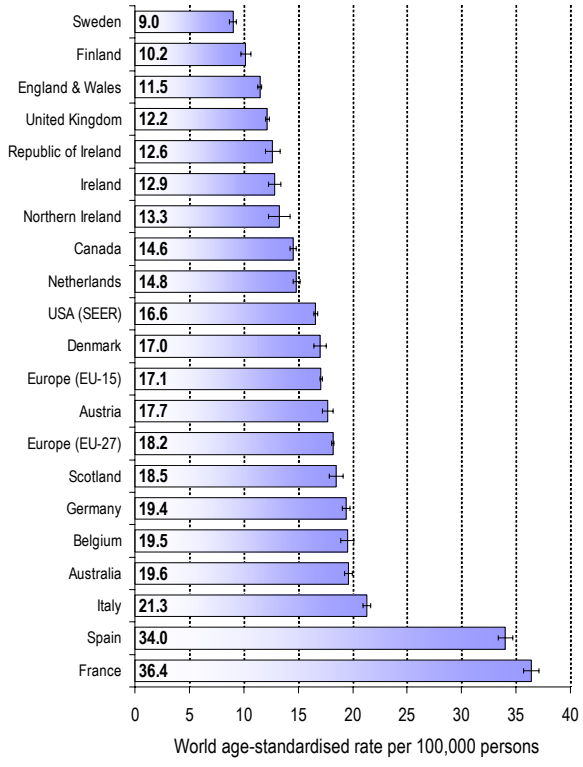
Incidence of cancer of the head and neck was 18% higher in the most deprived areas of Northern Ireland than in the most deprived areas of Republic of Ireland (p=0.032). There was no significant difference for the other deprivation quintiles. (Fig. 5.6)

5.1.6: International comparisons

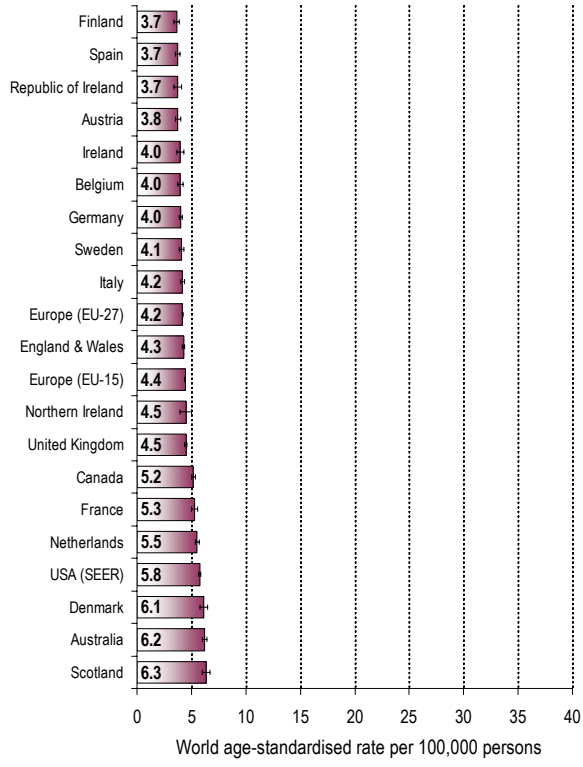
Incidence of cancer of the head and neck was low compared to the European Union during 1998-2000, with world age-standardised incidence rates (WASIR) in Ireland 24.6% lower among males and 9.1% lower among females than rates in the EU (measured using the 15 member countries at the end of 2004). Rates were also lower than those in USA, Australia and Canada for both males and females and than in the UK for females. (Fig. 5.7)

Figure 5.7: International comparisons of world age-standardised incidence rates for cancer of the head and neck: 1998-2000

(a) Male



(b) Female



Source: IARC[21]

5.2: Survival

Relative survival (age-standardised) from cancer of the head and neck was moderate with an estimated 74.0% of patients diagnosed in 2000-2004 surviving one year and 52.1% surviving five years. (Fig. 5.8, Tab. 5.3)

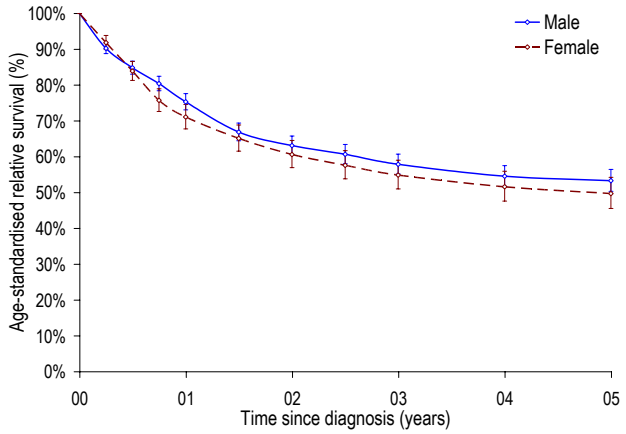
Table 5.3: Age-standardised relative survival for patients diagnosed with cancer of the head and neck by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	81.1% (77.5%, 84.8%)	77.8% (72.4%, 83.5%)	80.1% (77.1%, 83.1%)
	Republic of Ireland	72.5% (69.7%, 75.3%)	67.6% (63.5%, 72.1%)	70.8% (68.5%, 73.2%)
	Ireland	75.3% (73.1%, 77.6%)	71.1% (67.8%, 74.6%)	74.0% (72.1%, 75.9%)
5-year	Northern Ireland	58.9% (53.6%, 64.7%)	55.8% (48.6%, 64.0%)	57.9% (53.6%, 62.6%)
	Republic of Ireland	50.4% (46.9%, 54.2%)	46.8% (41.9%, 52.4%)	49.0% (46.1%, 52.0%)
	Ireland	53.3% (50.4%, 56.5%)	49.8% (45.6%, 54.3%)	52.1% (49.7%, 54.6%)

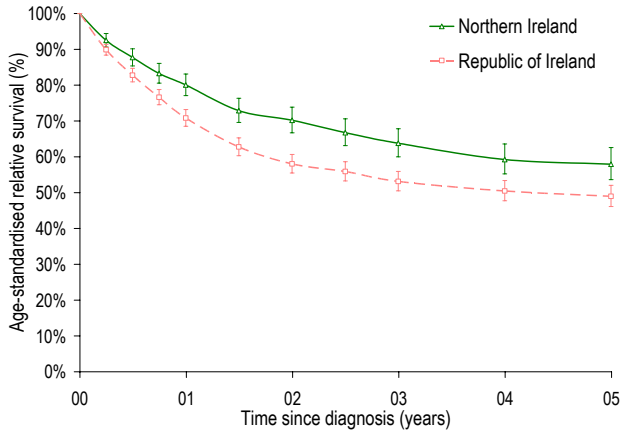
Age-standardised relative survival did not vary significantly by sex. However five-year (age-standardised) relative survival from the disease was 8.9% (p=0.018) higher for all persons in Northern Ireland than Republic of Ireland, although differences by sex were not statistically significant. The survival differences were likely related to variations in survival depending upon the type of head and neck cancer, the levels of which vary slightly in each country. (Fig. 5.8, Tab. 5.3)

Figure 5.8: Age-standardised relative survival for patients diagnosed with cancer of the head and neck by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



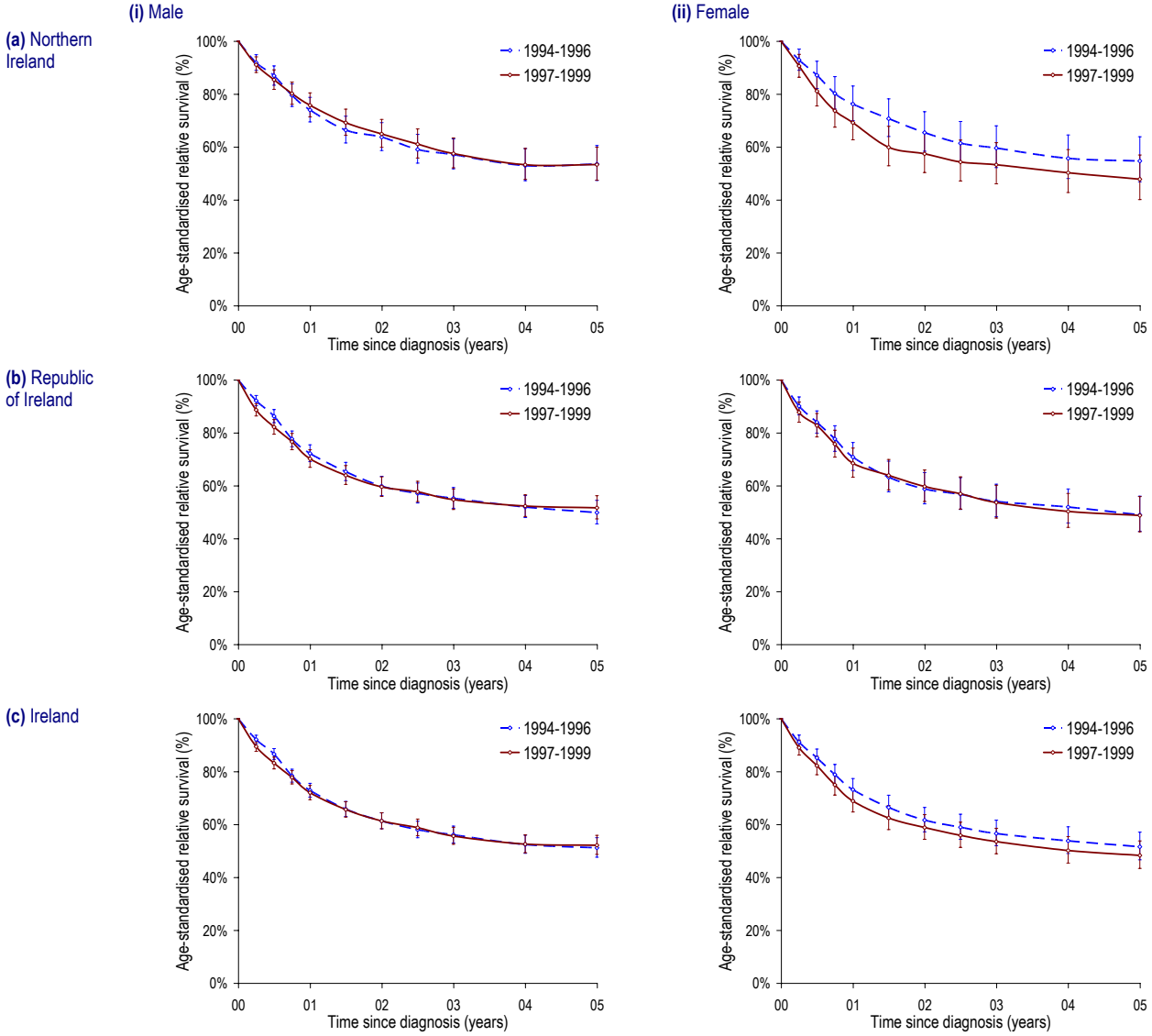
5.2.1: Changes in survival over time

There was no significant variation in one or five-year (age-standardised) relative survival for males or females between those diagnosed in 1994-1996 and 1997-1999. This was apparent in Northern Ireland and Republic of Ireland as well as Ireland as a whole. However the difference in the estimates of relative survival for patients diagnosed in 2000-2004 between the two countries was not present for patients diagnosed in 1994-1996 and 1997-1999. (Fig. 5.9, Tab. 5.4)

Table 5.4: Age-standardised relative survival for patients diagnosed with cancer of the head and neck by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	74.8% (71.2%, 78.6%)	73.9% (70.3%, 77.8%)	54.2% (49.4%, 59.5%)	51.9% (47.1%, 57.1%)
	Republic of Ireland	71.9% (69.2%, 74.6%)	69.6% (66.9%, 72.5%)	49.4% (45.9%, 53.2%)	50.8% (47.3%, 54.6%)
	Ireland	73.0% (70.8%, 75.2%)	71.1% (68.8%, 73.4%)	51.2% (48.3%, 54.2%)	51.0% (48.2%, 54.1%)
Male	Northern Ireland	74.1% (69.6%, 78.9%)	75.9% (71.4%, 80.6%)	53.6% (47.4%, 60.6%)	53.4% (47.5%, 60.0%)
	Republic of Ireland	72.3% (69.2%, 75.5%)	70.3% (67.0%, 73.7%)	49.9% (45.7%, 54.6%)	51.7% (47.5%, 56.3%)
	Ireland	73.0% (70.4%, 75.6%)	72.1% (69.5%, 74.8%)	51.3% (47.7%, 55.1%)	52.2% (48.8%, 56.0%)
Female	Northern Ireland	76.3% (70.0%, 83.1%)	69.3% (62.8%, 76.5%)	54.8% (46.9%, 64.0%)	47.9% (40.2%, 57.1%)
	Republic of Ireland	70.9% (65.9%, 76.4%)	68.6% (63.3%, 74.3%)	49.1% (42.9%, 56.2%)	48.9% (42.7%, 55.9%)
	Ireland	73.2% (69.3%, 77.4%)	68.9% (64.8%, 73.3%)	51.7% (46.7%, 57.2%)	48.4% (43.5%, 53.9%)

Figure 5.9: Age-standardised relative survival for patients diagnosed with cancer of the head and neck by sex, country and period of diagnosis: 1994-1999



5.2.2: Observed survival

One-year observed survival (which takes account of causes of death other than cancer and is thus lower than relative survival) was 70.5% for males and 66.7% for females diagnosed in 1997-1999. Five-year observed survival was also average for those diagnosed in this time period at 43.8% for males and 42.0% for females. The variations by sex were not statistically significant, nor were any variations in observed survival between Northern Ireland and Republic of Ireland. Analysis of differences in observed survival over time did not reveal any significant change between 1994-1996 and 1997-1999. (Tab. 5.5)

Table 5.5: Observed survival for patients diagnosed with cancer of the head and neck by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	73.2% (69.8%, 76.7%)	71.9% (68.5%, 75.6%)	46.0% (42.3%, 50.1%)	43.9% (40.1%, 48.0%)
	Republic of Ireland	70.1% (67.6%, 72.7%)	68.2% (65.6%, 71.0%)	40.2% (37.5%, 43.0%)	43.1% (40.3%, 46.0%)
	Ireland	71.1% (69.1%, 73.2%)	69.5% (67.4%, 71.7%)	42.1% (40.0%, 44.4%)	43.3% (41.1%, 45.7%)
Male	Northern Ireland	72.5% (68.4%, 76.8%)	74.4% (70.4%, 78.7%)	44.8% (40.4%, 49.7%)	45.8% (41.3%, 50.8%)
	Republic of Ireland	70.9% (68.1%, 73.9%)	68.6% (65.6%, 71.8%)	40.0% (37.0%, 43.2%)	42.8% (39.7%, 46.3%)
	Ireland	71.4% (69.1%, 73.9%)	70.5% (68.1%, 73.0%)	41.5% (39.0%, 44.2%)	43.8% (41.2%, 46.6%)
Female	Northern Ireland	74.7% (68.7%, 81.2%)	66.1% (59.6%, 73.3%)	48.9% (42.2%, 56.7%)	39.3% (32.9%, 47.1%)
	Republic of Ireland	67.2% (62.0%, 72.9%)	67.0% (61.7%, 72.8%)	40.8% (35.5%, 46.9%)	43.7% (38.3%, 50.0%)
	Ireland	70.2% (66.2%, 74.4%)	66.7% (62.5%, 71.1%)	44.0% (39.7%, 48.7%)	42.0% (37.7%, 46.7%)

5.2.3: Cancer site

Survival from cancer of the head and neck depended upon cancer site with five-year (age-standardised) relative survival for patients diagnosed in Ireland during 1997-1999 with laryngeal cancer 63.4% compared to 46.0% for patients diagnosed with oral cancer. (Fig. 5.10, Tab. 5.6)

There was no significant variation between Northern Ireland and Republic of Ireland for oral cancer, cancer of the nose & sinuses or laryngeal cancer during 1994-1996 or 1997-1999. Additionally there were no changes in five-year (age-standardised) relative survival for any head and neck cancer site between 1994-1996 and 1997-1999. (Tab. 5.6)

Figure 5.10: Age-standardised relative survival for patients diagnosed with cancer of the head and neck by cancer site: 1997-1999

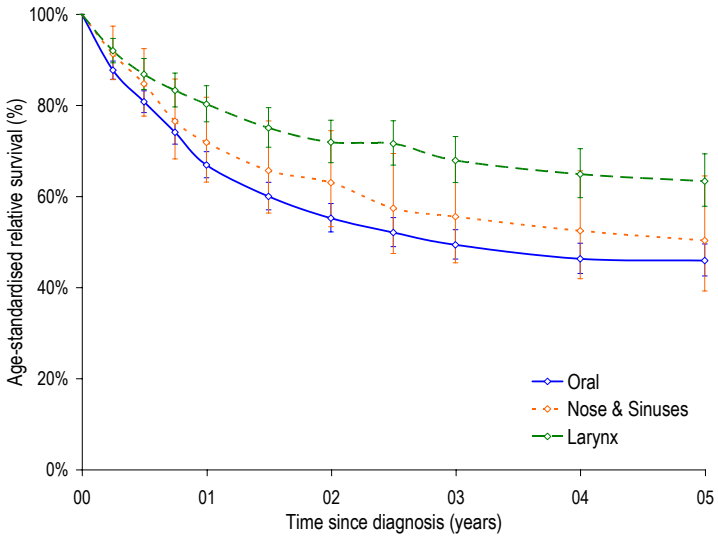


Table 5.6: Five-year age-standardised relative survival for patients diagnosed with cancer of the head and neck by cancer site and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)					
	Oral (C00-C14)		Nose & sinuses (C30-C31)		Larynx (C32)	
	1994-1996	1997-1999	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	50.1% (44.3%, 56.7%)	43.9% (38.5%, 50.0%)	53.2% (36.4%, 77.8%)	59.3% (41.7%, 84.4%)	62.6% (53.4%, 73.3%)	65.1% (55.1%, 76.8%)
Republic of Ireland	47.1% (42.9%, 51.6%)	47.5% (43.3%, 52.2%)	35.1% (24.1%, 51.3%)	41.3% (29.1%, 58.5%)	58.9% (51.9%, 66.8%)	62.1% (55.6%, 69.3%)
Ireland	48.3% (44.9%, 52.0%)	46.0% (42.6%, 49.6%)	41.7% (31.4%, 55.5%)	50.4% (39.3%, 64.5%)	60.3% (54.6%, 66.6%)	63.4% (57.9%, 69.4%)

5.3: Mortality

There were on average 191 male and 77 female deaths from cancer of the head and neck each year during 2000-2004. This made up 3.2% of all male cancer deaths (excluding NMSC) and 1.4% of all female cancer deaths (excluding NMSC). It was the ninth most common male cancer death with a cumulative risk of dying from the disease before the age of 75 of 0.6%. Among females it was the seventeenth commonest cause of cancer death, with a lower risk than males of dying from the disease of 0.2%. (Tab. 5.7)

The number of male deaths from cancer of the head and neck was almost 2.5 times higher than the number of female deaths with European age-standardised mortality rates (EASMR) over three times higher among males than females. Mortality rates from cancer of the head and neck (EASMRs) in Northern Ireland were 24.0% ($p<0.001$) lower than in Republic of Ireland for males but mortality rates in both countries were similar for females. (Tab. 5.7)

Table 5.7: Summary statistics for deaths from cancer of the head and neck: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	51	25	75	140	52	192	191	77	267
% of all cancer deaths (ex. NMSC)	2.7%	1.4%	2.1%	3.5%	1.5%	2.5%	3.2%	1.4%	2.4%
Rank (ex. NMSC)	11	17	14	8	16	12	9	17	12
Median age at death	68	72	69	67	74	68	67	73	68
Cumulative risk (Aged 0 to 74)	0.5%	0.2%	0.3%	0.6%	0.2%	0.4%	0.6%	0.2%	0.4%
Crude rate per 100,000 persons	6.1	2.8	4.4	7.2	2.7	4.9	6.9	2.7	4.8
EASMR ± 95% CI	6.3 ±0.8	2.3 ±0.4	4.1 ±0.4	8.3 ±0.6	2.4 ±0.3	5.1 ±0.3	7.6 ±0.5	2.4 ±0.2	4.8 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-24.0% ±11.1	-4.1% ±21.8	-20.4% ±9.7

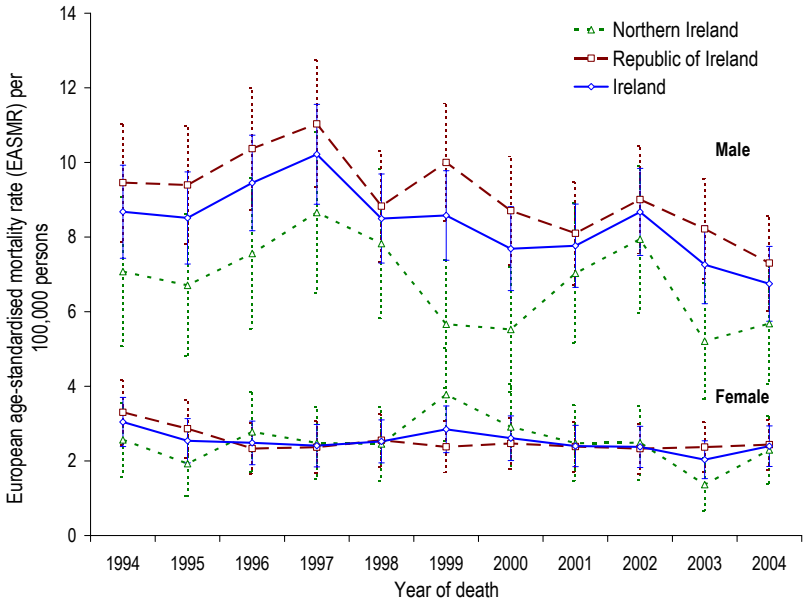
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

5.3.1: Trends

European age standardised mortality rates (EASMR) in Ireland for cancer of the head and neck decreased among males and females during 1994-2004 by 2.5% (p=0.015) and 2.0% (p=0.036) per year respectively. The reduction in mortality rates translated to annual decreases of 1.5 male and 0.7 female deaths per year. (Fig. 5.11)

Considering each country separately, there was no significant trend in EASMRs for cancer of the head and neck in Northern Ireland during 1994-2004. In Republic of Ireland however male EASMRs decreased by 2.6% (p=0.011) per year while female EASMRs decreased by 2.2% (p=0.024) per year. (Fig. 5.11)

Figure 5.11: Trends in European age-standardised mortality rates (EASMR) for cancer of the head and neck by sex and country: 1994-2004



5.4: Prevalence

Between 1994 and 2004 there were 6,900 people diagnosed with cancer of the head and neck. Of these 45.7% (3,151 people) were still alive at the end of 2004. The majority of these (1,858 people) were diagnosed in the 2000-2004 period, which was 60.4% of all those diagnosed during 2000-2004. (Tab. 5.8)

Table 5.8: Prevalence of cancer of the head and neck in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	806	48.6%	475	65.5%
	Female	319	45.9%	188	61.4%
	All persons	1,125	47.8%	663	64.3%
Republic of Ireland	Male	1,509	44.4%	886	59.3%
	Female	517	45.1%	309	56.2%
	All persons	2,026	44.6%	1,195	58.4%
Ireland	Male	2,315	45.8%	1,361	61.3%
	Female	836	45.4%	497	58.1%
	All persons	3,151	45.7%	1,858	60.4%

73.3% of those alive at the end of 2004 having been diagnosed within the previous five years were male (1,361 males compared to 497 females) while 663 survivors were resident in Northern Ireland compared to 1,195 in Republic of Ireland. At the end of 2004 the number of people per 100,000 members of the population who had been diagnosed with the disease in the previous five years was 31.2% higher in Northern Ireland than Republic of Ireland. (Tab. 5.8)

5.5: Discussion

Cancer of the head and neck includes both oral and laryngeal cancer and cancers of the nasopharynx and sinuses. Oral cancer specifically refers to cancer of the mouth (including the lips and tongue) and the throat (also known as the pharynx) while the larynx (or voice box) is a part of the body located in the neck at the beginning of the wind pipe that channels air to the lungs rather than allowing it to enter the stomach. Symptoms of these types of cancer differ slightly. For oral cancer symptoms include persistent red or white patches, lumps on the lip, throat or in the neck, bad breath, unusual bleeding or numbness in the mouth, difficulty with chewing, swallowing or moving the jaw, speech difficulties, hearing loss, headaches and/or blood discharge from the nose.[22,23]

Cancer of the larynx presents itself through hoarseness, bad breath, difficulty in swallowing, shortness of breath, and/or a persistent cough.[24]

Tobacco and excessive alcohol consumption are linked with cancers of the lip, oral cavity and pharynx[25,26] and with cancer of the larynx, with the risk of developing the later increasing as the length of time a person has smoked increases.[27] Alcohol consumption also increases risk of developing laryngeal cancer with heavy drinkers having 2-5 times the risk of non drinkers of developing this disease.[28] Both smoking and drinking heavily can interact to give an even higher risk than either on their own.[27,28]

Diet can also affect the risk of developing cancer of the head and neck with a deficiency in zinc or Vitamin A increasing the risk and a diet high in fresh fruit and vegetables reducing the risk.[29,30] A weakened immune system, caused for example by medicines taken after an organ transplant, can increase the risk of developing all types of head and neck cancer[31,28] and a possible link with human papillomavirus (HPV) has recently been reported.[28,32] Exposure to UV radiation from sunshine or sunbeds is also known to be a risk factor for cancer of the lip[33] while regular exposure to certain chemicals such as wood dust, paint fumes or soot increase the risk of cancer of the mouth, nasal cavity or pharynx.[31]

Worldwide there are approximately 450,000 new cases of cancer of the head and neck diagnosed each year with high incidence of oral cancer found in India, Australia, Hungary, France, Brazil and Southern Africa, while incidence of laryngeal cancer is high in Southern and Eastern Europe, Latin America and Western Asia. Geographic patterns are linked to the prevalence of smoking and alcohol abuse or chewing of tobacco in less developed countries.

Due to the accessibility of head and neck cancers, surgery, usually combined with radiotherapy, is the main form of treatment for this cancer. However early diagnosis is essential for this to be effective. In more advanced cases a combination of chemotherapy and radiotherapy is used to control symptoms, however survival from late stage disease is poor. Control of this disease is thus best achieved through preventative measures, particularly in the areas of tobacco control and alcohol abuse. However early detection of the disease, requiring greater public awareness about symptoms, can often lead to successful treatment of the disease.

Chapter 06:

Oesophageal cancer (C15)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 296 male and 183 female cases diagnosed in Ireland each year.*
  - *There was no significant change in male incidence rates during 1994-2004, while female incidence rates fell by 1.2% each year.*
  - *Incidence rates among males were significantly higher during 1994-2004 than the average rate throughout Ireland in Belfast, while among females they were higher in Carlow, Kildare and Cork.*
  - *Incidence rates in the 20% most deprived populations of Northern Ireland and Republic of Ireland were higher than those in the 20% most affluent populations during 2000-2004.*
  - *Incidence rates were higher in Ireland during 1998-2000 than in the EU, USA, Canada and Australia for both males and females.*
  - *During 2000-2004 there were 296 male and 174 female deaths per year.*
  - *There was no significant change in mortality rates between 1994 and 2004 in Ireland for either sex.*

- *TREATMENT*
  - *During 2001 36.6% of patients in Ireland received radiotherapy, 30.8% received chemotherapy and 25.7% underwent surgery, with 40.2% receiving no form of tumour directed treatment.*
  - *Compared to 1996 the use of chemotherapy and radiotherapy increased in Ireland by 14.8% and 8.8% respectively, while surgery use decreased by 8.3%. The proportion of patients receiving no tumour directed treatment decreased by 7.6%.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year relative survival was estimated to be 12.8% for males and 17.0% for females diagnosed in 2000-2004.*
  - *There was no significant change in one or five-year (age-standardised) relative survival for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland.*
  - *Among those diagnosed in 1994-2004 816 people were still alive at the end of 2004.*

- *NORTH/SOUTH COMPARISONS*
  - *There was no significant difference between incidence rates in each country for either males or females during 2000-2004.*
  - *The use of surgery was 14.8% higher in Northern Ireland than in Republic of Ireland, while the use of chemotherapy and radiotherapy was 12.6% and 36.5% lower respectively. The proportion of patients receiving no tumour directed treatment was 12.3% higher in Northern Ireland than Republic of Ireland.*
  - *The increase in radiotherapy use was only present in Republic of Ireland (14.3%), where decreases in surgery use (11.3%) and the proportion of patients receiving no tumour directed treatment (11.3%) were also present.*
  - *Neither one nor five-year (age-standardised) relative survival varied significantly by country during 2000-2004.*
  - *There was no significant difference in mortality rates between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed with oesophageal cancer during 2000-2004 was 8.1% greater in Northern Ireland than Republic of Ireland.*

6.1: Incidence

Oesophageal cancer was the tenth most common male and fourteenth most common female cancer (excluding NMSC) diagnosed during 2000-2004 in Ireland. During this five-year period there were on average 296 male and 183 female cases diagnosed each year, a male to female ratio of 1.6:1 that made up 2.7% and 1.7% of all male and female cancers (excluding NMSC) respectively. The odds of developing the disease before the age of 75 were 1 in 109 for males and 1 in 250 for females. (Tab. 6.1)

European age-standardised incidence rates (EASIR) among males were over double those of females, a pattern present in both Northern Ireland and Republic of Ireland. Both countries had similar levels of oesophageal cancer with no significant difference between EASIRs for each country for either males or females. (Tab. 6.1)

Table 6.1: Summary statistics for incidence of oesophageal cancer: 2000-2004

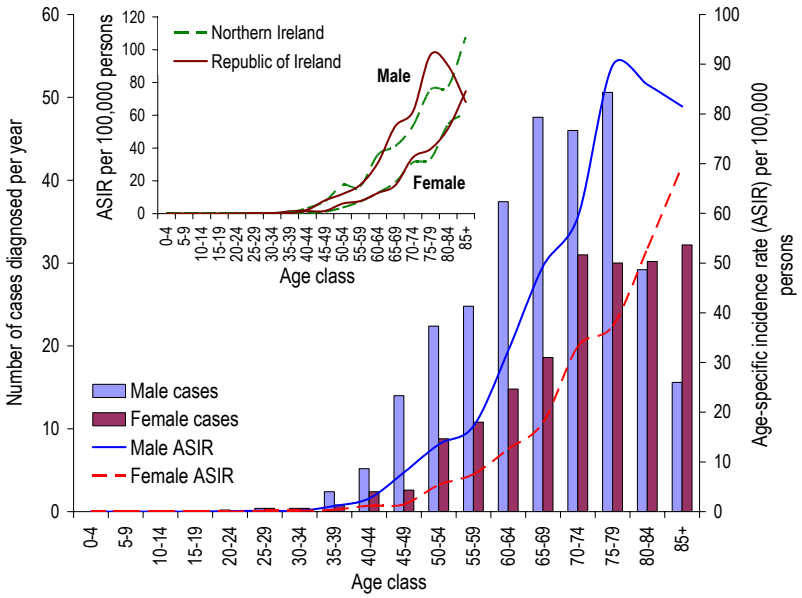
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	92	59	152	204	124	327	296	183	479
% of all cancer cases (ex. NMSC)	2.8%	1.7%	2.2%	2.6%	1.8%	2.2%	2.7%	1.7%	2.2%
Rank (ex. NMSC)	9	14	15	10	15	14	10	14	14
Median age at diagnosis	69	75	72	69	74	71	69	75	71
Cumulative risk (Aged 0 to 74)	0.9%	0.4%	0.6%	0.9%	0.4%	0.7%	0.9%	0.4%	0.6%
Crude rate per 100,000 persons	11.2	6.8	8.9	10.5	6.3	8.4	10.7	6.5	8.5
EASIR ± 95% CI	11.4 ±1.1	5.0 ±0.6	7.9 ±0.6	11.8 ±0.7	5.6 ±0.5	8.5 ±0.4	11.7 ±0.6	5.4 ±0.4	8.3 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-3.1% ±10.8	-9.8% ±13.2	-7.2% ±8.2

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

6.1.1: Age distribution

Oesophageal cancer had a median age of diagnosis among males of 69 years compared to 75 years for females. Male cases were highest among those aged 75-79 with 17.1% of all male oesophageal cancer cases in this age class. Among females cases peaked in the 85 and over age group which contributed 17.6% of female oesophageal cancer cases. There were no children diagnosed with the disease during 2000-2004. (Fig. 6.1)

Figure 6.1: Number of cases of oesophageal cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



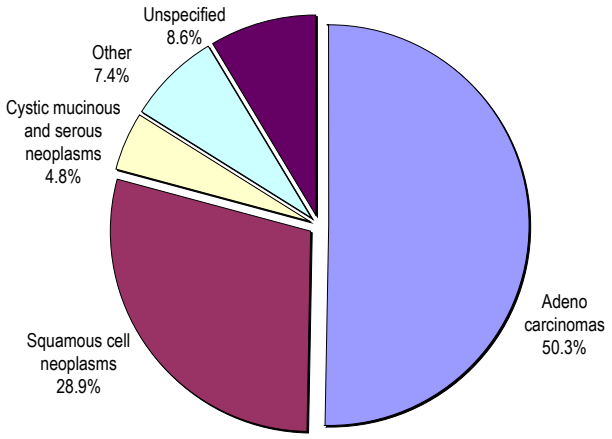
Among females in both countries in Ireland and males in Northern Ireland age-specific incidence rates (ASIR) rose steadily to a maximum in the 85 and over age class. ASIRs for males in the Republic of Ireland however peaked in the 75-79 age class, dropping for those aged 80 and over. (Fig. 6.1)

6.1.2: Cell type

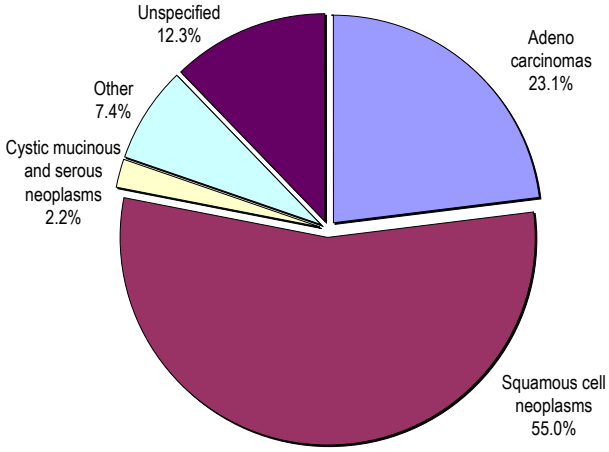
Among males the majority of oesophageal cancers diagnosed during 2000-2004 were adenocarcinomas, which made up 50.3% of all male cases diagnosed in Ireland. Among females however squamous cell carcinomas were the most common form of oesophageal cancer making up 55.0% of these cancers. Overall 10.0% of cases had an unspecified cell type with only slight differences in this proportion between Northern Ireland (11.7%) and Republic of Ireland (9.2%). (Fig. 6.2)

Figure 6.2: Types of oesophageal cancer diagnosed in Ireland: 2000-2004

(a) Male



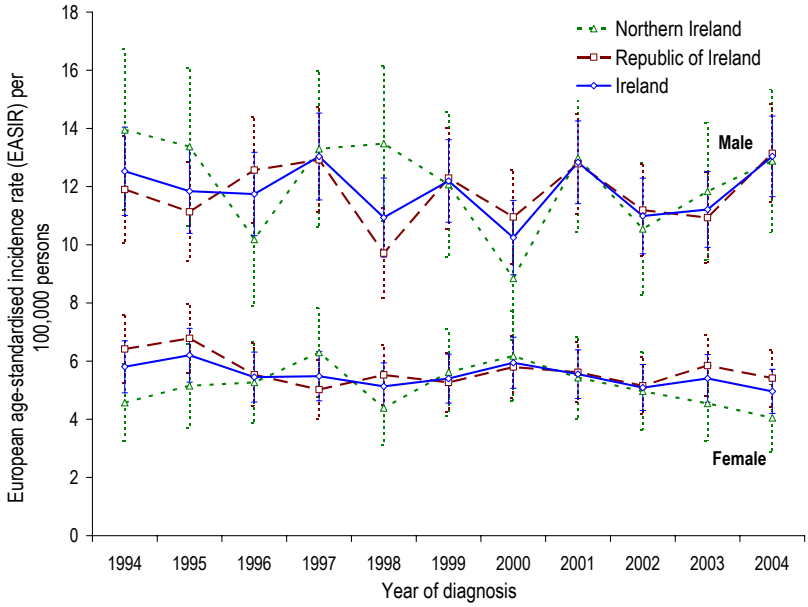
(b) Female



6.1.3: Trends

There was no significant trend in male European age-standardised incidence rates (EASIR) for oesophageal cancer in Ireland during 1994-2004. This was the situation in Northern Ireland and Republic of Ireland as well as the whole of Ireland. Female rates (EASIRs) however fell by 1.2% (p=0.05) each year during 1994-2004 in Ireland, although the decrease was not significant in either Northern Ireland or Republic of Ireland. (Fig. 6.3, Tab. 6.2)

Figure 6.3: Trends in European age-standardised incidence rates (EASIR) for oesophageal cancer by sex and country: 1994-2004



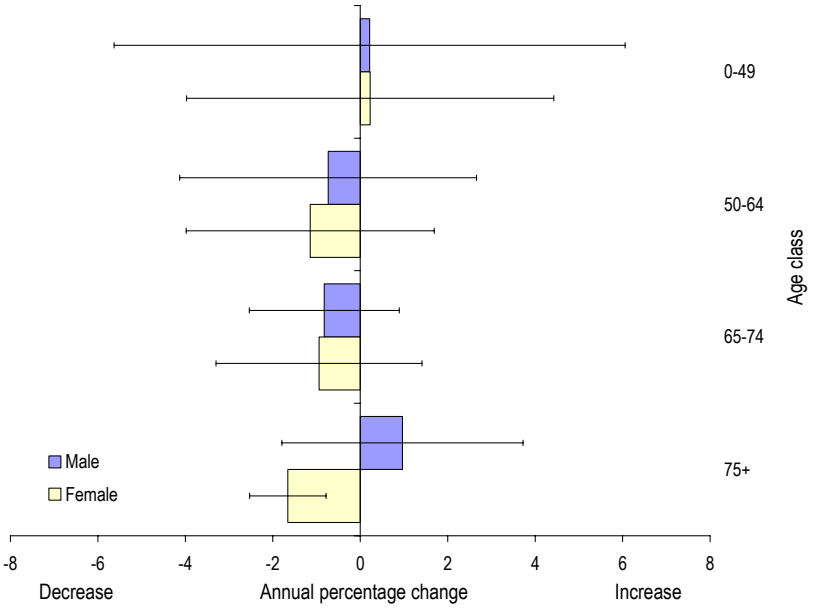
As a result of demographic change the static male incidence rates translated to an increase of 4.8 cases of oesophageal cancer diagnosed each year, the majority of which (4.4 cases) occurred in Republic of Ireland. The falling incidence rates among females however resulted in the annual number of cases remaining virtually static over the eleven-year period. (Tab. 6.2)

Table 6.2: Number of cases and European age-standardised incidence rates (EASIR) for oesophageal cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	100	13.9 ±2.8	172	11.9 ±1.8	272	12.5 ±1.5	52	4.6 ±1.3	128	6.4 ±1.2	180	5.8 ±0.9
1995	95	13.4 ±2.7	169	11.1 ±1.7	264	11.8 ±1.4	56	5.2 ±1.4	137	6.8 ±1.2	193	6.2 ±0.9
1996	78	10.2 ±2.3	188	12.6 ±1.8	266	11.7 ±1.4	60	5.3 ±1.4	111	5.5 ±1.1	171	5.5 ±0.9
1997	97	13.3 ±2.7	202	12.9 ±1.8	299	13.0 ±1.5	74	6.3 ±1.5	105	5.0 ±1.0	179	5.5 ±0.8
1998	100	13.5 ±2.7	154	9.7 ±1.6	254	10.9 ±1.4	53	4.4 ±1.3	119	5.5 ±1.0	172	5.1 ±0.8
1999	92	12.1 ±2.5	196	12.3 ±1.7	288	12.2 ±1.4	61	5.6 ±1.5	115	5.3 ±1.0	176	5.4 ±0.8
2000	69	8.8 ±2.1	182	11.0 ±1.6	251	10.2 ±1.3	69	6.2 ±1.5	124	5.8 ±1.1	193	5.9 ±0.9
2001	102	13.0 ±2.5	217	12.8 ±1.7	319	12.8 ±1.4	63	5.4 ±1.4	122	5.6 ±1.0	185	5.6 ±0.8
2002	84	10.5 ±2.3	194	11.2 ±1.6	278	11.0 ±1.3	59	5.0 ±1.3	115	5.2 ±1.0	174	5.1 ±0.8
2003	99	11.8 ±2.4	190	10.9 ±1.6	289	11.2 ±1.3	53	4.5 ±1.3	130	5.8 ±1.0	183	5.4 ±0.8
2004	108	12.9 ±2.5	236	13.1 ±1.7	344	13.0 ±1.4	53	4.1 ±1.2	127	5.4 ±1.0	180	5.0 ±0.8

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 6.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for oesophageal cancer by sex and age: 1994-2004



Examination of trends in oesophageal cancer by age illustrated no significant changes for any male age group (0-49, 50-64, 65-74, 75+) in Ireland during 1994-2004. (Fig. 6.4)

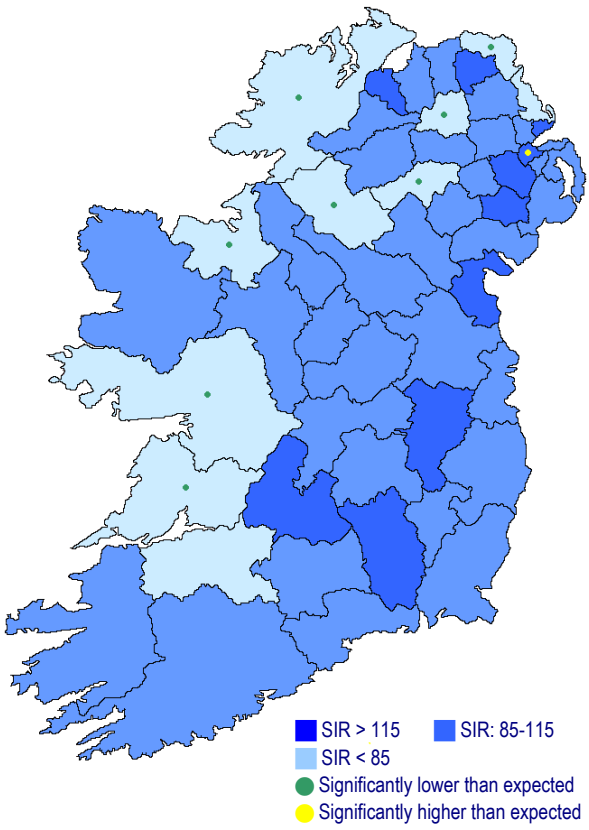
Among females however the drop in overall incidence rates appeared driven primarily by a 1.7% (p=0.002) decrease in EASIRs for females aged 75 and over, with slight but non-significant decreases among those aged 50-64 and 65-74. (Fig. 6.4)

6.1.4: Geographic variations

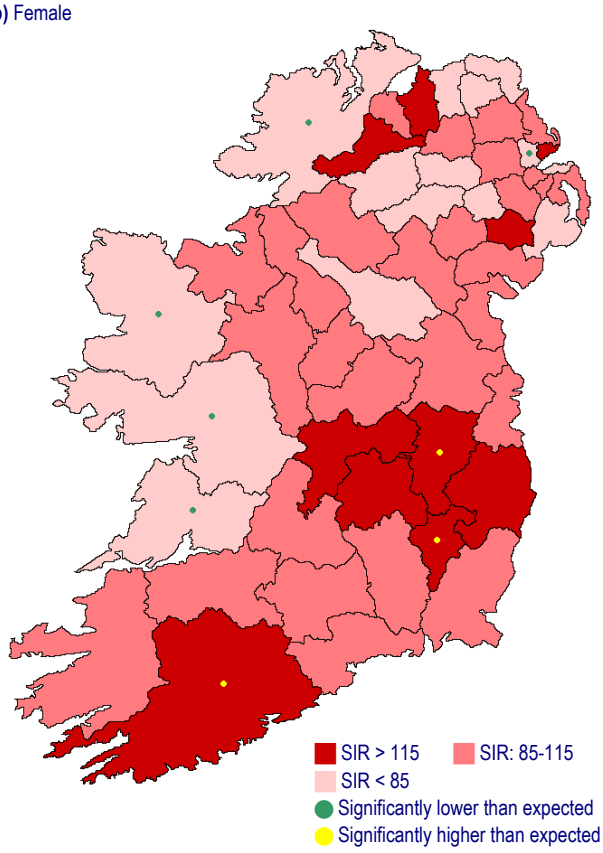
Incidence rates of oesophageal cancer among males were significantly higher during 1994-2004 than the average rate throughout Ireland in Belfast, while among females they were higher in Carlow, Kildare and Cork. Eight councils/counties in Ireland had lower than expected male incidence rates while five had lower than expected female incidence rates. Incidence rates of the disease were within the expected range for Dublin with an average of 51 male and 36 female cases within the county each year. (Fig. 6.5)

Figure 6.5: Significant differences in county/council standardised incidence ratios for oesophageal cancer compared to Ireland as a whole: 1994-2004

(a) Male



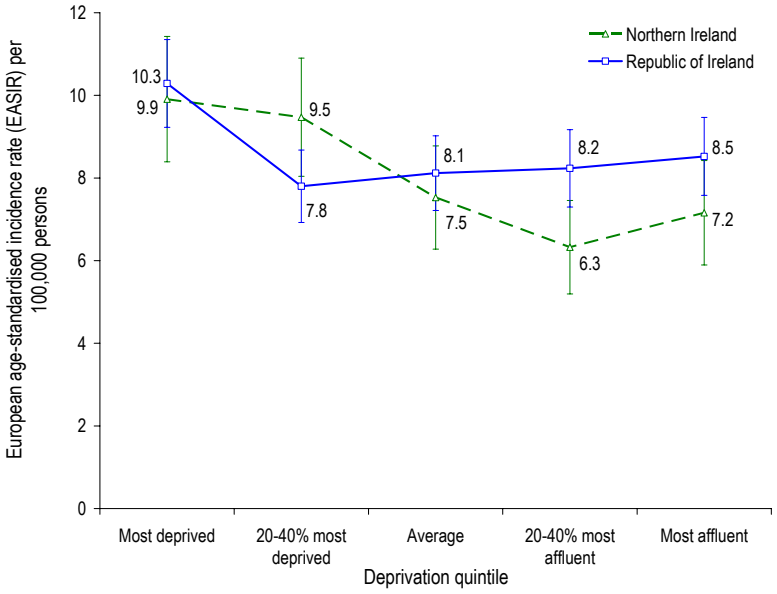
(b) Female



6.1.5: Socio-economic factors

Oesophageal cancer was related to the socio-economic characteristics of the geographic area that a patient resided in during 2000-2004 although the patterns differed slightly between Northern Ireland and Republic of Ireland. In Northern Ireland European age-standardised incidence rates declined steadily from 9.9 cases per 100,000 persons in the most deprived population quintile to 6.3 cases per 100,000 persons in the 20-40% most affluent quintile, a drop of 36.2% (p=0.002). EASIRs however increased again, but not significantly, to 7.2 per 100,000 persons among the 20% most affluent. In Republic of Ireland EASIRs dropped sharply, by 24.2% (p=0.002), between the 20% most deprived population and the next deprivation quintile representing the 20-40% most deprived. Incidence rates then climbed slightly, but not significantly, from that point onwards. (Fig. 6.6)

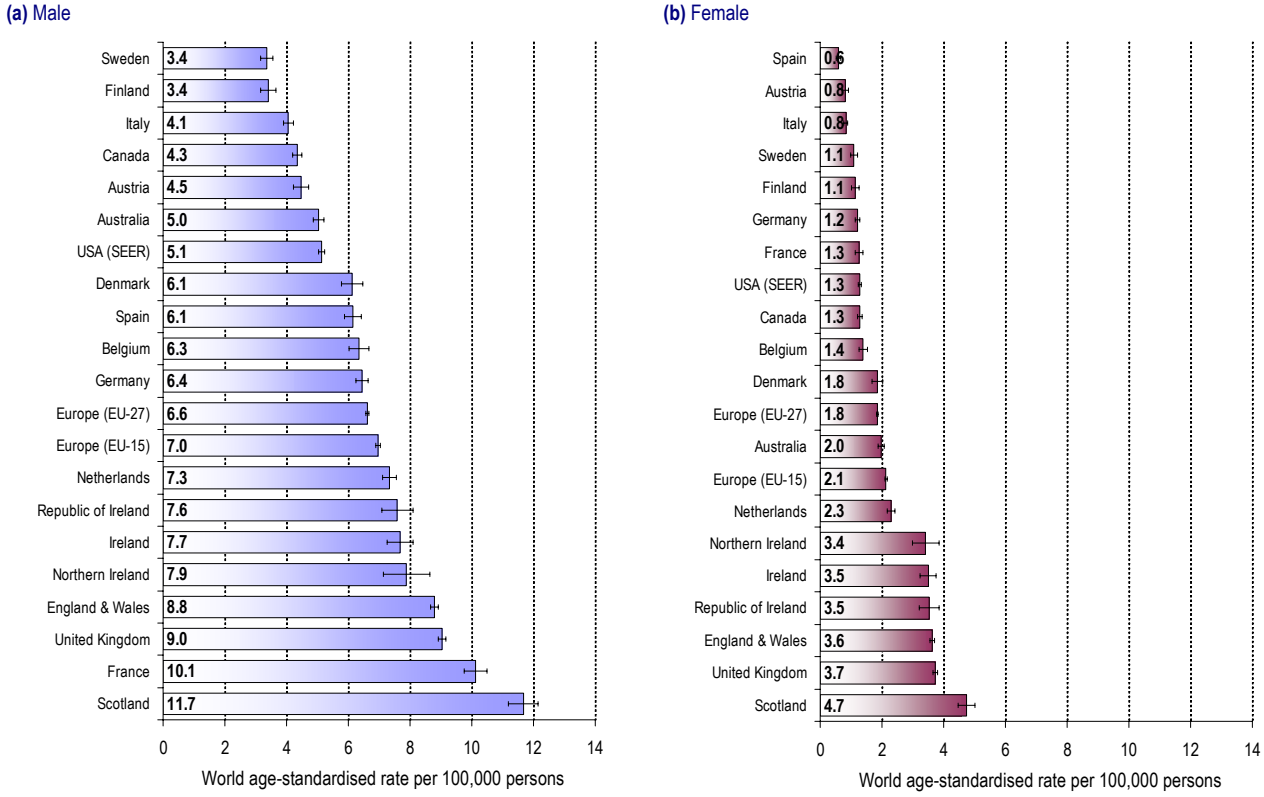
Figure 6.6: European age-standardised incidence rates (EASIR) for oesophageal cancer by country specific deprivation quintile: 2000-2004



6.1.6: International comparisons

Incidence rates of oesophageal cancer were high in Ireland during 1998-2000 compared to the European Union, USA, Canada and Australia for both males and females. For males however world age-standardised incidence rates (WASIR) were 14.4% (p<0.001) lower than those in the United Kingdom while they were similar to rates in the UK for females. These patterns also applied to Northern Ireland and Republic of Ireland separately. (Fig. 6.7)

Figure 6.7: International comparisons of world age-standardised incidence rates for oesophageal cancer: 1998-2000



Source: IARC[34]

6.2: Treatment

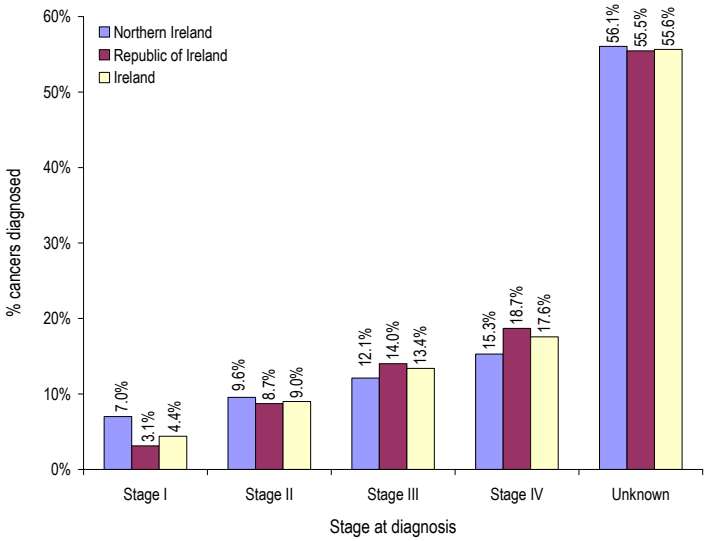
In 2001 there were 478 patients aged 15-99 with a diagnosis of oesophageal cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 418 patients diagnosed in 1996.

6.2.1: Stage at diagnosis

Staging of oesophageal cancer in 2001 was poor with 44.4% of patients in Ireland assigned a stage at diagnosis, similar to the 42.6% staged in 1996. The proportion of unstaged patients was similar in Northern Ireland and Republic of Ireland with 56.1% and 55.5% of patients not having a stage assigned respectively. (Fig. 6.8)

The overall distribution of stage among patients was also similar in both countries (χ^2=9.2, p=0.057), with no significant differences between the proportions assigned to each stage in each country. (Fig. 6.8)

Figure 6.8: Stage at diagnosis for oesophageal cancer patients by country: 2001

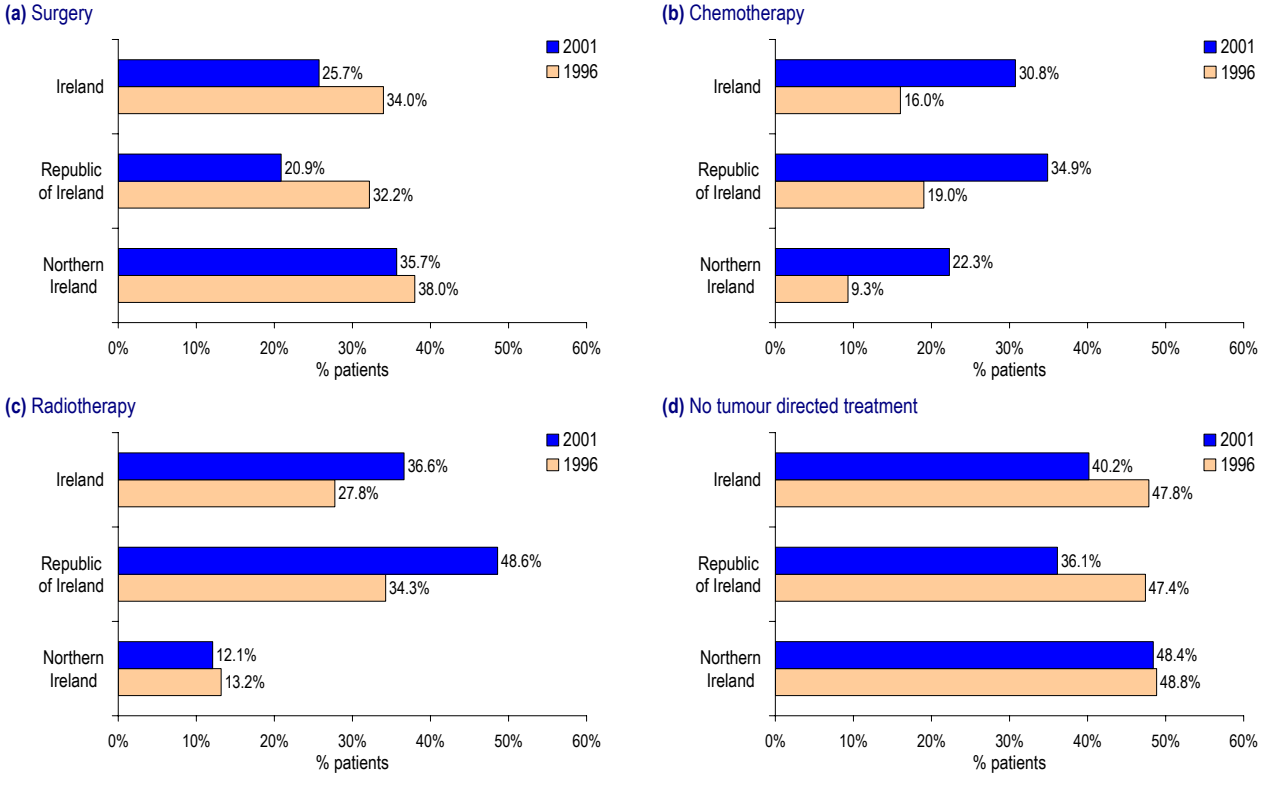


6.2.2: Treatment received

In 2001 36.6% of oesophageal cancer patients received radiotherapy, 30.8% received chemotherapy and 25.7% underwent surgery, with 40.2% receiving no form of tumour directed treatment. (Fig. 6.9)

Compared to 1996 the use of chemotherapy and radiotherapy increased in Ireland by 14.8% (p<0.001) and 8.8% (p=0.005) respectively while overall surgery levels decreased by 8.3% (p=0.007). The change in treatment levels resulted in the proportion of patients receiving no tumour directed treatment decreasing by 7.6% (p=0.021). The increase in chemotherapy use occurred in both Northern Ireland and Republic of Ireland (NI: 13.0%, p=0.003; ROI: 15.9%, p<0.001). The increase in radiotherapy use however was

Figure. 6.9: Tumour directed treatment received by oesophageal cancer patients by year of diagnosis and country: 1996 & 2001



only present in Republic of Ireland (14.3%, p<0.001), as were the decreases in surgery use (-11.3%, p=0.002) and the proportion of patients receiving no tumour directed treatment (-11.3%, p=0.005). (Fig. 6.9)

The use of surgery in treating oesophageal cancer was 14.8% (p=0.001) higher in Northern Ireland than in Republic of Ireland, while the use of chemotherapy and radiotherapy was 12.6% (p=0.005) and 36.5% (p<0.001) lower respectively. The proportion of patients receiving no tumour directed treatment was 12.3% (p=0.010) higher in Northern Ireland than Republic of Ireland. (Fig. 6.9)

Treatment combinations

In Ireland 26.6% of oesophageal cancer patients diagnosed in 2001 received more than one type of treatment, an increase of 8.4% (p=0.003) since 1996 that was driven by a 9.4% (p<0.001) increase in the proportion of patients receiving chemotherapy and radiotherapy together. The increase in the use of treatment combinations was present in both Northern Ireland (8.5%, p=0.038) and Republic of Ireland (8.7%, p=0.015). (Tab. 6.3)

Both countries had a different approach to delivery of different treatment combinations during 2001 (χ^2=298.4, p<0.001) with the percentage receiving treatment combinations 13.0% (p=0.002) lower in Northern Ireland. Northern Ireland favoured surgery only and surgery and chemotherapy, while Republic of Ireland favoured radiotherapy only or chemotherapy and radiotherapy or a combination of all three treatment types. (Tab. 6.3)

Table 6.3: Tumour directed treatment received by oesophageal cancer patients by country and year of diagnosis: 1996 & 2001

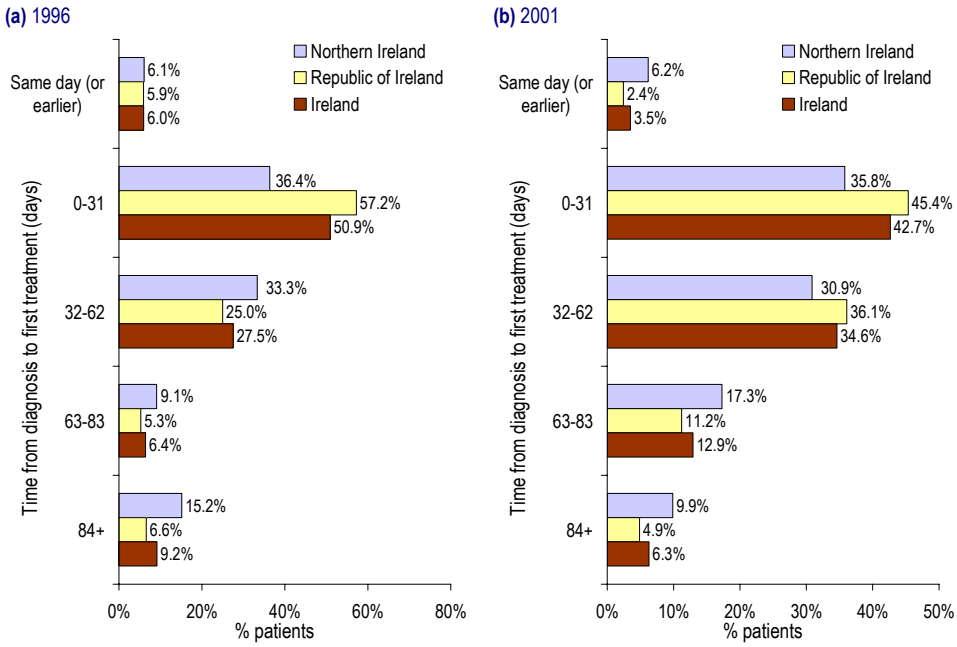
	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	29.5%	24.2%	17.0%	8.4%	20.8%	13.6%
Chemotherapy only	0.8%	5.7%	1.0%	6.2%	1.0%	6.1%
Radiotherapy only	11.6%	3.8%	12.5%	18.4%	12.2%	13.6%
Surgery and chemotherapy	7.8%	9.6%	0.3%	0.6%	2.6%	3.6%
Surgery and radiotherapy	0.8%	1.3%	4.2%	2.2%	3.1%	1.9%
Chemotherapy and radiotherapy	0.8%	6.4%	6.9%	18.4%	5.0%	14.4%
Surgery, chemotherapy and radiotherapy	0.0%	0.6%	10.7%	9.7%	7.4%	6.7%
No tumour directed treatment	48.8%	48.4%	47.4%	36.1%	47.8%	40.2%
Total patients	129	157	289	321	418	478

6.2.3: Waiting times

Among oesophageal cancer patients diagnosed in Ireland in 2001 46.2% of those receiving tumour directed treatment were treated within 31 days of diagnosis. This proportion was similar in Northern Ireland and Republic of Ireland (NI: 42.0%, ROI: 47.8%). (Fig. 6.10)

The proportion of patients waiting less than 31 days decreased by 15.4% (p=0.038) between 1996 and 2001 in Republic of Ireland, with no significant change noted in Northern Ireland. (Fig. 6.10)

Figure 6.10: Time between diagnosis and first treatment by country for patients diagnosed with oesophageal cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

6.3: Survival

Five-year (age-standardised) relative survival from oesophageal cancer was estimated to be 12.8% for males and 17.0% for females diagnosed in 2000-2004. (Fig. 6.11, Tab. 6.4)

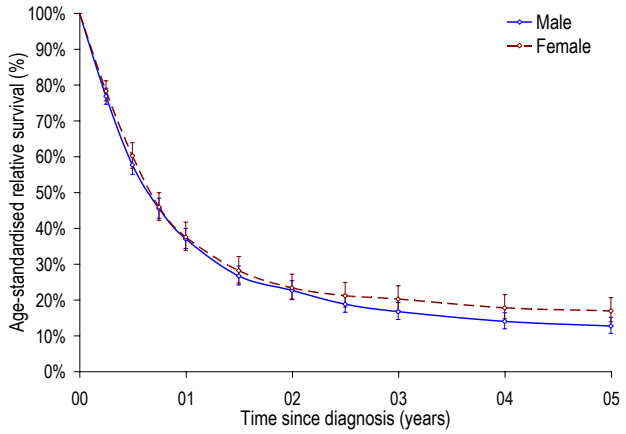
The variation by sex was not statistically significant in Ireland as a whole or in Northern Ireland or Republic of Ireland separately. Neither one nor five-year (age-standardised) relative survival varied significantly by country. (Fig. 6.11, Tab. 6.4)

Table 6.4: Age-standardised relative survival for oesophageal cancer patients by country and sex: 2000-2004 period analysis estimates

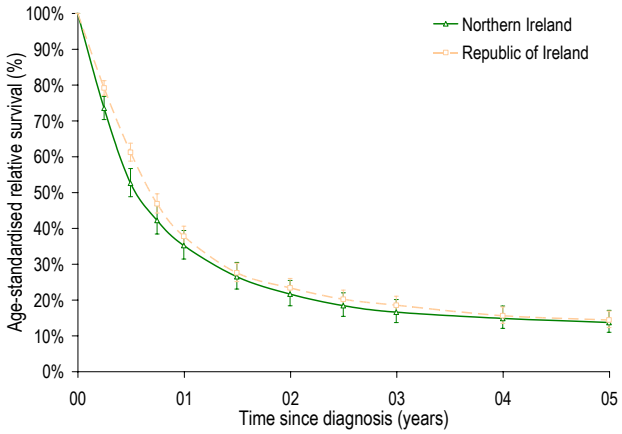
		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	33.9% (29.3%, 39.1%)	37.6% (31.1%, 45.5%)	35.2% (31.5%, 39.4%)
	Republic of Ireland	38.6% (35.3%, 42.2%)	37.1% (32.7%, 42.0%)	37.8% (35.2%, 40.6%)
	Ireland	37.1% (34.4%, 40.0%)	37.6% (33.9%, 41.7%)	37.0% (34.8%, 39.3%)
5-year	Northern Ireland	11.3% (8.4%, 15.2%)	16.7% (12.2%, 22.8%)	13.7% (11.0%, 17.1%)
	Republic of Ireland	13.4% (10.8%, 16.7%)	16.7% (13.2%, 21.1%)	14.4% (12.3%, 16.9%)
	Ireland	12.8% (10.7%, 15.2%)	17.0% (13.9%, 20.7%)	14.2% (12.5%, 16.2%)

Figure 6.11: Age-standardised relative survival for oesophageal cancer patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



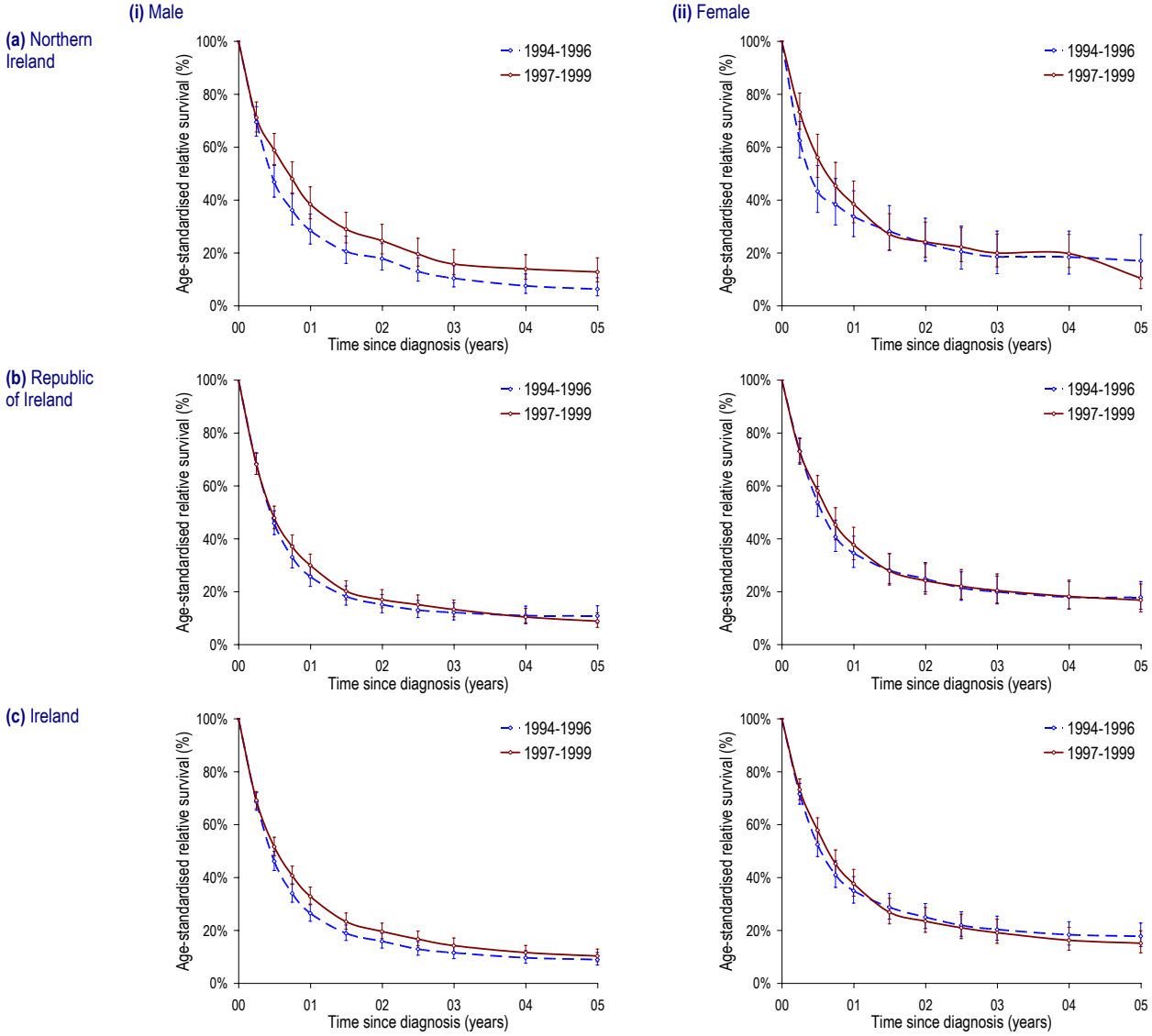
6.3.1: Changes in survival over time

There was no significant variation in one or five-year (age-standardised) relative survival from oesophageal cancer for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland or in Northern Ireland and Republic of Ireland considered separately. This was despite apparent increases of 10.0% (p=0.095) and 6.4% (p=0.105) in one-year and five-year (age-standardised) relative survival respectively for males in Northern Ireland that did not reach statistical significance. (Fig. 6.12, Tab. 6.5)

Table 6.5: Age-standardised relative survival for oesophageal cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	30.0% (25.7%, 35.0%)	37.9% (33.3%, 43.0%)	9.1% (6.4%, 12.8%)	12.8% (9.7%, 17.0%)
	Republic of Ireland	28.6% (25.5%, 32.0%)	32.1% (29.0%, 35.6%)	13.0% (10.5%, 15.9%)	11.2% (9.0%, 13.9%)
	Ireland	29.0% (26.5%, 31.8%)	34.1% (31.5%, 36.9%)	11.5% (9.6%, 13.7%)	11.8% (10.0%, 14.0%)
Male	Northern Ireland	28.5% (23.4%, 34.7%)	38.5% (32.9%, 45.0%)	6.4% (3.8%, 10.7%)	12.8% (9.1%, 18.2%)
	Republic of Ireland	25.7% (22.0%, 30.1%)	30.0% (26.3%, 34.3%)	10.9% (8.1%, 14.7%)	8.9% (6.5%, 12.1%)
	Ireland	26.5% (23.5%, 30.0%)	32.9% (29.7%, 36.4%)	9.0% (6.9%, 11.7%)	10.3% (8.2%, 13.0%)
Female	Northern Ireland	33.8% (26.2%, 43.5%)	38.5% (31.4%, 47.2%)	17.0% (10.8%, 26.9%)	10.5% (6.5%, 16.9%)
	Republic of Ireland	34.6% (29.2%, 41.0%)	37.7% (32.1%, 44.4%)	17.9% (13.4%, 23.9%)	16.8% (12.3%, 22.9%)
	Ireland	35.0% (30.4%, 40.4%)	37.7% (33.0%, 43.1%)	17.8% (13.9%, 22.8%)	15.2% (11.6%, 19.9%)

Figure 6.12: Age-standardised relative survival for oesophageal cancer patients by sex, country and period of diagnosis: 1994-1999



6.3.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by those diagnosed with cancer. Of those diagnosed in Ireland with oesophageal cancer during 1997-1999 9.2% survived a minimum of five-years. There was no significant variation in observed survival by sex or by country. There was no change in either one or five-year observed survival between 1994-1996 and 1997-1999 in Republic of Ireland, however in Northern Ireland five-year observed survival improved by 6.5% for males between these two three-year periods. (Tab. 6.6)

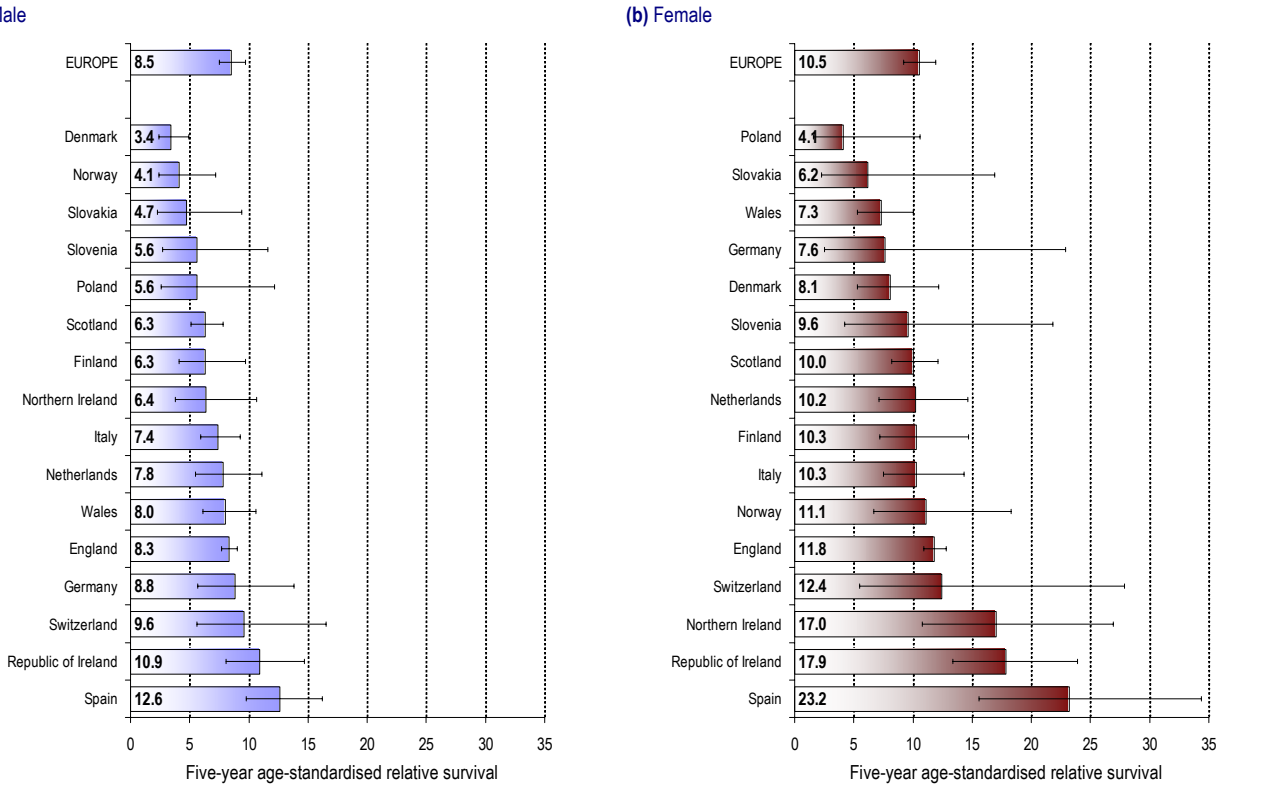
Table 6.6: Observed survival for oesophageal cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	28.1% (24.1%, 32.8%)	34.2% (30.1%, 38.9%)	7.3% (5.2%, 10.4%)	10.4% (7.9%, 13.6%)
	Republic of Ireland	25.2% (22.5%, 28.2%)	28.5% (25.6%, 31.8%)	9.5% (7.7%, 11.7%)	8.6% (6.9%, 10.7%)
	Ireland	26.1% (23.8%, 28.6%)	30.5% (28.1%, 33.1%)	8.8% (7.4%, 10.5%)	9.2% (7.7%, 10.9%)
Male	Northern Ireland	28.0% (23.0%, 34.1%)	37.2% (31.9%, 43.3%)	5.1% (3.0%, 8.3%)	11.6% (8.4%, 16.0%)
	Republic of Ireland	23.6% (20.2%, 27.6%)	28.2% (24.6%, 32.3%)	8.2% (6.1%, 10.9%)	7.2% (5.3%, 9.8%)
	Ireland	25.1% (22.2%, 28.3%)	31.3% (28.2%, 34.7%)	7.1% (5.5%, 9.2%)	8.7% (7.0%, 10.9%)
Female	Northern Ireland	28.3% (22.0%, 36.4%)	29.5% (23.5%, 37.1%)	11.2% (7.1%, 17.5%)	8.5% (5.3%, 13.8%)
	Republic of Ireland	27.4% (23.2%, 32.4%)	29.1% (24.5%, 34.6%)	11.4% (8.5%, 15.2%)	10.8% (7.8%, 14.8%)
	Ireland	27.7% (24.1%, 31.8%)	29.3% (25.5%, 33.6%)	11.3% (8.9%, 14.4%)	10.0% (7.6%, 13.0%)

6.3.3: European comparisons

Based upon the results from the EuroCare III study, five-year (age-standardised) relative survival from oesophageal cancer in Northern Ireland and Republic of Ireland for male patients diagnosed during 1994-1996 did not differ significantly from the European average for males and females diagnosed in 1990-1994; however female five-year (age-standardised) relative survival in Republic of Ireland was significantly higher than the European average. (Fig. 6.13)

Figure 6.13: European comparisons of five-year age-standardised relative survival for oesophageal cancer patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[35]

6.4: Mortality

Survival from oesophageal cancer is poor thus the disease is a common cause of cancer death being the fifth most common among males and eighth among females during 2000-2004. Within this five-year period there were 296 deaths per year in Ireland among males and 174 per year among females, making up 5.0% of all male and 3.3% of all female cancer deaths (excluding NMSC). The cumulative risk of dying from the disease before the age of 75, assuming the absence of death from other causes, was three times higher in males than females at 0.9% for males and 0.3% for females. (Tab. 6.7)

Adjusted for age, mortality rates from the disease (European age-standardised mortality rates, EASMR) were 138.7% higher among

Table 6.7: Summary statistics for deaths from oesophageal cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	97	56	152	199	118	318	296	174	470
% of all cancer deaths (ex. NMSC)	5.1%	3.1%	4.2%	4.9%	3.3%	4.2%	5.0%	3.3%	4.2%
Rank (ex. NMSC)	5	8	7	4	8	7	5	8	7
Median age at death	69	76	72	70	77	73	70	77	73
Cumulative risk (Aged 0 to 74)	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%
Crude rate per 100,000 persons	11.7	6.4	9.0	10.2	6.0	8.1	10.7	6.1	8.4
EASMR ± 95% CI	11.8 ±1.1	4.5 ±0.6	7.8 ±0.6	11.6 ±0.7	5.1 ±0.4	8.1 ±0.4	11.6 ±0.6	4.9 ±0.3	8.0 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							1.6% ±11.2	-10.8% ±13.5	-4.2% ±8.5

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

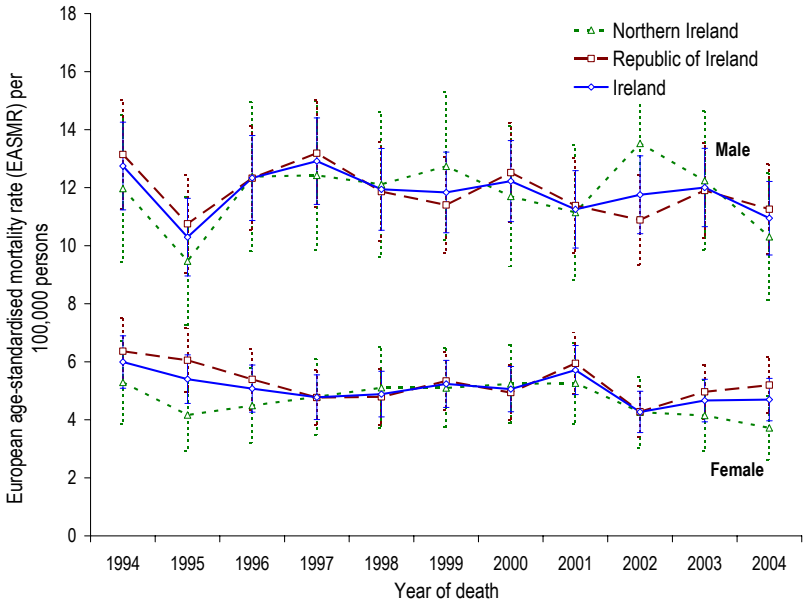
males than females, with this difference slightly higher in Northern Ireland (161.0%) than Republic of Ireland (128.9%). Despite this there was no significant difference in EASMRs between Northern Ireland and Republic of Ireland during 2000-2004 for oesophageal cancer. (Tab. 6.7)

6.4.1: Trends

There was no significant trend in European age-standardised mortality rates (EASMR) of oesophageal cancer between 1994 and 2004 in Ireland for either sex. Considered separately EASMRs for Northern Ireland and Republic of Ireland also appeared static although some weak evidence for a decline in female mortality rates existed in Republic of Ireland (-1.8%, p=0.10). (Fig. 6.14)

Despite the static mortality rates between 1994 and 2004 for oesophageal cancer the number of male deaths from the disease in Ireland increased by 3.5, while female deaths decreased by an average of 0.4 per year. (Fig. 6.14)

Figure 6.14: Trends in European age-standardised mortality rates (EASMR) for oesophageal cancer by sex and country: 1994-2004



6.5: Prevalence

Of the people diagnosed with oesophageal cancer during 1994-2004 only 16.0% were still alive at the end of 2004 (816 people) reflecting the poor survival from the disease. Among those diagnosed in 2000-2004 only 26.2% (628 people) were alive at the end of 2004. (Tab. 6.8)

Table 6.8: Prevalence of oesophageal cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	154	15.0%	119	25.8%
	Female	108	16.5%	78	26.3%
	All persons	262	15.6%	197	26.0%
Republic of Ireland	Male	342	16.3%	282	27.7%
	Female	212	15.9%	149	24.1%
	All persons	554	16.1%	431	26.3%
Ireland	Male	496	15.9%	401	27.1%
	Female	320	16.1%	227	24.8%
	All persons	816	16.0%	628	26.2%

The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed within the previous five-years (i.e. 2000-2004) was 8.1% greater in Northern Ireland than Republic of Ireland. (Tab. 6.8)

6.6: Discussion

The oesophagus, or gullet, is a tube contained in the upper half of the torso which carries food from the mouth to the stomach. Cancer can develop along any part of the oesophagus inducing symptoms such as difficulty with swallowing, coughing up blood, hoarseness or vomiting.[36]

The major risk factors for oesophageal cancer are tobacco and alcohol use. Both of these can interact to give an even higher risk than either on their own with the risk increasing with increased tobacco and alcohol consumption.[37] A diet low in fresh fruit,

vegetables and high protein foods resulting in insufficient quantities of zinc and vitamins being ingested also increases the risk of developing this cancer.[38] The consumption of large quantities of fried, barbecued or roasted meat may increase risk[39] while obesity significantly increases the chances of developing oesophageal cancer.[40] Patients with gastro-oesophageal reflux, including those with Barrett's oesophagus, are at a higher risk of developing adenocarcinoma of the oesophagus[41,42] and human papillomavirus (HPV) is a possible, but as yet unproven, risk. Certain drugs such as aminiphyllines and beta agonists can increase risk by a small amount while aspirin and anti-inflammatory drugs can have a slight protective effect.[39] Regular exposure over long periods of time to certain chemicals such as metal dust, vehicle exhaust, soot or silica dust can increase the risk of developing this cancer.[39]

Oesophageal cancer is the sixth most common cancer diagnosed worldwide with an average of 410,000 cases diagnosed each year and 337,000 deaths per year. Approximately 80% of cases occur in developing countries with the highest incidence rates in Iran, Central Asia, China, Brazil and Southern and Eastern Africa. Oesophageal cancer is made up of squamous cancers and adenocarcinomas, the later of which is increasing in many developed countries, linked possibly with changing lifestyles and obesity. In the UK trends in the disease vary, with an increase in the observed number of cases since 1960, although more recent trends have been static.

Treatment is dictated by several factors including tumour stage, general health, morphology, depth of tumour invasion and presence of metastasis with several of these factors identified through the use of scanning technologies. Ultimately, when applied, treatment usually takes the form of an oesophagectomy (removal of the oesophagus) sometimes combined with radiotherapy and/or chemotherapy, although the later two forms of treatment are occasionally applied in the absence of surgery. However many people present with late disease, for whom surgery is not an option, with chemotherapy and radiotherapy then applied mainly for palliative purposes with overall survival from the disease very poor.

Control of this disease is thus more likely to be achieved through prevention and the adoption of healthier lifestyles. The relationship to other diseases such as Barrett's oesophagus is being investigated, with Ireland one of the leaders in this field. This may lead the way to the identification of high risk individuals.

Chapter 07:

Stomach cancer (C16)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 429 male and 276 female cases diagnosed in Ireland each year.*
  - *Incidence rates in Ireland decreased by 2.8% per year for males and 1.8% per year for females during 1994-2004.*
  - *Incidence rates were significantly higher than the average in Ireland for males and females in Belfast, Dublin and Newry & Mourne. They were also higher for males in Limavady and Derry and for females in Monaghan, Cavan and Louth.*
  - *During 2000-2004 incidence rates increased with increasing level of deprivation.*
  - *Incidence rates during 1998-2000 were similar in Ireland to those in the EU (15 countries) but were higher than those in USA, Canada and Australia.*
  - *There were 300 male and 202 female deaths from stomach cancer each year in Ireland between 2000 and 2004.*
  - *Mortality rates decreased among males by 4.1% and by 4.5% among females between 1994 and 2004.*

- *TREATMENT*
  - *During 2001 surgery was the most common form of treatment received by patients in Ireland (44.2%), followed by chemotherapy (22.3%) and radiotherapy (9.6%), with 43.2% of patients receiving no form of tumour directed treatment.*
  - *Compared to 1996 the use of chemotherapy and radiotherapy increased in Ireland by 12.4% and 5.4% respectively with no significant change in surgery levels or the proportion receiving no tumour directed treatment.*

- *SURVIVAL AND PREVALENCE*
  - *Five year (age-standardised) relative survival for patients diagnosed in 2000-2004 in Ireland was estimated to be 17.8% for males and 22.1% for females.*
  - *There was no significant change in one or five-year (age-standardised) relative survival for males or females diagnosed in 1994-1996 and 1997-1999 in Ireland.*
  - *At the end of 2004 there were 1,412 people living with stomach cancer after a diagnosis during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *There was no significant difference in male or female incidence rates between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *There was no significant difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving surgery or chemotherapy or in the proportion receiving no tumour directed treatment. The use of radiotherapy however was 9.4% lower in Northern Ireland than in Republic of Ireland.*
  - *Radiotherapy use only increased significantly in Republic of Ireland with 8.7% more patients receiving this form of treatment in 2001 compared to 1996.*
  - *There was no significant difference in five-year (age-standardised) relative survival for patients diagnosed in 2000-2004 between Northern Ireland and Republic of Ireland.*
  - *There was no significant difference in mortality rates for males or females between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed in 2000-2004 with stomach cancer was 20.5% greater in Northern Ireland than Republic of Ireland.*

7.1: Incidence

During 2000-2004 there were on average 429 male and 276 female cases of stomach cancer diagnosed each year with 34.3% occurring in Northern Ireland. In Ireland as a whole 3.9% of all male and 2.6% of all female cancers (excluding NMSC) were cancers of the stomach making this disease the seventh most common male and ninth most common female cancer. The cumulative risk of a male developing the disease before the age of 75 was 1.3% compared to 0.6% among females. (Tab. 7.1)

The number of cases diagnosed annually was 55.4% higher among males than females, however given the older female population the difference increases once rates are age-standardised, with male European age-standardised incidence rates (EASIRs) 106.4% higher than those for females. The difference between males and females was higher in Northern Ireland however there was no significant difference in male or female EASIRs between Northern Ireland and Republic of Ireland. (Tab. 7.1)

Table 7.1: Summary statistics for incidence of stomach cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	147	95	242	282	181	463	429	276	705
% of all cancer cases (ex. NMSC)	4.5%	2.7%	3.6%	3.7%	2.6%	3.1%	3.9%	2.6%	3.3%
Rank (ex. NMSC)	5	8	6	7	10	7	7	9	7
Median age at diagnosis	71	75	73	70	74	72	70	74	72
Cumulative risk (Aged 0 to 74)	1.4%	0.6%	1.0%	1.3%	0.6%	0.9%	1.3%	0.6%	0.9%
Crude rate per 100,000 persons	17.8	10.9	14.3	14.5	9.2	11.8	15.5	9.7	12.6
EASIR ± 95% CI	17.7 ±1.3	7.9 ±0.8	12.3 ±0.7	16.4 ±0.9	8.2 ±0.6	11.9 ±0.5	16.8 ±0.7	8.2 ±0.4	12.1 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							8.1% ±9.7	-3.9% ±11.2	3.2% ±7.3

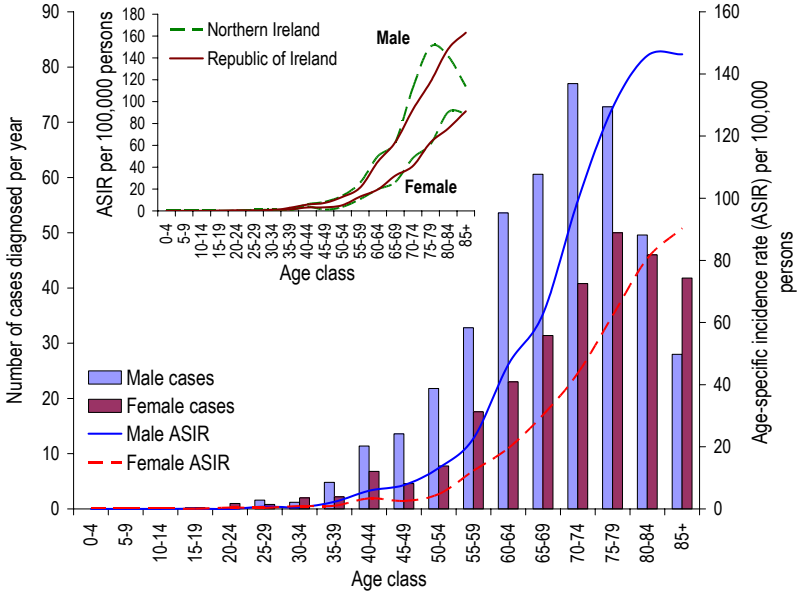
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

7.1.1: Age distribution

The median age at diagnosis for all patients with stomach cancer was 72 years of age, with cases peaking in the 70-74 age class for males and 75-79 age class for females. These age groups represented 17.9% of all male and 18.1% of all female cases of stomach cancer diagnosed in 2000-2004. Age-specific incidence rates (ASIR) were considerably higher among males than females for those aged over 40. (Fig. 7.1)

Among males and females in Republic of Ireland ASIRs increased steadily to a maximum in the 85 and over age class. ASIRs for males in the Northern Ireland however peaked in the 75-79 age class, while among females they were highest among those aged 80-84. (Fig. 7.1)

Figure 7.1: Number of cases of stomach cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

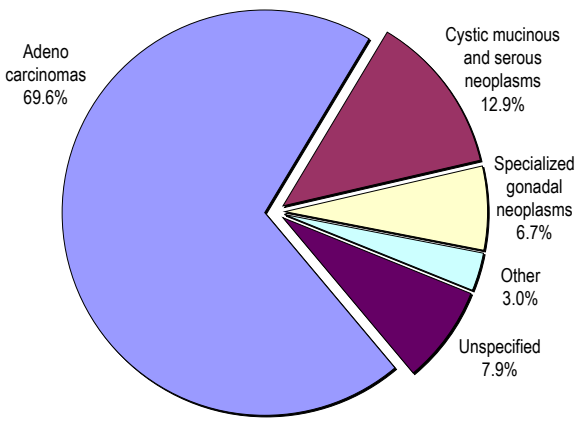


7.1.2: Cell type

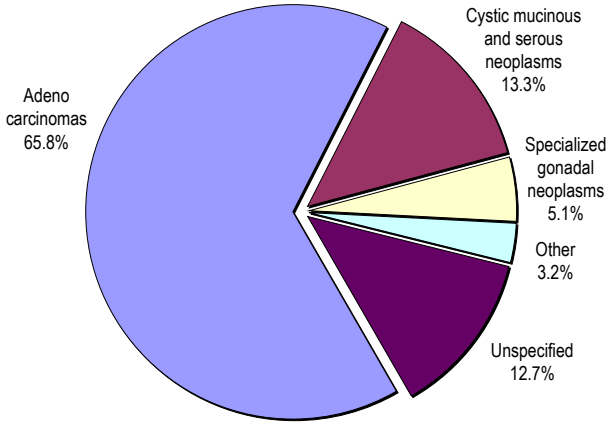
There are a variety of types of stomach cancer that affect different cell types. During 2000-2004 in Ireland the majority were adenocarcinomas, which made up 69.6% of all male and 65.8% of all female stomach cancers. This was followed by cystic mucinous and serous neoplasms and specialised gonadal neoplasms. A small percentage (7.9% of male and 12.7% of female) had an unspecified cell type. This percentage was similar in Northern Ireland (10.4%) and Republic of Ireland (9.4%). (Fig. 7.2)

Figure 7.2: Types of stomach cancer diagnosed in Ireland: 2000-2004

(a) Male



(b) Female



7.1.3: Trends

Over the eleven-year period from 1994 to 2004 European age-standardised incidence rates (EASIR) for stomach cancer decreased in Ireland for both males and females and in both Northern Ireland and Republic of Ireland considered separately. For males the annual percentage change in EASIRs in Ireland was –2.8% (p<0.001). The magnitude of the decrease was similar in Northern Ireland and Republic of Ireland with annual percentage changes of –2.9% (p=0.014) and –2.7% (p<0.001) respectively. Among females EASIRs decreased by 1.8% (p=0.003) each year in all of Ireland. In Northern Ireland they decreased by 2.3% (p=0.037) each year while in Republic of Ireland an annual decrease of 1.6% (p<0.001) was observed. The difference in annual percentage change in EASIRs between Northern Ireland and Republic of Ireland was not statistically significant. (Fig. 7.3)

Figure 7.3: Trends in European age-standardised incidence rates (EASIR) for stomach cancer by sex and country: 1994-2004

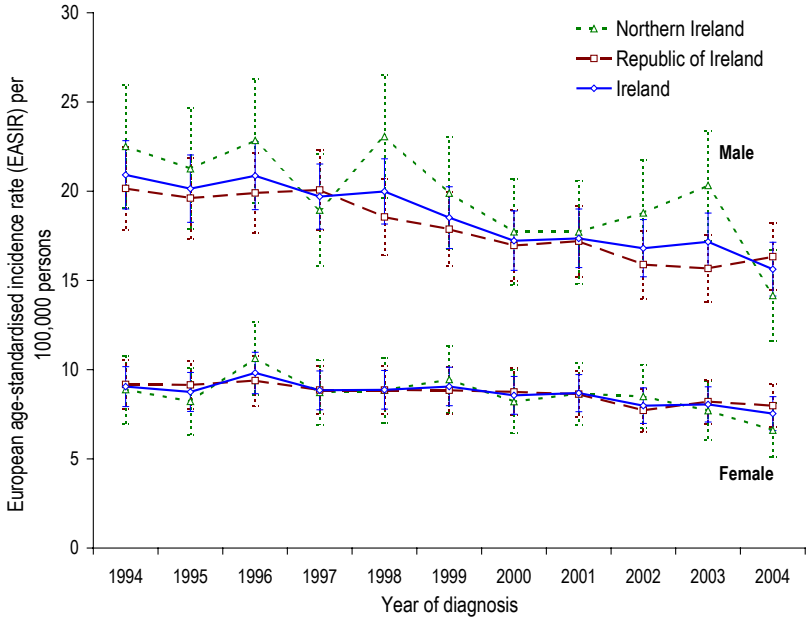
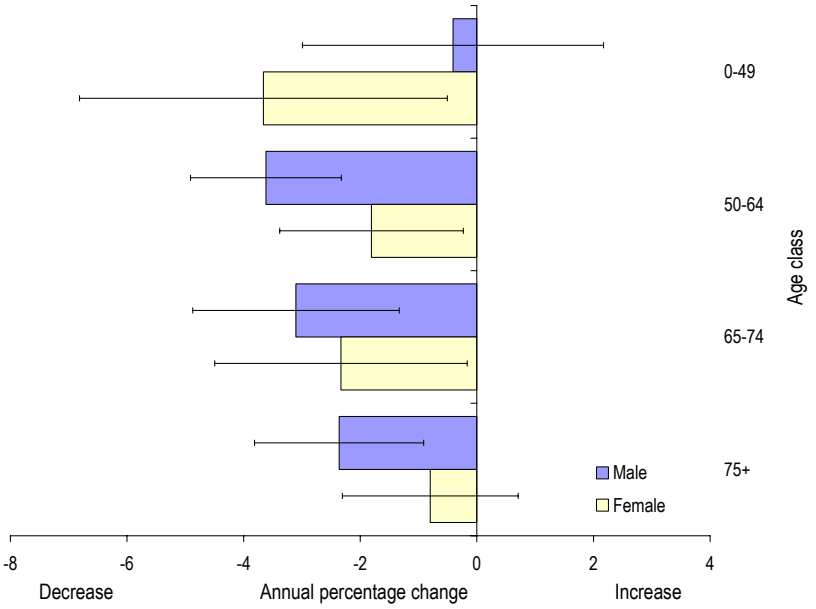


Table 7.2: Number of cases and European age-standardised incidence rates (EASIR) for stomach cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	167	22.5 ±3.5	305	20.2 ±2.3	472	20.9 ±1.9	96	8.9 ±1.9	180	9.2 ±1.4	276	9.1 ±1.1
1995	155	21.3 ±3.4	299	19.6 ±2.3	454	20.1 ±1.9	85	8.2 ±1.9	190	9.1 ±1.4	275	8.7 ±1.1
1996	170	22.8 ±3.5	308	19.9 ±2.3	478	20.9 ±1.9	117	10.6 ±2.1	185	9.4 ±1.4	302	9.8 ±1.2
1997	143	18.9 ±3.1	315	20.1 ±2.2	458	19.7 ±1.8	99	8.7 ±1.8	180	8.9 ±1.4	279	8.8 ±1.1
1998	175	23.1 ±3.4	294	18.6 ±2.1	469	20.0 ±1.8	99	8.8 ±1.8	184	8.9 ±1.3	283	8.9 ±1.1
1999	157	19.9 ±3.1	289	17.9 ±2.1	446	18.5 ±1.7	107	9.4 ±1.9	189	8.8 ±1.3	296	9.1 ±1.1
2000	140	17.7 ±3.0	279	17.0 ±2.0	419	17.2 ±1.7	92	8.2 ±1.8	184	8.8 ±1.3	276	8.6 ±1.1
2001	148	17.7 ±2.9	289	17.2 ±2.0	437	17.4 ±1.6	108	8.7 ±1.7	187	8.6 ±1.3	295	8.7 ±1.0
2002	157	18.8 ±3.0	271	15.9 ±1.9	428	16.8 ±1.6	100	8.5 ±1.8	168	7.7 ±1.2	268	8.0 ±1.0
2003	170	20.3 ±3.1	273	15.7 ±1.9	443	17.2 ±1.6	92	7.7 ±1.7	185	8.2 ±1.2	277	8.1 ±1.0
2004	122	14.2 ±2.5	296	16.3 ±1.9	418	15.6 ±1.5	82	6.6 ±1.5	182	8.0 ±1.2	264	7.5 ±1.0

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 7.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for stomach cancer by sex and age: 1994-2004



Despite the population growth and ageing effect between 1994 and 2004 the decrease in EASIRs did translate to a decrease in the annual number of cases of stomach cancer diagnosed. Male cases in Northern Ireland dropped by an average of 2.1 per year compared to a decrease of 0.7 cases per year for females. In Republic of Ireland there was a decrease of 3.0 cases per year among males and 0.4 cases per year among females. Overall the combined decrease in Ireland was 6.2 cases per year. (Tab. 7.2)

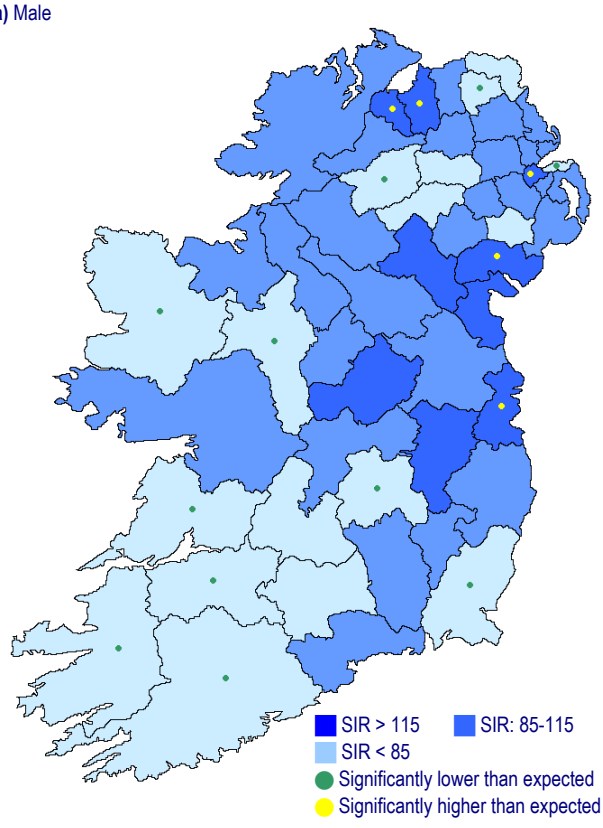
The decreasing trend in incidence rates for stomach cancer was apparent in most age groups for both sexes. The exceptions were the male 0-49 age group and the female 75 and over age group. The largest decreases were among males aged 50-64 and females aged 0-49 with annual decreases in EASIRs of 3.6% ($p<0.001$) and 3.7% ($p=0.032$) respectively. (Fig. 7.4)

7.1.4: Geographic variations

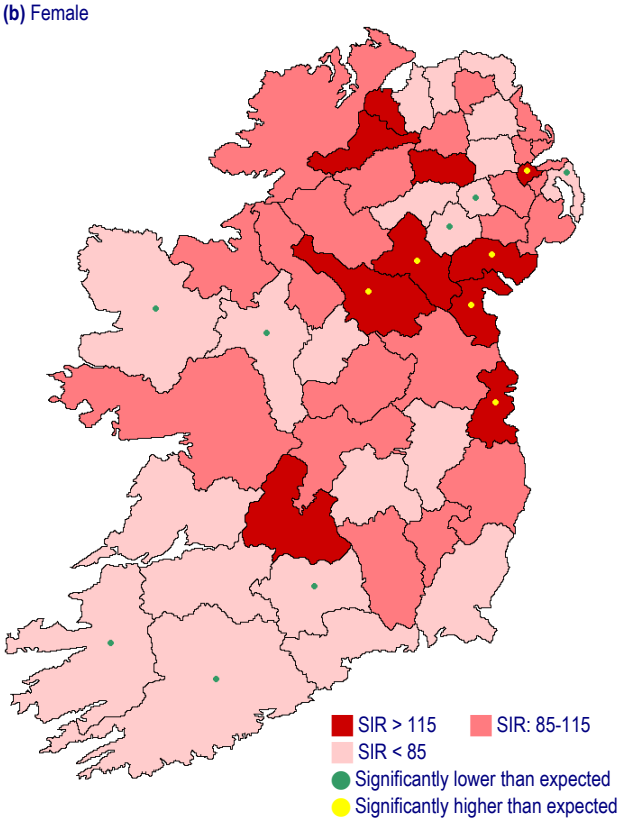
There was considerable geographic variation in incidence of stomach cancer in Ireland during 1994-2004. Rates were significantly higher for both males and females in Belfast, Dublin and Newry & Mourne than in Ireland as a whole. They were also higher for males in Limavady and Derry and for females in Monaghan, Cavan and Louth. Balancing the higher incidence rates in these areas, there were eleven councils/counties that had significantly lower male incidence rates and eight councils/counties with lower than expected female rates. (Fig. 7.5)

Figure 7.5: Significant differences in county/council standardised incidence ratios for stomach cancer compared to Ireland as a whole: 1994-2004

(a) Male



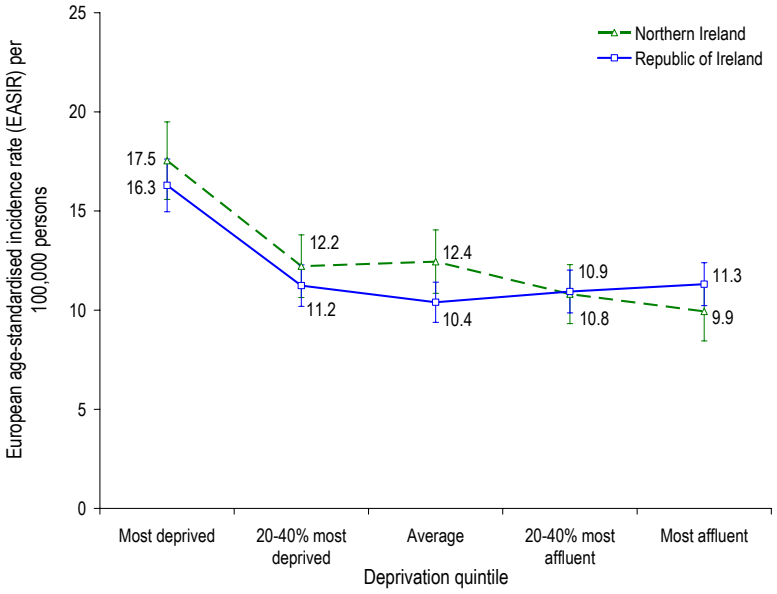
(b) Female



7.1.5: Socio-economic factors

During 2000-2004 the relationship between stomach cancer and the socio-economic characteristics of the geographic area a patient resided in was quite strong. In Northern Ireland European age-standardised incidence rates (EASIR) were 76.8% ($p<0.001$) higher among the 20% of the population living in the most deprived than in the most affluent areas. The difference was not as large in Republic of Ireland with a 44.2% ($p<0.001$) difference between the two population quintiles. The downward gradient also had a different pattern in the two countries. While a sharp decrease in EASIRs was present in both countries between the 20% and 20-40% most deprived population, in Northern Ireland rates continued to decrease with increasing affluence, while in Republic of Ireland EASIRs remained at approximately the same level for the remaining population quintiles. (Fig. 7.6)

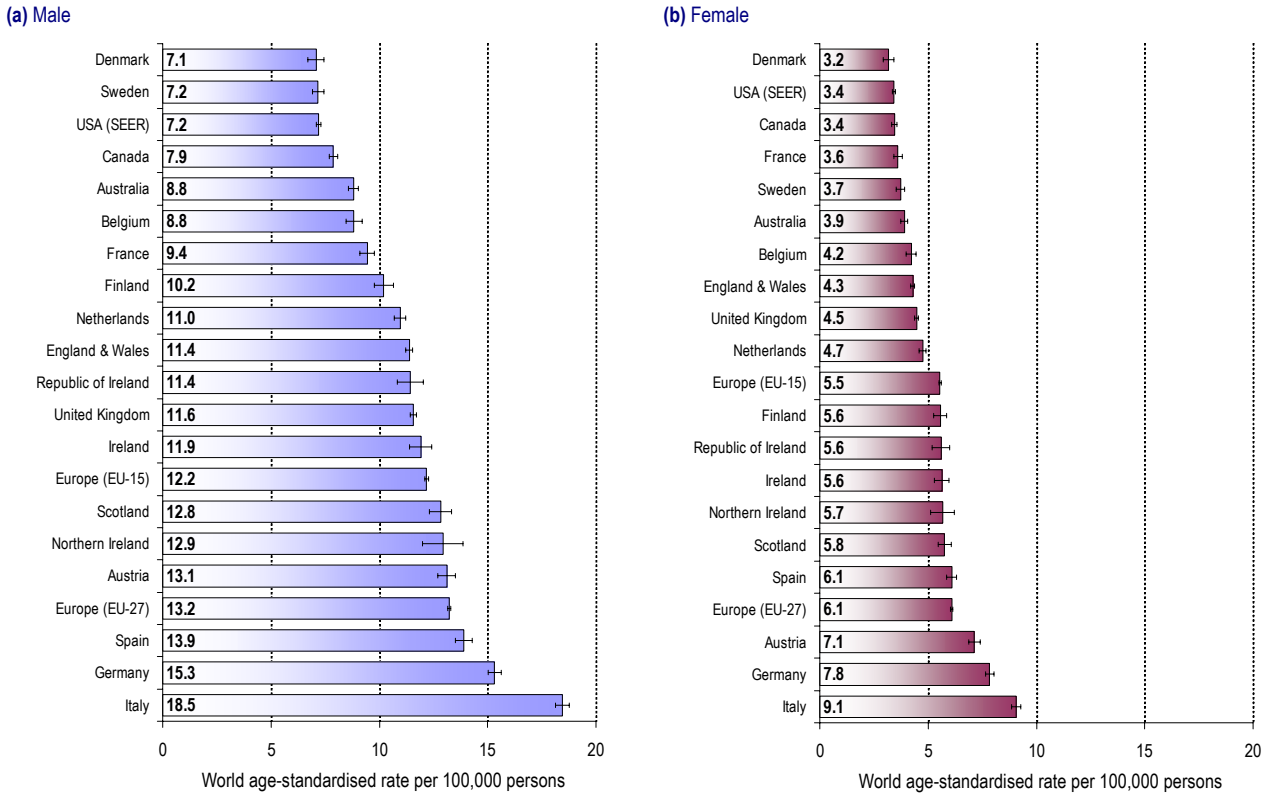
Figure 7.6: European age-standardised incidence rates (EASIR) for stomach cancer by country specific deprivation quintile: 2000-2004



7.1.6: International comparisons

Incidence rates of stomach cancer during 1998-2000 were similar in Ireland to those in the European Union as measured using the 15 member countries at the end of 2004. However compared to the 27 countries that were members of the EU at the end of 2007 Ireland had significantly lower incidence rates for both males and females. However rates were higher in Ireland than in USA, Canada and Australia and than in the UK for females. (Fig. 7.7)

Figure 7.7: International comparisons of world age-standardised incidence rates for stomach cancer: 1998-2000



Source: IARC[43]

7.2: Treatment

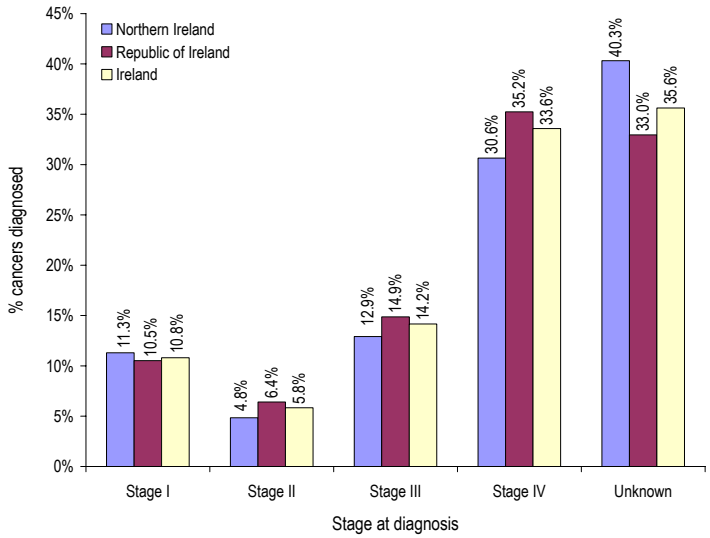
In 2001 there were 685 patients aged 15-99 with a diagnosis of stomach cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 735 patients diagnosed in 1996.

7.2.1: Stage at diagnosis

Staging of stomach cancer in 2001 was average with 64.4% of patients in Ireland assigned a stage at diagnosis, a significant improvement on the 58.6% staged in 1996 (p=0.026). There was no significant difference in the proportion of patients with an unknown stage between Northern Ireland and Republic of Ireland. (Fig. 7.8)

Similarly the overall distribution of stage among patients did not differ significantly between the two countries (χ^2=7.3, p=0.121). (Fig. 7.8)

Figure 7.8: Stage at diagnosis for stomach cancer patients by country: 2001

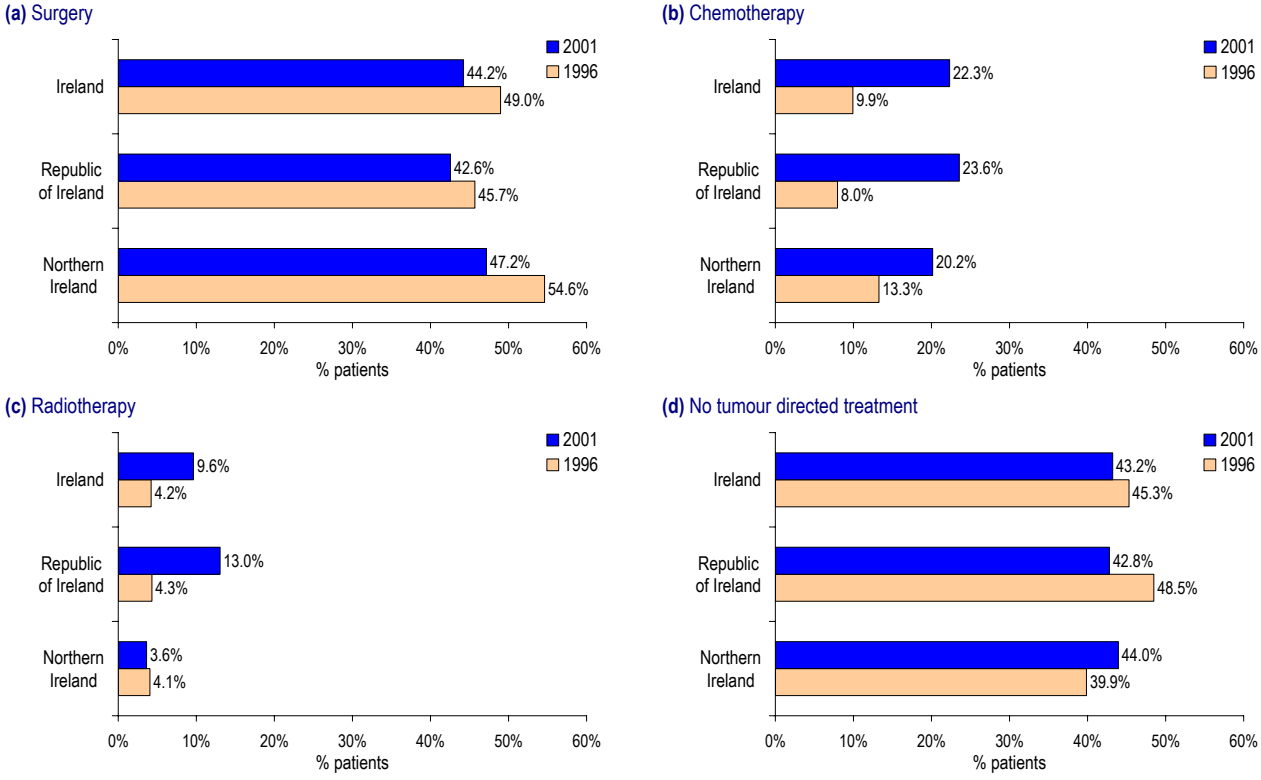


7.2.2: Treatment received

In 2001 surgery was the most common form of treatment received by stomach cancer patients in Ireland (44.2%), followed by chemotherapy (22.3%) and radiotherapy (9.6%), however overall 43.2% of patients received no form of tumour directed treatment. (Fig. 7.9)

Compared to 1996 the use of chemotherapy and radiotherapy in 2001 in Ireland increased by 12.4% (p<0.001) and 5.4% (p<0.001) respectively with no significant change in overall surgery levels or the proportion receiving no tumour directed treatment. While the increase in the use of chemotherapy between 1996 and 2001 was present in both Northern Ireland (6.9%, p=0.035) and Republic of

Figure. 7.9: Tumour directed treatment received by stomach cancer patients by year of diagnosis and country: 1996 & 2001



Ireland (15.6%, p<0.001), the increase in the use of radiotherapy was only present in Republic of Ireland where an 8.7% (p=0.001) increase occurred. (Fig. 7.9)

There was no significant difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving surgery or chemotherapy or in the proportion receiving no tumour directed treatment (p>0.05) during 2001. The use of radiotherapy however was 9.4% (p<0.001) lower in Northern Ireland than in Republic of Ireland. (Fig. 7.9)

Treatment combinations

In Ireland 14.7% of stomach cancer patients diagnosed in 2001 received more than one type of treatment, a 7.9% (p<0.001) increase on 1996 levels. The use of surgery only decreased by 10.8% (p<0.001), while the use of chemotherapy only, surgery and chemotherapy together, chemotherapy and radiotherapy together and all three treatment types together increased by 4.7% (p<0.001), 2.8% (p=0.019), 1.9% (p=0.004) and 3.1% (p=0.001) respectively albeit from initially low percentages. (Tab. 7.3)

Northern Ireland and Republic of Ireland had a slightly different approach to the use of treatment combinations with 6.2% (p=0.002) more patients in Northern Ireland receiving a combination of surgery and chemotherapy, while the proportion receiving either chemotherapy and radiotherapy or all three types was higher in Republic of Ireland by 2.9% (p=0.025) and 4.8% (p=0.015) respectively. (Tab. 7.3)

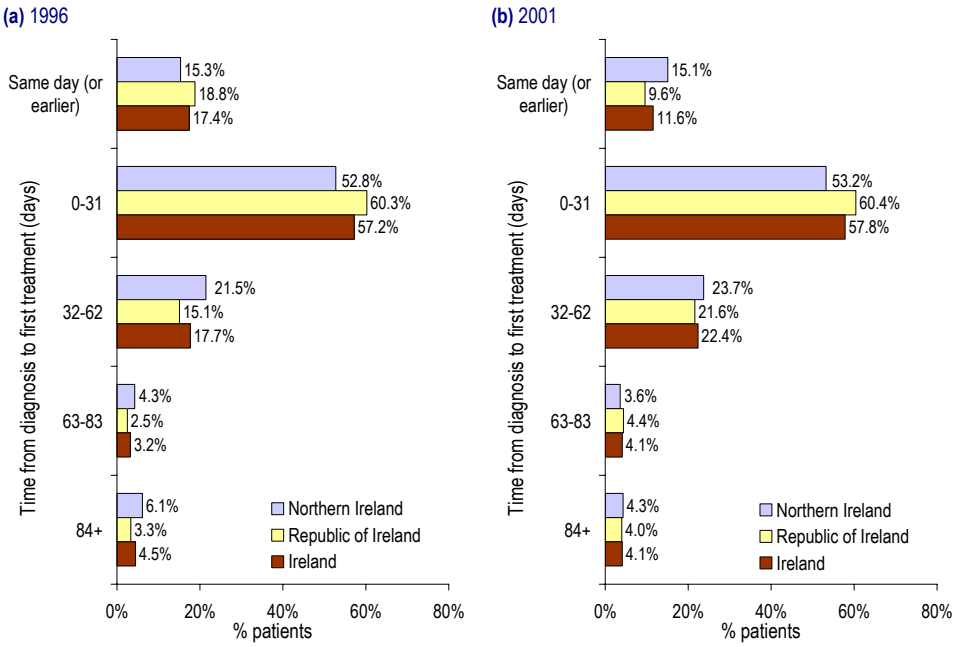
Table 7.3: Tumour directed treatment received by stomach cancer patients by country and year of diagnosis: 1996 & 2001

	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	45.4%	34.7%	41.4%	30.7%	42.9%	32.1%
Chemotherapy only	4.8%	7.3%	3.2%	9.2%	3.8%	8.5%
Radiotherapy only	0.7%	0.8%	1.5%	1.8%	1.2%	1.5%
Surgery and chemotherapy	5.9%	10.5%	2.6%	4.3%	3.8%	6.6%
Surgery and radiotherapy	0.7%	0.4%	0.6%	1.1%	0.7%	0.9%
Chemotherapy and radiotherapy	0.0%	0.8%	1.1%	3.7%	0.7%	2.6%
Surgery, chemotherapy and radiotherapy	2.6%	1.6%	1.1%	6.4%	1.6%	4.7%
No tumour directed treatment	39.9%	44.0%	48.5%	42.8%	45.3%	43.2%
Total patients	271	248	464	437	735	685

7.2.3: Waiting times

Among stomach cancer patients diagnosed in 2001 in Ireland 69.4% of those who received tumour directed treatment were treated within 31 days of diagnosis. This proportion was similar in both countries, with the general distribution similar in both countries (χ^2=6.1, p=0.191). (Fig. 7.10)

Figure 7.10: Time between diagnosis and first treatment by country for patients diagnosed with stomach cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

7.3: Survival

Five year (age-standardised) relative survival for stomach cancer patients diagnosed in 2000-2004 in Ireland was estimated to be 19.3%. This did not vary significantly by sex although male five-year (age-standardised) relative survival was 17.8% compared to 22.1% for females, a 4.3% (p=0.094) difference. (Fig. 7.11, Tab. 7.4)

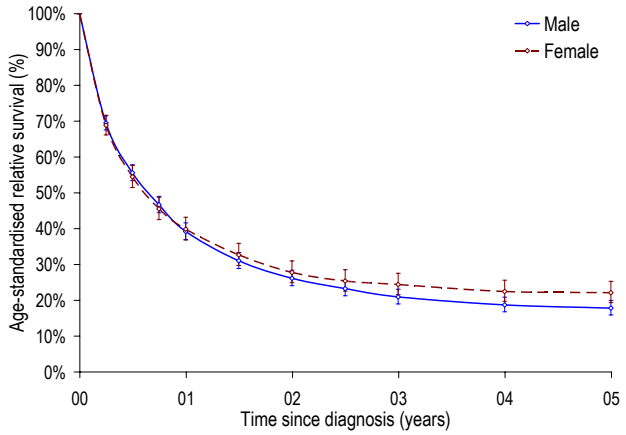
Table 7.4: Age-standardised relative survival for stomach cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	41.1% (37.3%, 45.3%)	39.9% (34.5%, 46.1%)	40.3% (37.2%, 43.7%)
	Republic of Ireland	38.0% (35.2%, 40.9%)	39.9% (36.2%, 44.0%)	38.7% (36.5%, 41.1%)
	Ireland	39.2% (37.0%, 41.6%)	39.9% (36.8%, 43.2%)	39.4% (37.6%, 41.3%)
5-year	Northern Ireland	18.5% (15.2%, 22.4%)	19.9% (15.5%, 25.6%)	19.2% (16.6%, 22.2%)
	Republic of Ireland	17.2% (14.9%, 19.9%)	22.7% (19.4%, 26.7%)	19.3% (17.2%, 21.3%)
	Ireland	17.8% (15.9%, 20.0%)	22.1% (19.3%, 25.3%)	19.3% (17.7%, 21.0%)

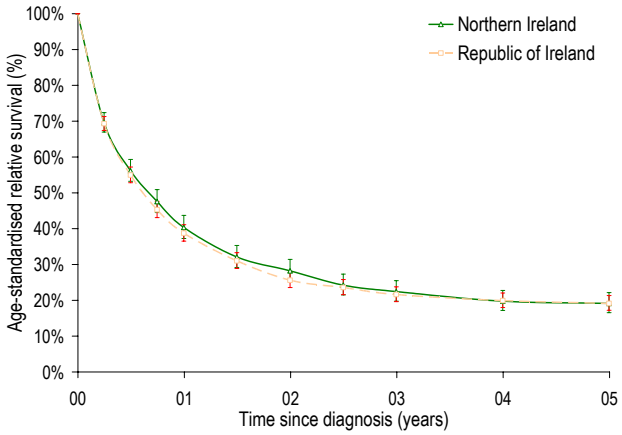
Estimates of both one and five-year (age-standardised) relative survival for both males and females diagnosed with stomach cancer in 2000-2004 were similar in Northern Ireland and Republic of Ireland with no significant differences apparent. (Fig. 7.11, Tab. 7.4)

Figure 7.11: Age-standardised relative survival for stomach cancer patients by sex and country: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



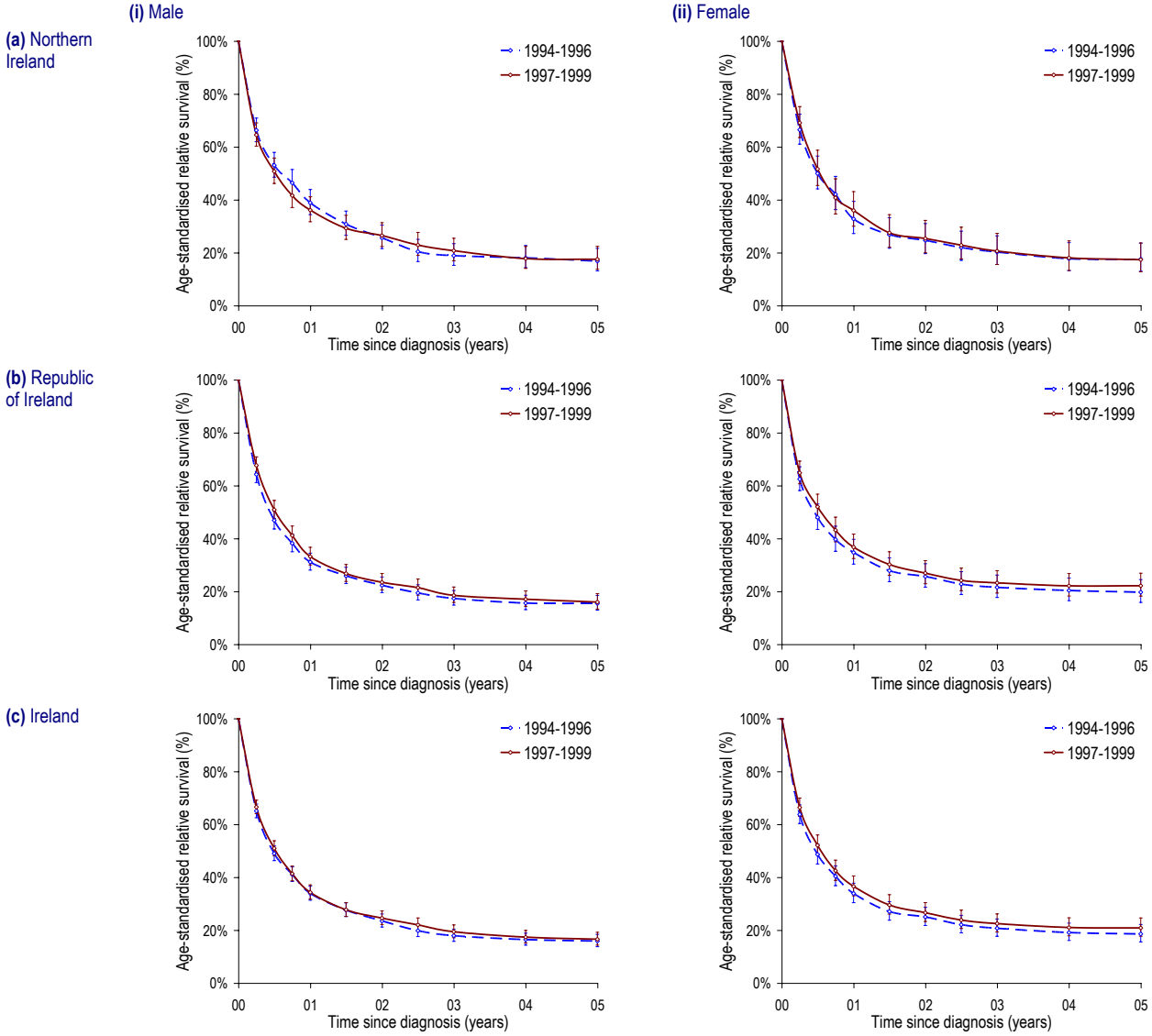
7.3.1: Changes in survival over time

There was no significant variation in one or five-year (age-standardised) relative survival from oesophageal cancer for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland or in Northern Ireland and Republic of Ireland considered separately. (Fig. 7.12, Tab. 7.5)

Table 7.5: Age-standardised relative survival for stomach cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	36.8% (33.3%, 40.7%)	35.7% (32.2%, 39.6%)	16.7% (13.8%, 20.2%)	17.4% (14.5%, 20.9%)
	Republic of Ireland	32.4% (29.9%, 35.1%)	34.3% (31.7%, 37.0%)	17.1% (14.9%, 19.6%)	18.0% (15.8%, 20.6%)
	Ireland	34.0% (32.0%, 36.3%)	34.8% (32.7%, 37.0%)	17.0% (15.2%, 18.9%)	17.9% (16.1%, 19.9%)
Male	Northern Ireland	39.0% (34.5%, 44.0%)	36.2% (31.8%, 41.2%)	16.9% (13.2%, 21.7%)	17.6% (13.8%, 22.5%)
	Republic of Ireland	31.2% (28.2%, 34.6%)	33.3% (30.2%, 36.8%)	15.6% (13.0%, 18.6%)	16.1% (13.4%, 19.3%)
	Ireland	34.0% (31.4%, 36.8%)	34.4% (31.8%, 37.2%)	16.0% (13.9%, 18.5%)	16.7% (14.4%, 19.3%)
Female	Northern Ireland	32.9% (27.4%, 39.5%)	36.1% (30.1%, 43.2%)	17.7% (13.1%, 23.8%)	17.5% (12.9%, 23.7%)
	Republic of Ireland	34.8% (30.4%, 39.8%)	36.9% (32.6%, 41.8%)	19.8% (16.0%, 24.6%)	22.3% (18.3%, 27.0%)
	Ireland	34.0% (30.5%, 37.9%)	36.7% (33.1%, 40.6%)	18.7% (15.7%, 22.3%)	21.0% (17.8%, 24.7%)

Figure 7.12: Age-standardised relative survival for stomach cancer patients by sex, country and period of diagnosis: 1994-1999



7.3.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by cancer patients. For patients diagnosed with stomach cancer in 1997-1999 in Ireland, 12.5% of males and 15.4% of females survived five-years. After five-years there was no conclusive difference between Northern Ireland and Republic of Ireland, nor was there any change in five-year observed survival between 1994-1996 and 1997-1999. (Tab. 7.6)

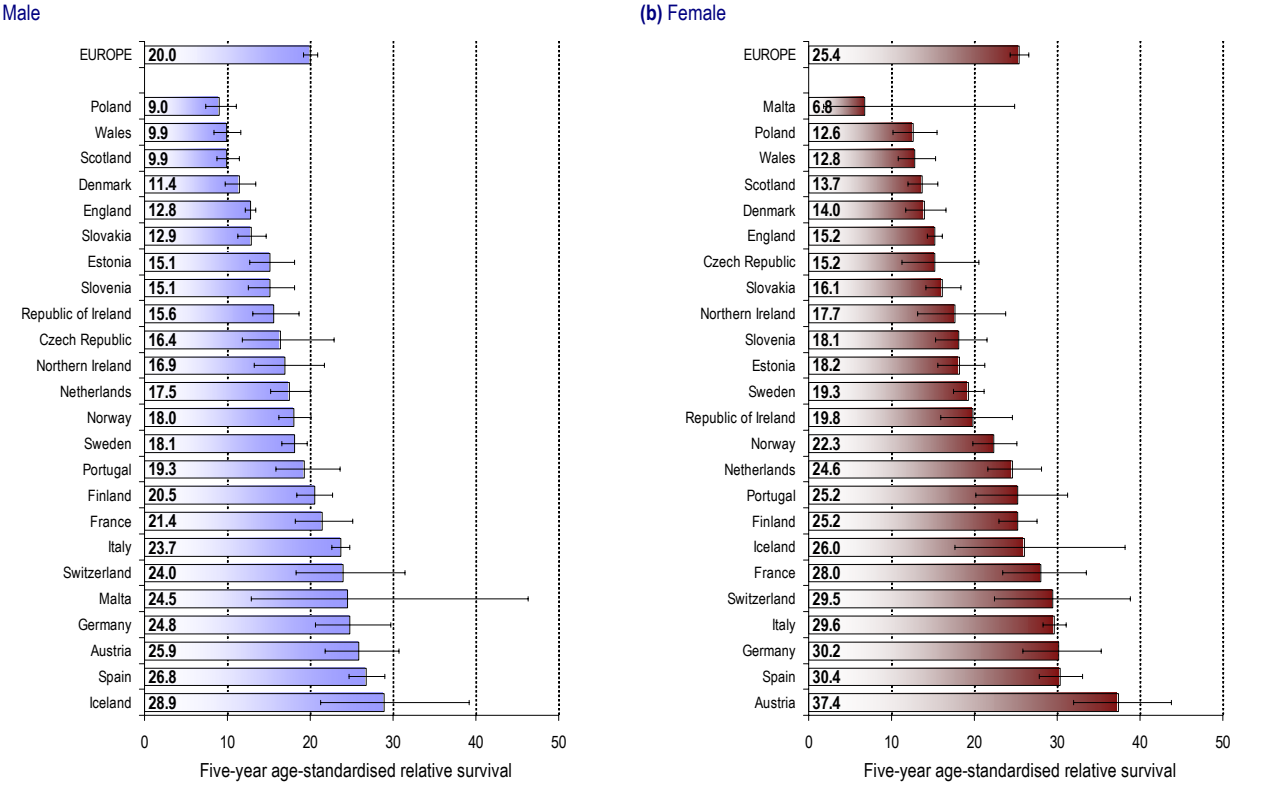
Table 7.6: Observed survival for stomach cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	33.6% (30.3%, 37.1%)	32.7% (29.5%, 36.3%)	12.6% (10.4%, 15.2%)	13.5% (11.3%, 16.3%)
	Republic of Ireland	29.3% (27.0%, 31.8%)	30.8% (28.4%, 33.3%)	12.7% (11.1%, 14.6%)	13.7% (11.9%, 15.6%)
	Ireland	30.8% (28.9%, 32.8%)	31.4% (29.5%, 33.5%)	12.7% (11.3%, 14.2%)	13.6% (12.2%, 15.2%)
Male	Northern Ireland	36.2% (32.1%, 40.9%)	33.6% (29.5%, 38.3%)	12.4% (9.7%, 15.8%)	13.3% (10.5%, 16.8%)
	Republic of Ireland	28.6% (25.7%, 31.7%)	30.0% (27.1%, 33.3%)	12.0% (10.0%, 14.3%)	12.1% (10.1%, 14.6%)
	Ireland	31.2% (28.8%, 33.8%)	31.3% (28.9%, 33.9%)	12.1% (10.5%, 14.0%)	12.5% (10.9%, 14.5%)
Female	Northern Ireland	29.1% (24.3%, 35.0%)	31.2% (26.2%, 37.1%)	13.0% (9.5%, 17.6%)	14.0% (10.4%, 18.7%)
	Republic of Ireland	30.6% (26.9%, 34.9%)	31.9% (28.1%, 36.3%)	14.0% (11.3%, 17.3%)	16.2% (13.2%, 19.7%)
	Ireland	30.1% (27.1%, 33.5%)	31.7% (28.6%, 35.1%)	13.6% (11.4%, 16.2%)	15.4% (13.1%, 18.1%)

7.3.3: European comparisons

Five-year (age-standardised) relative survival from stomach cancer for males diagnosed during 1994-1996 in Northern Ireland was 16.9% while in Republic of Ireland it was 15.6%; with the later significantly lower than the 20.0% five-year (age-standardised) relative survival in Europe for patients diagnosed in 1990-1994. For females diagnosed during 1994-1996 the five-year (age-standardised) relative survival in Northern Ireland was 17.7% while in Republic of Ireland it was 19.8%, with the former significantly lower than the 25.4% five-year (age-standardised) relative survival in Europe for patients diagnosed in 1990-1994. (Fig. 7.13)

Figure 7.13: European comparisons of five-year age-standardised relative survival for stomach cancer patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[44]

7.4: Mortality

During 2000-2004 there were 502 deaths per year in Ireland from stomach cancer with 300 of these among males, 48.5% higher than the female annual average of 202. Adjusting for the different age structure of the male and female population, male European age-standardised mortality rates (EASMR) were double those for females. Stomach cancer was the fourth most common cause of cancer death among males contributing 5.1% of male deaths due to cancer (excluding NMSC). It was the sixth most common female cancer death, causing 3.8% of all female cancer deaths (excluding NMSC). The odds of dying from the disease prior to a 75th birthday and assuming the absence of other disease was 1 in 119 for males and 1 in 256 for females. (Tab. 7.7)

Table 7.7: Summary statistics for deaths from stomach cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	101	71	172	199	131	330	300	202	502
% of all cancer deaths (ex. NMSC)	5.4%	4.0%	4.7%	4.9%	3.7%	4.3%	5.1%	3.8%	4.5%
Rank (ex. NMSC)	4	6	5	5	6	6	4	6	6
Median age at death	72	77	74	72	76	73	72	76	74
Cumulative risk (Aged 0 to 74)	0.9%	0.4%	0.6%	0.8%	0.4%	0.6%	0.8%	0.4%	0.6%
Crude rate per 100,000 persons	12.2	8.2	10.1	10.2	6.7	8.4	10.8	7.1	8.9
EASMR ± 95% CI	12.0 ±1.1	5.7 ±0.6	8.5 ±0.6	11.6 ±0.7	5.8 ±0.5	8.4 ±0.4	11.7 ±0.6	5.8 ±0.4	8.4 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							3.2% ±11.2	-0.7% ±13.5	1.7% ±8.6

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

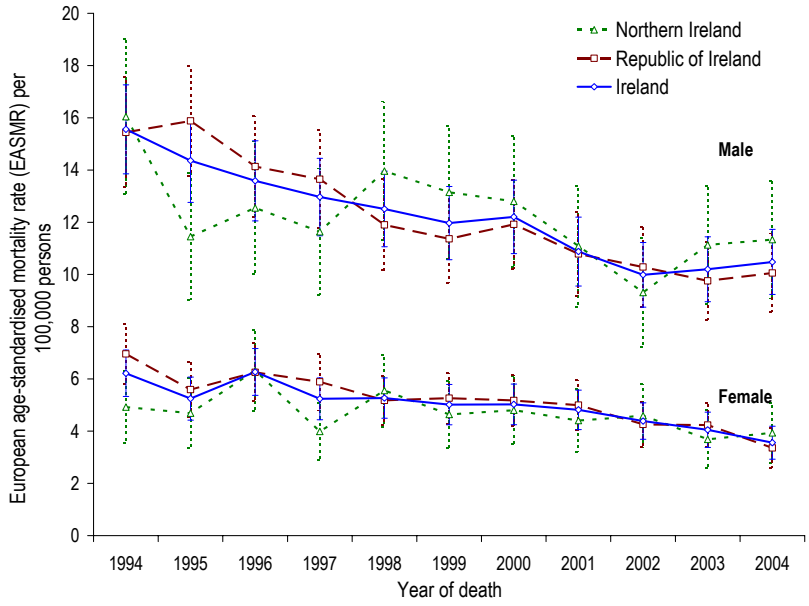
There was no significant difference in European age-standardised mortality rates (EASMR) for either males or females between Northern Ireland and Republic of Ireland during 2000-2004. (Tab. 7.7)

7.4.1: Trends

European age-standardised mortality rates (EASMR) for stomach cancer decreased among males by 4.2% (p<0.001) and by 4.5% (p<0.001) among females between 1994 and 2004. This corresponded to an annual average decrease of 0.8 male deaths from stomach cancer per year, while on average there was no annual change in the number of deaths among females. (Fig. 7.14)

Male EASMRs decreased significantly in both Northern Ireland and Republic of Ireland by 2.7% (p=0.034) and 4.9% (p<0.001) respectively. Among females EASMRs decreased in Republic of Ireland by 5.4% per year, however there was no significant change in Northern Ireland. (Fig. 7.14)

Figure 7.14: Trends in European age-standardised mortality rates (EASMR) for stomach cancer by sex and country: 1994-2004



7.5: Prevalence

Of the people diagnosed with stomach cancer during 1994-2004 only 17.6% were still alive at the end of 2004 (1,412 people) reflecting the poor survival from the disease. Among those diagnosed in 2000-2004 only 26.8% (945 people) were alive at the end of 2004. (Tab. 7.8)

Table 7.8: Prevalence of stomach cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	293	17.2%	204	27.7%
	Female	181	16.8%	115	24.3%
	All persons	474	17.0%	319	26.3%
Republic of Ireland	Male	540	16.8%	370	26.3%
	Female	398	19.8%	256	28.3%
	All persons	938	17.9%	626	27.1%
Ireland	Male	833	16.9%	574	26.8%
	Female	579	18.7%	371	26.9%
	All persons	1,412	17.6%	945	26.8%

The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed within the previous five-years (i.e. 2000-2004) with stomach cancer was 20.5% greater in Northern Ireland than Republic of Ireland. (Tab. 7.8)

7.6: Discussion

The stomach is the part of the body which breaks up ingested food before passing it to the small intestine for digestion. Cancer of the stomach presents itself with a variety of symptoms including indigestion, difficulty swallowing, stomach pain, anemia due to bleeding, feeling sick or full, blood clots, or in advanced cases, blood in the stool, weight loss or loss of appetite.[45]

There is epidemiological evidence of associations between stomach cancer and diets high in salt[46] while a diet high in fresh fruit and vegetables is seen to reduce the risk of stomach cancer due to the protective effect of vitamin C on the stomach lining.[47] The

consumption of preserved foods which contain N-nitroso compounds, nitrates and nitrites as preservatives may increase the risk of stomach cancer, however further studies are required to confirm this conclusion.[48] Other risk factors that have been shown to be important for this cancer include tobacco use[49] and infection with helicobacter pylori bacteria.[50,51] People with pernicious anaemia have a risk of developing stomach cancer which is 2 to 3 times that of the general population[52] and having atrophic gastritis can also increase risk.[48] The inherited condition, familial adenomatous polyposis (FAP) is associated with an elevated risk[48] as is exposure to ionising radiation.[48]

Globally there are approximately 870,000 cases of stomach cancer diagnosed each year, making it the fourth most common cancer worldwide. Survival from the disease is generally quite poor at around 15% after five-years. Consequently the number of deaths relative to cases is quite high with 650,000 deaths per year making it the second most common cause of cancer death, after lung cancer. Incidence and mortality rates are highest in Eastern Asia, Western South America, Eastern Europe and China, with the lowest rates in India and parts of Africa. Rates however are decreasing in Europe and North America due to the reduction of salt intake (particularly salt preserved food), a reduction in the use of traditionally preserved foods and an increase in fruit and vegetable consumption.

Diagnosis of stomach cancer at an early stage is difficult due to the lack of symptoms, with 80% of patients in developing countries presenting at a late stage with symptoms prompting either endoscopy or biopsy. Management of the disease depends upon stage at diagnosis and, when applicable, staging information is also used to dictate the type of surgery applied (endoscopic mucosal resection or gastrectomy). Chemotherapy is also used for advanced disease; however this is a reasonably new development, the effectiveness of which remains uncertain. In most cases treatment is applied for palliative reasons.

Further reductions in mortality from the disease are thus more likely to come about as a result of preventative measures. The decreases already observed in Ireland mirror those in the rest of Europe, although much still remains to be done in this regard. Eradication of stomach cancer caused by high salt intake and tobacco use would still leave many stomach cancers from other causes. Early detection remains the best chance for mortality reduction among these cancers. Some countries, such as Japan where levels of stomach cancer are particularly high, use screening programmes based upon different diagnostic tests, such as X-ray examination, with stomach cancers diagnosed via screening being detected at an earlier stage. Japan has one of the highest five-year survival rates from stomach cancer in the world (48%) although given that only 10-15% of stomach cancers are detected by screening, this is more likely a factor of classification differences than the effectiveness of the screening programme.

Chapter 08:

Colorectal cancer (including colon, rectum and anus; C18-C21)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were 1,618 male and 1,297 female cases diagnosed annually between 2000 and 2004.*
  - *Incidence rates remained unchanged during 1994-2004 for both males and females.*
  - *Incidence rates during 1994-2004 were higher than expected for males and females in Newry & Mourne and Cork, for males in Derry and Dublin and for females in Donegal.*
  - *During 2000-2004 incidence rates of colorectal cancer were higher in deprived than affluent areas.*
  - *Compared to the EU incidence rates were higher in Ireland for males and females.*
  - *During 2000-2004 there were on average 744 male and 594 female deaths from colorectal cancer each year in Ireland.*
  - *Mortality rates decreased between 1994 and 2004 by 1.4% for males and 2.3% for females.*

- *TREATMENT*
  - *In 2001 surgery was the most common form of treatment in Ireland (78.4%), followed by chemotherapy (36.4%) and radiotherapy (17.1%), with 14.2% of patients having received no form of tumour directed treatment.*
  - *Use of chemotherapy and radiotherapy increased in Ireland by 13.4% and 7.7% respectively between 1996 and 2001 while the proportion receiving no tumour directed treatment decreased by 2.9%.*
  - *Lower treatment levels were present among those aged 55 and over (compared to aged 15-44) and those diagnosed at stage IV or unstaged (compared to stage I). Gender and deprivation were not factors in receipt of treatment.*

- *SURVIVAL AND PREVALENCE*
  - *Five year (age-standardised) relative survival in 2000-2004 was estimated to be 53.1%, with no variation by sex.*
  - *Five-year (age-standardised) relative survival improved by 5.3% for males and 4.2% for females between 1994-96 and 1997-99.*
  - *Survival for patients diagnosed in 1995-1999 in Republic of Ireland was lower for males than the European average. There was no difference in survival between Northern Ireland and Europe for males or females or for females in Republic of Ireland.*
  - *There was a relationship between survival and age, stage at diagnosis and receipt of treatment during 1996 and 2001.*
  - *At the end of 2004 there were 13,480 people alive after a diagnosis of colorectal cancer during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were lower in Northern Ireland than Republic of Ireland by 5.8% for males, with no difference for females.*
  - *Use of surgery was 7.6% higher in Northern Ireland than Republic of Ireland; however chemotherapy use was 7.0% higher in Republic of Ireland while radiotherapy use was 5.1% higher.*
  - *Treatment receipt was greater in Northern Ireland than Republic of Ireland once adjusted for factors such as age, stage and cancer site.*
  - *Five-year (age-standardised) relative survival was similar in both countries; however one-year (age-standardised) relative survival for females diagnosed in 2000-2004 was 3.7% higher in Northern Ireland than in Republic of Ireland.*
  - *Five-year (age-standardised) relative survival for females in Northern Ireland increased by 6.9% between 1994-1996 and 1997-1999, while for males there was a 5.8% increase in Republic of Ireland.*
  - *Excess mortality was 1.3% higher in Republic of Ireland once adjusted for age, stage, cancer site and basis of diagnosis.*
  - *Mortality rates were 12.1% lower in Northern Ireland than Republic of Ireland for males with no difference for females.*
  - *At the end of 2004 the number of people living with colorectal cancer diagnosed since 2000 per 100,000 people was 15.2% greater in Northern Ireland than Republic of Ireland.*

8.1: Incidence

Colorectal cancer was a common cancer diagnosed during 2000-2004 with approximately 52 people in every 100,000 diagnosed with the disease each year. On average there were 1,618 male and 1,297 female cases diagnosed annually contributing 14.7% of male and 12.3% of female cancers (excluding NMSC) in Ireland. It was the second most common male and female cancer although the risk of developing the disease before age 75 was higher among males with a 1 in 20 risk for males and 1 in 32 risk for females. (Tab. 8.1)

European age-standardised incidence rates (EASIR) for colorectal cancer were higher among males than females. Rates were lower in Northern Ireland than Republic of Ireland by 5.8% (p=0.011) for males, although there was no significant difference for females. (Tab. 8.1)

Table 8.1: Summary statistics for incidence of colorectal cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	501	437	938	1,117	860	1,977	1,618	1,297	2,915
% of all cancer cases (ex. NMSC)	15.2%	12.7%	13.9%	14.5%	12.2%	13.4%	14.7%	12.3%	13.6%
Rank (ex. NMSC)	3	2	2	2	2	3	2	2	2
Median age at diagnosis	70	72	71	70	72	70	70	72	71
Cumulative risk (Aged 0 to 74)	4.9%	3.1%	3.9%	5.1%	3.1%	4.1%	5.0%	3.1%	4.0%
Crude rate per 100,000 persons	60.5	50.4	55.3	57.4	43.7	50.5	58.3	45.7	51.9
EASIR ± 95% CI	61.1 ±2.4	40.1 ±1.8	49.2 ±1.4	64.9 ±1.7	40.6 ±1.3	51.6 ±1.0	63.6 ±1.4	40.5 ±1.0	50.8 ±0.8
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-5.8% ±4.5	-1.3% ±5.3	-4.5% ±3.4

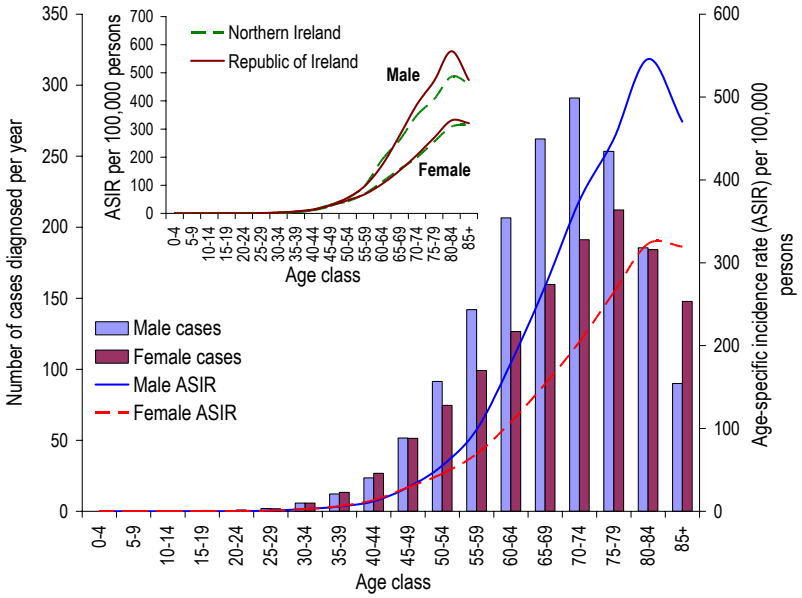
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

8.1.1: Age distribution

While colorectal cancer was diagnosed mainly among the elderly with a median age at diagnosis of 71 during 2000-2004, 5.9% of all male and 7.8% of female colorectal cancers were diagnosed among those aged under 50. However there were less than five cases diagnosed among those aged less than 15 during the five-year period . (Fig. 8.1)

Cases peaked in the 70-74 age class for males and the 75-79 age class for females with 291 (18.0%) male and 212 female (16.4%) cases per year. Age specific incidence rates (ASIR) were highest for both males and females aged 80-84. (Fig. 8.1)

Figure 8.1: Number of cases of colorectal cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



ASIRs in Northern Ireland and Republic of Ireland had distributions with similar shapes, however male ASIRs in Republic of Ireland were consistently higher than those in Northern Ireland for those aged 70+. (Fig. 8.1)

8.1.2: Cancer site and cell type

Colorectal cancer includes cancer of four distinct body parts: colon, rectum, rectosigmoid junction and anus. The most common of these during 2000-2004 in Ireland was colon cancer, which contributed 57.9% of male and 67.5% of female colorectal cancers. Cancer of the rectum was the next most common with cancer of the rectosigmoid junction and anus collectively making up less than 10% of colorectal cancers (Fig. 8.2). The distribution of colorectal cancers by site was similar in both countries.

Figure 8.2: Types of colorectal cancer diagnosed in Ireland by cancer site: 2000-2004
(a) Male **(b)** Female

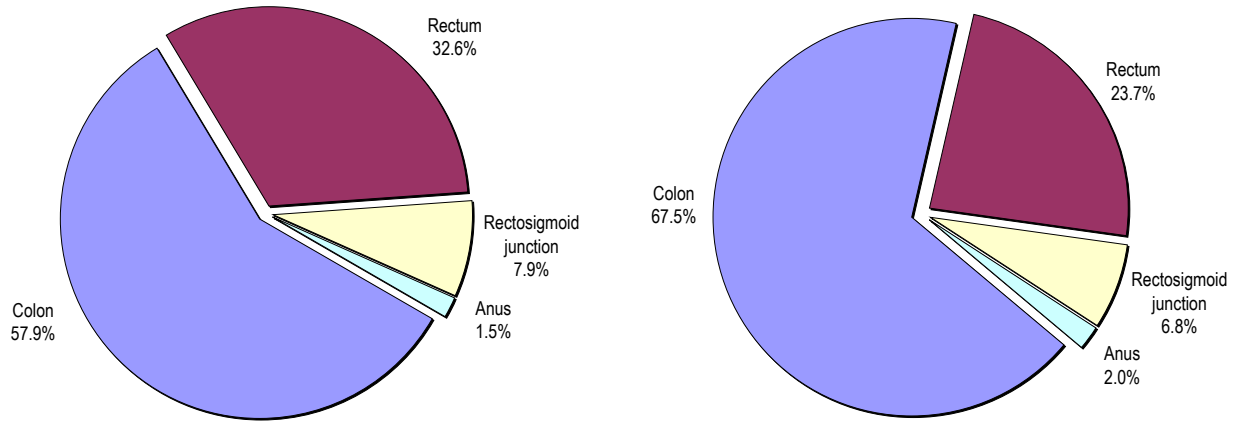
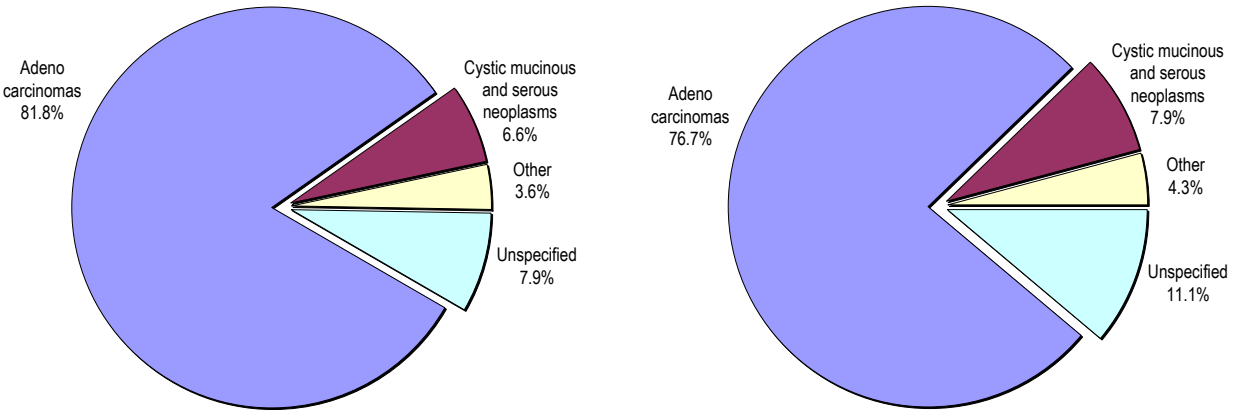


Figure 8.3: Types of colorectal cancer diagnosed in Ireland by cell type: 2000-2004
(a) Male **(b)** Female



Adenocarcinomas were by far the most common cell type of colorectal cancer during 2000-2004 contributing 81.8% of all male and 76.7% of all female colorectal cancers. 9.4% of all colorectal cancers however had an unspecified cell type with this proportion similar in Northern Ireland and Republic of Ireland (NI: 10.3%; ROI: 8.9%). (Fig. 8.3)

8.1.3: Trends

European age-standardised incidence rates (EASIR) for colorectal cancer remained unchanged during 1994-2004 for both males and females. As a result of demographic change however this corresponded to an annual increase of 23.0 male and 12.3 female cases each year. (Fig. 8.4, Tab. 8.2)

While static EASIRs were also observed for males and females in Republic of Ireland and for males in Northern Ireland, EASIRs for females in Northern Ireland decreased annually by 1.3% (p=0.008). These trends were equivalent to annual increases of 19.2 male and 14.4 female

Figure 8.4: Trends in European age-standardised incidence rates (EASIR) for colorectal cancer by sex and country: 1994-2004

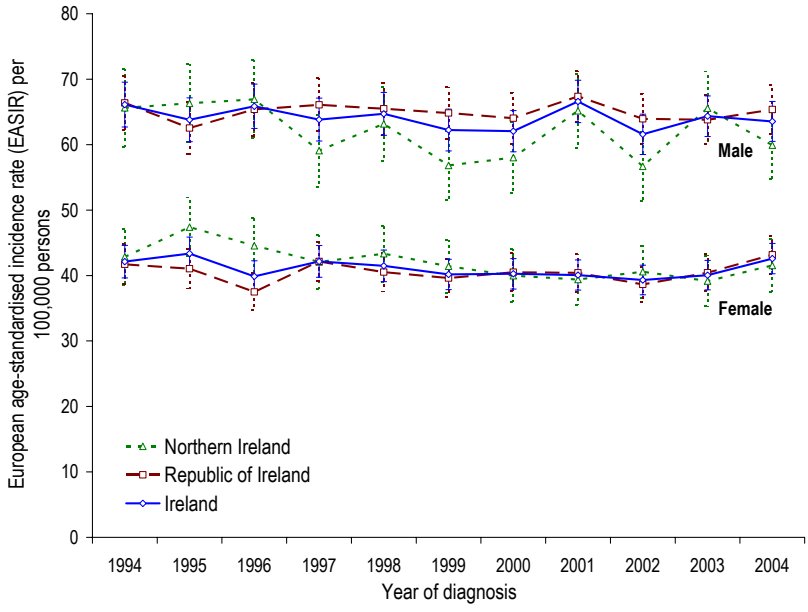


Table 8.2: Number of cases and European age-standardised incidence rates (EASIR) for colorectal cancer by year of diagnosis, sex and country: 1994-2004

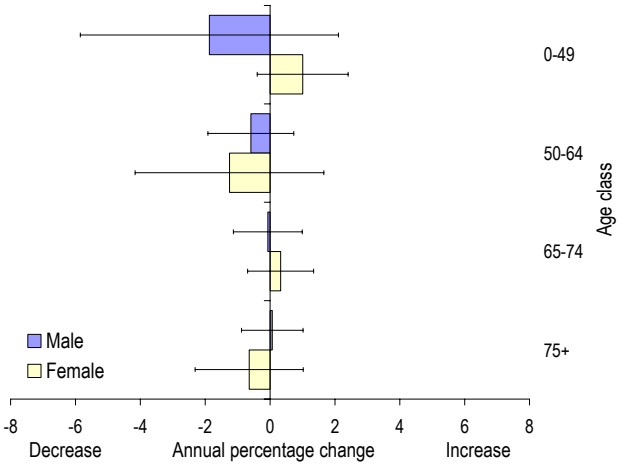
Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	479	65.6 ±5.9	998	66.4 ±4.2	1,477	66.1 ±3.4	433	42.8 ±4.3	782	41.7 ±3.1	1,215	42.1 ±2.5
1995	489	66.3 ±6.0	948	62.5 ±4.0	1,437	63.8 ±3.3	492	47.4 ±4.5	765	41.0 ±3.0	1,257	43.4 ±2.5
1996	499	66.9 ±5.9	995	65.4 ±4.1	1,494	65.9 ±3.4	466	44.5 ±4.3	732	37.5 ±2.8	1,198	39.9 ±2.4
1997	452	59.1 ±5.5	1,041	66.1 ±4.1	1,493	63.8 ±3.3	455	42.1 ±4.1	815	42.1 ±3.0	1,270	42.2 ±2.4
1998	485	63.2 ±5.7	1,043	65.5 ±4.0	1,528	64.7 ±3.3	441	43.3 ±4.3	795	40.5 ±2.9	1,236	41.5 ±2.4
1999	443	56.8 ±5.3	1,045	64.8 ±4.0	1,488	62.2 ±3.2	450	41.4 ±4.0	807	39.6 ±2.8	1,257	40.2 ±2.3
2000	457	58.0 ±5.4	1,054	64.0 ±3.9	1,511	62.0 ±3.2	419	40.0 ±4.0	826	40.5 ±2.9	1,245	40.3 ±2.3
2001	524	65.2 ±5.6	1,129	67.4 ±4.0	1,653	66.6 ±3.2	425	39.4 ±3.9	830	40.4 ±2.8	1,255	40.1 ±2.3
2002	462	56.7 ±5.2	1,095	63.9 ±3.8	1,557	61.6 ±3.1	439	40.6 ±4.0	826	38.6 ±2.7	1,265	39.3 ±2.3
2003	552	65.6 ±5.5	1,123	63.8 ±3.8	1,675	64.3 ±3.1	443	39.2 ±3.8	868	40.4 ±2.8	1,311	40.1 ±2.3
2004	510	59.9 ±5.2	1,184	65.4 ±3.7	1,694	63.5 ±3.0	459	41.5 ±4.0	948	43.2 ±2.8	1,407	42.6 ±2.3

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

cases in Republic of Ireland, an annual increase of 3.7 male cases in Northern Ireland and an annual decrease of 2.1 female cases in Northern Ireland. (Fig. 8.4, Tab. 8.2)

There were no significant trends in EASIRs for colorectal cancer for any age group (0-49, 50-64, 65-74, 75+) for either males or females during 1994-2004 in Ireland. (Fig. 8.5)

Figure 8.5: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for colorectal cancer by sex and age: 1994-2004



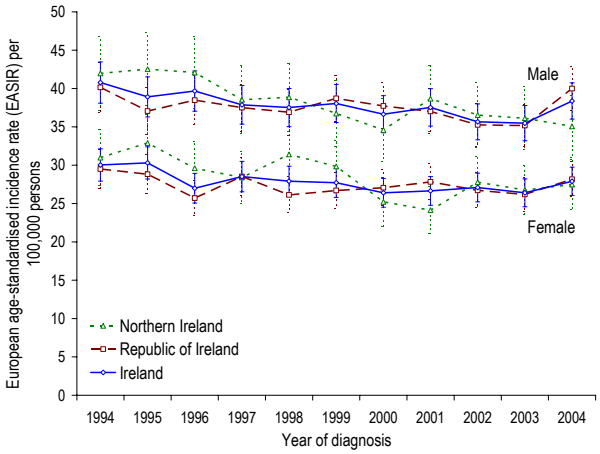
Trends by cancer site

While overall incidence rates of colorectal cancer did not change significantly during 1994-2004, European age-standardised incidence rates (EASIR) decreased by 0.9% (p=0.012) per year for males and 1.0% (p=0.017) per year for females diagnosed with cancer of the colon in Ireland. This downward trend however was driven by decreases in Northern Ireland where there was a 1.9% (p<0.001) decrease per year among males and a 1.9% (p=0.017) decrease per year among females. In Republic of Ireland there was no significant change in EASIRs each year for either males or females. (Fig. 8.6a)

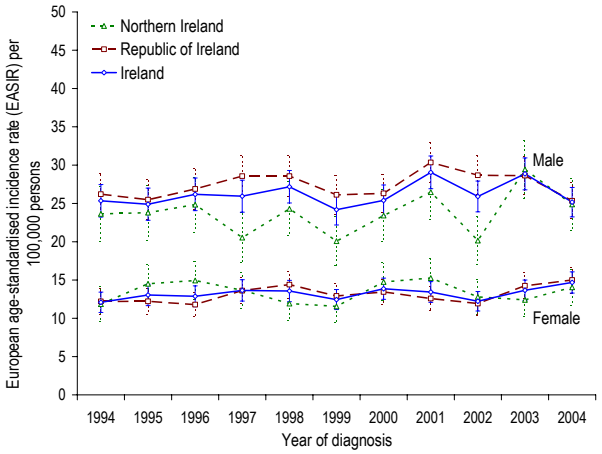
For cancer of the rectum (including rectosigmoid junction and anus) there was no significant change in EASIRs for either sex between 1994 and 2004 in Ireland. The lack of significant change was also apparent in both Northern Ireland and Republic of Ireland for both males and females. (Fig. 8.6b)

Figure 8.6: Trends in European age-standardised incidence rates (EASIR) for colorectal cancer by cancer site, sex and country: 1994-2004

(a) Colon



(b) Rectum*

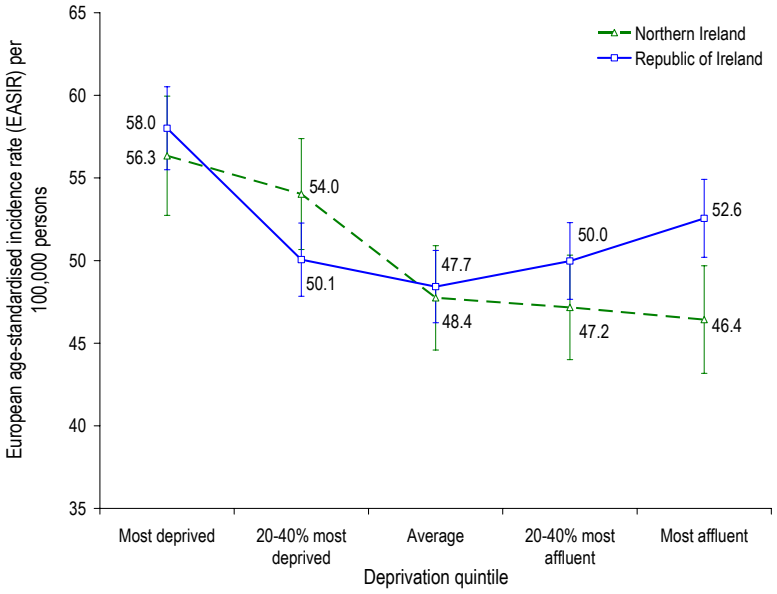


* Includes rectosigmoid junction and anus

8.1.4: Socio-economic factors

In Northern Ireland European age-standardised incidence rates (EASIR) of colorectal cancer decreased steadily with increasing affluence, with EASIRs of the 20% of most deprived population 21.4% (p=0.005) higher than the 20% most affluent population. In Republic of Ireland EASIRs followed a U-shaped pattern with rates lowest in the middle population quintile. Despite the U-shaped relationship EASIRs among the 20% most deprived population in Republic of Ireland were 10.4% (p=0.028) higher than the 20% most affluent population. EASIRs for colorectal cancer among the 20% most affluent population in Northern Ireland were 11.7% lower than in the equivalent Republic of Ireland population during 2000-2004. It is likely however that at least some of the difference between countries is a result of differences in how deprivation is measured (Fig. 8.7)

Figure 8.7: European age-standardised incidence rates (EASIR) for colorectal cancer by country specific deprivation quintile: 2000-2004

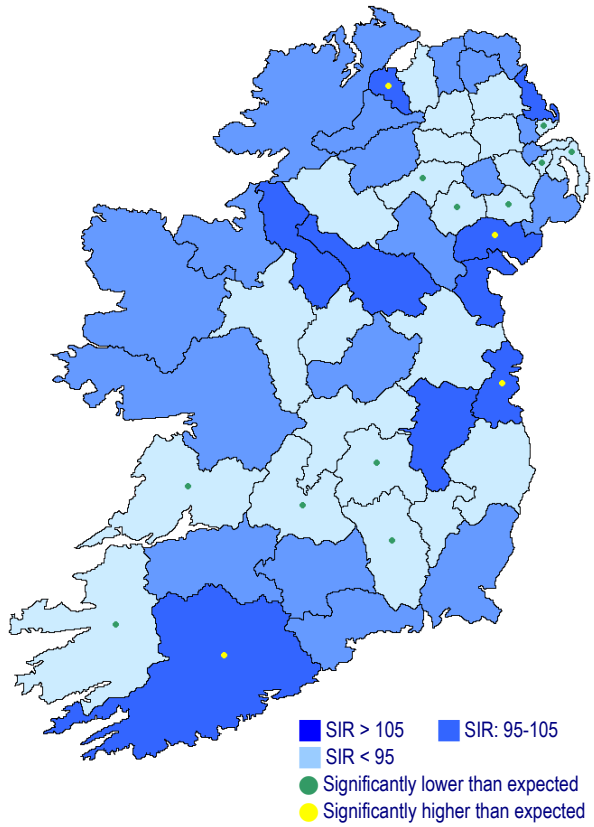


8.1.5: Geographic variations

Compared to all of Ireland incidence rates of colorectal cancer during 1994-2004 were higher than expected for males and females in Newry & Mourne and Cork. They were also higher than expected for males in Derry and Dublin and for females in Donegal. Lower than expected rates were found in eleven of the councils/counties in Ireland for males compared to six for females. Several of these were clustered in the south east of Republic of Ireland. (Fig. 8.8)

Figure 8.8: Significant differences in county/council standardised incidence ratios for colorectal cancer compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female

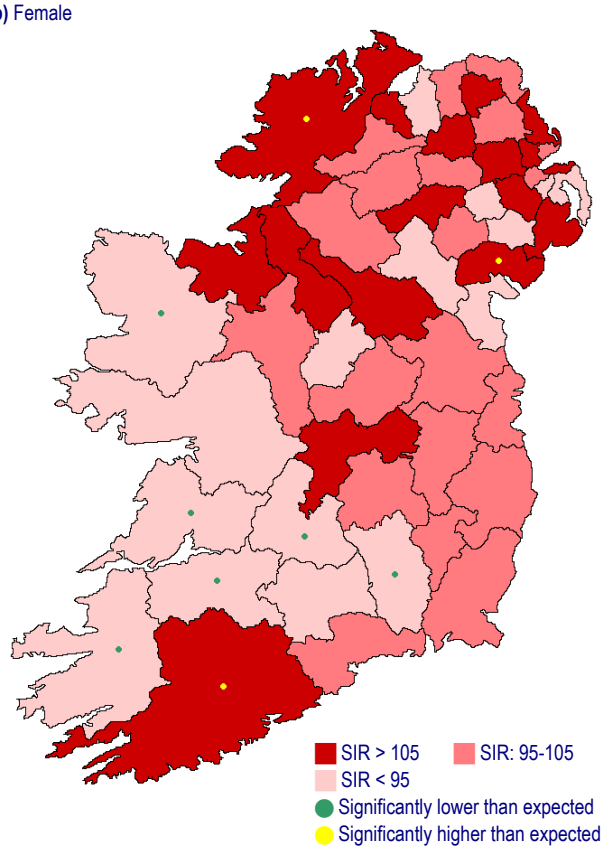
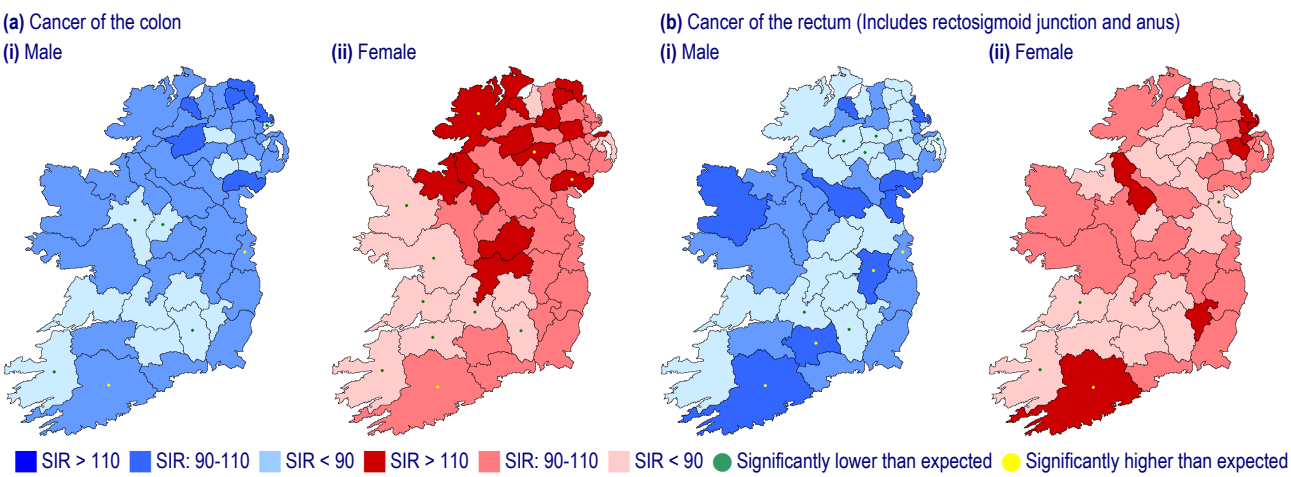


Figure 8.9: Significant differences in county/council standardised incidence ratios for cancer of the colon and cancer of the rectum compared to Ireland as a whole: 1994-2004

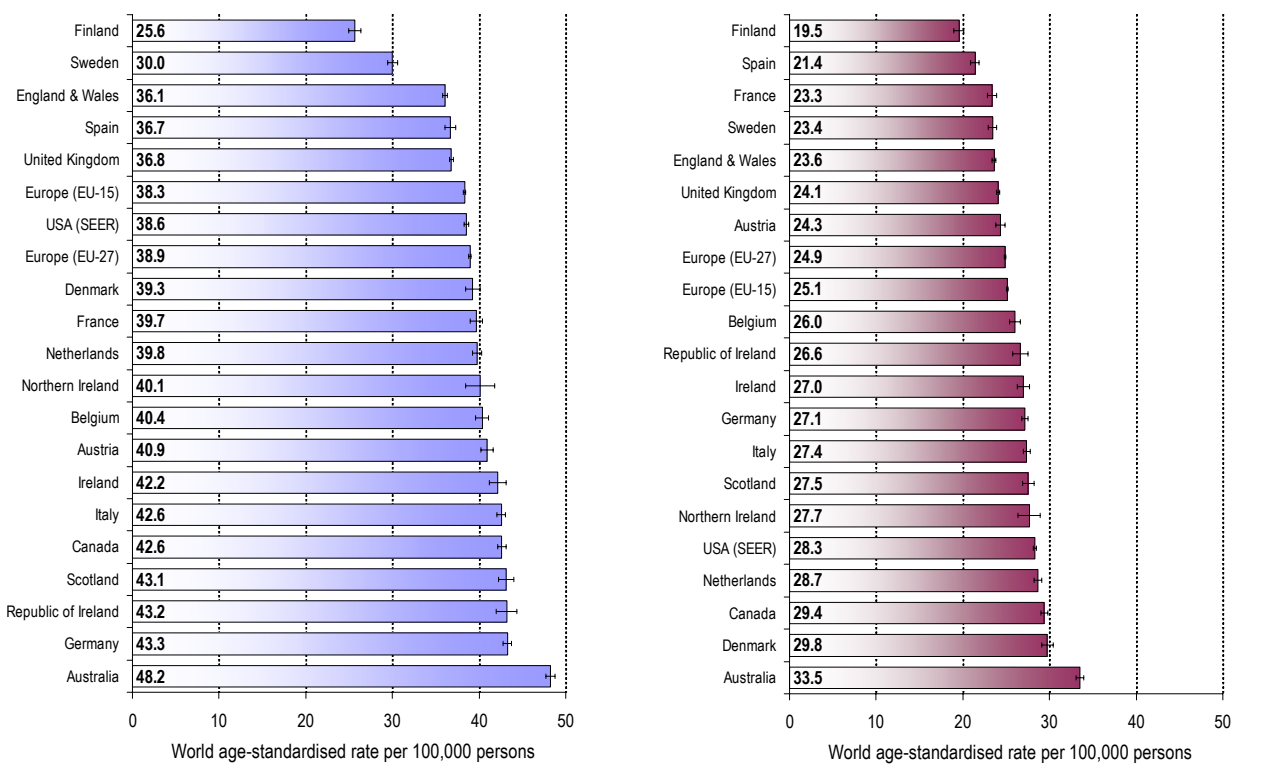


Considering cancer of the rectum and cancer of the colon separately, males exhibited higher than expected incidence rates (compared to Ireland as a whole) of colon cancer during 1994-2004 in Dublin and Cork with higher than expected rates of cancer of the rectum in both these two counties plus counties Kildare and South Tipperary. Among females incidence rates of cancer of the colon were higher than expected in Donegal, Dungannon, Newry & Mourne and Cork, while incidence rates of cancer of the rectum was higher than expected in Cork only. (Fig. 8.9)

8.1.6: International comparisons

Compared to the EU (15 countries) world age-standardised incidence rates (WASIR) were 10.2% ($p<0.001$) higher in Ireland for males and 7.6% for females. WASIRs were also higher in Ireland than in USA and the United Kingdom for males with only Australia having significantly higher rates of colorectal cancer than in Republic of Ireland. Among females however rates of colorectal cancer in Ireland were lower than in USA, Canada and Australia, although they were still higher than in the United Kingdom. Considering colorectal cancer by type, both males and females had higher incidence rates of colon cancer in Ireland than in the EU (15 countries) as did males for cancer of the rectum, however females had similar rates for cancer of the rectum compared to the EU. (Fig. 8.10)

Figure 8.10: International comparisons of world age-standardised incidence rates for colorectal cancer: 1998-2000



Source: IARC[53]

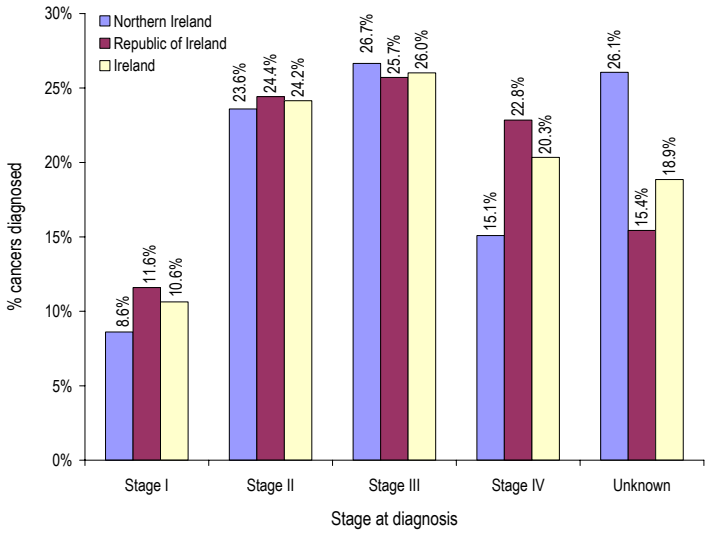
8.2: Treatment

8.2.1: Stage at diagnosis

Staging of colorectal cancer in 2000-2004 was very good with 81.1% of patients in Ireland assigned a stage at diagnosis. This was a significant improvement on the 74.8% staged in 1997-1999 ($p<0.001$). The proportion of patients with an unknown stage differed between Northern Ireland and Republic of Ireland with 10.7% more patients having a stage assigned in Republic of Ireland ($p<0.001$). (Fig. 8.11)

The distribution of stage among patients differed between the two countries with the proportion assigned to stage I 3.0% and stage IV 7.8% higher in Republic of Ireland ($\chi^2=467.6$, $p<0.001$). (Fig. 8.11)

Figure 8.11: Stage at diagnosis for colorectal cancer patients by country: 2000-2004

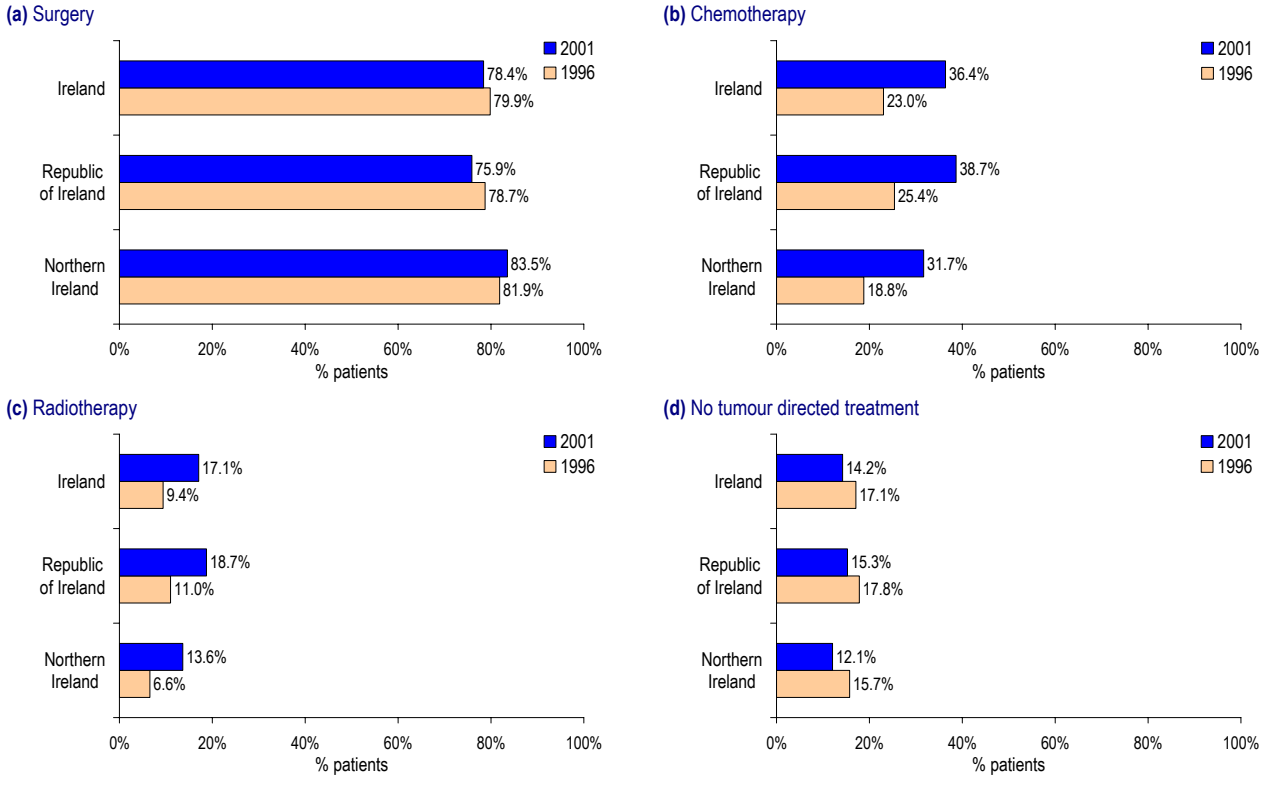


8.2.2: Treatment received

There were 2,708 patients aged 15-99 diagnosed in 2001 and 2,541 diagnosed in 1996 with colorectal cancer as their first (or only) cancer (measured from 1994) who possibly received some form of treatment (i.e. not registered by death certificate or autopsy only).

In 2001 surgery was the most common form of treatment received by colorectal cancer patients in Ireland (78.4%), followed by chemotherapy (36.4%) and radiotherapy (17.1%), with 14.2% of patients receiving no form of tumour directed treatment. Compared to 1996 the use of chemotherapy and radiotherapy increased in Ireland by 13.4% ($p<0.001$) and 7.7% ($p<0.001$) respectively while the proportion receiving no tumour directed treatment decreased by 2.9% ($p=0.004$). Changes in the percentage of patients receiving no tumour directed treatment were not significant in each individual country; however chemotherapy and radiotherapy increases of similar sizes were present in both Northern Ireland and Republic of Ireland. (Fig. 8.12)

Figure. 8.12: Tumour directed treatment received by colorectal cancer patients by year of diagnosis and country: 1996 & 2001



The use of surgery as a treatment for colorectal cancers was 7.6% (p<0.001) higher in Northern Ireland than Republic of Ireland, however both chemotherapy and radiotherapy were more common in Republic of Ireland, by 7.0% (p<0.001) for chemotherapy and 5.1% (p=0.001) for radiotherapy. Overall the proportion of patients receiving no tumour directed treatment was 3.2% (p=0.025) higher in Republic of Ireland than Northern Ireland. (Fig. 8.12)

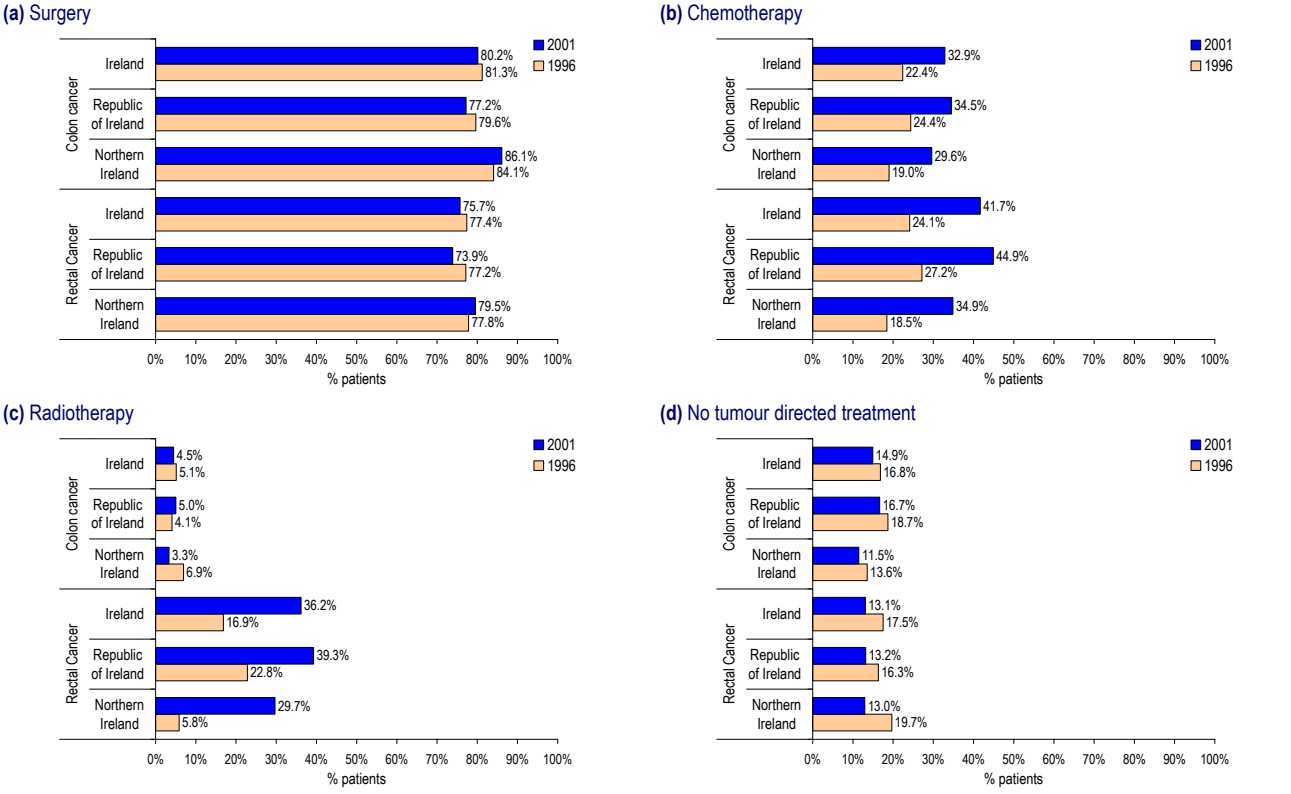
Treatment received by cancer site

Considering colorectal cancers by cancer site, surgery followed by chemotherapy and radiotherapy were the most common treatments for cancers of the colon and rectum, although radiotherapy was more commonly used in treating cancer of the rectum than cancer of the colon. (Fig. 8.13)

Between 1996 and 2001 chemotherapy use increased in Ireland by 10.5% (p<0.001) for colon cancer and by 17.6% for rectal cancer while radiotherapy use increased by 19.3% among rectal cancer patients. Overall there were 4.4% fewer rectal cancer patients receiving no tumour directed treatment in 2001 than in 1996, although there was no change for colon cancer patients. (Fig. 8.13)

Surgery use was higher in Northern Ireland than Republic of Ireland for both types of cancer during 2001 while the opposite was true for chemotherapy use. In Northern Ireland 9.6% (p=0.002) fewer rectal cancer patients received radiotherapy than in Republic of Ireland while 5.2% (p=0.006) fewer colon cancer patients received no tumour directed treatment. (Fig. 8.13)

Figure. 8.13: Tumour directed treatment received by colorectal cancer patients by year of diagnosis, cancer site and country: 1996 & 2001



Note: Rectum includes rectosigmoid junction and anus

Treatment combinations

In Ireland 36.5% of colorectal cancer patients diagnosed in 2001 received more than one type of treatment, an 11.7% (p<0.001) increase since 1996. This increase was driven primarily by a 5.0% (p<0.001) increase in the use of surgery and chemotherapy together, and a 5.1% (p<0.001) increase in the use of a combination of all three treatment types. (Tab. 8.3)

During 2001 the use of surgery only was 9.2% (p=0.001) higher in Northern Ireland than Republic of Ireland, while chemotherapy on its own was used for 2.2% (p=0.020) more patients in Republic of Ireland. Surgery and radiotherapy use together was 2.3% (p=0.003) higher in Northern Ireland while the use of all three treatment types together was 5.0% higher in Republic of Ireland. There was no significant difference between countries in the proportion of patients receiving a combination of treatments. (Tab. 8.3)

Table 8.3: Tumour directed treatment received by colorectal cancer patients by country and year of diagnosis: 1996 & 2001

	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	61.9%	50.3%	52.5%	41.1%	55.9%	44.1%
Chemotherapy only	1.6%	1.9%	1.1%	4.1%	1.3%	3.4%
Radiotherapy only	0.4%	1.0%	1.2%	2.3%	0.9%	1.8%
Surgery and chemotherapy	14.2%	22.1%	17.5%	20.9%	16.3%	21.3%
Surgery and radiotherapy	3.2%	5.0%	3.1%	2.7%	3.1%	3.5%
Chemotherapy and radiotherapy	0.3%	1.5%	1.2%	2.5%	0.9%	2.2%
Surgery, chemotherapy and radiotherapy	2.6%	6.2%	5.6%	11.2%	4.5%	9.6%
No tumour directed treatment	15.7%	12.1%	17.8%	15.3%	17.1%	14.2%
Total patients	915	887	1,626	1,821	2,541	2,708

For cancers of the colon surgery only or surgery and chemotherapy were the usual combinations of treatment received by patients diagnosed in 2001 in Ireland, and in both countries considered separately. For cancers of the rectum however combinations of all three treatment types were used for 20.3% of patients. Overall 46.4% of rectal cancer patients received at least two separate types of treatment compared to 29.9% for colon cancer patients. (Tab. 8.4)

Table 8.4: Tumour directed treatment received by colorectal cancer patients by country, cancer site and year of diagnosis: 1996 & 2001

	Cancer of the colon						Cancer of the rectum*					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001	1996	2001	1996	2001	1996	2001
Surgery only	63.6%	58.5%	55.1%	47.1%	58.2%	50.9%	58.8%	37.5%	48.2%	32.0%	51.9%	33.8%
Chemotherapy only	1.7%	1.3%	1.1%	4.8%	1.3%	3.7%	1.5%	2.9%	1.2%	2.9%	1.3%	2.9%
Radiotherapy only	0.5%	0.2%	0.4%	0.7%	0.4%	0.6%	0.3%	2.3%	2.5%	4.5%	1.7%	3.8%
Surgery and chemotherapy	14.2%	25.4%	21.1%	26.3%	18.6%	26.0%	14.2%	17.0%	11.5%	12.6%	12.4%	14.0%
Surgery and radiotherapy	3.4%	0.2%	1.5%	1.0%	2.2%	0.7%	2.8%	12.4%	5.8%	5.4%	4.8%	7.6%
Chemotherapy and radiotherapy	0.2%	0.9%	0.2%	0.5%	0.2%	0.7%	0.6%	2.3%	2.8%	5.5%	2.1%	4.5%
Surgery, chemotherapy and radiotherapy	2.9%	2.0%	2.0%	2.7%	2.4%	2.5%	2.2%	12.7%	11.7%	23.9%	8.3%	20.3%
No treatment	13.6%	11.5%	18.7%	16.7%	16.8%	14.9%	19.7%	13.0%	16.3%	13.2%	17.5%	13.1%
Total patients	590	540	1,026	1,093	1,616	1,633	325	347	600	728	925	1,075

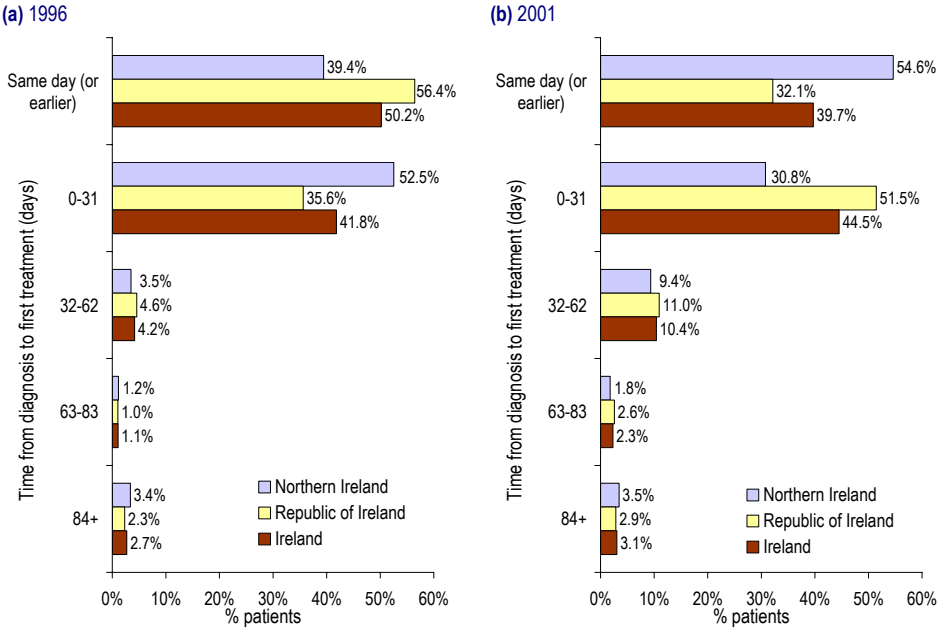
* Includes rectosigmoid junction and anus

8.2.3: Waiting times

Among colorectal cancer patients diagnosed in 2001 in Ireland 84.2% of those who received tumour directed treatment were treated within 31 days of diagnosis. This was a decrease of 7.8% on the 1996 proportion ($p<0.001$).

Waiting time between diagnosis and treatment differed between Northern Ireland and Republic of Ireland ($\chi^2=192.1$, $p<0.001$). However the proportion treated within 31 days was similar in both countries ($p=0.003$). (Fig. 8.14)

Figure 8.14: Time between diagnosis and first treatment by country for patients diagnosed with colorectal cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

8.2.4: Patient characteristics and factors influencing treatment

Among colorectal cancer patients diagnosed in 1996 and 2001 there was a slightly greater possibility of receiving treatment in Northern Ireland than Republic of Ireland once factors such as age, stage and cancer site were adjusted for. Additionally treatment of colorectal cancer patients was slightly more common in 2001 than 1996 in Northern Ireland, while there was no significant difference in treatment levels between the two years in Republic of Ireland. (Tab. 8.5)

Neither stage nor age were significant factors in treatment receipt in Northern Ireland during 1996 and 2001, with the exception that having an unknown stage lowered the possibility of receiving treatment. The lack of significance for these factors may be due to the small number of cases in each group as Republic of Ireland and Ireland as a whole had lower treatment levels for those age 55-64, 65-74 and 75+ compared to age 15-44 and for those diagnosed stage IV or unstaged compared to stage I. Those diagnosed with cancer of the rectum (including rectosigmoid junction) had lower treatment levels than colon cancer in Northern Ireland, but not in Republic of Ireland. Basis of diagnosis was also a factor in treatment receipt in both countries with patients diagnosed by clinical opinion less likely than those diagnosed by microscopic verification to receive treatment. Gender and socio-economic status (based upon deprivation quintile) were not factors in receipt of treatment once adjusted for other factors. (Tab. 8.5)

Table 8.5: Number and percentage of colorectal cancer patients diagnosed in 1996 and 2001 receiving tumour directed treatment by patient and tumour characteristics with relative risk ratios derived using multivariate logistic regression

	Northern Ireland			Republic of Ireland			Ireland		
	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)
Male	949	87.0%	1.00	1,998	84.3%	1.00	2,947	85.2%	1.00
Female	853	85.0%	0.99 (0.94,1.03)	1,449	82.4%	1.00 (0.96,1.04)	2,302	83.4%	1.00 (0.97,1.03)
Age 15-44	73	93.2%	1.00	120	99.2%	1.00	193	96.9%	1.00
Age 45-54	153	90.8%	0.95 (0.73,1.04)	344	93.3%	0.95 (0.70,1.00)	497	92.6%	0.97 (0.88,1.00)
Age 55-64	342	91.8%	0.93 (0.70,1.03)	682	91.1%	0.93 (0.63,1.00)*	1,024	91.3%	0.95 (0.85,1.00)*
Age 65-74	566	87.3%	0.89 (0.65,1.01)	1,164	87.1%	0.89 (0.52,0.99)*	1,730	87.2%	0.92 (0.79,0.98)*
Age 75+	668	80.2%	0.88 (0.64,1.01)	1,137	70.7%	0.77 (0.31,0.97)*	1,805	74.2%	0.84 (0.67,0.94)*
Stage I	170	91.8%	1.00	409	98.0%	1.00	579	96.2%	1.00
Stage II	509	93.1%	1.03 (0.97,1.06)	829	98.7%	1.01 (0.99,1.02)	1,338	96.6%	1.01 (0.99,1.02)
Stage III	450	94.2%	1.03 (0.97,1.06)	814	97.3%	0.99 (0.96,1.01)	1,264	96.2%	1.00 (0.98,1.02)
Stage IV	385	86.8%	0.98 (0.89,1.03)	789	66.3%	0.74 (0.57,0.86)*	1,174	73.0%	0.82 (0.73,0.89)*
Stage unknown	288	56.6%	0.75 (0.58,0.89)*	606	56.9%	0.74 (0.57,0.87)*	894	56.8%	0.75 (0.64,0.84)*
Microscopically verified	1,642	91.4%	1.00	3,155	90.1%	1.00	4,797	90.5%	1.00
Clinical basis	153	32.0%	0.39 (0.29,0.51)*	266	13.5%	0.36 (0.27,0.47)*	419	20.3%	0.38 (0.31,0.46)*
Other basis	7	14.3%	0.28 (0.04,0.84)*	26	3.8%	0.16 (0.02,0.62)*	33	6.1%	0.18 (0.04,0.52)*
Cancer of the colon	1,130	87.4%	1.00	2,119	82.4%	1.00	3,249	84.1%	1.00
Cancer of the rectum	638	83.9%	0.89 (0.82,0.96)*	1,275	85.3%	1.03 (0.99,1.07)	1,913	84.8%	0.98 (0.94,1.01)
Cancer of the anus	34	82.4%	0.86 (0.61,1.02)	53	86.8%	1.03 (0.82,1.13)	87	85.1%	0.95 (0.80,1.06)
20% most affluent	295	84.1%	1.00	569	87.0%	1.00	864	86.0%	1.00
20-40% most affluent	358	88.5%	1.06 (0.97,1.11)	581	85.5%	0.98 (0.91,1.04)	939	86.7%	1.01 (0.96,1.05)
Average	351	89.5%	1.07 (0.99,1.12)	626	83.2%	0.98 (0.91,1.04)	977	85.5%	1.01 (0.96,1.05)
20-40% most deprived	399	85.2%	1.00 (0.90,1.07)	712	80.3%	0.94 (0.86,1.00)	1,111	82.1%	0.97 (0.91,1.01)
20% most deprived	379	85.5%	0.99 (0.89,1.07)	673	82.2%	0.96 (0.88,1.01)	1,052	83.4%	0.97 (0.91,1.02)
Unknown	20	40.0%	0.26 (0.10,0.54)*	286	84.3%	0.96 (0.86,1.03)	306	81.4%	0.91 (0.81,0.99)*
Diagnosed in 1996	915	84.3%	1.00	1,626	82.2%	1.00	2,541	82.9%	1.00
Diagnosed in 2001	887	87.9%	1.08 (1.04,1.11)*	1,821	84.7%	1.02 (0.98,1.06)	2,708	85.8%	1.04 (1.01,1.07)*
Northern Ireland	1,802	86.1%					1,802	86.1%	
Republic of Ireland				3,447	83.5%		3,447	83.5%	0.97 (0.93,1.00)*
All patients	1,802	86.1%		3,447	83.5%		5,249	84.4%	

* Significantly different from baseline group ($p<0.05$)

8.3: Survival

Five year (age-standardised) relative survival for colorectal cancer patients diagnosed in 2000-2004 in Ireland was estimated to be 53.1%. This did not vary significantly by sex despite a 2.7% difference between survival for males and females (p=0.095). (Fig. 8.15, Tab. 8.6)

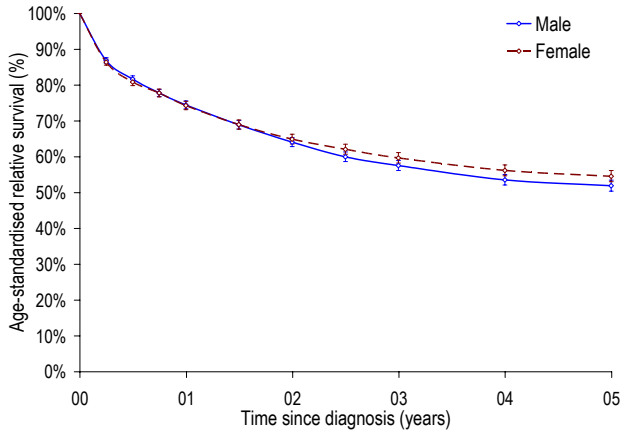
Table 8.6: Age-standardised relative survival for colorectal cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	75.6% (73.7%, 77.6%)	76.7% (74.7%, 78.7%)	76.1% (74.7%, 77.5%)
	Republic of Ireland	74.0% (72.7%, 75.4%)	73.0% (71.6%, 74.5%)	73.5% (72.5%, 74.5%)
	Ireland	74.5% (73.4%, 75.6%)	74.3% (73.1%, 75.5%)	74.4% (73.6%, 75.2%)
5-year	Northern Ireland	52.6% (49.9%, 55.4%)	54.9% (52.3%, 57.7%)	53.7% (51.8%, 55.7%)
	Republic of Ireland	51.7% (49.9%, 53.6%)	54.4% (52.5%, 56.4%)	52.8% (51.5%, 54.1%)
	Ireland	51.9% (50.4%, 53.5%)	54.6% (53.0%, 56.2%)	53.1% (52.0%, 54.2%)

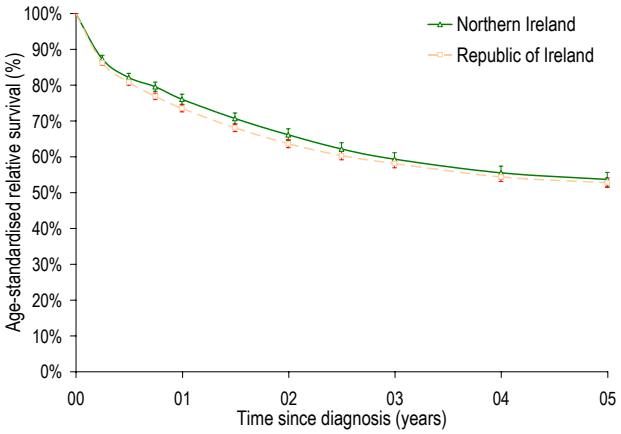
Colorectal cancer patients diagnosed in 2000-2004 in Northern Ireland and Republic of Ireland had similar five-year (age-standardised) relative survival. However one-year (age-standardised) relative survival for females with colorectal cancer was 3.7% (p=0.036) higher in Northern Ireland than in Republic of Ireland. (Fig. 8.15, Tab. 8.6)

Figure 8.15: Age-standardised relative survival for colorectal cancer patients by sex and country: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



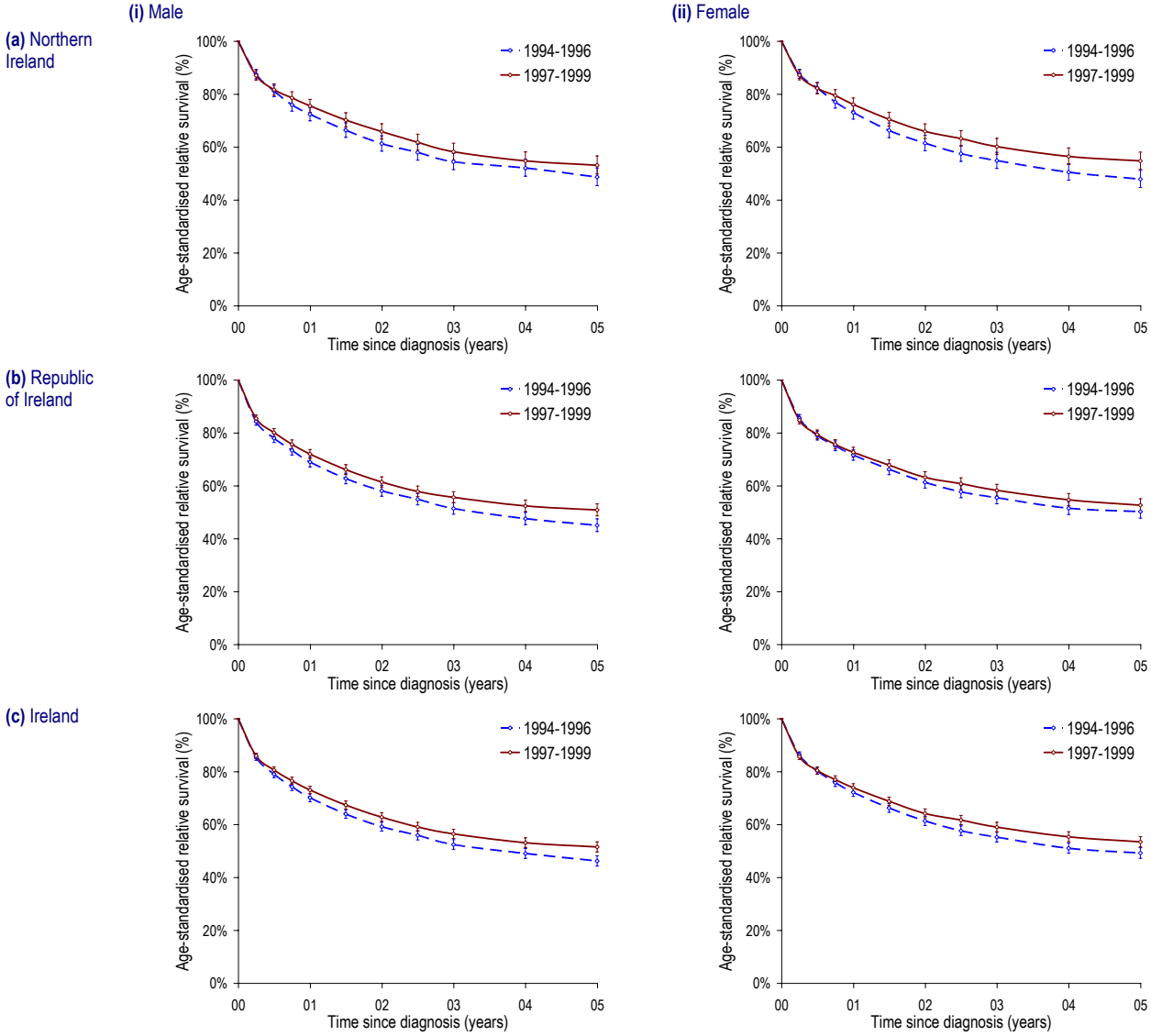
8.3.1: Changes in survival over time

Five-year (age-standardised) relative survival for colorectal cancer patients diagnosed in Ireland improved by 5.3% (p=0.007) for males and 4.2% (p=0.034) for females between 1994-1996 and 1997-1999. Improvements were significant for males and females combined in both countries with a 6.0% (p=0.011) increase in Northern Ireland and a 4.2% (p=0.013) increase in Republic of Ireland between the two three-year periods. However, when analysed by gender, there was no significant change for males in Northern Ireland or females in Republic of Ireland observed, possibly as a result of the smaller number of cases. Five-year (age-standardised) relative survival for female colorectal cancer in Northern Ireland however increased by 6.9% (p=0.036) between 1994-1996 and 1997-1999, while males exhibited five-year survival increases of 5.8% (p=0.015) in Republic of Ireland. (Tab. 8.7, Fig. 8.16)

Table 8.7: Age-standardised relative survival for colorectal cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	72.5% (70.7%, 74.3%)	75.9% (74.2%, 77.6%)	47.9% (45.6%, 50.2%)	53.9% (51.6%, 56.3%)
	Republic of Ireland	70.1% (68.8%, 71.5%)	72.3% (71.0%, 73.6%)	47.3% (45.6%, 49.0%)	51.5% (49.9%, 53.2%)
	Ireland	71.0% (69.9%, 72.1%)	73.4% (72.4%, 74.5%)	47.4% (46.0%, 48.8%)	52.3% (51.0%, 53.7%)
Male	Northern Ireland	72.4% (69.9%, 75.0%)	75.6% (73.2%, 78.1%)	48.7% (45.5%, 52.2%)	53.2% (49.9%, 56.7%)
	Republic of Ireland	69.0% (67.2%, 70.9%)	72.0% (70.3%, 73.8%)	45.1% (42.7%, 47.6%)	50.9% (48.7%, 53.2%)
	Ireland	70.2% (68.7%, 71.7%)	73.1% (71.7%, 74.5%)	46.3% (44.3%, 48.3%)	51.6% (49.7%, 53.5%)
Female	Northern Ireland	73.1% (70.6%, 75.7%)	76.2% (73.8%, 78.6%)	47.9% (44.8%, 51.2%)	54.8% (51.6%, 58.1%)
	Republic of Ireland	71.7% (69.7%, 73.6%)	72.7% (70.9%, 74.6%)	50.3% (47.8%, 52.9%)	52.7% (50.4%, 55.2%)
	Ireland	72.2% (70.7%, 73.8%)	74.0% (72.5%, 75.5%)	49.3% (47.3%, 51.3%)	53.5% (51.6%, 55.5%)

Figure 8.16: Age-standardised relative survival for colorectal cancer patients by sex, country and period of diagnosis: 1994-1999



8.3.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by cancer patients. For those diagnosed with colorectal cancer during 1997-1999 in Ireland, 40.2% of males and 42.8% of females survived five years. After five-years there was no conclusive difference in survival between Northern Ireland and Republic of Ireland. Observed survival improved in Ireland between 1994-1996 and 1997-1999 by 4.8% (p=0.001) for males and 3.9% (p=0.021) for females. Significant improvements occurred in this period among males in Republic of Ireland and females in Northern Ireland. (Tab. 8.8)

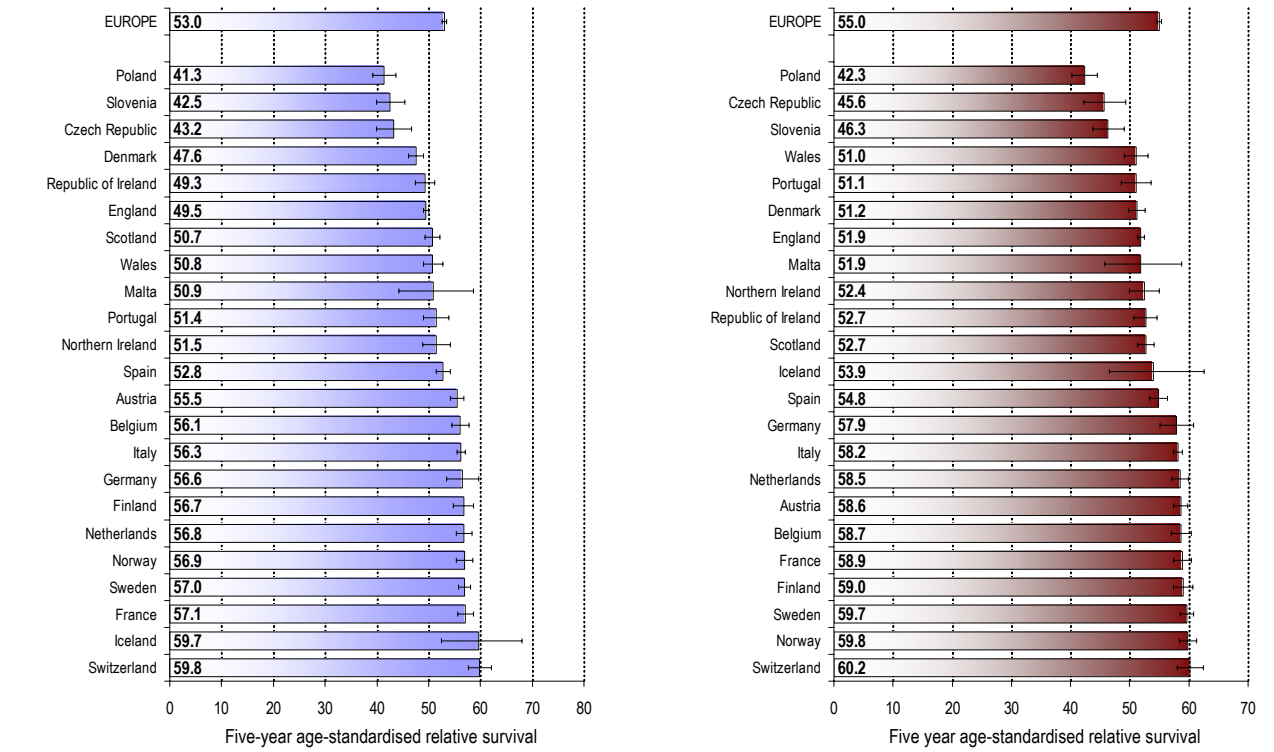
Table 8.8: Observed survival for colorectal cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	67.9% (66.2%, 69.7%)	70.6% (68.9%, 72.4%)	37.1% (35.3%, 38.9%)	42.3% (40.4%, 44.2%)
	Republic of Ireland	66.1% (64.8%, 67.4%)	67.9% (66.6%, 69.1%)	36.9% (35.6%, 38.3%)	40.9% (39.6%, 42.3%)
	Ireland	66.7% (65.7%, 67.8%)	68.8% (67.8%, 69.8%)	37.0% (35.9%, 38.1%)	41.4% (40.3%, 42.5%)
Male	Northern Ireland	68.1% (65.7%, 70.6%)	70.9% (68.5%, 73.4%)	37.0% (34.5%, 39.6%)	41.4% (38.8%, 44.2%)
	Republic of Ireland	65.5% (63.8%, 67.3%)	68.1% (66.4%, 69.8%)	34.6% (32.8%, 36.3%)	39.7% (38.0%, 41.5%)
	Ireland	66.4% (65.0%, 67.8%)	68.9% (67.6%, 70.3%)	35.4% (33.9%, 36.8%)	40.2% (38.8%, 41.7%)
Female	Northern Ireland	67.7% (65.2%, 70.2%)	70.3% (67.9%, 72.9%)	37.2% (34.6%, 39.9%)	43.1% (40.5%, 46.0%)
	Republic of Ireland	66.8% (64.9%, 68.8%)	67.6% (65.7%, 69.6%)	40.0% (38.0%, 42.1%)	42.6% (40.6%, 44.6%)
	Ireland	67.1% (65.6%, 68.7%)	68.6% (67.1%, 70.1%)	38.9% (37.4%, 40.6%)	42.8% (41.2%, 44.4%)

8.3.3: European comparisons

Five-year (age-standardised) relative survival from colorectal cancer for patients diagnosed in 1995-1999 in Republic of Ireland was 3.7% (p=0.001) lower for males than the European average. There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and the European average for males or females or for females in Republic of Ireland. Survival in both Northern Ireland and Republic of Ireland was similar to that in UK. (Fig. 8.17)

Figure 8.17: European comparisons of five-year age-standardised relative survival for colorectal cancer patients: 1995-1999

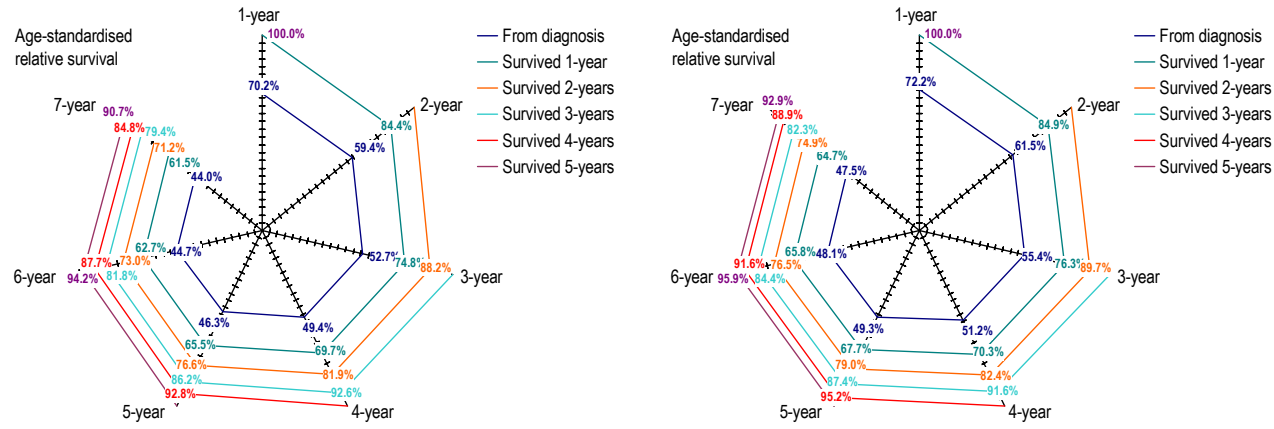


Source: EUROCARE-IV[54]

8.3.4: Conditional survival

Long-term survival from colorectal cancer in Ireland was moderate for patients diagnosed in 1994-1996, with seven-year relative survival from diagnosis 44.0% for males and 47.5% for females. However of the male and female patients surviving two years (59.4% and 61.5% respectively), 71.2% of males and 74.9% of females went on to survive a further five years (excluding other causes of death), which was approximately 25% higher than five-year relative survival from diagnosis. However while this indicates that the longer a patient survives the greater the long-term survival probability, there was no "cure" point for colorectal cancer apparent with only 90.7% of males and 92.9% of females surviving two years after having already survived five-years. (Fig. 8.18)

Figure 8.18: Conditional survival from colorectal cancer by sex: Overall relative survival for patients who have already survived a given amount of time: 1994-1996.

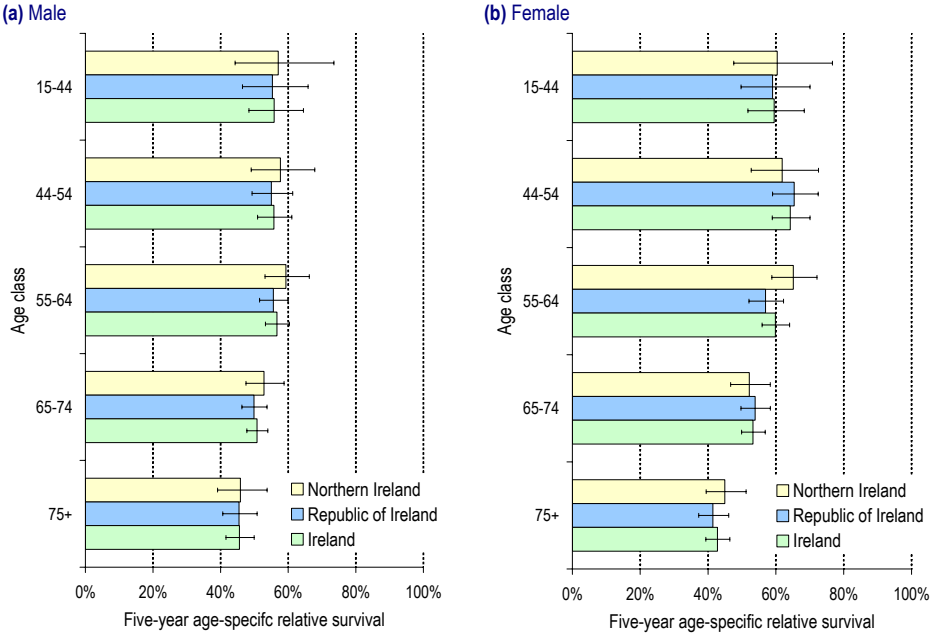


8.3.5: Factors influencing survival

Age

Age was a factor in survival from colorectal cancer for those diagnosed in 1997-1999 in Ireland, more so for females than males. In particular five-year age-specific relative survival for males aged 45-54 was 10.2% higher than those aged 75 and over. The equivalent difference in female survival was 21.5%. Differences of a similar magnitude were found in Northern Ireland and Republic of Ireland. Additionally there was no significant difference in five-year (age-standardised) relative survival for those aged 15-64 or aged 65 and over between the two countries for patients diagnosed with colorectal cancer in 1997-99. (Fig. 8.19, Tab. 8.9)

Figure 8.19: Five-year age-specific relative survival for colorectal cancer patients by sex and country: 1997-1999



Between 1994-96 and 1997-99 five-year (age-standardised) relative survival for patients aged 15-64 improved by 9.9% (p=0.003) in Northern Ireland and 9.1% (p<0.001) in Republic of Ireland. There was no significant change for those aged 65 and over. (Tab. 8.9)

Table 8.9: Five-year age-standardised relative survival for colorectal cancer patients by country, age and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)			
	Aged 15-64		Aged 65+	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	50.9% (47.3%, 54.6%)	60.8% (57.2%, 64.5%)	45.7% (42.9%, 48.8%)	49.0% (46.0%, 52.1%)
Republic of Ireland	48.1% (45.6%, 50.8%)	57.2% (54.8%, 59.7%)	46.6% (44.4%, 49.0%)	47.4% (45.3%, 49.6%)
Ireland	49.0% (47.0%, 51.2%)	58.3% (56.3%, 60.4%)	46.2% (44.4%, 48.1%)	47.9% (46.2%, 49.7%)

Cancer site

Cancer site did not have a major influence on survival from colorectal cancer for patients diagnosed in Ireland during 1997-1999. This was apparent in both Northern Ireland and Republic of Ireland, although some variation did exist between cancer of the anus and cancers of the colon in Republic of Ireland. However this may be result of the small number of cancers of the anus. (Fig. 8.20, Tab. 8.10)

Survival from both cancer of the colon and cancer of the rectum was higher for patients diagnosed in 1997-1999 compared to those diagnosed in 1994-1996. In particular five-year (age-standardised) relative survival for cancer of the colon increased by 4.7% (p=0.007) while there was a 5.0% increase (p=0.035) for cancer of the rectum. (Fig. 8.20, Tab. 8.10)

Figure 8.20: Age-standardised relative survival for colorectal cancer patients by cancer site: 1997-1999

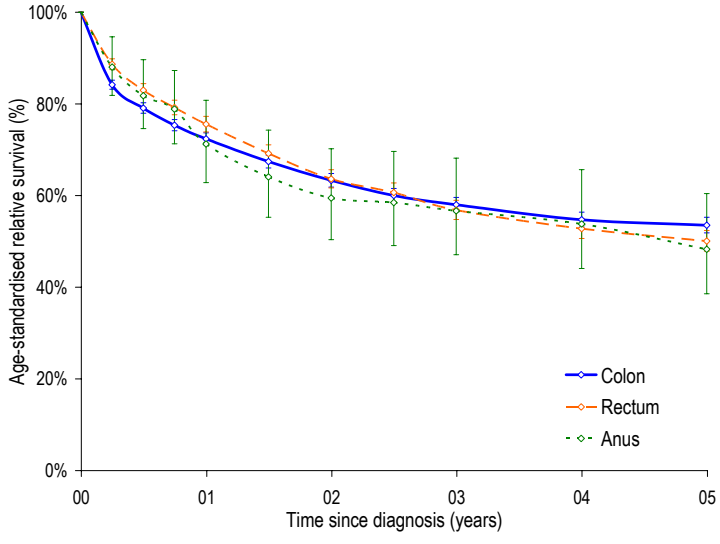


Table 8.10: Five-year age-standardised relative survival for colorectal cancer patients by cancer site and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)					
	Colon		Rectum		Anus	
	1994-1996	1997-1999	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	48.7% (46.0%, 51.7%)	55.3% (52.5%, 58.2%)	46.9% (43.1%, 51.0%)	49.8% (45.8%, 54.2%)	40.6% (26.5%, 62.3%)	69.7% (53.0%, 91.9%)
Republic of Ireland	48.9% (46.8%, 51.2%)	52.6% (50.6%, 54.8%)	44.6% (41.8%, 47.6%)	50.1% (47.5%, 52.9%)	42.6% (30.4%, 59.8%)	33.1% (22.7%, 48.4%)
Ireland	48.8% (47.1%, 50.6%)	53.5% (51.9%, 55.3%)	45.1% (42.8%, 47.5%)	50.1% (47.9%, 52.4%)	41.4% (31.9%, 53.7%)	48.3% (38.6%, 60.4%)

Stage

Stage at diagnosis was probably the biggest factor influencing survival from colorectal cancer for patients diagnosed in Ireland during 1997-1999. Five-year (age-standardised) relative survival ranged from 92.3% for patients diagnosed at stage I to 8.6% for patients diagnosed at stage IV. Survival for patients without a stage assigned was closest to that for patients diagnosed at stage III, albeit slightly lower. (Fig. 8.21, Tab. 8.11)

There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland for patients diagnosed at any stage during 1997-1999. This includes patients with an unspecified stage at diagnosis. Additionally the difference in survival between stage I and stage IV patients was similar in both countries although the difference between stage III patients and those with an unknown stage was slightly higher in Northern Ireland. (Fig. 8.21, Tab.8.11)

Figure 8.21: Age-standardised relative survival for colorectal cancer patients by stage: 1997-1999

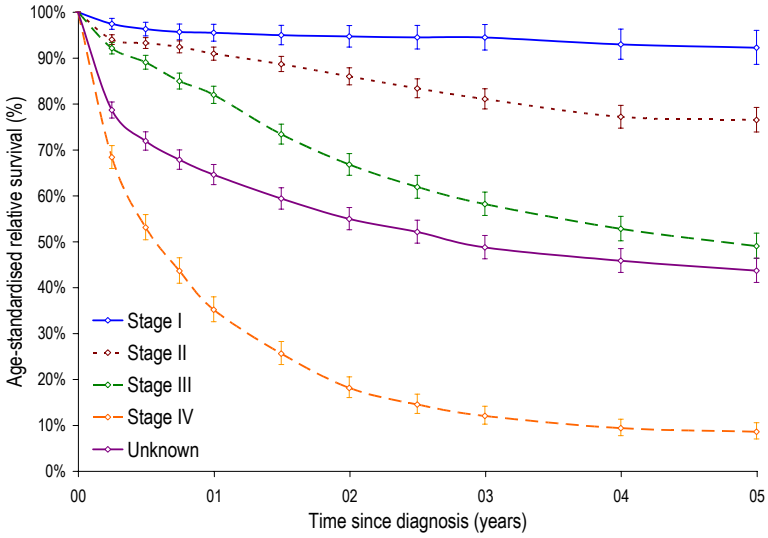


Table 8.11: Five-year age-standardised relative survival for colorectal cancer by stage and country: 1997-1999

	Five-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
Stage I	92.7% (86.2%, 99.7%)	92.4% (88.1%, 96.9%)	92.3% (88.7%, 96.1%)
Stage II	77.9% (73.1%, 82.9%)	75.7% (72.6%, 78.9%)	76.5% (73.9%, 79.3%)
Stage III	50.3% (45.9%, 55.1%)	48.4% (45.1%, 51.9%)	49.1% (46.4%, 51.9%)
Stage IV	12.2% (7.6%, 19.6%)	8.2% (6.5%, 10.2%)	8.6% (7.0%, 10.6%)
Unknown	40.3% (36.8%, 44.2%)	47.3% (43.7%, 51.2%)	43.7% (41.1%, 46.5%)

Treatment

Receipt of treatment was a factor in survival for patients diagnosed in 1996 and 2001; however this is a reflection not only of the effectiveness of the treatment but of the selection of patients who receive the treatment and the reasons for its application (e.g. curative intent or pain relief). For colorectal cancer patients diagnosed in Ireland in 1996 and 2001 those receiving any form of treatment had three-year (age-standardised) relative survival of 61.8% compared to 24.2% for those not receiving any tumour directed treatment, a significant difference of 37.6% (p<0.001). (Fig. 8.22, Tab. 8.12)

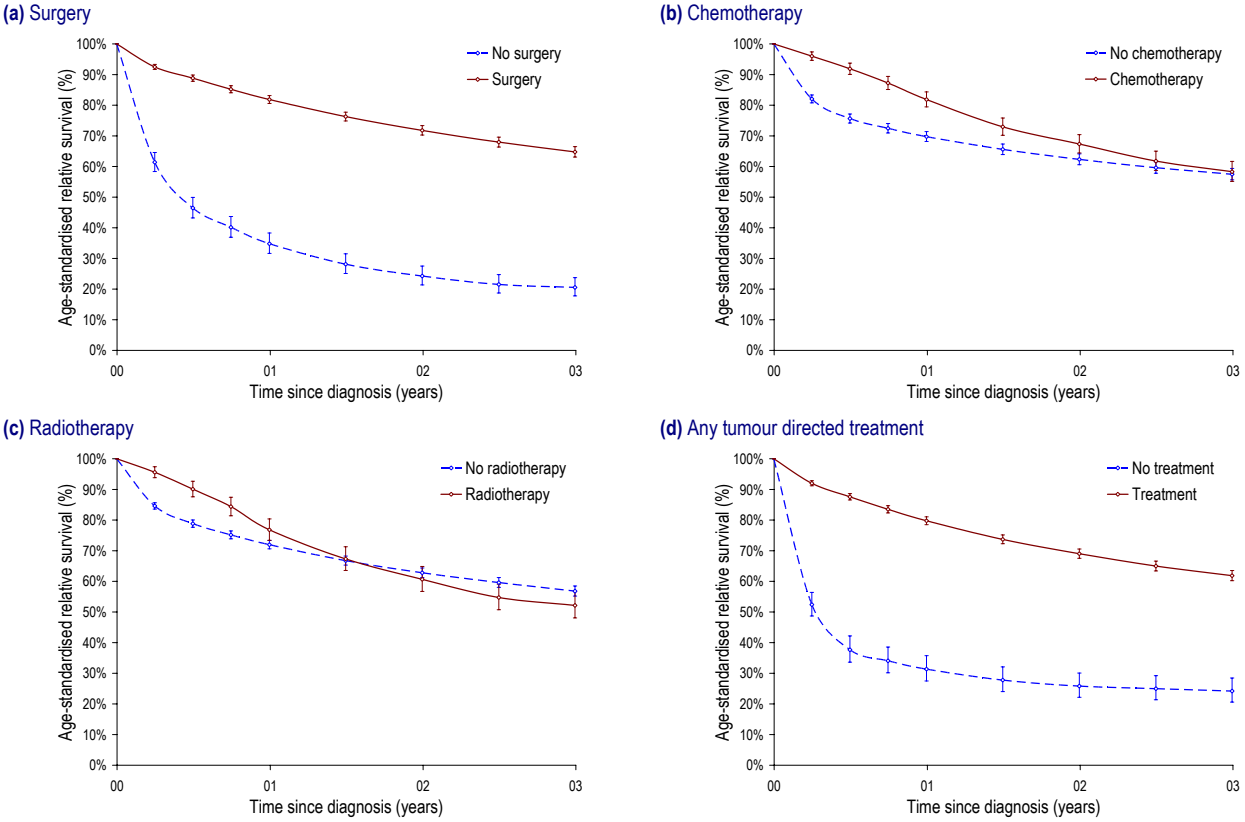
Receipt of surgery had the greatest impact on survival from colorectal cancer with a 44.1% difference in three-year (age-standardised) relative survival between those receiving and not receiving surgery. However there was no significant difference in three-year (age-standardised) relative survival between those who did and did not receive chemotherapy or radiotherapy, although in both cases receipt of these treatments did improve short term survival

Table 8.12: Three-year age-standardised relative survival for colorectal cancer by treatment type: 1996 & 2001

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
No surgery	34.7% (28.9%, 41.7%)	14.8% (12.0%, 18.4%)	20.6% (17.8%, 23.7%)
Surgery	63.4% (60.6%, 66.2%)	65.5% (63.4%, 67.7%)	64.7% (63.1%, 66.5%)
No chemotherapy	59.7% (56.8%, 62.8%)	56.1% (53.8%, 58.6%)	57.5% (55.6%, 59.4%)
Chemotherapy	59.3% (54.3%, 64.9%)	58.2% (54.1%, 62.7%)	58.3% (55.1%, 61.7%)
No radiotherapy	59.3% (56.6%, 62.0%)	55.4% (53.3%, 57.5%)	56.8% (55.2%, 58.5%)
Radiotherapy	55.4% (47.9%, 64.1%)	50.2% (45.3%, 55.6%)	52.2% (48.1%, 56.6%)
No treatment*	37.2% (30.6%, 45.1%)	19.1% (16.0%, 22.9%)	24.2% (20.6%, 28.4%)
Treatment*	62.2% (59.5%, 65.0%)	61.8% (59.7%, 63.9%)	61.8% (60.2%, 63.5%)

* Refers to tumour directed treatment only

Figure. 8.22: Age-standardised relative survival for colorectal cancer patients by treatment: 1996 & 2001



(up to 1 year for radiotherapy and 2 years for chemotherapy patients). (Fig. 8.22, Tab. 8.12)

There was no significant difference in the survival experience of patients receiving any treatment, surgery, chemotherapy or radiotherapy between Northern Ireland and Republic of Ireland. However, three-year (age-standardised) relative survival for patients receiving no form of tumour directed treatment was higher in Northern Ireland by 18.1% (p=0.001). (Fig. 8.22, Tab. 8.12)

Interaction between factors

The differences observed between the different factors in this section may in part be due to their relationship to other factors (e.g. differences in survival by age may be related to the stage at diagnosis). Modelling of excess mortality allows investigation of differences while adjusting for other possible factors. This process illustrates similar conclusions for most factors as those drawn from direct examination of survival rates. There was a strong relationship between excess mortality and age, stage at diagnosis, basis of diagnosis and receipt of treatment.

Sex was not a significant factor, albeit only by a small margin, while there was no significant difference in excess mortality from colon and rectal cancers although cancer of the anus demonstrated better survival. Adjusting for all these factors demonstrates that excess mortality was 1.3% higher in Republic of Ireland than in Northern Ireland; however there was no difference in excess mortality between 1996 and 2001, suggesting that survival improvements were related to changes in stage at diagnosis, age at diagnosis or proportions of patients receiving treatment. (Tab. 8.13)

Table 8.13: Excess hazard ratios for colorectal cancer patients by patient and tumour characteristics: 1996 & 2001

	Excess hazard ratio		Excess hazard ratio
Male	1.00	**Colon**	1.00
Female	0.90 (0.81, 1.01)	**Rectum**	0.97 (0.86, 1.08)
		Anus	0.21 (0.05, 0.88)
Age 15-44	1.00		
Age 45-54	1.54 (1.00, 2.37)	**Microscopically verified**	1.00
Age 55-64	1.84 (1.22, 2.77)	**Other basis of diagnosis**	1.85 (1.37, 2.49)
Age 65-74	2.13 (1.42, 3.18)		
Age 75+	2.80 (1.87, 4.19)	**No treatment**	1.00
		Treatment	0.60 (0.47, 0.77)
Stage 1	1.00		
Stage 2	2.12 (1.52, 2.96)	**Year 1996**	1.00
Stage 3	3.83 (2.77, 5.30)	**Year 2001**	0.96 (0.86, 1.07)
Stage 4	9.67 (7.01, 13.36)		
Stage unknown	3.86 (2.75, 5.42)	**Northern Ireland**	1.00
		Republic of Ireland	1.32 (1.17, 1.48)

8.4: Mortality

During 2000-2004 there were on average 744 male and 594 female deaths from colorectal cancer each year in Ireland. The number of male deaths exceeded those among females by 25.3% with the difference between sexes even greater when adjusted for age with a 71.3% difference in European age-standardised mortality rates (EASMR). Colorectal cancer was the third most common male and female cause of death as a result of cancer contributing 12.6% of all male and 11.1% of all female cancer deaths. The cumulative risk of dying from the disease before the age of 75, assuming the absence of other causes of death was 2.1% for males and 1.2% for females. (Tab. 8.14)

Mortality from the disease was higher among males in Republic of Ireland than Northern Ireland with EASMRs 12.1% (p<0.001) lower in Northern Ireland. EASMRs were however similar in both countries for females. (Tab. 8.14)

Table 8.14: Summary statistics for deaths from colorectal cancer: 2000-2004

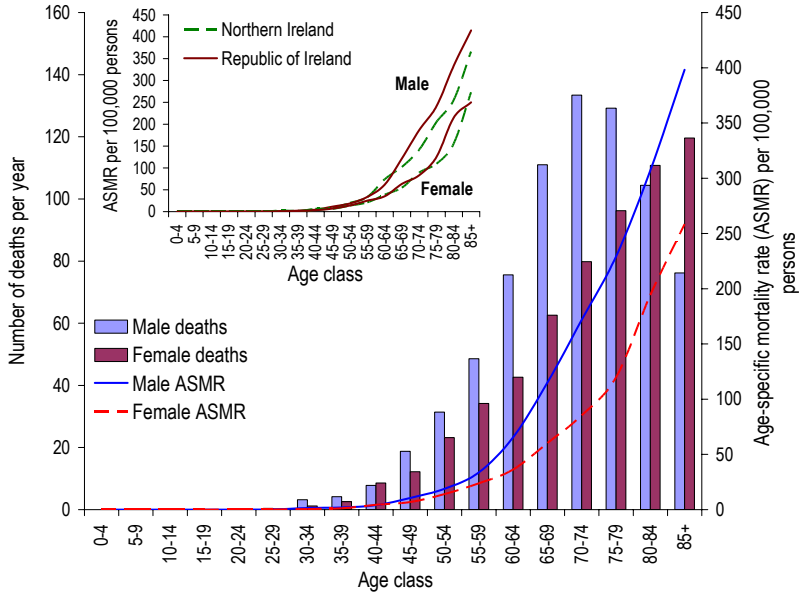
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	221	197	418	523	397	920	744	594	1,338
% of all cancer deaths (ex. NMSC)	11.8%	11.1%	11.4%	12.9%	11.2%	12.1%	12.6%	11.1%	11.9%
Rank (ex. NMSC)	2	3	2	3	3	2	3	3	2
Median age at death	72	76	74	72	76	74	72	76	74
Cumulative risk (Aged 0 to 74)	1.9%	1.1%	1.5%	2.2%	1.2%	1.7%	2.1%	1.2%	1.6%
Crude rate per 100,000 persons	26.7	22.7	24.7	26.9	20.2	23.5	26.8	20.9	23.9
EASMR ± 95% CI	26.9 ±1.6	16.5 ±1.1	20.9 ±0.9	30.6 ±1.2	17.4 ±0.8	23.2 ±0.7	29.3 ±1.0	17.1 ±0.6	22.4 ±0.5
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-12.1% ±6.3	-5.2% ±7.6	-9.6% ±4.8

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

8.4.1: Age distribution

Half of the deaths from colorectal cancer in Ireland during 2000-2004 occurred before the age of 74, although there was a four year difference in the median age at death between males and females. Additionally the number of male deaths peaked in the 70 to 74 age group with 133 (17.9%) deaths per year, while female deaths peaked in the 85 and over age group with 120 (20.1%) deaths per year. (Fig. 8.23)

Figure 8.23: Number of deaths per year from colorectal cancer by sex and age with age-specific mortality rate (ASMR) per 100,000 persons: 2000-2004



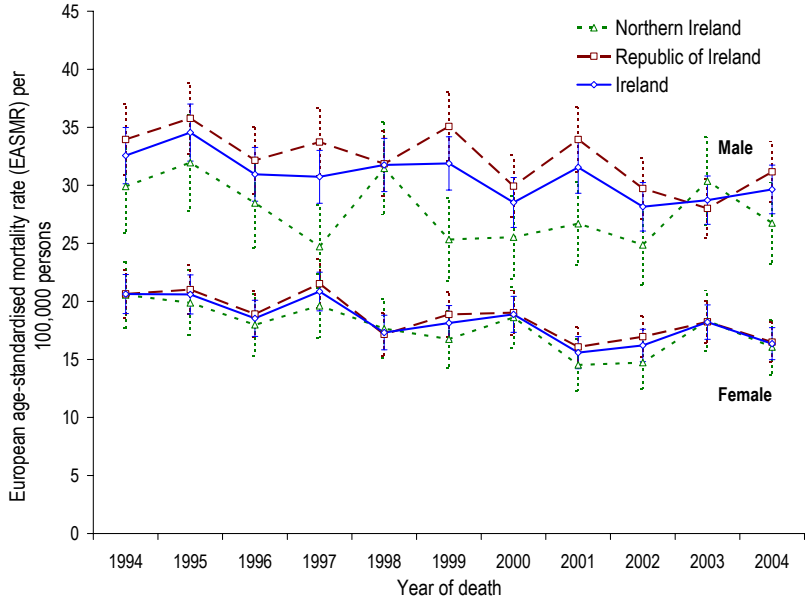
For both sexes age-specific mortality rates (ASMR) climbed steadily with increasing age to a maximum of 398.2 male and 258.5 female deaths per 100,000 persons aged 85 and over. The pattern was similar in both Northern Ireland and Republic of Ireland, although ASMRs were consistently higher for males aged 65 and over in Republic of Ireland. (Fig. 8.23)

8.4.2: Trends

European age-standardised mortality rates (EASMR) decreased between 1994 and 2004 by 1.4% (p=0.009) for males and 2.3% (p=0.006) for females. However while this corresponded to a decrease of 4.9 female deaths per year, as a result of demographic change male deaths from colorectal cancer actually increased by an average of 2.1 deaths per year. (Fig. 8.24)

Both Northern Ireland and Republic of Ireland shared the decrease in female EASMRs (NI: -2.4%, p=0.017; ROI: -2.2%, p=0.007). However the decrease in male EASMRs was only significant in Republic of Ireland where there was an annual decrease of -1.5% (p=0.028). (Fig. 8.24)

Figure 8.24: Trends in European age-standardised mortality rates (EASMR) for colorectal cancer by sex and country: 1994-2004

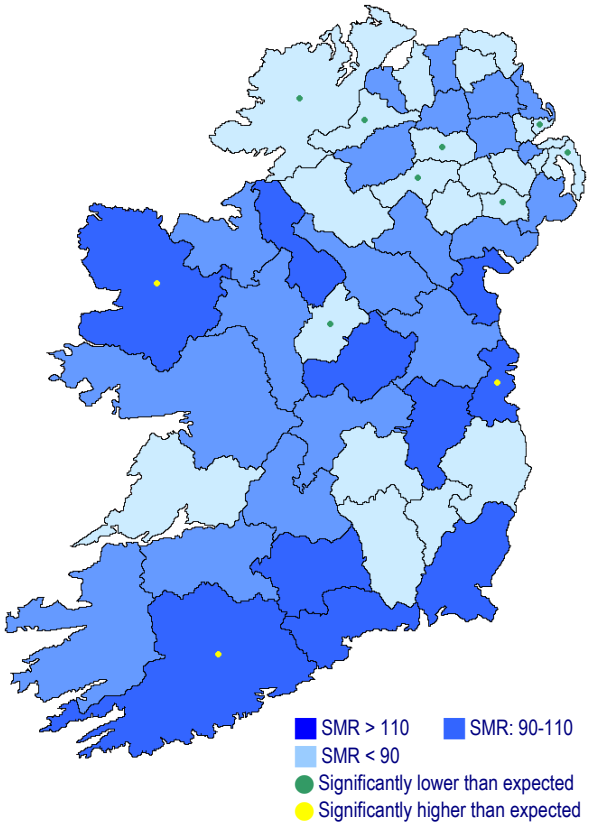


8.4.3: Geographic variations

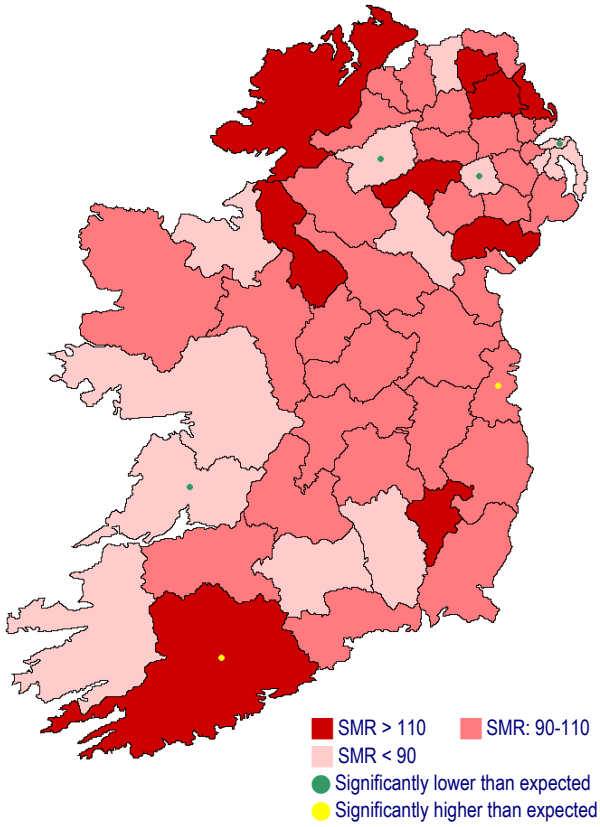
Compared to Ireland as a whole mortality rates from colorectal cancer during 1994-2004 were higher than expected for males and females in Cork and Dublin. They were also higher for males in county Mayo. Eight counties/councils had lower than expected male mortality rates while four counties/councils had lower than expected female rates of the disease. The majority of these were located in Northern Ireland. On average there were 42 male and 41 female deaths from colorectal cancer in Belfast district council each year between 1994 and 2004 while there were 132 male and 118 female deaths from the disease in county Dublin. (Fig. 8.25)

Figure 8.25: Significant differences in county/council standardised mortality ratios for colorectal cancer compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female



8.5: Prevalence

With its high incidence rates and moderate survival prevalence of colorectal cancer in Ireland was high at the end of 2004 with 13,480 persons diagnosed in 1994-2004 still alive, 43.6% of those diagnosed during the eleven-year period. Of these 8,349 were diagnosed during 2000-2004. (Tab. 8.15)

Of those alive at the end of 2004 having been diagnosed in 2000-2004, 54.9% were male while 67.2% were resident in Republic of Ireland. (Tab. 8.15)

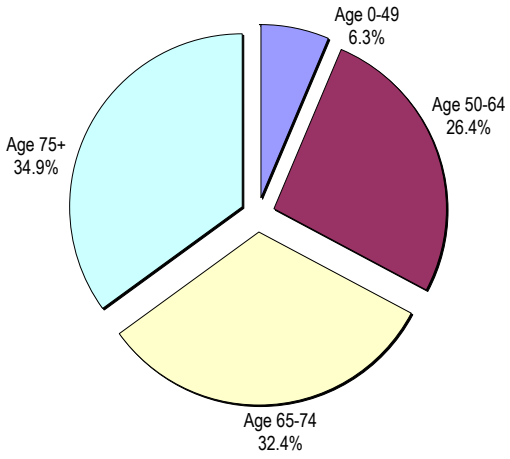
Table 8.15: Prevalence of colorectal cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	2,301	43.0%	1,444	57.6%
	Female	2,186	44.4%	1,291	59.1%
	All persons	4,487	43.7%	2,735	58.3%
Republic of Ireland	Male	4,925	42.3%	3,138	56.2%
	Female	4,068	45.2%	2,476	57.6%
	All persons	8,993	43.6%	5,614	56.8%
Ireland	Male	7,226	42.5%	4,582	56.6%
	Female	6,254	44.9%	3,767	58.1%
	All persons	13,480	43.6%	8,349	57.3%

8.5.1: Age distribution

The median age for a member of the population living with colorectal cancer at the end of 2004 and diagnosed since 2000 was 70 years of age, with 34.9% aged 75 and over. Only a small proportion of people living with the disease were aged under 50 (6.3%). (Fig. 8.26)

Figure 8.26: Prevalence of colorectal cancer in Ireland at the end of 2004 by age for patients diagnosed in 2000-2004

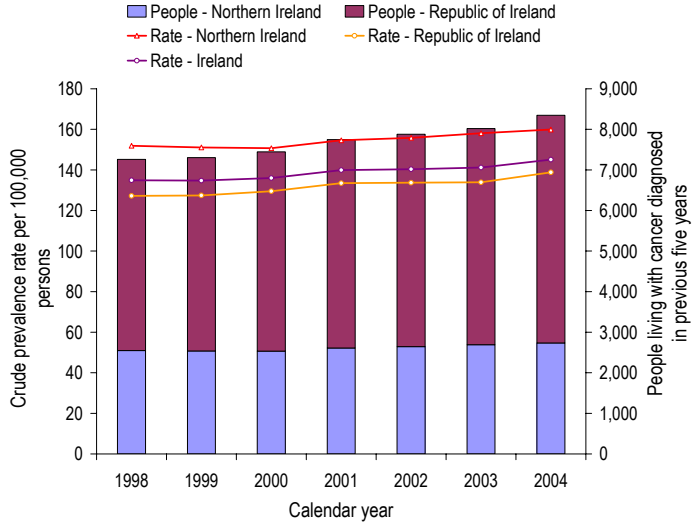


8.5.2: Trends

The number of people alive at the end of each year who have had a diagnosis of colorectal cancer within the previous five years increased between 1998 and 2004 by an average of 183 per year. Increases in incidence levels, improvements in survival, population growth and reductions in mortality rates all contribute to the increases in prevalence of this disease. (Fig. 8.27)

The majority of the increase occurred in Republic of Ireland where there was an increase of 148 people per year living with the disease compared to an annual increase of 35 in Northern Ireland. The main reason behind this differing trend is likely to be population growth. Examination of crude prevalence rates supports this hypothesis as per 100,000 persons the number of people alive at the end of each calendar year after a diagnosis of colorectal cancer within the previous five-years increased in Northern Ireland by 1.0% each year, which was similar to the increase of 1.4% in Republic of Ireland. However at the end of 2004 the number of living people with colorectal cancer diagnosed since 2000 per 100,000 people was 15.2% greater in Northern Ireland than Republic of Ireland, which was likely a factor of the older average age of the population in Northern Ireland. (Fig. 8.27)

Figure 8.27: Number of people (and crude rate per 100,000 persons) living with colorectal cancer at the end of each calendar year, who were diagnosed within the previous five years by calendar year and country



8.6: Discussion

Colorectal cancer, also commonly known as bowel cancer, encompasses several parts of the body including the colon (C18), rectum (C19), rectosigmoid junction (C20) and anus (C21). Colorectal cancers can take 5-10 years to develop starting with small growths on the bowel wall. Symptoms of the disease include bleeding from the rectum or blood in stools, permanent changes in normal bowel habits, a lump in the right side of the abdomen or rectum, losing weight, abdominal pain or anaemia (low red blood cells).[55]

Evidence exists that diets with less red and processed meat, less carbohydrates and more fish, vegetables and fibre are associated with a reduced risk of bowel cancer.[56,57] The consumption of alcohol also increases bowel cancer risk with a 40% increase for those drinking 4 or more units per day.[58] Physical exercise has been shown in epidemiological studies to reduce the risk of colon (but not rectal) cancer by 40-50%.[59,60] Other risk groups are those with a strong family history such as having two or more close relatives or one relative aged less than 45 years having been diagnosed with colorectal cancer.[61] Two further inherited conditions; familial adenomatous polyposis (FAP) and hereditary non-polyposis colorectal cancer (HNPCC) also increase the risk of colorectal cancer. FAP accounts for 1% of colorectal cancers and HNPCC accounts for 5% of colorectal cancers.[61] Colon cancers are also more common in people with chronic inflammatory disease of their bowels such as ulcerative colitis[62] and Crohn's disease[63] and among those with diabetes or benign polyps in the bowel.[61] Hormone replacement therapy (HRT), calcium and multivitamin supplements may help protect against this disease.[64] Some studies have also shown that non-steroidal anti-inflammatory drugs reduce the risk of both colon and rectal cancer.[65]

Colorectal cancer is the second most common cancer worldwide both in terms of incidence and mortality with approximately 945,000 cases and 492,000 deaths per year. It is more common in developed countries with trends in incidence of the disease generally static in Western Europe but decreasing in USA. Prevention strategies are the best approach for control of this disease due to its relationship with diet, alcohol and physical exercise. Many health initiatives already exist in Ireland regarding these issues, such as the five fruit and vegetables a day campaigns, and it is hoped that these messages will be taken on board by the general public thereby leading to a decline in colorectal cancer.

Not all colorectal cancers are related to diet, while it is also unrealistic to assume that all members of the population will adopt healthier lifestyles. In the event of the development of colorectal cancer treatment depends upon many factors such as stage at diagnosis, general health, type of colorectal cancer and even whether or not it is the familial or hereditary (FAP, HNPCC) form of the disease. Early diagnosis improves survival possibilities and improvements in endoscopic examination techniques are partially responsible for improvements in survival over the last decade. Encouraged by the success of early detection and the results of trials of screening programmes, a colorectal screening programme for people aged 60-69 is being introduced in Northern Ireland in 2009 which will increase the proportion of colorectal cancers diagnosed at an early stage and ultimately survival from the disease. While no plans exist in Republic of Ireland for colorectal screening, the experience in Northern Ireland will help inform future decisions with regard to its implementation.

Chapter 09:

Liver cancer (C22)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *Between 2000 and 2004 there were on average 111 males and 68 females diagnosed in Ireland each year.*
  - *Incidence rates increased between 1994 and 2004 by 4.8% per year for males and 4.3% per year for females.*
  - *Males and females had higher than expected incidence rates in Belfast while males also had higher levels than expected in Dublin, Cork and Waterford.*
  - *Incidence rates in Ireland were among some of the lowest found in developed countries.*
  - *During 2000-2004 there was on average 132 male and 105 female liver cancer deaths per year.*
  - *There was no significant trend in mortality rates in Ireland for either males or females between 1994 and 2004.*

- *SURVIVAL AND PREVALENCE*
  - *Relative survival from the disease was very poor with five-year relative survival estimated to be 10.9% for males and 12.8% for females.*
  - *There was no significant change in relative survival between those diagnosed in 1994-1996 and 1997-1999 for either males or females or in Northern Ireland or Republic of Ireland.*
  - *At the end of 2004 there were 214 people living in Ireland who had been diagnosed with the disease in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates of liver cancer were similar in Northern Ireland and Republic of Ireland for both sexes during 2000-2004.*
  - *Increases in incidence rates were apparent in Republic of Ireland (6.9% for males, 8.9% for females) but not in Northern Ireland.*
  - *There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland.*
  - *There was no significant variation in mortality rates between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *Female mortality rates in Republic of Ireland rose by 3.6% each year, while there was no significant change in Northern Ireland.*
  - *At the end of 2004 the number of people living with liver cancer diagnosed within the previous five years per 100,000 persons was 11.8% greater in Republic of Ireland than Northern Ireland.*

9.1: Incidence

The liver is often a site of secondary spread of cancer, however both cancer registries in Ireland carefully check each liver cancer to exclude secondary cancers and thus only records primary tumours. Between 2000 and 2004 there were 111 males and 68 females diagnosed each year with a primary liver cancer. It was one of the less common cancers contributing 1.0% of male and 0.6% of female cancers (excluding NMSC) during the period making it the sixteenth most common male and eighteenth most common female cancer. The risk of a member of the population developing the disease before the age of 75 was small but not negligible (0.3% for males and 0.2% for females). (Tab. 9.1)

The difference between males and females increased when incidence rates were adjusted for the different age distribution of the two sexes with male European age standardised incidence rates (EASIR) double those of females ($p<0.001$). Incidence rates were however similar in Northern Ireland and the Republic of Ireland for both sexes during 2000-2004. (Tab. 9.1)

Table 9.1: Summary statistics for incidence of liver cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	36	24	60	76	44	119	111	68	179
% of all cancer cases (ex. NMSC)	1.1%	0.7%	0.9%	1.0%	0.6%	0.8%	1.0%	0.6%	0.8%
Rank (ex. NMSC)	16	18	20	16	18	20	16	18	20
Median age at diagnosis	69	72	71	68.5	70	69	69	71	69
Cumulative risk (Aged 0 to 74)	0.3%	0.2%	0.3%	0.3%	0.2%	0.3%	0.3%	0.2%	0.3%
Crude rate per 100,000 persons	4.3	2.8	3.5	3.9	2.2	3.0	4.0	2.4	3.2
EASIR ± 95% CI	4.4 ±0.6	2.2 ±0.4	3.2 ±0.4	4.4 ±0.4	2.1 ±0.3	3.2 ±0.3	4.4 ±0.4	2.2 ±0.2	3.2 ±0.2
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							0.2% ±18.1	5.3% ±24.7	0.0% ±14.2

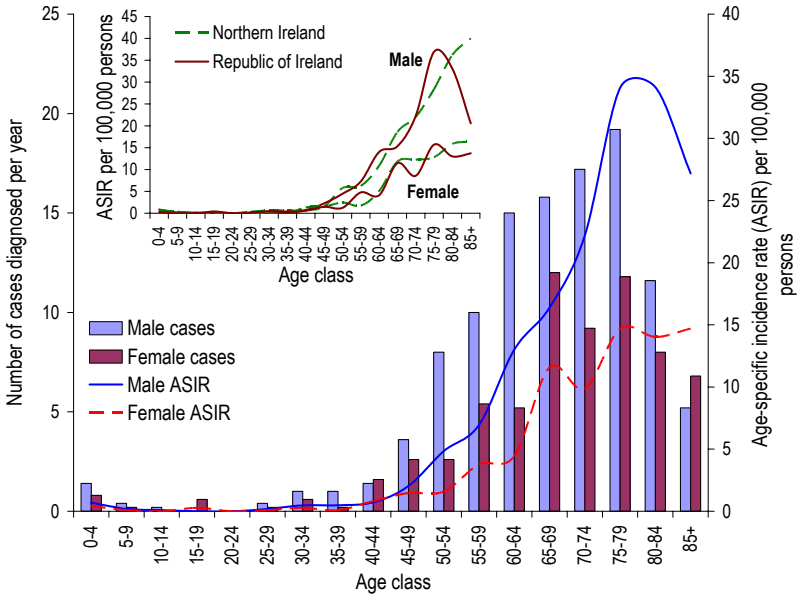
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

9.1.1: Age distribution

Like most cancers liver cancer is a disease found mostly in the elderly with a median age at diagnosis during 2000-2004 of 69 years. However there was an average of 2 boys and 1 girl (aged 0-14) diagnosed each year during 2000-2004. (Tab. 9.1)

For males diagnoses of liver cancer peaked in the 75-79 age class with 19 cases per year (17.2% of male cases) while for females the 65-69 age class had the highest number of cases with 12 per year (17.7% of female cases). Age-specific incidence rates (ASIR) however were highest for males aged 80-84 and females aged 85 and over. This pattern varied by country with male ASIRs for those aged 85+ lower in Republic of Ireland than in Northern Ireland. (Fig. 9.1)

Figure 9.1: Number of cases of liver cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

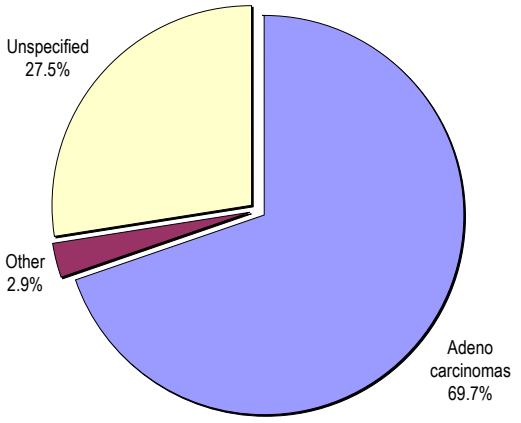


9.1.2: Cell type

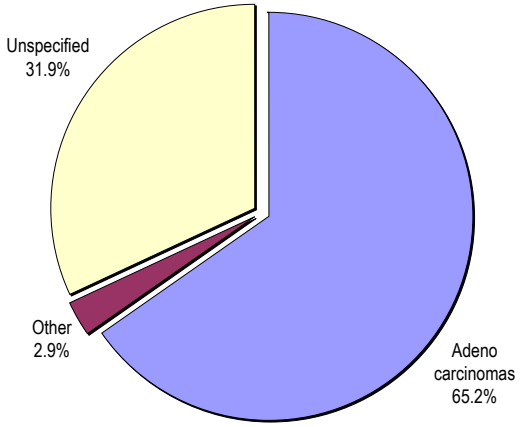
Adenocarcinomas were the most common form of liver cancer diagnosed in Ireland during 2000-2004 making up 68.0% of the 179 liver cancers diagnosed per year with a further 29.1% of an unspecified cell type. These proportions varied slightly by sex but larger differences occurred between countries with 10.4% of cases having an unspecified cell type in Northern Ireland compared to 38.5% in Republic of Ireland. The majority of childhood liver cancers were complex mixed and stromal neoplasms. (Fig. 9.2)

Figure 9.2: Types of liver cancer diagnosed in Ireland: 2000-2004

(a) Male



(b) Female

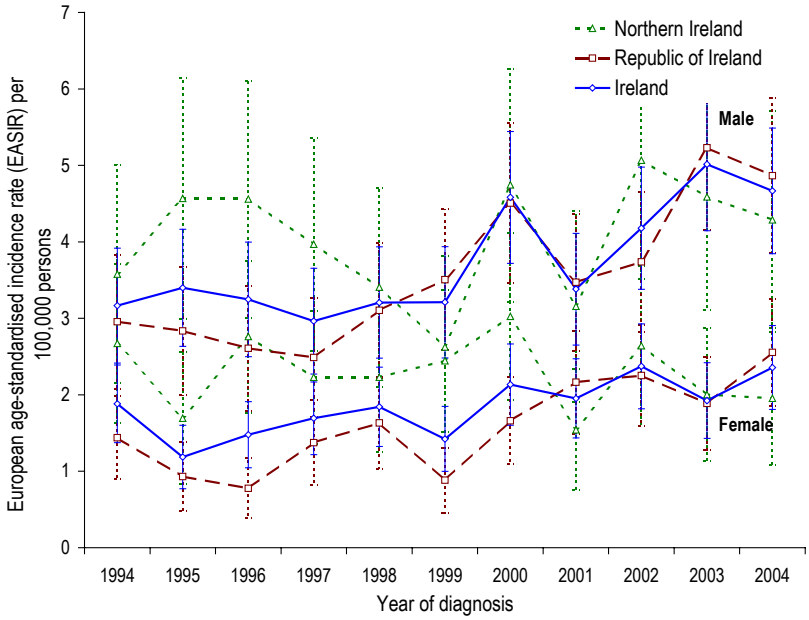


9.1.3: Trends

European age-standardised incidence rates (EASIR) for liver cancer increased between 1994 and 2004 by 4.8% (p=0.003) per year for males and 4.3% (p=0.018) per year for females. This corresponded to an annual increase of 5.8 male and 2.8 female cases per year. (Fig. 9.3, Tab. 9.2)

The significant increase in rates was not observed in Northern Ireland but was apparent in Republic of Ireland where EASIRs increased by 6.9% (p<0.001) per year for males and 8.9% (p=0.004) per year for females. (Fig. 9.3, Tab. 9.2)

Figure 9.3: Trends in European age-standardised incidence rates (EASIR) for liver cancer by sex and country: 1994-2004



9.1.4: Geographic variations

Belfast had higher than expected levels of liver cancer diagnosed in 2000-2004 for both males and females. Males also had higher than expected levels of liver cancer in Dublin, Cork and Waterford. Eleven counties/councils had lower than expected levels of the disease among males while six had lower levels among females. The majority of these areas were in Republic of Ireland. (Fig. 9.4)

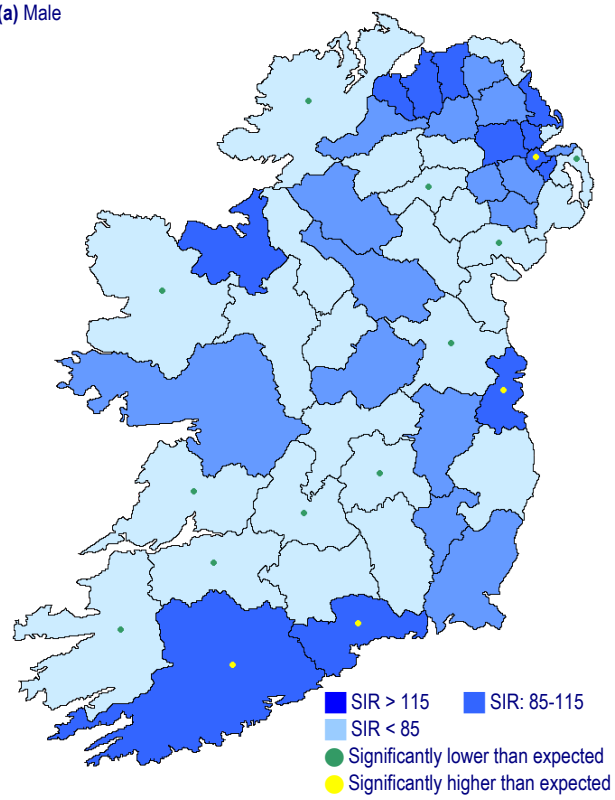
Table 9.2: Number of cases and European age-standardised incidence rates (EASIR) for liver cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	25	3.6 ±1.4	46	3.0 ±0.9	71	3.2 ±0.8	29	2.7 ±1.0	29	1.4 ±0.5	58	1.9 ±0.5
1995	33	4.6 ±1.6	45	2.8 ±0.8	78	3.4 ±0.8	16	1.7 ±0.9	18	0.9 ±0.4	34	1.2 ±0.4
1996	34	4.6 ±1.6	40	2.6 ±0.8	74	3.2 ±0.7	32	2.8 ±1.0	16	0.8 ±0.4	48	1.5 ±0.4
1997	32	4.0 ±1.4	40	2.5 ±0.8	72	3.0 ±0.7	29	2.2 ±0.9	25	1.4 ±0.6	54	1.7 ±0.5
1998	27	3.4 ±1.3	49	3.1 ±0.9	76	3.2 ±0.7	22	2.2 ±1.0	30	1.6 ±0.6	52	1.8 ±0.5
1999	19	2.6 ±1.2	57	3.5 ±0.9	76	3.2 ±0.7	29	2.4 ±0.9	18	0.9 ±0.4	47	1.4 ±0.4
2000	38	4.7 ±1.5	72	4.5 ±1.0	110	4.6 ±0.9	32	3.0 ±1.1	35	1.7 ±0.6	67	2.1 ±0.5
2001	25	3.2 ±1.3	59	3.5 ±0.9	84	3.4 ±0.7	16	1.5 ±0.8	42	2.2 ±0.7	58	2.0 ±0.5
2002	42	5.1 ±1.6	65	3.7 ±0.9	107	4.2 ±0.8	27	2.6 ±1.0	49	2.3 ±0.7	76	2.4 ±0.6
2003	38	4.6 ±1.5	92	5.2 ±1.1	130	5.0 ±0.9	23	2.0 ±0.9	39	1.9 ±0.6	62	1.9 ±0.5
2004	36	4.3 ±1.4	90	4.9 ±1.0	126	4.7 ±0.8	22	2.0 ±0.9	54	2.6 ±0.7	76	2.4 ±0.5

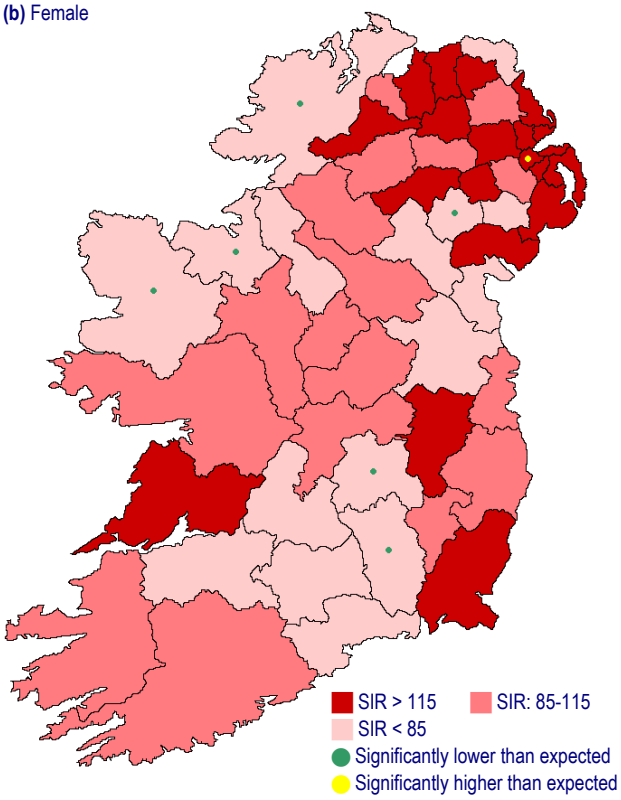
EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 9.4: Significant differences in county/council standardised incidence ratios for liver cancer compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female

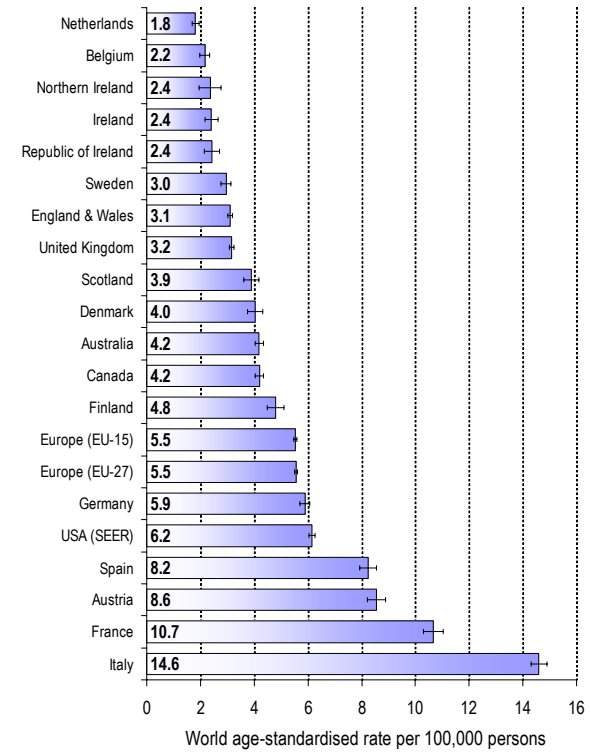


9.1.5: International comparisons

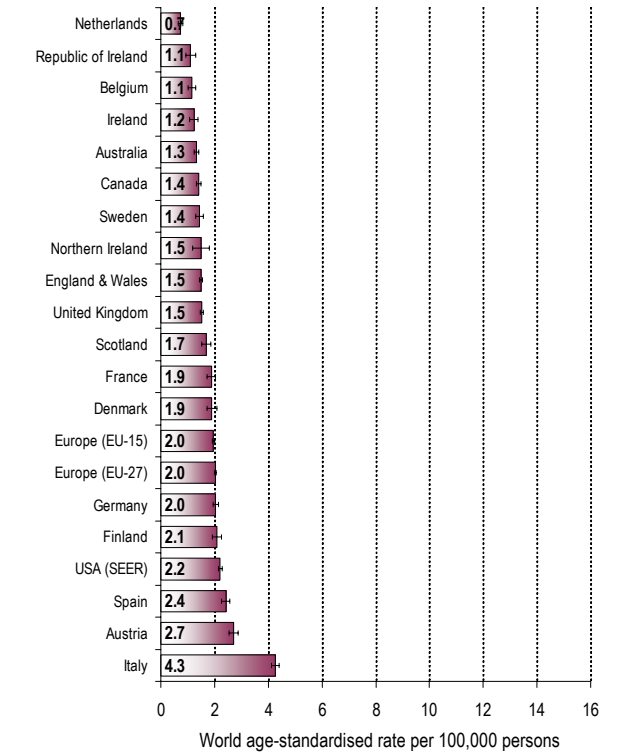
Internationally Ireland had some of the lowest incidence rates of liver cancer among developed countries with only the Netherlands having significantly lower rates. In particular incidence rates were below those of the European Union and USA for both males and females and than UK, Canada and Australia for males. Incidence rates were also lower in Republic of Ireland than in Canada and the UK for females. These variations however may be related to the inclusion of secondary liver cancers in other countries (Fig. 9.5)

Figure 9.5: International comparisons of world age-standardised incidence rates for liver cancer: 1998-2000

(a) Male



(b) Female



Source: IARC[66]

9.2: Survival

Relative survival (age-standardised) from liver cancer was very poor with an estimated 26.6% of patients diagnosed in 2000-2004 surviving one-year and 11.2% surviving five-years. (Fig. 9.6, Tab. 9.3)

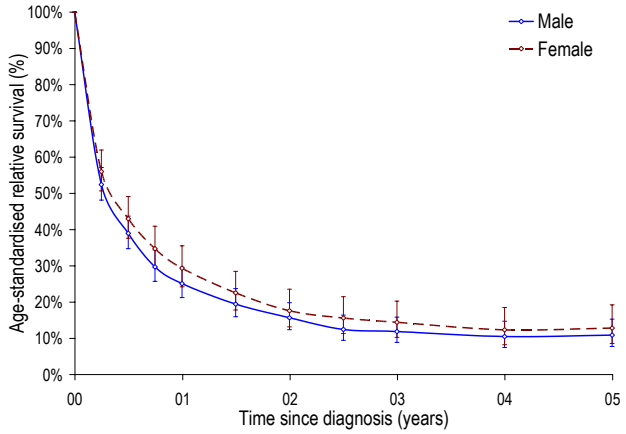
Table 9.3: Age-standardised relative survival for liver cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	20.1% (14.4%, 28.1%)	25.5% (17.7%, 36.6%)	21.8% (16.9%, 28.1%)
	Republic of Ireland	27.5% (22.8%, 33.2%)	30.6% (24.5%, 38.2%)	28.9% (25.1%, 33.3%)
	Ireland	25.1% (21.3%, 29.6%)	29.3% (24.2%, 35.5%)	26.6% (23.5%, 30.1%)
5-year	Northern Ireland	6.3% (2.9%, 13.5%)	4.3% (1.4%, 13.3%)	7.0% (3.9%, 12.6%)
	Republic of Ireland	11.7% (8.0%, 17.1%)	15.7% (10.1%, 24.5%)	13.6% (10.1%, 18.3%)
	Ireland	10.9% (7.7%, 15.3%)	12.8% (8.6%, 19.2%)	11.2% (8.5%, 14.8%)

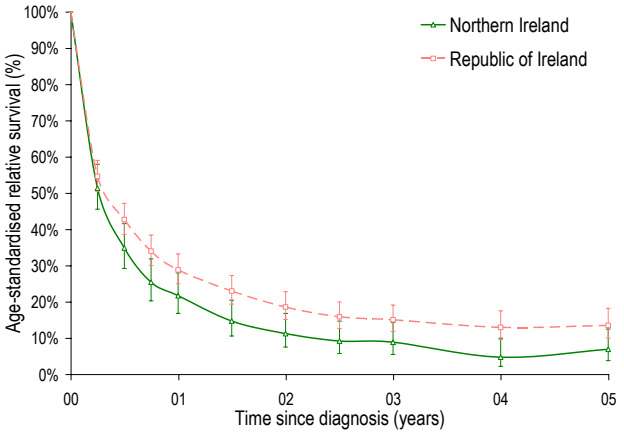
These values did not vary significantly by sex or country despite female five-year (age-standardised) relative survival appearing 11.4% (p=0.058) higher in Republic of Ireland compared to Northern Ireland. This difference was likely an artefact of the small number of liver cancer patients in Northern Ireland, particularly the number surviving five years. (Fig. 9.6, Tab. 9.3)

Figure 9.6: Age-standardised relative survival for liver cancer patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



Despite poor survival among adults, children with liver cancer usually have a different cell type affected and their survival experience was much better, with five-year relative survival for children (aged 0-14) with liver cancer diagnosed in 2000-2004 estimated to be 91.9% (95% CI: 77.5%, 109.0%). It should be stressed however that this conclusion is based on a small number of cases.

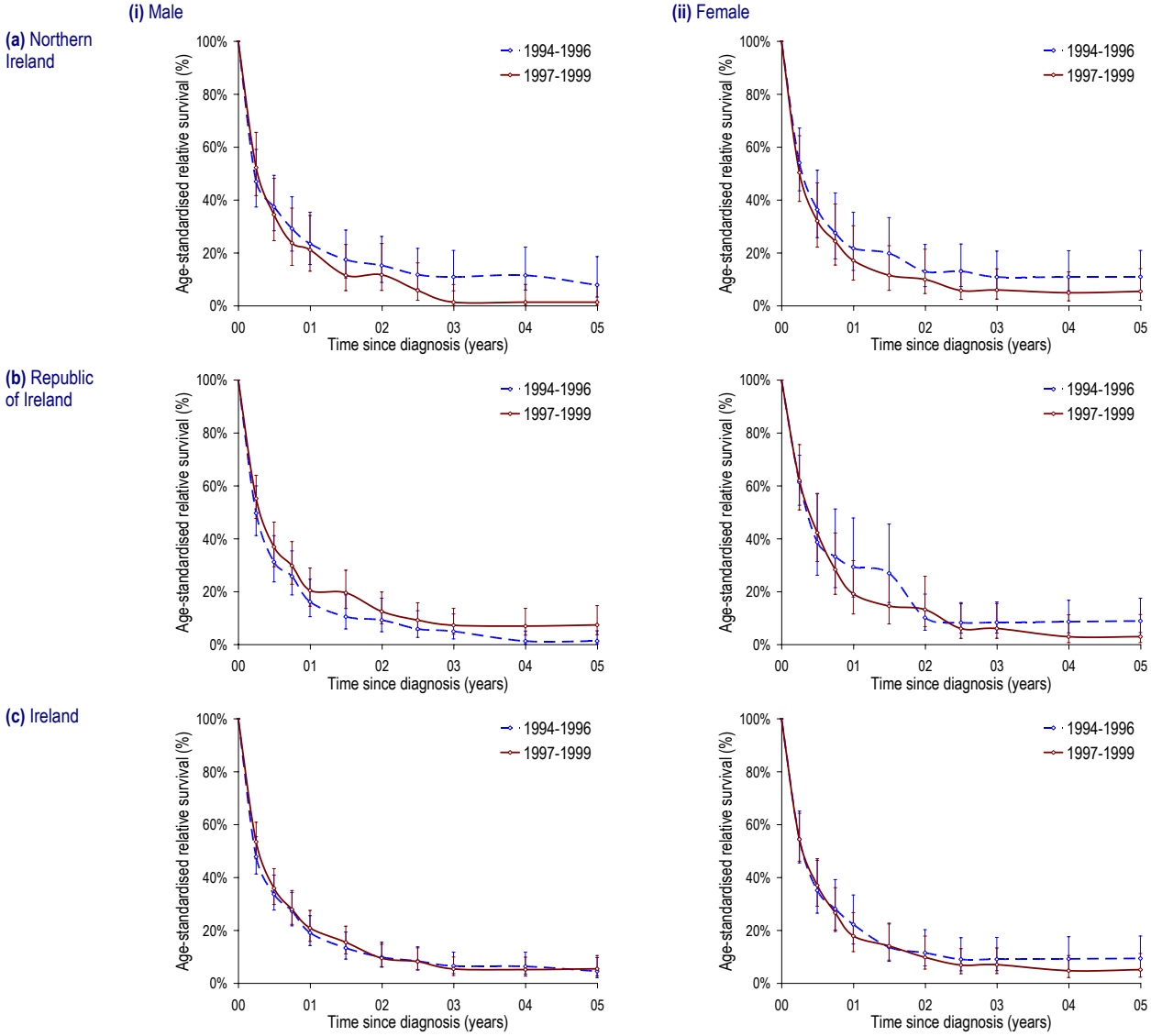
9.2.1: Changes in survival over time

There was no significant variation in (age-standardised) relative survival for males or females between those diagnosed in 1994-1996 and 1997-1999. This was apparent in Northern Ireland and Republic of Ireland as well as Ireland as a whole. (Fig. 9.7, Tab. 9.4)

Table 9.4: Age-standardised relative survival for liver cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	21.7% (15.6%, 30.2%)	18.7% (12.9%, 27.0%)	7.0% (3.4%, 14.4%)	4.4% (1.9%, 10.3%)
	Republic of Ireland	17.5% (12.6%, 24.3%)	20.4% (15.3%, 27.3%)	4.1% (2.1%, 8.3%)	6.2% (3.3%, 11.5%)
	Ireland	19.4% (15.4%, 24.4%)	20.0% (16.0%, 25.0%)	5.6% (3.4%, 9.1%)	5.7% (3.5%, 9.4%)
Male	Northern Ireland	23.5% (15.6%, 35.4%)	21.2% (13.1%, 34.2%)	7.9% (3.4%, 18.6%)	1.4% (0.2%, 8.1%)
	Republic of Ireland	16.2% (10.6%, 24.8%)	20.5% (14.5%, 29.0%)	1.4% (0.4%, 5.3%)	7.5% (3.8%, 14.7%)
	Ireland	19.1% (14.3%, 25.6%)	20.9% (15.9%, 27.6%)	4.6% (2.2%, 9.8%)	5.5% (2.9%, 10.5%)
Female	Northern Ireland	21.8% (13.4%, 35.4%)	17.2% (9.7%, 30.3%)	11.0% (5.8%, 21.0%)	5.5% (2.1%, 14.1%)
	Republic of Ireland	29.4% (18.0%, 47.9%)	19.2% (11.6%, 31.8%)	8.9% (4.6%, 17.6%)	3.0% (0.8%, 11.4%)
	Ireland	22.3% (14.9%, 33.4%)	17.9% (12.0%, 26.8%)	9.4% (5.0%, 17.9%)	5.2% (2.4%, 11.3%)

Figure 9.7: Age-standardised relative survival for liver cancer patients by sex, country and period of diagnosis: 1994-1999



9.2.2: Observed survival

One-year observed survival (which includes causes of death other than cancer) was 20.0% for males and 16.4% for females diagnosed in 1997-1999. Five-year observed survival was also very poor for those diagnosed in this time period at 4.4% for males and 4.5% for females. The variations by sex were not statistically significant, nor were any variations in observed survival between Northern Ireland and Republic of Ireland. Analysis of differences in observed survival over time did not reveal any significant change between 1994-1996 and 1997-1999. (Tab. 9.5)

Table 9.5: Observed survival for liver cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	18.5% (13.3%, 25.9%)	17.7% (12.4%, 25.3%)	4.6% (2.2%, 9.6%)	3.5% (1.5%, 8.4%)
	Republic of Ireland	16.4% (11.8%, 22.7%)	19.2% (14.4%, 25.5%)	4.4% (2.2%, 8.6%)	5.1% (2.8%, 9.2%)
	Ireland	17.4% (13.7%, 21.9%)	18.6% (14.9%, 23.2%)	4.5% (2.7%, 7.4%)	4.4% (2.7%, 7.3%)
Male	Northern Ireland	22.2% (14.8%, 33.4%)	20.0% (12.5%, 32.0%)	6.2% (2.6%, 14.4%)	1.4% (0.2%, 10.0%)
	Republic of Ireland	14.9% (9.7%, 22.8%)	20.0% (14.3%, 28.0%)	1.7% (0.4%, 6.5%)	5.9% (3.0%, 11.6%)
	Ireland	17.8% (13.3%, 24.0%)	20.0% (15.2%, 26.3%)	3.5% (1.7%, 7.2%)	4.4% (2.3%, 8.3%)
Female	Northern Ireland	14.3% (8.0%, 25.4%)	15.5% (9.0%, 26.7%)	2.9% (0.7%, 11.2%)	5.6% (2.2%, 14.6%)
	Republic of Ireland	19.4% (11.6%, 32.2%)	17.5% (10.2%, 29.9%)	9.7% (4.5%, 20.7%)	3.2% (0.8%, 12.4%)
	Ireland	16.7% (11.4%, 24.4%)	16.4% (11.2%, 24.1%)	6.1% (3.1%, 11.9%)	4.5% (2.0%, 9.8%)

9.3: Mortality

Liver cancer was the thirteenth commonest form of cancer death among males during 2000-2004 and was the eleventh most common cause of female cancer death. With 132 male deaths per year it made up 2.2% of male cancer deaths (excluding NMSC) with a cumulative risk of death from this disease before age 75 of 0.4%. Among females there were 105 deaths per year thereby contributing 2.0% of female cancer deaths (excluding NMSC) with a cumulative risk of 0.2% of death from this disease before age 75. (Tab. 9.6)

The number of deaths per year was higher among males than females by 25.7% with European age-standardised mortality rates (EASMR) higher among males by 67.7% ($p<0.001$). There was however no significant difference in EASMRs between Northern Ireland and Republic of Ireland during 2000-2004. (Tab. 9.6)

In both countries the average number of deaths each year from liver cancer between 2000 and 2004 exceeded the number of cases diagnosed. This was probably a result of deaths classified as being the result of liver cancer including secondary liver cancer which has spread from a different part of the body to the liver.

Table 9.6: Summary statistics for deaths from liver cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	39	34	73	93	70	164	132	105	237
% of all cancer deaths (ex. NMSC)	2.1%	1.9%	2.0%	2.3%	2.0%	2.2%	2.2%	2.0%	2.1%
Rank (ex. NMSC)	13	12	15	13	12	14	13	11	15
Median age at death	73	74	73	72	76	74	72	75	74
Cumulative risk (Aged 0 to 74)	0.3%	0.2%	0.3%	0.4%	0.2%	0.3%	0.4%	0.2%	0.3%
Crude rate per 100,000 persons	4.7	4.0	4.3	4.8	3.6	4.2	4.8	3.7	4.2
EASMR ± 95% CI	4.7 ±0.7	3.0 ±0.5	3.7 ±0.4	5.4 ±0.5	3.1 ±0.3	4.1 ±0.3	5.2 ±0.4	3.1 ±0.3	4.0 ±0.2
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-13.9% ±14.7	-3.8% ±18.6	-10.6% ±11.3

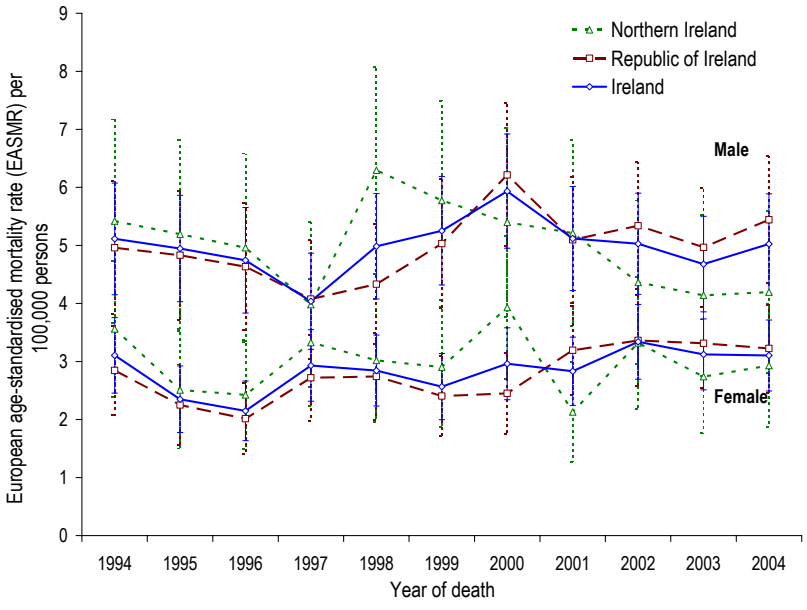
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

9.3.1: Trends

Between 1994 and 2004 there was no significant trend in European age-standardised mortality rates (EASMR) for liver cancer in Ireland for either males or females. However the actual number of deaths rose by 2.8 male and 3.1 female deaths per year as a result of growth and ageing of the population. All of the increase in deaths was due to increases observed in Republic of Ireland with the number of deaths per year in Northern Ireland remaining static between 1994 and 2004. (Fig. 9.8)

While the differing trend in the absolute number of deaths between countries was reflected in the annual percentage change in EASMRs for each country, the only significant trend established was in Republic of Ireland where female EASMRs rose by 3.6% ($p=0.015$) each year between 1994 and 2004. (Fig. 9.8)

Figure 9.8: Trends in European age-standardised mortality rates (EASMR) for liver cancer by sex and country: 1994-2004



9.4: Prevalence

Between 1994 and 2004 there were 1,636 people diagnosed with liver cancer. Of these 13.7% (224 people) were still alive at the end of 2004. The majority of these (195 people) were diagnosed in the 2000-2004 period, which was 21.8% of all those diagnosed within these five years. (Tab. 9.7)

Table 9.7: Prevalence of liver cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	40	11.5%	33	18.4%
	Female	23	8.3%	20	16.7%
	All persons	63	10.1%	53	17.7%
Republic of Ireland	Male	101	15.4%	91	24.1%
	Female	60	16.9%	51	23.3%
	All persons	161	15.9%	142	23.8%
Ireland	Male	141	14.0%	124	22.3%
	Female	83	13.1%	71	20.9%
	All persons	224	13.7%	195	21.8%

The majority of those alive at the end of 2004 having been diagnosed within the previous five years were male (124 males compared to 71 females) while 53 survivors were resident in Northern Ireland compared to 142 in Republic of Ireland. At the end of 2004 the number of people living with liver cancer diagnosed within the previous five years per 100,000 persons was 11.8% greater in Republic of Ireland than Northern Ireland. (Tab. 9.7)

9.5: Discussion

The liver performs many of the body's chemical functions ranging from the production of bile for digestive purposes to helping the blood clot in the event of an injury. It is the second largest organ in the body and is located behind the right lung. Symptoms of the disease include significant loss of weight (more than 10%) and/or appetite, dark coloured urine with light coloured faeces and/or a swollen or painful abdomen.[67] Cirrhosis is the strongest predisposing risk factor of liver cancer, which may be caused by alcohol[68] or infection with hepatitis B or hepatitis C viruses.[69,70] Further established and likely risk factors include diabetes,[71] exposure to Aflatoxin B1[70] or vinyl chloride or in tropical countries from liver fluke infection.[68]

Worldwide there are approximately 560,000 cases of liver cancer diagnosed annually; however it is a disease more common in developing countries, particularly in Asia and central Africa due to its relationship to hepatitis B. In developing countries such as Ireland however it is liver cirrhosis caused by alcohol abuse that is the major causal factor.

Treatment options for this cancer are limited as liver cancer is largely resistant to radiotherapy. While both chemotherapy and surgery are used the former has limited impact on survival and while the later can prove an effective treatment it is only applicable at an early stage and in the absence of other liver disease. The difficulty in treating the disease means that survival for patients diagnosed with liver cancer is typically very poor.

Due to the poor survival control of this disease in Ireland will most likely be achieved through prevention programmes with efforts continuously ongoing to reduce alcohol consumption by changing public attitudes towards levels of alcohol intake. Additionally as a result of increases in the numbers of people diagnosed with the hepatitis C virus in Republic of Ireland careful monitoring of those affected is also undertaken and good diagnostic procedures for the virus are in place.

Incidence rates of liver cancer have shown an increase over recent years in Republic of Ireland and have remained static in Northern Ireland. This however is not necessarily an indication of a failure on the part of the programmes in place to reduce alcohol consumption, nor has it been directly connected to increases in hepatitis C (although this cannot be completed ruled out as a possible explanation). Given that immigration from other countries in the European Union has been partly responsible for the large increase in the population of Republic of Ireland over the last ten years, it is likely that immigration has also contributed to the increases in liver cancer in Republic of Ireland as a result of higher incidence rates of liver cancer in European countries, particularly Italy and Spain, which immigrants originally resided in. The degree to which immigration should lead to an expectation of liver cancer increase in Ireland is however difficult to quantify due to the different treatment of secondary liver cancers by different cancer registries.

Chapter 10:

Pancreatic cancer (C25)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were on average 265 male and 272 female cases diagnosed annually in Ireland during 2000-2004.*
  - *There was no significant trend in incidence rates between 1994 and 2004 for either sex or country.*
  - *Incidence rates during 1994-2004 were higher than expected in Cork for both males and females, in Leitrim for males and Mayo for females.*
  - *Incidence rates in Ireland for males and females were similar to those of the EU-15 countries but were lower than those found in USA.*
  - *During 2000-2004 there was an average of 270 male and 277 female deaths each year.*
  - *Between 1994 and 2004 there was no significant trend in mortality rates in Ireland for either sex.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year relative survival was estimated to be 6.1%. There was no significant variation in this value by sex.*
  - *In Ireland as a whole both one-year and five-year (age-standardised) relative survival remained unchanged between 1994-1996 and 1997-1999.*
  - *At the end of 2004 there were only 367 people living in Ireland who had been diagnosed with the disease during 1994-2004. The majority of these (157) were diagnosed in 2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were 17.8% lower in Northern Ireland than Republic of Ireland for males and 13.2% lower for females.*
  - *Five-year (age-standardised) survival was 4.7% higher in Republic of Ireland than in Northern Ireland, driven by higher survival for females.*
  - *In Northern Ireland five-year (age-standardised) relative survival decreased by 7.3% for females between 1994-1996 and 1997-1999 while there was no change in Republic of Ireland.*
  - *Mortality rates in Northern Ireland were 10.4% lower than those in Republic of Ireland.*
  - *Mortality rates in Republic of Ireland showed a decrease of 1.4% per year for males, with no significant change in Northern Ireland.*
  - *The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed in 2000-2004 was 17.1% greater in Republic of Ireland than Northern Ireland.*

10.1: Incidence

Pancreatic cancer made up 2.4% of all male and 2.6% of all female cancers (excluding NMSC) in Ireland during 2000-2004. It was one of the few cancers where the number of female cases exceeded the number of male cases with 265 male and 272 female cases diagnosed annually. Overall it was the tenth most common female cancer and twelfth most common male cancer. Once adjusted for age however incidence rates (EASIRs) were 30.3% higher for males compared to females (p<0.001). The odds of developing the disease before the age of 75 was 1 in 128 for males and 1 in 167 for females. (Tab. 10.1)

There was a considerable difference in levels of this cancer between Northern Ireland and Republic of Ireland with European age-standardised incidence rates (EASIR) 17.8% lower in Northern Ireland than Republic of Ireland for males (p<0.001) and 13.2% lower for females (p=0.014). (Tab. 10.1)

Table 10.1: Summary statistics for incidence of pancreatic cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	75	84	160	190	188	378	265	272	538
% of all cancer cases (ex. NMSC)	2.3%	2.4%	2.4%	2.5%	2.7%	2.6%	2.4%	2.6%	2.5%
Rank (ex. NMSC)	12	9	13	12	9	11	12	10	13
Median age at diagnosis	71	74	73	71	75	73	71	75	73
Cumulative risk (Aged 0 to 74)	0.7%	0.6%	0.6%	0.8%	0.6%	0.7%	0.8%	0.6%	0.7%
Crude rate per 100,000 persons	9.1	9.7	9.4	9.8	9.5	9.7	9.6	9.6	9.6
EASIR ± 95% CI	9.1 ±0.9	7.3 ±0.7	8.1 ±0.6	11.1 ±0.7	8.4 ±0.6	9.6 ±0.4	10.4 ±0.6	8.0 ±0.4	9.1 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-17.8% ±9.9	-13.2% ±10.5	-15.7% ±7.2

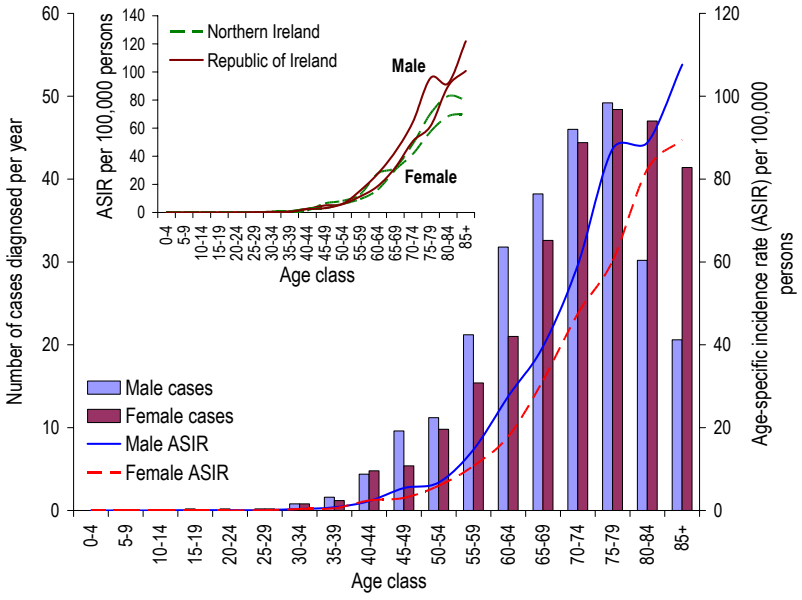
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

10.1.1: Age distribution

The median age at diagnosis for male patients with pancreatic cancer was 71 years of age compared to 75 for females. However the number of cases peaked in the 75-79 age class for both males and females. This age class represented 18.5% of all male and 17.8% of all female cases of pancreatic cancer diagnosed in 2000-2004. (Fig. 10.1)

Age-specific rates were highest for those aged 85 and over with 107.6 male and 89.5 female cases per 100,000 people of that age and sex. This pattern was observed for females in both Northern Ireland and Republic of Ireland, although the former had much lower rates, however in Northern Ireland male age-specific rates peaked in the 80-84 age class. (Fig. 10.1)

Figure 10.1: Number of cases of pancreatic cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

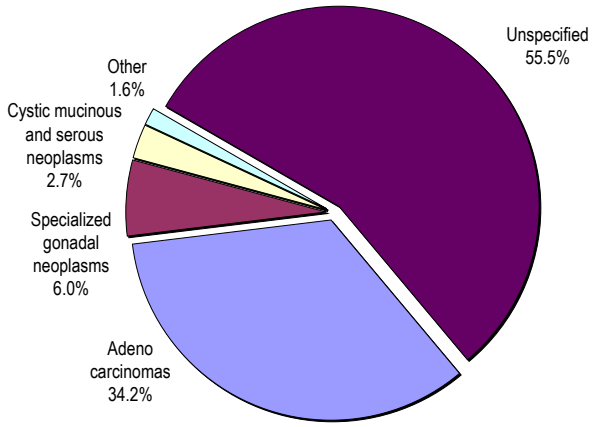


10.1.2: Cell type

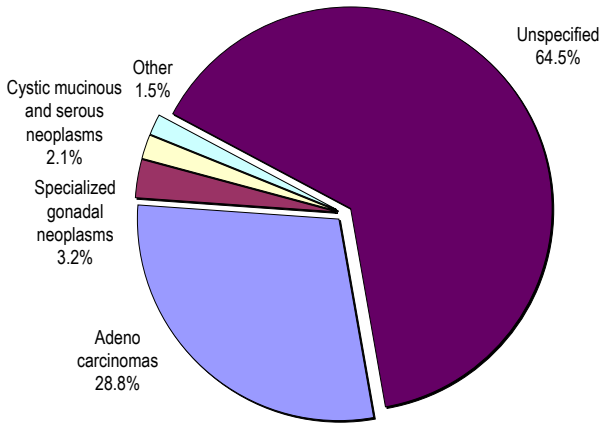
Of the 265 male cases of pancreatic cancer in Ireland diagnosed between 2000 and 2004 per year 34.2% were adenocarinomas as were 28.8% of the 272 female cases diagnosed each year. This, however, needs considered in the context of the 60.1% (male: 55.5%; female: 64.5%) of cases with an unspecified cell type. The proportion of cases with an unknown cell type varied by county with 69.3% unknown in Northern Ireland compared to 56.1% in Republic of Ireland. (Fig. 10.2)

Figure 10.2: Types of pancreatic cancer diagnosed in Ireland: 2000-2004

(a) Male



(b) Female

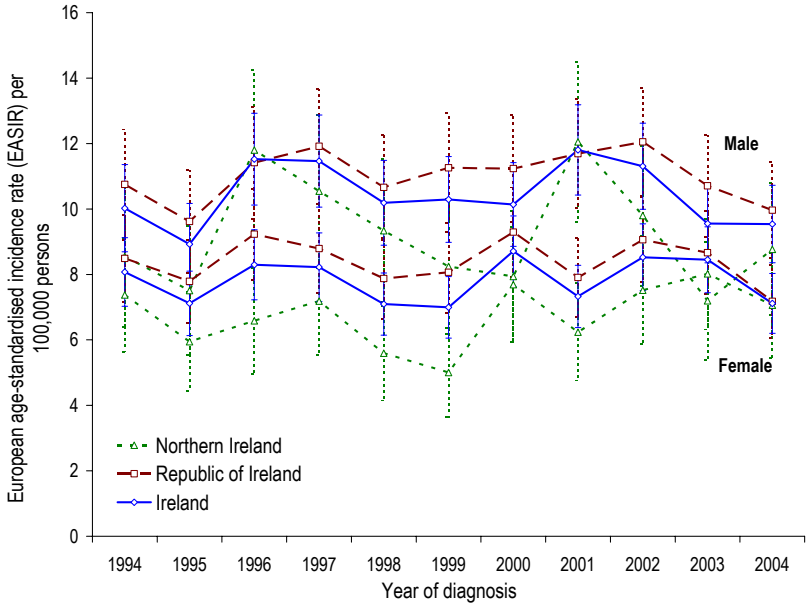


10.1.3: Trends

There was no significant trend in European age-standardised incidence rates (EASIR) of pancreatic cancer between 1994 and 2004 for either sex or country. (Fig. 10.3)

Despite the static rates the number of cases in the population increased by 4.0 male and 4.0 female cases each year. (Tab. 10.2)

Figure 10.3: Trends in European age-standardised incidence rates (EASIR) for pancreatic cancer by sex and country: 1994-2004



10.1.4: Geographic variations

Incidence of pancreatic cancer during 1994-2004 was higher than expected in Cork for males and females, in Leitrim for males and Mayo for females. Six of the counties/councils in Ireland showed lower than expected levels of pancreatic cancer compared to nine for females. With the exception of Monaghan, which had lower than expected female pancreatic cancer levels, all of these areas were in Northern Ireland. Neither Belfast nor Dublin had significantly different numbers of pancreatic cancer cases diagnosed than expected. (Fig. 10.4)

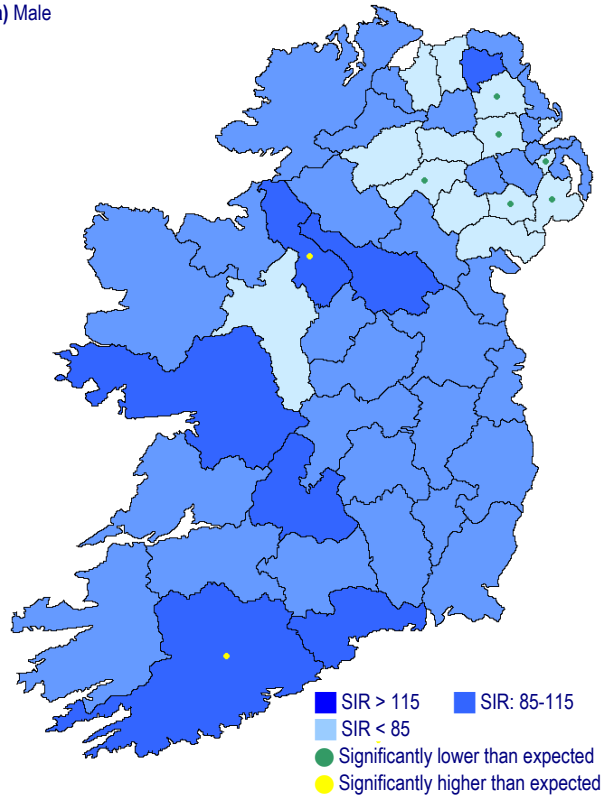
Table 10.2: Number of cases and European age-standardised incidence rates (EASIR) for pancreatic cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	62	8.5 ±2.2	164	10.8 ±1.7	226	10.0 ±1.3	77	7.4 ±1.7	173	8.5 ±1.3	250	8.1 ±1.0
1995	57	7.5 ±2.0	148	9.6 ±1.6	205	8.9 ±1.2	65	5.9 ±1.5	156	7.8 ±1.3	221	7.1 ±1.0
1996	91	11.8 ±2.5	176	11.4 ±1.7	267	11.5 ±1.4	72	6.6 ±1.6	183	9.2 ±1.4	255	8.3 ±1.1
1997	80	10.5 ±2.3	182	11.9 ±1.8	262	11.5 ±1.4	82	7.2 ±1.7	179	8.8 ±1.3	261	8.2 ±1.0
1998	71	9.3 ±2.2	172	10.7 ±1.6	243	10.2 ±1.3	65	5.6 ±1.4	170	7.9 ±1.2	235	7.1 ±1.0
1999	63	8.2 ±2.1	179	11.3 ±1.7	242	10.3 ±1.3	58	5.0 ±1.4	175	8.1 ±1.2	233	7.0 ±0.9
2000	62	7.9 ±2.0	185	11.2 ±1.6	247	10.1 ±1.3	80	7.7 ±1.8	192	9.3 ±1.4	272	8.7 ±1.1
2001	96	12.0 ±2.4	192	11.7 ±1.7	288	11.8 ±1.4	75	6.2 ±1.5	175	7.9 ±1.2	250	7.3 ±1.0
2002	83	9.8 ±2.1	207	12.1 ±1.7	290	11.3 ±1.3	87	7.5 ±1.7	205	9.1 ±1.3	292	8.5 ±1.0
2003	62	7.2 ±1.8	186	10.7 ±1.6	248	9.6 ±1.2	97	8.0 ±1.7	196	8.7 ±1.3	293	8.4 ±1.0
2004	74	8.8 ±2.0	180	10.0 ±1.5	254	9.5 ±1.2	83	7.1 ±1.6	172	7.2 ±1.1	255	7.1 ±0.9

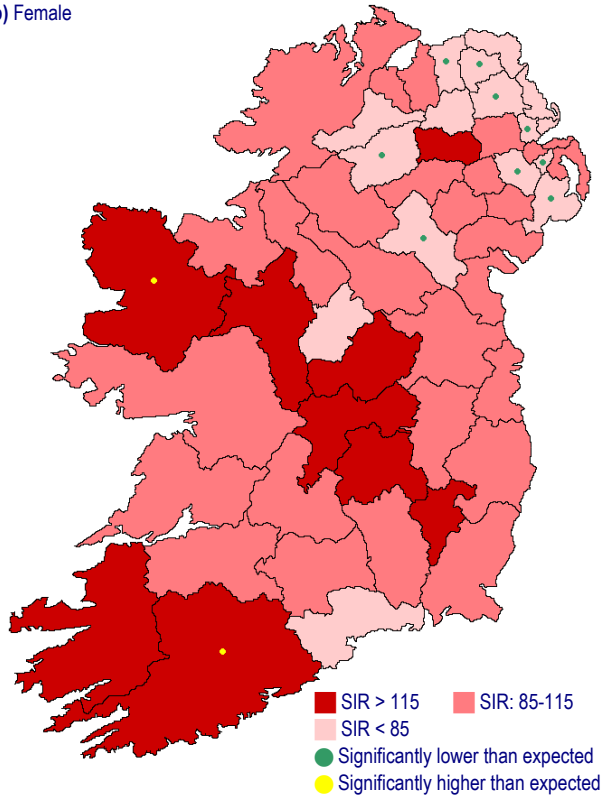
EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 10.4: Significant differences in county/council standardised incidence ratios for pancreatic cancer compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female

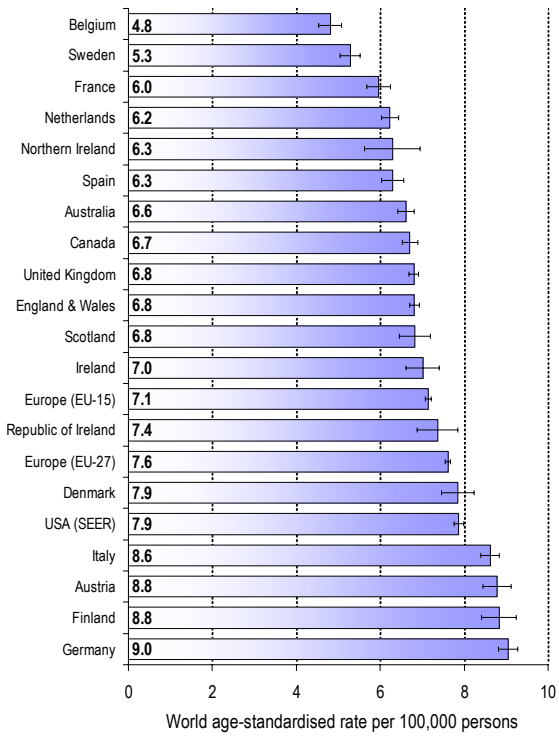


10.1.5: International comparisons

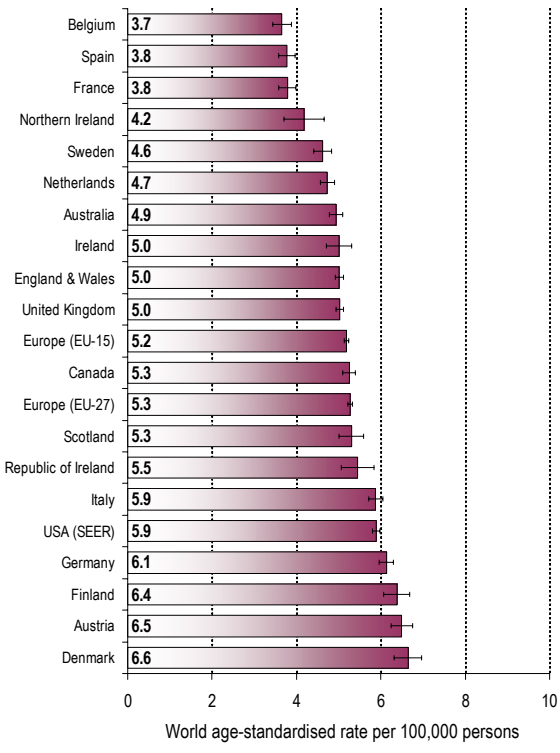
Incidence rates of pancreatic cancer in Ireland for males and females were similar to those of the EU-15 countries but were 7.9% lower for males than in the EU-27 countries (p=0.009). Rates for males in Ireland overall and in both constituent countries were similar to those in the UK, while female rates in Northern Ireland were 16.0% lower than in that country (p=0.004). Compared to USA pancreatic cancer levels in Ireland were 11.4% lower for males (p=0.001) and 15.2% lower for females (p<0.001). (Fig. 10.5)

Figure 10.5: International comparisons of world age-standardised incidence rates for pancreatic cancer: 1998-2000

(a) Male



(b) Female



Source: IARC[73]

10.2: Survival

Survival from pancreatic cancer in Ireland was very poor for patients diagnosed in 2000-2004 with five-year (age-standardised) relative survival Ireland estimated to be 6.1%. (Fig. 10.6, Tab. 10.3)

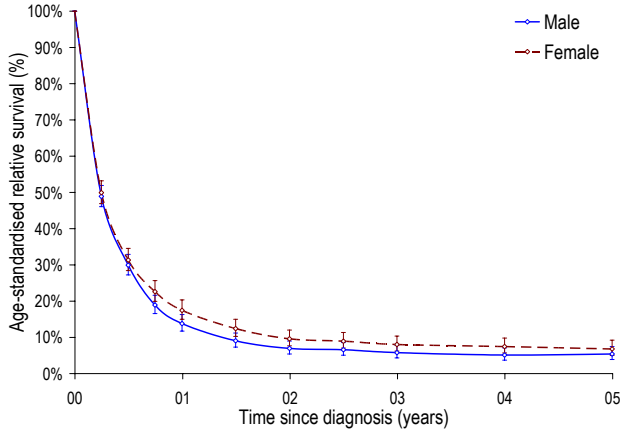
Table 10.3: Age-standardised relative survival for pancreatic cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	12.5% (8.9%, 17.5%)	13.2% (9.7%, 18.0%)	12.7% (10.1%, 16.0%)
	Republic of Ireland	14.6% (12.1%, 17.6%)	19.5% (16.4%, 23.1%)	16.6% (14.6%, 18.9%)
	Ireland	13.8% (11.7%, 16.3%)	17.5% (15.0%, 20.3%)	15.4% (13.8%, 17.2%)
5-year	Northern Ireland	6.3% (3.7%, 10.8%)	1.2% (0.3%, 4.4%)	2.7% (1.3%, 5.5%)
	Republic of Ireland	6.0% (4.3%, 8.5%)	9.2% (6.8%, 12.4%)	7.4% (6.0%, 9.3%)
	Ireland	5.4% (3.9%, 7.5%)	6.8% (5.0%, 9.2%)	6.1% (5.0%, 7.5%)

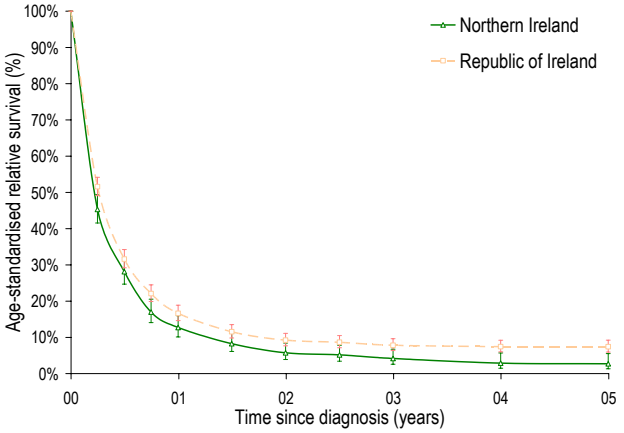
There was no significant variation in one or five-year (age-standardised) relative survival by sex despite the one-year value being 3.7% higher for females than males (p=0.149). Five-year (age-standardised) relative sur vival however varied by country for all patients, with a significant survival advantage of 4.7% (p=0.009) for patients in the Republic of Ireland compared to Northern Ireland. This difference was driven by higher female survival in Republic of Ireland (1.2% in NI compared to 9.2% in ROI; p<0.001). (Fig. 10.6, Tab. 10.3)

Figure 10.6: Age-standardised relative survival for pancreatic cancer patients by sex and country: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



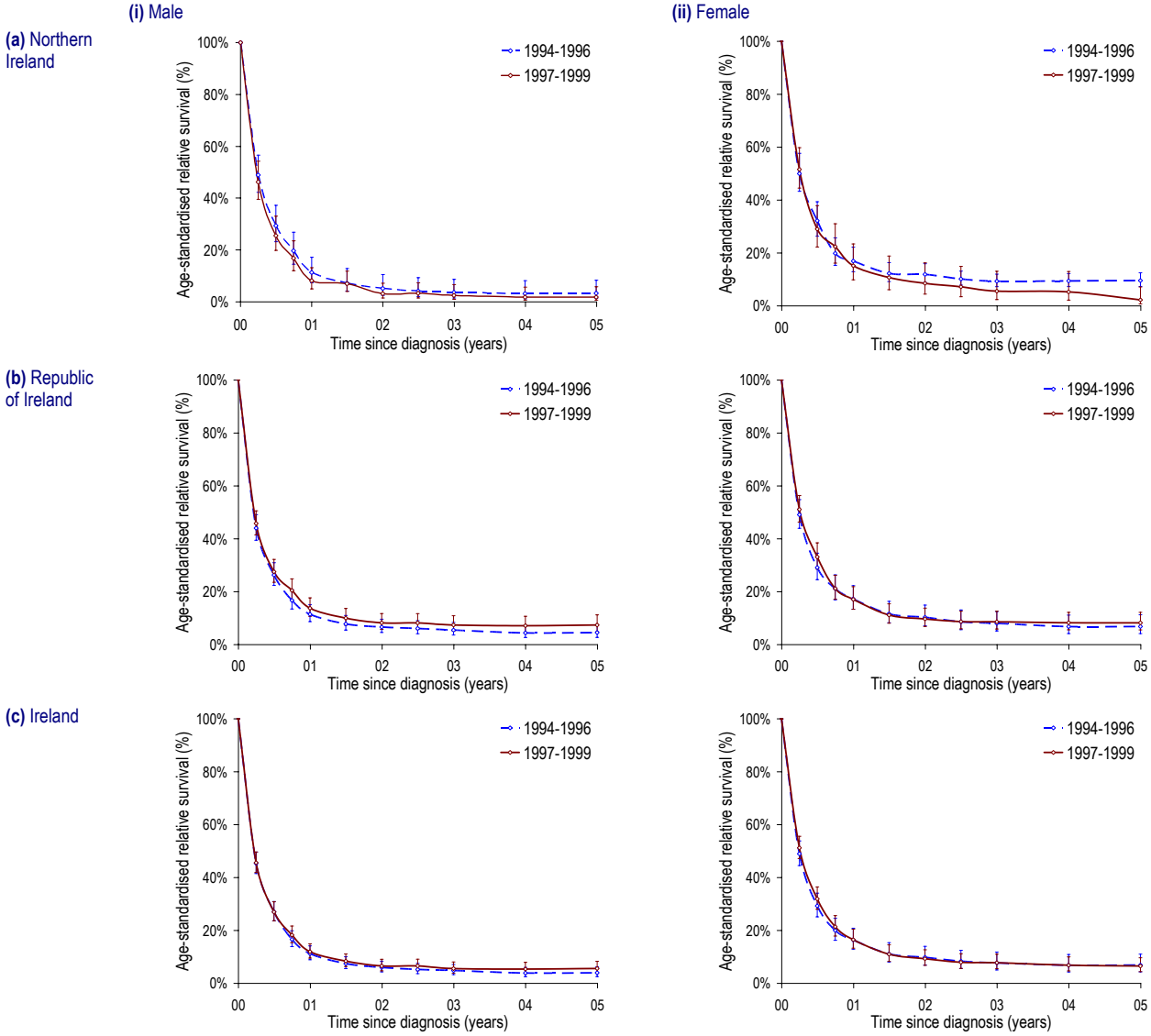
10.2.1: Changes in survival over time

In Ireland as a whole and for all persons in each country both one-year and five-year (age-standardised) relative survival remained unchanged between 1994-1996 and 1997-1999. However in Northern Ireland five-year (age-standardised) relative survival decreased by 7.3% for females between 1994-1996 and 1997-1999 (p<0.001) to 2.3%, a value similar to the estimates for the 2000-2004 period. In Republic of Ireland five-year (age-standardised) relative survival did not change significantly between the two periods for either sex. (Fig. 10.7, Tab. 10.4)

Table 10.4: Age-standardised relative survival for pancreatic cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	11.6% (8.3%, 16.0%)	11.1% (8.1%, 15.3%)	4.0% (2.0%, 8.0%)	2.4% (1.0%, 5.3%)
	Republic of Ireland	14.0% (11.7%, 16.8%)	14.9% (12.5%, 17.8%)	5.3% (3.8%, 7.4%)	7.6% (5.7%, 10.1%)
	Ireland	13.2% (11.3%, 15.5%)	13.7% (11.8%, 16.0%)	4.9% (3.6%, 6.6%)	5.9% (4.5%, 7.8%)
Male	Northern Ireland	11.3% (7.4%, 17.3%)	8.2% (5.1%, 13.2%)	3.3% (1.3%, 8.4%)	1.9% (0.6%, 5.8%)
	Republic of Ireland	11.5% (8.7%, 15.1%)	13.8% (10.7%, 17.7%)	4.6% (2.8%, 7.5%)	7.4% (4.9%, 11.3%)
	Ireland	11.2% (8.9%, 14.2%)	12.0% (9.6%, 14.9%)	4.0% (2.6%, 6.3%)	5.6% (3.8%, 8.4%)
Female	Northern Ireland	16.9% (12.9%, 22.2%)	15.2% (9.9%, 23.4%)	9.6% (7.3%, 12.5%)	2.3% (0.7%, 7.2%)
	Republic of Ireland	17.3% (13.4%, 22.3%)	17.1% (13.3%, 21.9%)	6.9% (4.2%, 11.3%)	8.2% (5.6%, 12.2%)
	Ireland	16.4% (12.9%, 20.9%)	16.5% (13.3%, 20.5%)	6.9% (4.4%, 11.0%)	6.6% (4.4%, 9.7%)

Figure 10.7: Age-standardised relative survival for pancreatic cancer patients by sex, country and period of diagnosis: 1994-1999



10.2.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by those diagnosed with cancer. Of those diagnosed in Ireland with pancreatic cancer during 1997-1999 3.8% survived a minimum of five-years. While there was no significant variation by sex this value varied by country with five-year observed survival during this period higher for all persons in Republic of Ireland than Northern Ireland by 3.5% (p=0.007). There was no change in either one or five-year observed survival between 1994-1996 and 1997-1999. (Tab. 10.5)

Table 10.5: Observed survival for pancreatic cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	10.0% (7.4%, 13.5%)	10.1% (7.5%, 13.6%)	2.3% (1.2%, 4.4%)	1.3% (0.6%, 3.2%)
	Republic of Ireland	12.6% (10.7%, 15.0%)	12.3% (10.4%, 14.5%)	4.0% (2.9%, 5.5%)	4.8% (3.6%, 6.3%)
	Ireland	11.9% (10.2%, 13.7%)	11.7% (10.1%, 13.5%)	3.5% (2.6%, 4.6%)	3.8% (2.9%, 5.0%)
Male	Northern Ireland	9.8% (6.4%, 15.0%)	8.3% (5.2%, 13.3%)	2.1% (0.8%, 5.4%)	1.6% (0.5%, 4.8%)
	Republic of Ireland	10.8% (8.3%, 14.1%)	12.0% (9.4%, 15.3%)	3.3% (2.0%, 5.4%)	4.3% (2.9%, 6.6%)
	Ireland	10.5% (8.4%, 13.2%)	10.9% (8.8%, 13.6%)	2.9% (1.9%, 4.6%)	3.6% (2.4%, 5.3%)
Female	Northern Ireland	10.3% (6.8%, 15.5%)	12.0% (8.1%, 17.7%)	2.6% (1.1%, 6.1%)	1.1% (0.3%, 4.3%)
	Republic of Ireland	14.3% (11.5%, 17.9%)	12.6% (9.9%, 15.9%)	4.6% (3.1%, 7.0%)	5.2% (3.6%, 7.7%)
	Ireland	13.2% (10.8%, 16.0%)	12.4% (10.1%, 15.2%)	4.0% (2.8%, 5.8%)	4.1% (2.8%, 5.9%)

10.3: Mortality

Due to the low survival experienced by those diagnosed with pancreatic cancer the number of deaths per year in Ireland from this disease was similar to the number of cases diagnosed. During 2000-2004 there was an average of 270 male and 277 female deaths from pancreatic cancer each year. This represented 4.6% of all male and 5.2% of all female cancer deaths (excluding NMSC). It was the sixth most common male cancer death and the fifth most common among females with a cumulative risk of dying from pancreatic cancer before the age of 75 being 0.8% for males and 0.6% for females. (Tab. 10.6)

While the number of deaths was similar for males and female, age standardised rates were 33.2% (p<0.001) higher for males than females. Variations by country also existed with rates lower in Northern Ireland by 10.4% (p=0.006) although differences for each gender did not reach statistical significance. (Tab. 10.6)

Table 10.6: Summary statistics for deaths from pancreatic cancer: 2000-2004

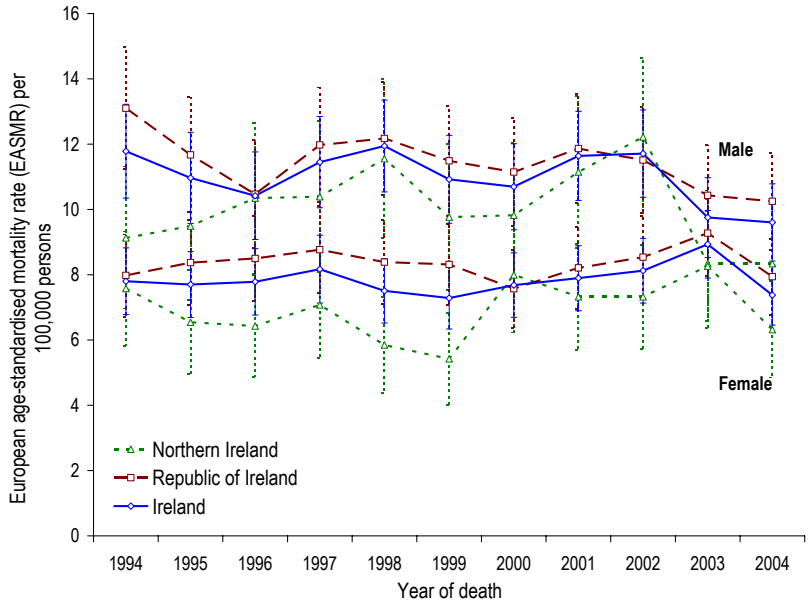
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	82	89	171	188	188	376	270	277	547
% of all cancer deaths (ex. NMSC)	4.4%	5.0%	4.7%	4.7%	5.3%	5.0%	4.6%	5.2%	4.9%
Rank (ex. NMSC)	6	5	6	6	5	5	6	5	5
Median age at death	71.5	75	74	71	75	74	71	75	74
Cumulative risk (Aged 0 to 74)	0.7%	0.5%	0.6%	0.8%	0.6%	0.7%	0.8%	0.6%	0.7%
Crude rate per 100,000 persons	9.9	10.2	10.1	9.7	9.6	9.6	9.7	9.8	9.8
EASMR ± 95% CI	9.9 ±1.0	7.4 ±0.7	8.5 ±0.6	11.0 ±0.7	8.3 ±0.6	9.5 ±0.4	10.7 ±0.6	8.0 ±0.4	9.2 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-9.7% ±10.6	-10.5% ±10.6	-10.4% ±7.4

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

10.3.1: Trends

Between 1994 and 2004 there was no significant trend in European age-standardised mortality rates (EASMR) for pancreatic cancer in Ireland for either males or females. Despite this the actual number of deaths rose as a result of demographic change with an increase of 1.5 deaths per year among males and a larger increase of 4.6 deaths per year among females. (Fig. 10.8)

Figure 10.8: Trends in European age-standardised mortality rates (EASMR) for pancreatic cancer by sex and country: 1994-2004



Considering each country separately, Northern Ireland exhibited static age-standardised rates with an accompanying increase in the annual number of deaths of 0.9 male and 1.8 female deaths per year. In Republic of Ireland however while there was no change in female EASMRs male rates showed a decrease of 1.4% per year (p=0.036). However this still translated to a small increase in the annual number of deaths for both sexes due to the large increases in the population over the last ten years. The increase was 0.6 deaths per year for males and 2.8 deaths per year for females. (Fig. 10.8)

10.4: Prevalence

Of the people diagnosed with pancreatic cancer during 1994-2004 only 6.6% were still alive at the end of 2004 (367 people) reflecting the poor survival from the disease. Among those diagnosed in 2000-2004 only 285 people were alive at the end of 2004 with the majority (157 people) diagnosed in 2004. (Tab. 10.7)

Table 10.7: Prevalence of pancreatic cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	41	5.1%	36	9.5%
	Female	43	5.1%	38	9.0%
	All persons	84	5.1%	74	9.3%
Republic of Ireland	Male	135	6.8%	105	11.1%
	Female	148	7.5%	106	11.3%
	All persons	283	7.2%	211	11.2%
Ireland	Male	176	6.3%	141	10.6%
	Female	191	6.8%	144	10.6%
	All persons	367	6.6%	285	10.6%

The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed within the previous five years (i.e. 2000-2004) was 17.1% greater in Republic of Ireland than Northern Ireland. (Tab. 10.7)

10.5: Discussion

The pancreas is a large gland lodged behind the stomach, the function of which is to produce digestive juices and insulin. Cancer can develop in the separate parts of the pancreas that perform these functions. Symptoms for the disease vary depending upon the cancer site but include loss of weight or appetite, jaundice (yellowing of the skin), abdominal pain, itching, sickness or fever[74].

Cigarette smoking is associated with 30% of all pancreatic cancers[75] while an unhealthy diet with low levels of fruit and vegetables and high fat and sugar intake can also increase risk.[76] Alcohol abuse, low levels of physical exercise and being overweight may increase the risk of developing pancreatic cancer by a small amount although studies are inconclusive and there is further work required in this area.[77] An increased risk may also come from frequent exposure to chlorinated hydrocarbon solvents which are found in paints, glue and dry cleaning solutions.[78] A link has also been established between pancreatic cancer and medical conditions such as chronic pancreatitis, diabetes and stomach ulcers.[77] Hereditary diseases such as hereditary pancreatitis[79] and a family history of pancreatic cancer also substantially increase risk of pancreatic cancer.[80]

Pancreatic cancer is the fourteenth most common cancer worldwide and is more common in developing countries. Survival from the disease is globally very poor as diagnosis is rarely made at an early stage. While surgery can potentially improve survival the success rate is low and treatment is usually applied for symptom control and pain relief. Further study is required to better understand this disease.

Chapter 11:

Lung cancer (including trachea, bronchus and lung; C33-C34)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were on average 1,599 male and 1,016 female cases of lung cancer diagnosed each year in Ireland during 2000-2004.*
  - *Male incidence rates decreased by 1.5% per year between 1994 and 2004, while they increased for females by 1.6% per year.*
  - *Incidence was higher than expected in Belfast, Dublin and Derry for both males and females and also in Carrickfergus, Louth and Kildare for males.*
  - *Incidence was strongly related to deprivation in both Northern Ireland and Republic of Ireland during 2000-2004.*
  - *Incidence rates in Ireland were lower than the European Union for males but were higher for females during 1998-2000.*
  - *There were on average 1,447 male and 893 female deaths each year in Ireland between 2000 and 2004.*
  - *During 1997-2004 male mortality rates decreased by 1.3% per year. For females there was no significant change in 1994-2004.*

- *TREATMENT*
  - *In 2001 radiotherapy was the most common form of treatment received by patients in Ireland (36.6%), followed by chemotherapy (18.2%) and surgery (12.5%), however overall 46.3% of patients received no form of tumour directed treatment.*
  - *Chemotherapy and radiotherapy use increased by 5.2% and 4.2% between 1996 and 2001 while surgery use decreased by 2.7%.*
  - *Higher levels of treatment occurred among those with small cell lung cancer (compared to non-small cell) while lower levels were present among those aged 65 and over (compared to aged 15-44), those diagnosed at stage III, stage IV or unstaged (compared to stage I) and the 20% most deprived population (compared to the 20% most affluent population).*

- *SURVIVAL AND PREVALENCE*
  - *Five year relative survival for patients diagnosed in 2000-2004 was estimated to be 10.4% with survival for females better than males by 2.9%.*
  - *One-year relative survival improved between 1994-1996 and 1997-1999 by 2.4% with no change in five-year relative survival.*
  - *Survival for patients diagnosed in Northern Ireland and Republic of Ireland in 1995-1999 was significantly below the European average for both males and females.*
  - *There was a relationship between survival and sex, age, stage at diagnosis and receipt of treatment. Differences in survival by cell type.*
  - *At the end of 2004 there were 3,223 people living in Ireland who had been diagnosed with lung cancer during 1994-2004 with 1,270 people having been diagnosed in 2004. This value increased by an average of 68 people per year since 1998.*

- *NORTH/SOUTH COMPARISONS*
  - *Male incidence rates were higher in Northern Ireland than in Republic of Ireland by 6.3% during 2000-2004 while no significant difference existed for females.*
  - *Male incidence rates decreased between 1994-2004 in both countries while female rates in Northern Ireland remained static but increased in Republic of Ireland.*
  - *The proportion of lung cancers with an unspecified cell type was 19.9% higher in Northern Ireland than Republic of Ireland.*
  - *There was no difference in proportions of patients receiving different treatment types between the two countries.*
  - *There was no difference in one or five-year relative survival between Northern Ireland and Republic of Ireland.*
  - *Excess mortality was 1.2% higher in Republic of Ireland than Northern Ireland once adjusted for sex, age, stage and cell type.*
  - *The number of people living with lung cancer per 100,000 persons was 23.5% higher in Northern Ireland than Republic of Ireland.*

11.1: Incidence

In Ireland there were on average 1,599 male and 1,016 female cases of lung cancer diagnosed each year between 2000 and 2004, making it the third most common male and female cancer diagnosed and the fourth most common cancer overall (behind breast, colorectal and prostate cancer). It made up 12.2% of all cancers in Ireland (excluding NMSC), although this proportion was slightly higher in Northern Ireland than in the Republic of Ireland (NI: 13.2%; ROI: 11.7%). In the absence of other disease males had a 5.0% risk of developing lung cancer before the age of 75 compared to 2.8% for females. (Tab. 11.1)

Among males European age-standardised incidence rates (EASIR) for lung cancer were higher in Northern Ireland during 2000-2004 than in the Republic of Ireland by 6.3% (p=0.013). While a difference also existed for females, this was not significant (5.5%; p=0.088). Both countries exhibited male age-standardised rates that were almost double those for females (p<0.001). (Tab. 11.1)

Table 11.1: Summary statistics for incidence of lung cancer: 2000-2004

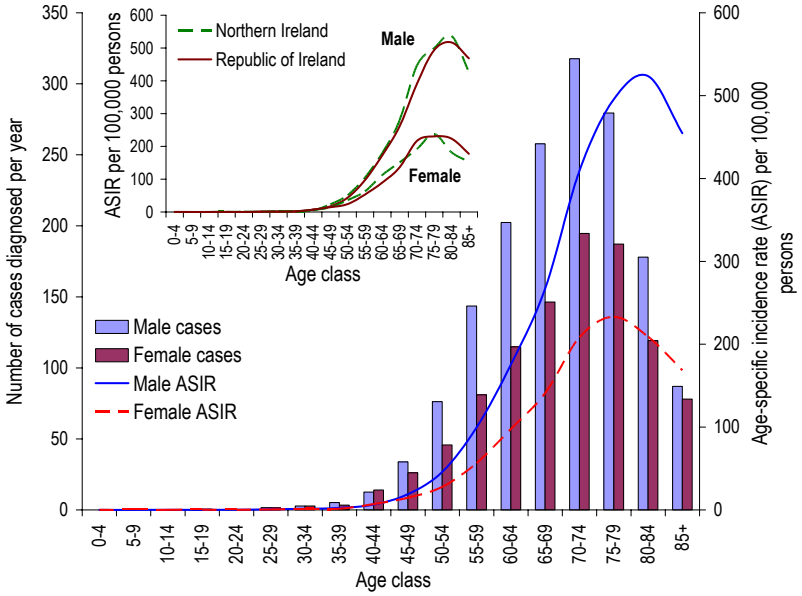
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	542	352	895	1,057	664	1,721	1,599	1,016	2,615
% of all cancer cases (ex. NMSC)	16.4%	10.2%	13.2%	13.7%	9.4%	11.7%	14.5%	9.7%	12.2%
Rank (ex. NMSC)	2	3	3	3	3	4	3	3	4
Median age at diagnosis	71	71	71	70	72	71	71	71	71
Cumulative risk (Aged 0 to 74)	5.3%	2.9%	4.0%	4.9%	2.7%	3.8%	5.0%	2.8%	3.8%
Crude rate per 100,000 persons	65.5	40.6	52.7	54.3	33.7	43.9	57.6	35.8	46.6
EASIR ± 95% CI	65.5 ±2.5	33.6 ±1.6	47.2 ±1.4	61.6 ±1.7	31.9 ±1.1	45.1 ±1.0	62.8 ±1.4	32.4 ±0.9	45.8 ±0.8
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							6.3% ±5.0	5.5% ±6.3	4.6% ±3.9

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

11.1.1: Age distribution

The median age at diagnosis for patients with lung cancer during 2000-2004 was 71 years of age (compared to 70 in 1994-1998), with cases peaking in the 70-74 age class for both males and females. This age class represented 19.9% of all male and 19.1% of all female cases of lung cancer diagnosed in 2000-2004. (Fig. 11.1)

Figure 11.1: Number of cases of lung cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



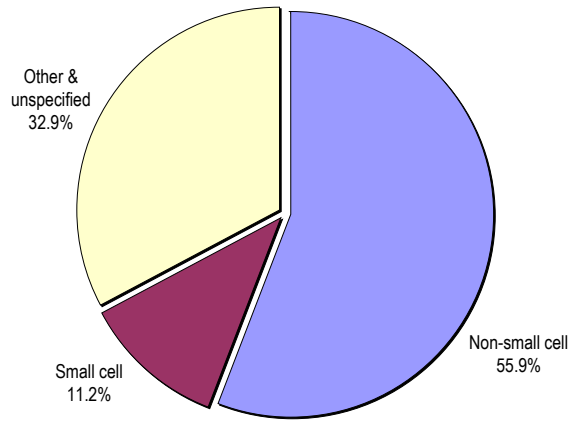
Age-specific incidence rates (ASIR) were highest among the 80-84 age class for males and 75-79 age class for females with 524 and 233 cases per 100,000 persons respectively. For all age classes between 35 and 84 years male ASIRs were higher in Northern Ireland than in Republic of Ireland, however for females ASIRs were higher in Northern Ireland for those aged 50-69 and higher in Republic of Ireland among the elderly (80+). (Fig. 11.1)

11.1.2: Cell type

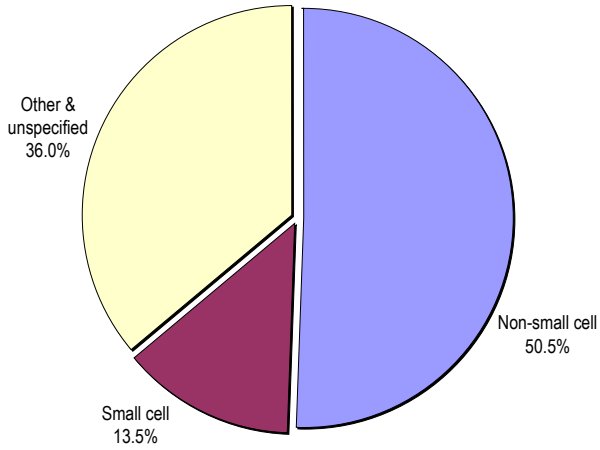
Non-small cell lung cancer made up 55.9% of male and 50.5% of female lung cancers in Ireland during 2000-2004, while small cell lung cancer made up 11.2% and 13.5% respectively. However 34.1% of lung cancers in Ireland had an unspecified cell type. This percentage varied considerably by country with Republic of Ireland having 27.3% of lung cancers with an unspecified lung cancer cell type compared to 47.2% in Northern Ireland. (Fig. 11.2)

Figure 11.2: Types of lung cancer diagnosed in Ireland: 2000-2004

(a) Male



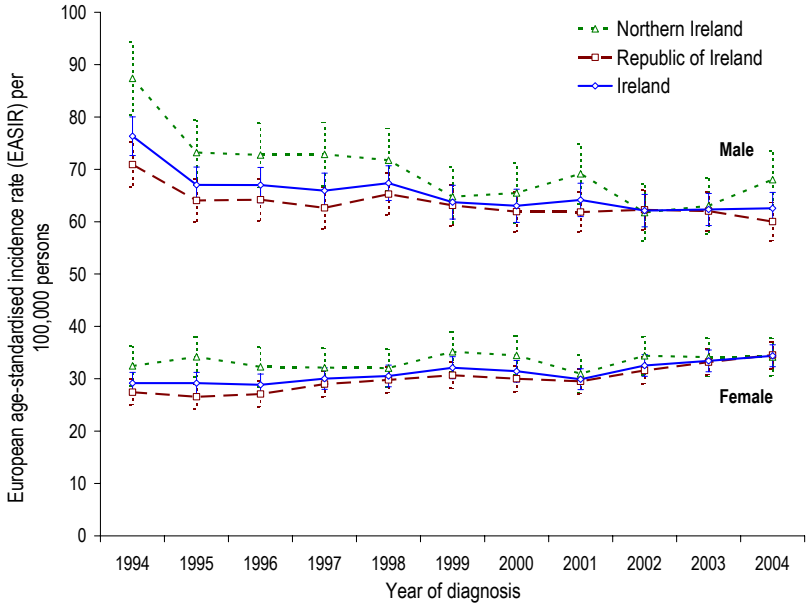
(b) Female



11.1.3: Trends

Trends in European age-standardised incidence rates (EASIR) for lung cancer were different for males and females. For males EASIRs decreased by 1.5% (p<0.001) per year between 1994 and 2004, while they increased for females by 1.6% (p<0.001) per year. However due to the ageing and increasing population in Ireland the actual number of cases diagnosed each year increased for both males and females by 3.6 and 27.5 cases respectively each year. (Fig. 11.3; Tab. 11.2)

Figure 11.3: Trends in European age-standardised incidence rates (EASIR) for lung cancer by sex and country: 1994-2004



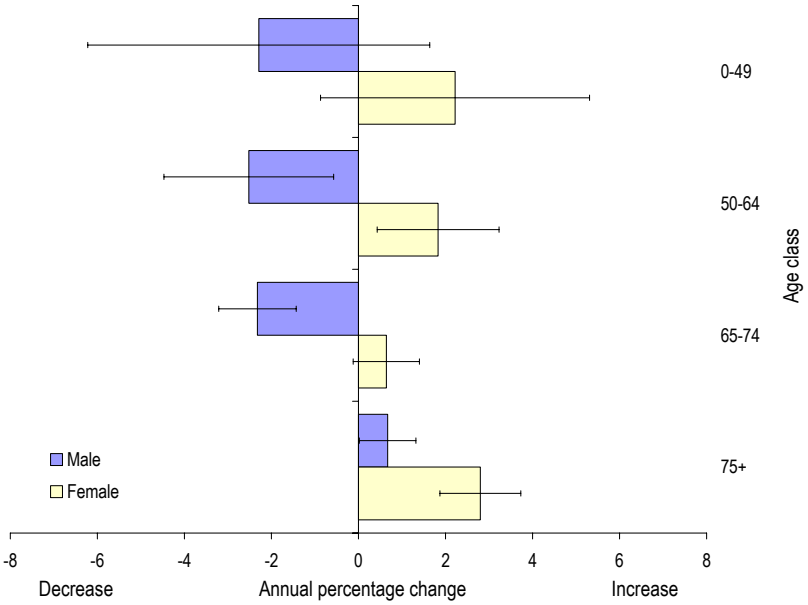
Both Northern Ireland and Republic of Ireland demonstrated the decreasing male EASIRs during 1994-2004 although the downward trend was slightly, but not significantly, greater in Northern Ireland (NI: -2.3%; ROI: -1.0%), albeit from a higher level. This corresponded to a decrease of 3.3 male cases of lung cancer in Northern Ireland per year but an increase of 6.9 per year in Republic of Ireland due to population increase and ageing. For females the trend was

Table 11.2: Number of cases and European age-standardised incidence rates (EASIR) for lung cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	624	87.4 ±6.9	1,066	70.9 ±4.3	1,690	76.3 ±3.7	310	32.5 ±3.8	513	27.4 ±2.5	823	29.2 ±2.1
1995	546	73.2 ±6.2	982	64.1 ±4.1	1,528	67.0 ±3.4	331	34.2 ±3.9	511	26.6 ±2.4	842	29.2 ±2.1
1996	551	72.7 ±6.1	1,000	64.2 ±4.0	1,551	67.0 ±3.4	309	32.3 ±3.8	523	27.1 ±2.4	832	28.8 ±2.0
1997	553	72.9 ±6.1	976	62.6 ±4.0	1,529	65.9 ±3.3	325	32.1 ±3.7	568	29.0 ±2.5	893	30.0 ±2.1
1998	562	71.8 ±6.0	1,048	65.3 ±4.0	1,610	67.4 ±3.3	330	32.0 ±3.6	575	29.8 ±2.5	905	30.5 ±2.1
1999	510	64.8 ±5.7	1,020	63.1 ±3.9	1,530	63.7 ±3.2	358	35.2 ±3.8	611	30.7 ±2.5	969	32.1 ±2.1
2000	517	65.5 ±5.7	1,021	61.9 ±3.8	1,538	63.0 ±3.2	343	34.5 ±3.8	608	30.0 ±2.5	951	31.4 ±2.1
2001	561	69.2 ±5.8	1,031	61.9 ±3.8	1,592	64.2 ±3.2	318	30.9 ±3.6	616	29.5 ±2.4	934	29.9 ±2.0
2002	509	61.8 ±5.4	1,063	62.3 ±3.8	1,572	62.1 ±3.1	366	34.4 ±3.7	656	31.6 ±2.5	1,022	32.5 ±2.1
2003	533	63.0 ±5.4	1,092	62.0 ±3.7	1,625	62.3 ±3.1	358	34.1 ±3.7	703	33.2 ±2.5	1,061	33.4 ±2.1
2004	592	68.0 ±5.5	1,076	60.0 ±3.6	1,668	62.6 ±3.0	376	34.2 ±3.6	737	34.5 ±2.6	1,113	34.4 ±2.1

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 11.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for lung cancer by sex and age: 1994-2004



significantly different in both countries, with female EASIRs static in Northern Ireland but increasing with an annual percentage change of 2.4% (p<0.001) in Republic of Ireland. (Fig. 11.3; Tab 11.2)

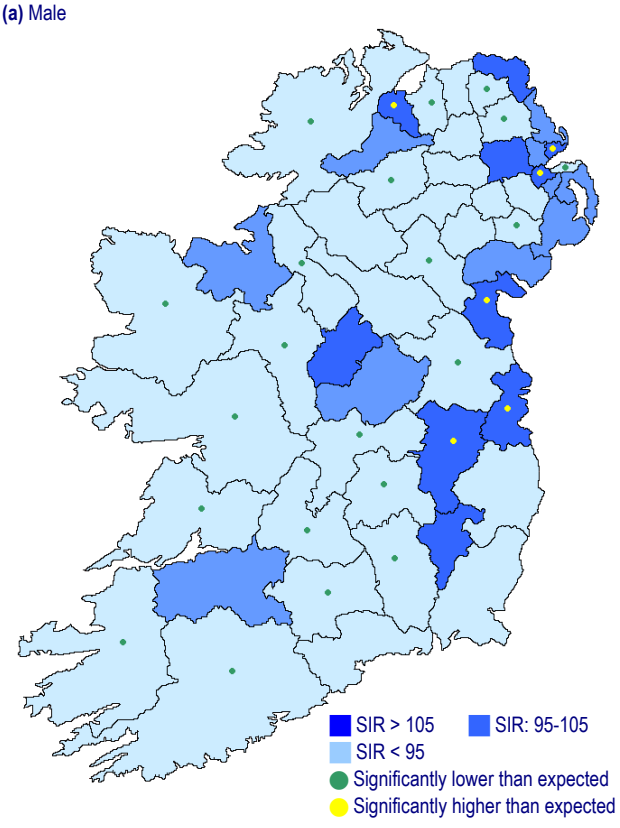
Trends in lung cancer EASIRs varied by age in Ireland during 1994-2004, particularly for males. While overall male EASIRs decreased, this was driven by those aged 50-64 and 65-75 who saw decreases of 2.5% (p=0.018) and 2.3% (p<0.001) respectively in EASIRs each year. For those aged 75 and over however the annual percentage change was positive for males (0.7%). Females showed increases in EASIRs for all age groups although these were only significant for the 50-64 (1.8%, p=0.016) and 75 and over (2.8%, p<0.001) age classes. The decreasing trends among younger age groups are a promising sign for the future. (Fig. 11.4)

11.1.4: Geographic variations

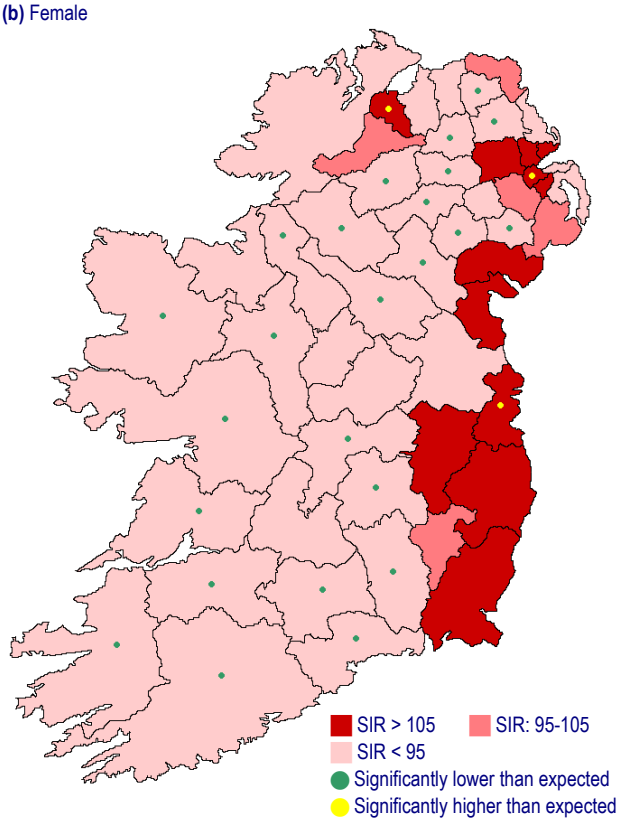
Lung cancer incidence in Ireland during 1994-2004 was related to urban/rural factors with higher than expected incidence rates (compared to Ireland as a whole) in Belfast, Dublin and Derry for both males and females. For males incidence was also higher than expected in Carrickfergus, Louth and Kildare. Of the remaining district councils/counties 21 had lower than expected levels of lung cancer among males, while 24 geographic areas had lower than expected levels among females. Belfast, which had the highest incidence rates, had 144 male and 96 female cases of lung cancer diagnosed each year, while the other major urban area in Ireland, Dublin, had 329 male and 231 female cases diagnosed each year. (Fig. 11.5)

Figure 11.5: Significant differences in county/council standardised incidence ratios for lung cancer compared to Ireland as a whole: 1994-2004

(a) Male



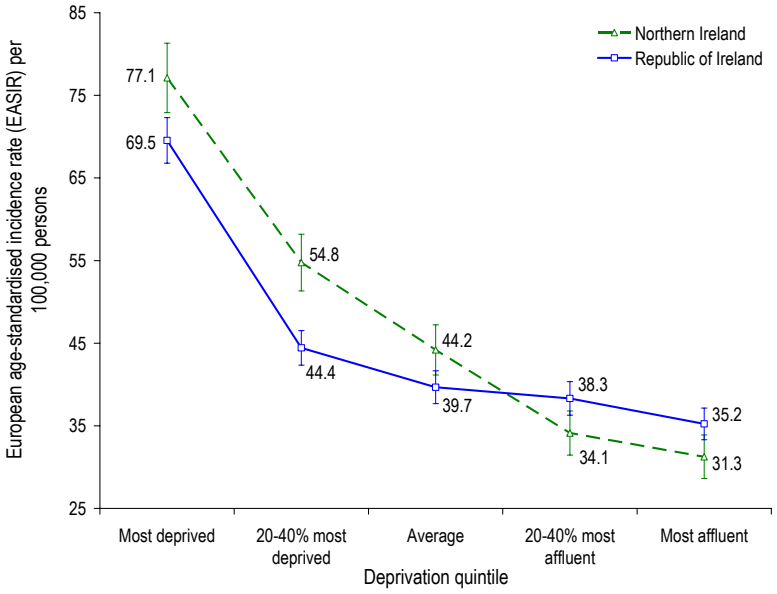
(b) Female



11.1.5: Socio-economic factors

Lung cancer incidence was strongly related to deprivation in both Northern Ireland and Republic of Ireland during 2000-2004 with the relationship to socio-economic factors strongest in Northern Ireland where EASIRs in the most deprived areas were 2.5 times greater than those in the most affluent areas ($p<0.001$). Consequently the 40% most deprived population in Northern Ireland had significantly higher lung cancer incidence rates than the equivalent population in Republic of Ireland while the 40% most affluent had lower levels of lung cancer in Northern Ireland. It is likely however that at least some of the difference between countries is a result of differences in how deprivation is measured. (Fig. 11.6)

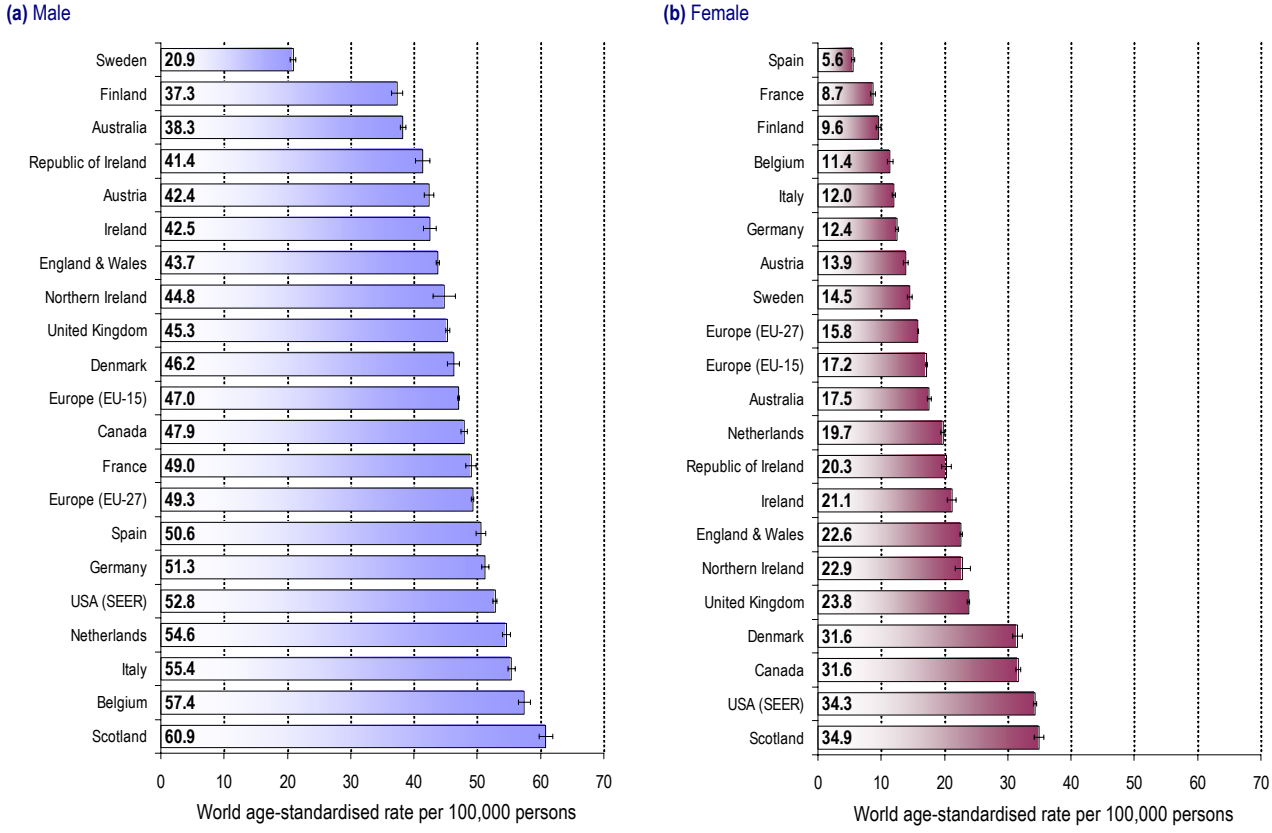
Figure 11.6: European age-standardised incidence rates (EASIR) for lung cancer by country specific deprivation quintile: 2000-2004



11.1.6: International comparisons

Lung cancer incidence rates in Northern Ireland were equivalent to those in the rest of the UK for males and females in 1998-2000, however Republic of Ireland and Ireland as a whole had significantly lower incidence rates than the UK. Ireland had lower male lung cancer incidence rates than the European Union during this time period (measured using both 15 and 27 countries) however the island had higher incidence rates for females. Compared to the USA and Canada incidence of lung cancer was lower in Ireland for both males and females. (Fig. 11.7)

Figure 11.7: International comparisons of world age-standardised incidence rates for lung cancer: 1998-2000



Source: IARC[81]

11.2: Treatment

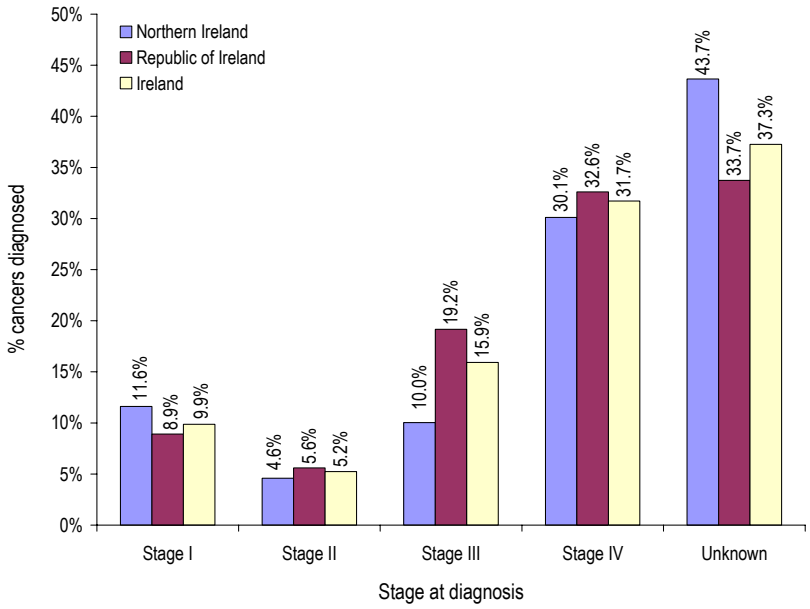
In 2001 there were 2,330 patients aged 15-99 with a diagnosis of lung cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 2,237 patients diagnosed in 1996.

11.2.1: Stage at diagnosis

Staging of lung cancer in 2001 was average with 62.7% of patients in Ireland assigned a stage at diagnosis. This however was a significant improvement on the 50.6% staged in 1996 ($p<0.001$). The proportion of patients with an unknown stage however differed between Northern Ireland and Republic of Ireland with 9.9% more patients having a stage assigned in Republic of Ireland ($p<0.001$). (Fig. 11.8)

The overall distribution of stage among patients also differed between the two countries ($\chi^2=69.8$, $p<0.001$), with the proportion assigned to stage III 9.2% ($p<0.001$) higher and stage I 2.7% ($p=0.04$) lower in Republic of Ireland (Fig. 11.8)

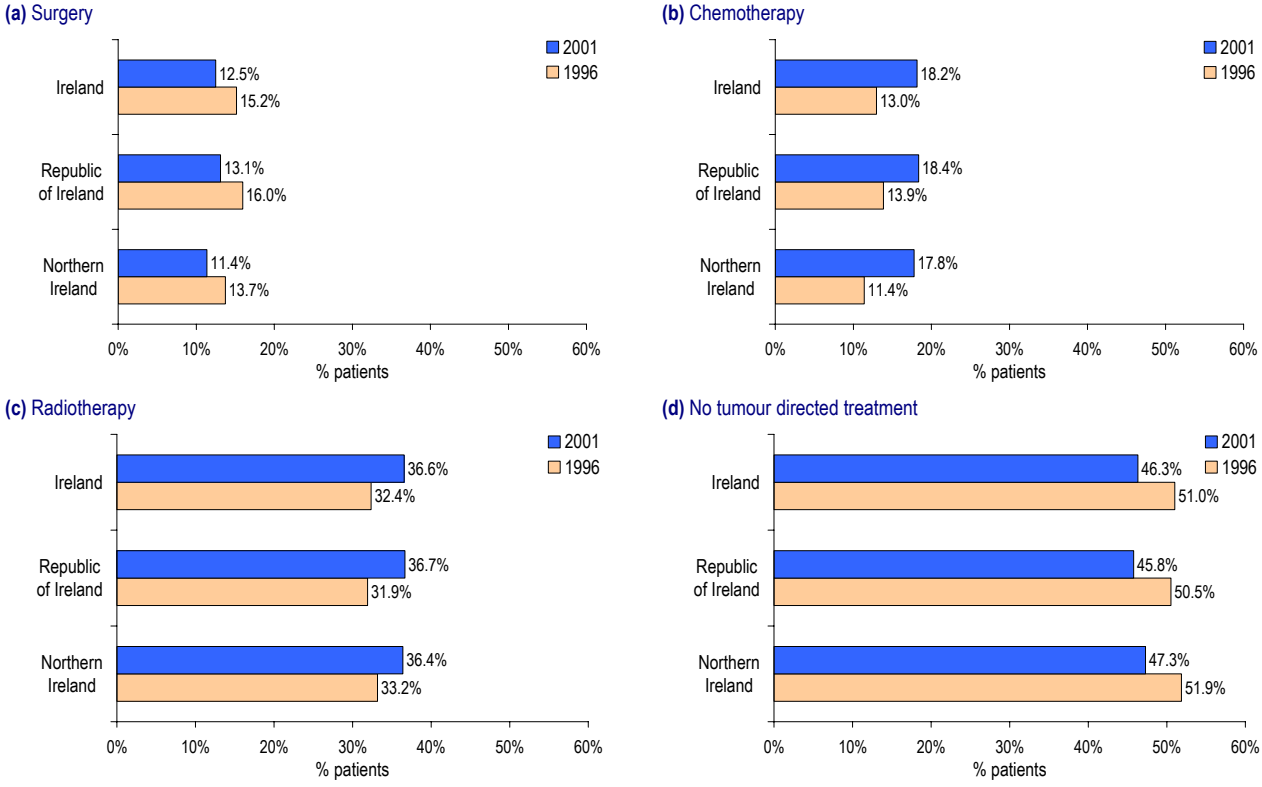
Figure 11.8: Stage at diagnosis for lung cancer patients by country: 2001



11.2.2: Treatment received

In 2001 radiotherapy was the most common form of treatment received by lung cancer patients in Ireland (36.6%), followed by chemotherapy (18.2%) and surgery (12.5%), however overall 46.3% of patients received no form of tumour directed treatment.

Figure. 11.9: Tumour directed treatment received by lung cancer patients by year of diagnosis and country: 1996 & 2001



Compared to 1996 the use of chemotherapy and radiotherapy increased in Ireland by 5.2% (p=0.001) and 4.2% (p=0.034) respectively while the proportion of patients receiving surgery decreased by 2.7% (p=0.009). The changes in treatment levels resulted in a 4.7% (p=0.002) decrease in the proportion of patients receiving no tumour directed treatment. Changes in the percentage of patients receiving radiotherapy, surgery or no tumour directed treatment were only significant in Republic of Ireland, however chemotherapy use did increase significantly in both countries (NI: 6.4%, p<0.001; ROI: 4.5%, p=0.001). (Fig. 11.9)

There was no significant difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving any form of treatment or in the proportion receiving no tumour directed treatment (p>0.05). (Fig. 11.9)

Treatment combinations

In Ireland 12.7% of lung cancer patients diagnosed in 2001 received more than one type of treatment, although less than 1% received all of surgery, radiotherapy and chemotherapy. This was slightly higher than the 10.7% of patients diagnosed in 1996 (p=0.038). The change in the proportion of patient receiving a combination of treatments, was driven primarily by a 2.9% (p=0.009) increase in the use of chemotherapy and radiotherapy together, although the use of surgery and radiotherapy together decreased between 1996 and 2001 by 1.4% (p=0.002). (Tab. 11.3)

Both Northern Ireland and Republic of Ireland had a similar distribution of patients receiving different treatment combinations ($\chi 2$=10.5, p=0.162). (Tab. 11.3)

Table 11.3: Tumour directed treatment received by lung cancer patients by country and year of diagnosis: 1996 & 2001

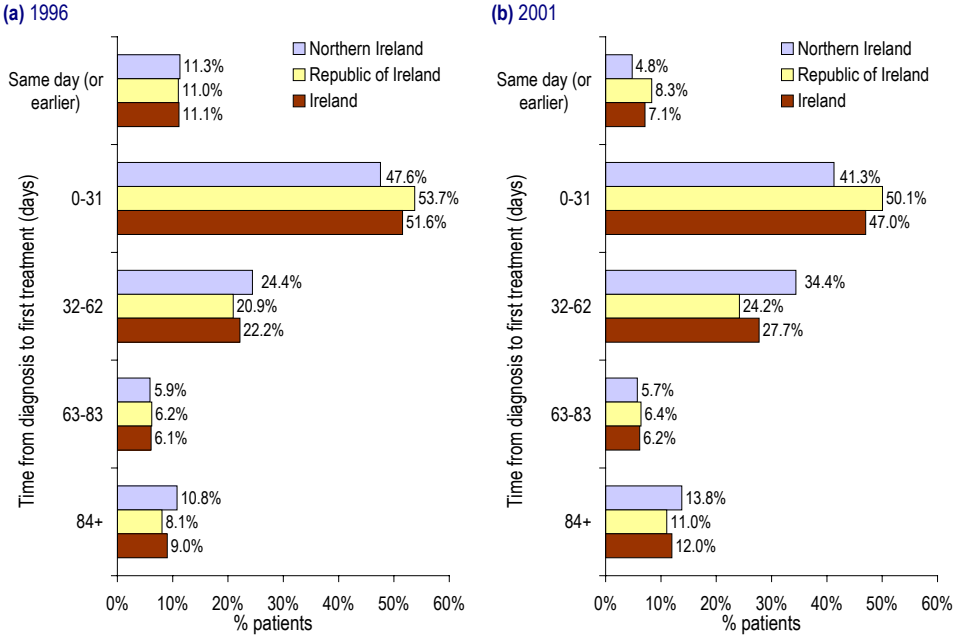
	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	9.0%	8.0%	11.5%	9.4%	10.6%	8.9%
Chemotherapy only	5.2%	7.1%	5.9%	7.6%	5.7%	7.4%
Radiotherapy only	24.3%	25.4%	20.6%	24.3%	21.9%	24.7%
Surgery and chemotherapy	0.7%	1.2%	0.1%	0.6%	0.3%	0.8%
Surgery and radiotherapy	3.5%	1.6%	3.4%	2.2%	3.4%	2.0%
Chemotherapy and radiotherapy	5.0%	8.8%	6.9%	9.2%	6.2%	9.1%
Surgery, chemotherapy and radiotherapy	0.5%	0.6%	0.9%	0.9%	0.8%	0.8%
No tumour directed treatment	51.9%	47.3%	50.5%	45.8%	51.0%	46.3%
Total patients	808	827	1,429	1,503	2,237	2,330

11.2.3: Waiting times

Among lung cancer patients diagnosed in 2001 in Ireland 54.1% of those who received tumour directed treatment were treated within 31 days of diagnosis. This was a decrease of 8.6% on the 1996 proportion (p=0.003).

Waiting time between diagnosis and treatment differed between Northern Ireland and Republic of Ireland ($\chi 2$=35.3, p<0.001). In particular Republic of Ireland had 12.3% more patients treated within 31 days (p=0.003).

Figure 11.10: Time between diagnosis and first treatment by country for patients diagnosed with lung cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

The proportion of patients in Northern Ireland waiting less than 31 days fell 12.8% between 1996 and 2001 (p=0.009) while those waiting 32-61 days increased by10.0% (p=0.025). There was no significant change in waiting time in Republic of Ireland. (Fig. 11.10)

11.2.4: Patient characteristics and factors influencing treatment

Among lung cancer patients diagnosed in 1996 and 2001 those with small cell lung cancer were more likely than those with non-small cell lung cancer to receive treatment as were those diagnosed in 2001 compared to 1996. Age and stage at diagnosis also influenced treatment receipt in Ireland with treatment more likely to be received by those aged 15-44 than 65 and over and those diagnosed at stage III, stage IV or unstaged less likely to receive treatment than those diagnosed at stage I. Socio-economic factors also influenced treatment with the 20% most affluent more likely to receive treatment than the 20% most deprived (once adjusted for age, stage, sex and cell type). (Tab. 11.4)

There was no significant difference between the relative risk ratios for Northern Ireland and Republic of Ireland for lung cancer patients diagnosed in 1996 and 2001 suggesting that the factors influencing treatment are the same in both countries. (Tab. 11.4)

Table 11.4: Number and percentage of lung cancer patients diagnosed in 1996 and 2001 receiving tumour directed treatment by patient and tumour characteristics with relative risk ratios (adjusted for other factors in the table) derived using logistic regression

	Northern Ireland			Republic of Ireland			Ireland		
	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)
Male	1,043	50.0%	1.00	1,878	52.7%	1.00	2,921	51.8%	1.00
Female	592	51.2%	1.04 (0.92,1.16)	1,054	50.5%	1.00 (0.91,1.08)	1,646	50.7%	1.01 (0.94,1.08)
Age 15-44	23	87.0%	1.00	70	82.9%	1.00	93	83.9%	1.00
Age 45-54	124	71.8%	0.87 (0.51,1.06)	209	80.9%	1.00 (0.83,1.10)	333	77.5%	0.95 (0.81,1.05)
Age 55-64	328	68.3%	0.88 (0.53,1.06)	564	69.3%	0.89 (0.71,1.02)	892	68.9%	0.89 (0.74,1.01)
Age 65-74	654	53.5%	0.75 (0.39,1.00)	1,099	55.8%	0.78 (0.58,0.94)*	1,753	54.9%	0.77 (0.61,0.92)*
Age 75+	506	28.1%	0.49 (0.20,0.85)*	990	29.4%	0.52 (0.34,0.72)*	1,496	28.9%	0.52 (0.36,0.69)*
Stage I	150	80.0%	1.00	251	80.1%	1.00	401	80.0%	1.00
Stage II	65	81.5%	1.02 (0.82,1.13)	191	79.1%	0.96 (0.83,1.06)	256	79.7%	0.98 (0.87,1.06)
Stage III	176	76.7%	0.92 (0.76,1.04)	474	61.8%	0.75 (0.62,0.87)*	650	65.8%	0.80 (0.71,0.89)*
Stage IV	457	53.4%	0.69 (0.54,0.83)*	831	50.2%	0.60 (0.48,0.72)*	1,288	51.3%	0.64 (0.55,0.73)*
Stage unknown	787	34.7%	0.51 (0.38,0.65)*	1,185	38.8%	0.55 (0.43,0.66)*	1,972	37.2%	0.54 (0.45,0.63)*
Microscopically verified	1,153	62.6%	1.00	2,204	64.0%	1.00	3,357	63.5%	1.00
Clinical basis	477	21.6%	0.81 (0.64,0.98)*	682	15.5%	0.67 (0.39,0.98)*	1,159	18.0%	0.73 (0.59,0.88)*
Other basis	5	0.0%		46	10.9%	0.66 (0.28,1.11)	51	9.8%	0.62 (0.30,1.01)
Non-small cell	855	62.8%	1.00	1,790	64.2%	1.00	2,645	63.8%	1.00
Small cell	221	70.1%	1.16 (1.04,1.26)*	380	66.1%	1.07 (0.98,1.15)	601	67.6%	1.10 (1.03,1.16)*
Unspecified cell type	559	23.8%	0.64 (0.49,0.80)*	762	15.9%	0.59 (0.34,0.89)*	1,321	19.2%	0.60 (0.48,0.74)*
20% most affluent	200	55.0%	1.00	402	56.0%	1.00	602	55.6%	1.00
20-40% most affluent	235	49.4%	0.93 (0.73,1.13)	456	53.5%	0.96 (0.82,1.10)	691	52.1%	0.95 (0.83,1.06)
Average	309	51.8%	0.98 (0.78,1.16)	463	52.3%	0.98 (0.83,1.12)	772	52.1%	0.97 (0.85,1.08)
20-40% most deprived	363	55.4%	1.05 (0.86,1.23)	543	47.5%	0.88 (0.75,1.02)	906	50.7%	0.95 (0.84,1.05)
20% most deprived	522	45.6%	0.85 (0.67,1.02)	814	52.3%	0.87 (0.75,1.00)*	1,336	49.7%	0.86 (0.75,0.96)*
Unknown	6	0.0%		254	50.0%	0.98 (0.81,1.14)	260	48.8%	0.95 (0.80,1.10)
Diagnosed in 1996	808	48.1%	1.00	1,429	49.5%	1.00	2,237	49.0%	1.00
Diagnosed in 2001	827	52.7%	1.04 (0.92,1.16)	1,503	54.2%	1.14 (1.05,1.22)*	2,330	53.7%	1.09 (1.02,1.16)*
Northern Ireland	1,635	50.5%					1,635	50.5%	
Republic of Ireland				2,932	51.9%		2,932	51.9%	0.94 (0.87,1.02)
All patients	1,635	50.5%		2,932	51.9%		4,567	51.4%	

* Significantly different from baseline group (p<0.05)

11.3: Survival

Five year (age-standardised) relative survival for lung cancer patients diagnosed in 2000-2004 in Ireland was estimated to be 10.4%. This varied by sex with a difference of 2.9% between males and females (p=0.010). (Fig. 11.11, Tab. 11.5)

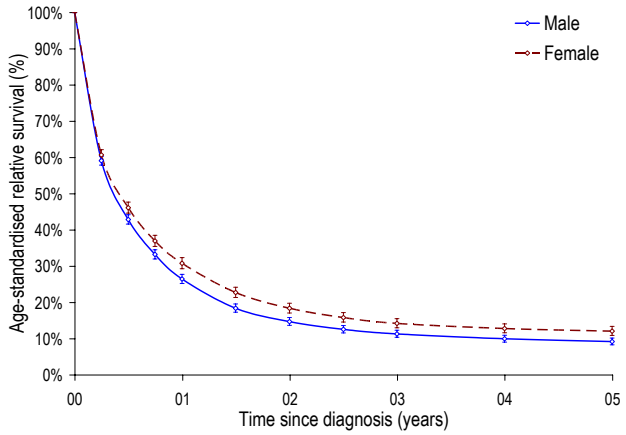
Table 11.5: Age-standardised relative survival for lung cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	28.5% (26.2%, 30.9%)	28.7% (26.2%, 31.3%)	28.6% (26.9%, 30.3%)
	Republic of Ireland	25.5% (24.0%, 27.0%)	32.1% (30.2%, 34.0%)	28.0% (26.8%, 29.2%)
	Ireland	26.5% (25.3%, 27.8%)	30.8% (29.3%, 32.4%)	28.2% (27.2%, 29.1%)
5-year	Northern Ireland	9.1% (7.5%, 11.0%)	11.2% (9.3%, 13.4%)	10.0% (8.8%, 11.5%)
	Republic of Ireland	9.4% (8.3%, 10.6%)	12.9% (11.4%, 14.6%)	10.8% (9.9%, 11.7%)
	Ireland	9.2% (8.3%, 10.2%)	12.1% (10.9%, 13.4%)	10.4% (9.7%, 11.2%)

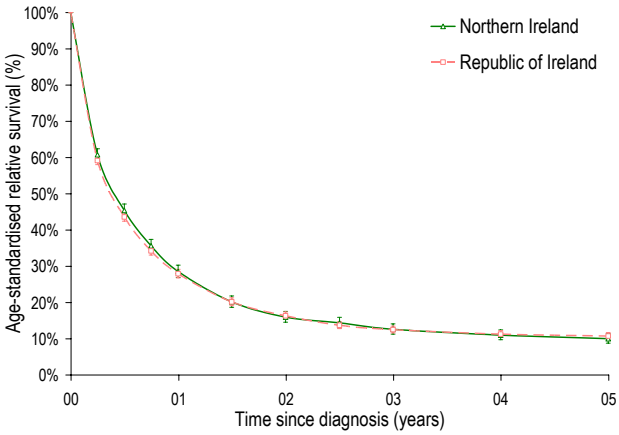
Lung cancer patients diagnosed in 2000-2004 in Northern Ireland and Republic of Ireland had similar one and five-year (age-standardised) relative survival. This was also the case when analysed by sex, however the difference in relative survival between males and females was larger in Republic of Ireland. (Fig. 11.11, Tab. 11.5)

Figure 11.11: Age-standardised relative survival for lung cancer patients by sex and country: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



11.3.1: Changes in survival over time

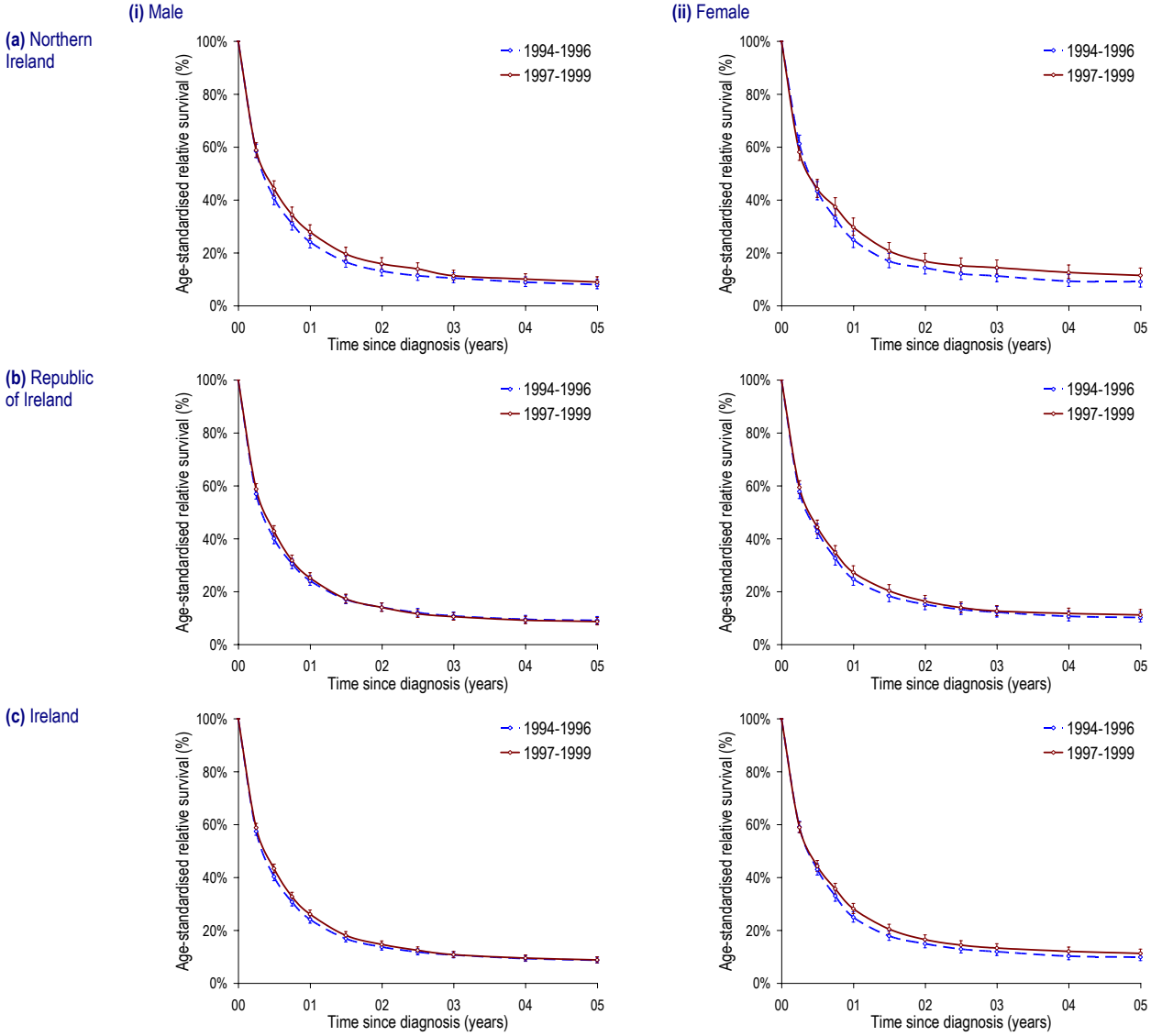
One-year (age-standardised) relative survival for all lung cancer patients diagnosed in Ireland in 1997-1999 was higher than for those diagnosed in 1994-1996 by 2.4% (p=0.039). This was driven by increases in survival for both male and female patients whose survival increased by 2.0% and 3.2% respectively although neither of the gender specific increases was statistically significant (p=0.186, p=0102). (Tab. 11.6, Fig. 11.12)

In Northern Ireland one-year (age-standardised) relative survival improved for all persons by 4.2% (p=0.036). In Republic of Ireland however there was no significant change for either sex or overall. Five-year (age-standardised) relative survival from lung cancer did not change between the two periods of time for either sex or country. (Tab. 11.6, Fig. 11.12)

Table 11.6: Age-standardised relative survival for lung cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	24.4% (22.6%, 26.4%)	28.6% (26.7%, 30.7%)	8.5% (7.2%, 10.0%)	10.0% (8.6%, 11.6%)
	Republic of Ireland	24.4% (23.0%, 25.9%)	26.0% (24.6%, 27.5%)	9.5% (8.5%, 10.7%)	9.7% (8.7%, 10.9%)
	Ireland	24.5% (23.3%, 25.6%)	26.9% (25.8%, 28.2%)	9.1% (8.3%, 10.1%)	9.9% (9.0%, 10.8%)
Male	Northern Ireland	24.2% (21.9%, 26.7%)	27.9% (25.5%, 30.7%)	8.0% (6.5%, 10.0%)	9.0% (7.4%, 11.0%)
	Republic of Ireland	24.2% (22.4%, 26.1%)	25.2% (23.4%, 27.2%)	9.1% (7.9%, 10.7%)	8.8% (7.5%, 10.3%)
	Ireland	24.2% (22.8%, 25.7%)	26.2% (24.7%, 27.7%)	8.7% (7.7%, 9.9%)	8.9% (7.8%, 10.0%)
Female	Northern Ireland	25.0% (22.1%, 28.3%)	29.8% (26.7%, 33.2%)	9.1% (7.2%, 11.7%)	11.5% (9.3%, 14.3%)
	Republic of Ireland	24.8% (22.4%, 27.4%)	27.3% (25.0%, 29.8%)	10.3% (8.5%, 12.3%)	11.2% (9.5%, 13.3%)
	Ireland	25.0% (23.1%, 27.0%)	28.2% (26.4%, 30.2%)	9.9% (8.6%, 11.5%)	11.3% (9.9%, 12.9%)

Figure 11.12: Age-standardised relative survival for lung cancer patients by sex, country and period of diagnosis: 1994-1999



11.3.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by cancer patients. For those diagnosed in 1997-1999 in Ireland, 6.6% of males and 8.4% of females survived five years. After five years there was no conclusive difference between Northern Ireland and Republic of Ireland, nor was there any change in five-year observed survival between 1994-1996 and 1997-1999. However one-year observed survival did improve in Northern Ireland between these two years for all persons by 3.4% (p=0.046). (Tab. 11.7)

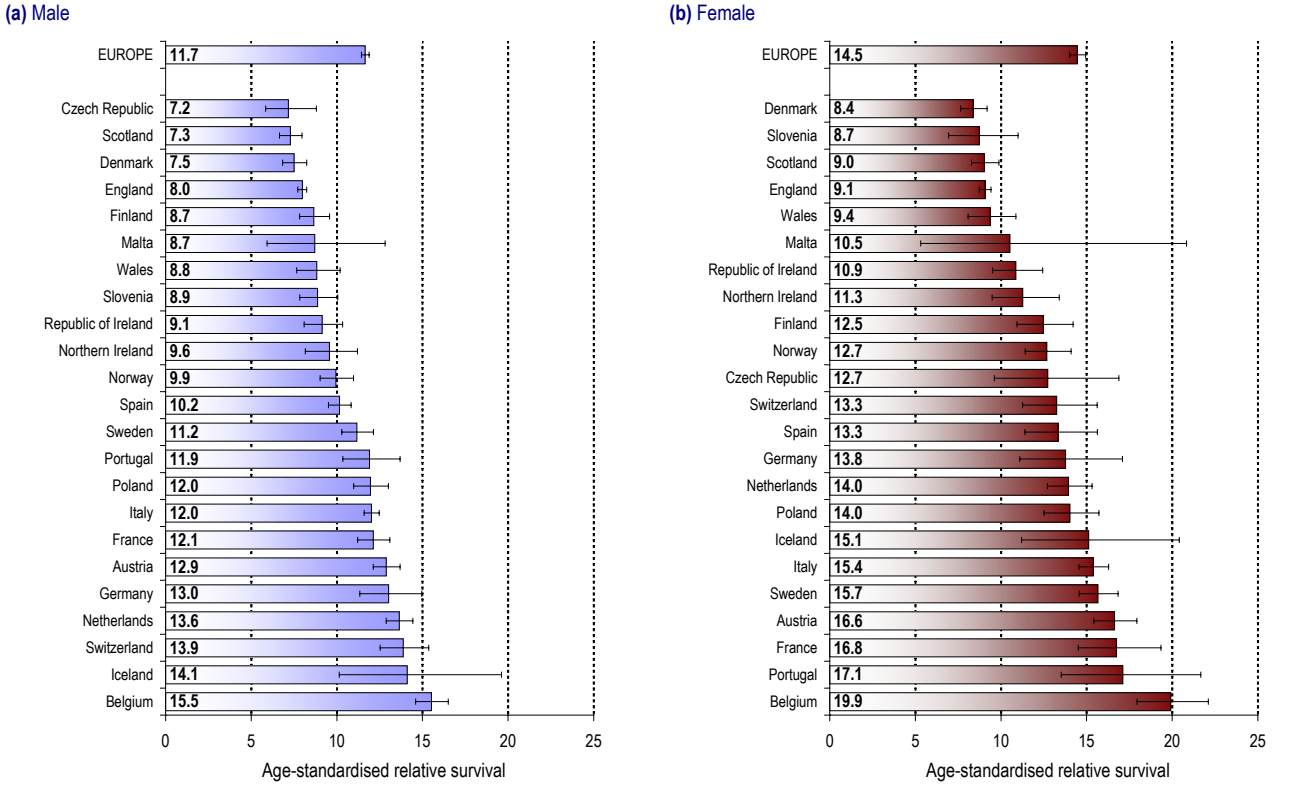
Table 11.7: Observed survival for lung cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	22.8% (21.2%, 24.5%)	26.2% (24.5%, 28.0%)	6.3% (5.4%, 7.3%)	7.7% (6.7%, 8.8%)
	Republic of Ireland	22.3% (21.1%, 23.6%)	23.3% (22.1%, 24.5%)	7.0% (6.3%, 7.8%)	7.0% (6.3%, 7.8%)
	Ireland	22.5% (21.5%, 23.5%)	24.3% (23.3%, 25.3%)	6.8% (6.2%, 7.4%)	7.2% (6.7%, 7.9%)
Male	Northern Ireland	22.1% (20.1%, 24.2%)	25.8% (23.7%, 28.1%)	5.5% (4.5%, 6.7%)	7.1% (6.0%, 8.6%)
	Republic of Ireland	22.2% (20.7%, 23.8%)	22.8% (21.3%, 24.4%)	6.5% (5.7%, 7.5%)	6.3% (5.4%, 7.2%)
	Ireland	22.1% (21.0%, 23.4%)	23.8% (22.6%, 25.1%)	6.2% (5.5%, 6.9%)	6.6% (5.9%, 7.4%)
Female	Northern Ireland	24.0% (21.4%, 27.0%)	26.9% (24.2%, 29.8%)	7.7% (6.2%, 9.7%)	8.5% (6.9%, 10.5%)
	Republic of Ireland	22.5% (20.4%, 24.7%)	24.1% (22.1%, 26.3%)	8.1% (6.8%, 9.6%)	8.2% (7.0%, 9.7%)
	Ireland	23.1% (21.4%, 24.8%)	25.1% (23.5%, 26.9%)	7.9% (6.9%, 9.1%)	8.4% (7.3%, 9.5%)

11.3.3: European comparisons

Survival from lung cancer for patients diagnosed in 1995-1999 in both Northern Ireland and Republic of Ireland was significantly below the European average for males and females. Compared to the UK survival was similar, although both Northern Ireland and Republic of Ireland had better male survival than Scotland and better female survival than England. (Fig. 11.13)

Figure 11.13: European comparisons of five-year age-standardised relative survival for lung cancer patients: 1995-1999

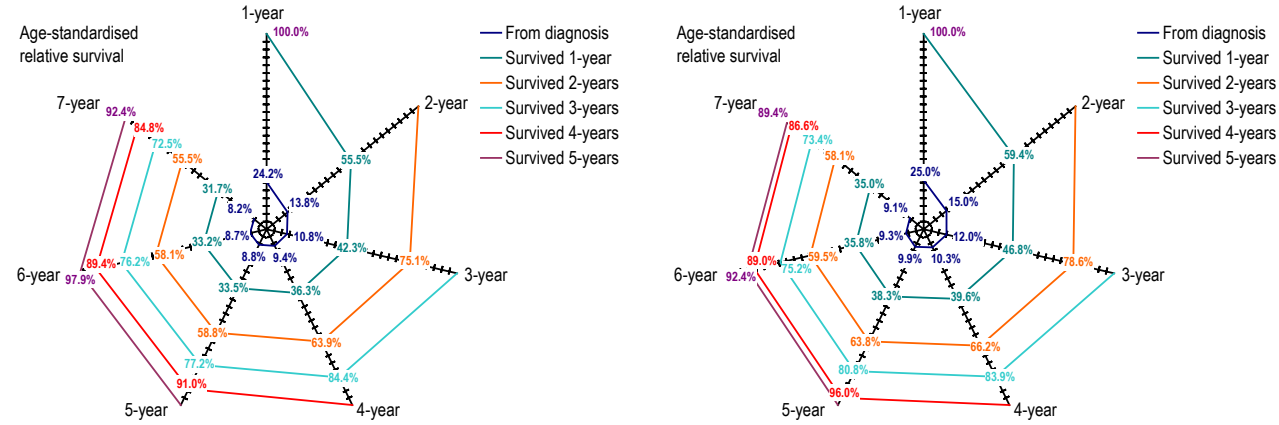


Source: EUROCARE-IV[82]

11.3.4: Conditional survival

Long-term survival from lung cancer in Ireland was very poor for patients diagnosed in 1994-1996, with seven-year (age-standardised) relative survival from diagnosis 8.2% for males and 9.1% for females. However, the longer a patient survived since their diagnosis the greater the long-term survival possibility. For example, of the male patients surviving two years (13.8%), 55.5% went on to survive a further five years, contrasted with 8.7% surviving five years from diagnosis. However despite these improvements no “cure” point for lung cancer was apparent with only 92.4% of males and 89.4% of females surviving a further two years after already surviving five years. (Fig. 11.14)

Figure 11.14: Conditional survival from lung cancer by sex: Overall relative survival for patients who have already survived a given amount of time: 1994-1996.

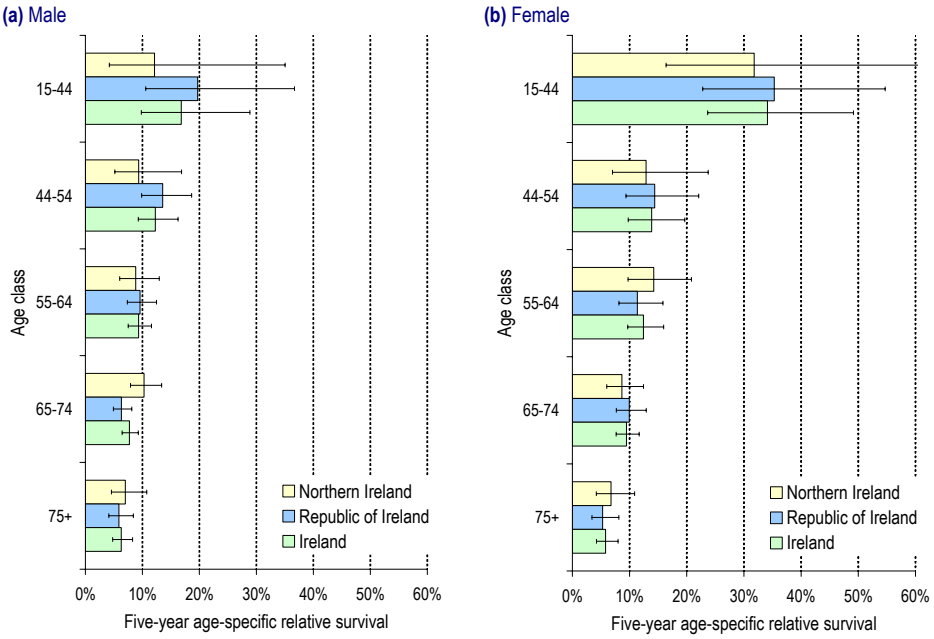


11.3.5: Factors influencing survival

Age

Survival varied by age for patients diagnosed with lung cancer in Ireland during 1997-1999 with age-specific relative survival dropping by 6.0% (p=0.023) for males between ages 45-54 and ages 75+ and by 8.1% (p=0.019) for females. These differences were also significant in Republic of Ireland but not in Northern Ireland where the number of cases was smaller. There were no conclusive differences in relative survival between males and females for any particular age class or between Northern Ireland and Republic of Ireland. (Fig. 11.15)

Figure 11.15: Five-year age-specific relative survival for lung cancer patients by sex and country: 1997-1999



Five-year (age-standardised) relative survival did not change significantly in Ireland between 1994-1996 and 1997-1999 for those either aged 15-64 or 65 and over. This was also evident in Northern Ireland and Republic of Ireland. (Tab. 11.8)

Table 11.8: Five-year age-standardised relative survival for lung cancer patients by country, age and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)			
	15-64		65+	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	12.3% (9.8%, 15.4%)	12.4% (9.9%, 15.7%)	5.7% (4.5%, 7.1%)	8.3% (6.9%, 9.9%)
Republic of Ireland	12.2% (10.2%, 14.5%)	14.1% (12.0%, 16.5%)	7.6% (6.6%, 8.8%)	6.6% (5.7%, 7.8%)
Ireland	12.2% (10.6%, 14.1%)	13.5% (11.8%, 15.4%)	6.9% (6.1%, 7.8%)	7.2% (6.4%, 8.1%)

Cell type

Five-year (age-standardised) relative survival from lung cancer varied by cell type for patients diagnosed in Ireland during 1997-1999 with survival from non-small cell lung cancer 8.1% higher than for small cell lung cancer (p<0.001). (Fig. 11.16)

Five-year (age-standardised) relative survival from non-small cell lung cancer was 4.1% higher in Northern Ireland than Republic of Ireland in 1997-1999 (p=0.036). While for other types of lung cancer relative survival was higher in Republic of Ireland, these differences were not significant. (Tab. 11.9)

There were no changes in five-year (age-standardised) relative survival for any lung cancer cell type between 1994-1996 and 1997-1999. (Tab. 11.9)

Figure 11.16: Age-standardised relative survival for lung cancer patients by cell type: 1997-1999

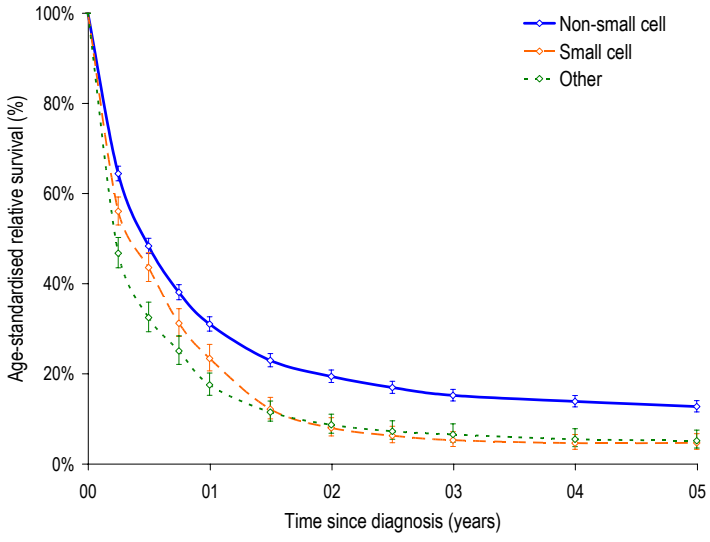


Table 11.9: Five-year age-standardised relative survival for lung cancer patients by cell type and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)					
	Non-small cell		Small cell		Other	
	1994-1996	1997-1999	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	13.1% (10.9%, 15.7%)	15.6% (13.4%, 18.3%)	4.4% (2.2%, 8.9%)	2.7% (1.2%, 6.1%)	5.2% (3.3%, 8.3%)	3.7% (2.5%, 5.4%)
Republic of Ireland	11.1% (9.8%, 12.7%)	11.5% (10.1%, 13.0%)	5.8% (3.9%, 8.8%)	5.6% (3.8%, 8.4%)	4.5% (3.3%, 6.1%)	8.4% (4.6%, 15.5%)
Ireland	11.7% (10.5%, 13.0%)	12.8% (11.6%, 14.1%)	5.4% (3.8%, 7.6%)	4.7% (3.3%, 6.7%)	5.5% (4.0%, 7.7%)	5.2% (3.6%, 7.5%)

Stage

Survival for lung cancer patients diagnosed in 1996 and 2001 was strongly dependent upon the stage at diagnosis with three-year (age-standardised) relative survival for patients diagnosed at stage I 42.7% higher (p<0.001) than those diagnosed at stage IV, whose three-year (age-standardised) relative survival was only 2.0%. A difference of this magnitude was observed in both Northern Ireland and Republic of Ireland. (Fig. 11.17, Tab. 11.10)

There was no significant difference in three-year (age-standardised) relative survival for any stage at diagnosis between Northern Ireland and Republic of Ireland. In particular survival of those with an unknown stage was similar in both countries and was closest to those diagnosed at stage III, with unstaged patients having significantly higher survival than those diagnosed at stage IV (NI: 5.8% difference, p=0.008; ROI: 6.7% difference, p<0.001). (Tab. 11.10)

Figure 11.17: Age-standardised relative survival for lung cancer patients by stage: 1996 & 2001

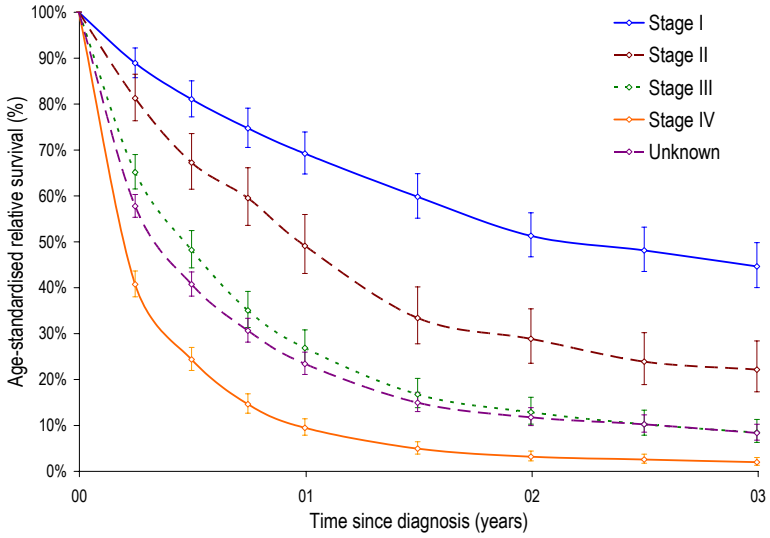


Table 11.10: Three-year age-standardised relative survival for lung cancer by stage and country: 1996 & 2001

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
Stage I	45.3% (37.8%, 54.4%)	43.8% (38.2%, 50.2%)	44.7% (40.0%, 49.8%)
Stage II	23.6% (15.8%, 35.4%)	21.9% (16.1%, 29.7%)	22.2% (17.3%, 28.4%)
Stage III	9.7% (5.6%, 16.9%)	8.0% (5.6%, 11.3%)	8.5% (6.3%, 11.3%)
Stage IV	2.0% (1.0%, 4.1%)	2.0% (1.2%, 3.3%)	2.0% (1.3%, 3.2%)
Unknown	7.8% (5.4%, 11.2%)	8.7% (6.8%, 11.2%)	8.4% (6.8%, 10.3%)

Treatment

Survival of groups of patients receiving treatment was a factor both of the selection of patients who receive the treatment, the reasons for the treatment (e.g. curative intent or pain relief) and the effectiveness of the treatment itself. For lung cancer patients diagnosed in Ireland in 1996 and 2001 those receiving any form of treatment had three-year (age-standardised) relative survival of 14.4% compared to 5.4% for those not receiving any tumour directed treatment, a significant difference of 9.0% (p<0.001). (Fig. 11.18, Tab. 11.11)

Those receiving surgery faired best with a 36.0% (p<0.001) improvement in three-year (age-standardised) relative survival compared to those not receiving surgery. Those selected for radiotherapy and chemotherapy however had lower long-term survival than those not receiving these treatments although short-term survival (up to 9 months for radiotherapy and 12 months for chemotherapy patients) was significantly higher. (Fig. 11.18, Tab. 11.11)

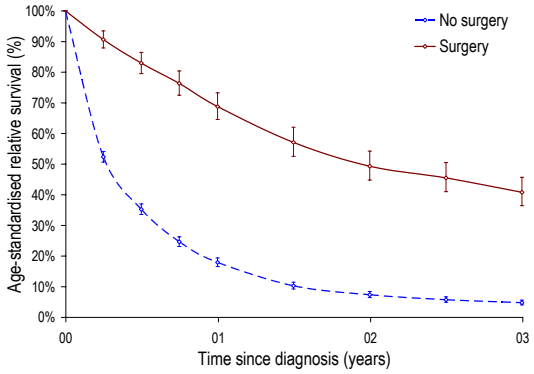
Table 11.11: Three-year age-standardised relative survival for lung cancer by treatment type: 1996 & 2001

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
No surgery	5.7% (4.3%, 7.7%)	4.5% (3.6%, 5.4%)	4.8% (4.1%, 5.6%)
Surgery	42.1% (34.4%, 51.4%)	40.0% (34.9%, 45.9%)	40.8% (36.4%, 45.7%)
No chemotherapy	12.7% (10.3%, 15.5%)	13.7% (12.0%, 15.5%)	13.3% (11.9%, 14.8%)
Chemotherapy	10.6% (6.3%, 18.1%)	3.9% (2.6%, 5.7%)	6.2% (4.3%, 9.0%)
No radiotherapy	14.0% (11.5%, 17.1%)	15.4% (13.5%, 17.5%)	14.8% (13.3%, 16.5%)
Radiotherapy	7.0% (4.9%, 10.1%)	5.5% (4.1%, 7.3%)	6.0% (4.8%, 7.5%)
No treatment*	7.6% (4.4%, 13.1%)	5.3% (3.8%, 7.4%)	5.4% (4.2%, 7.0%)
Treatment*	14.4% (11.8%, 17.5%)	14.3% (12.6%, 16.4%)	14.4% (12.9%, 16.0%)

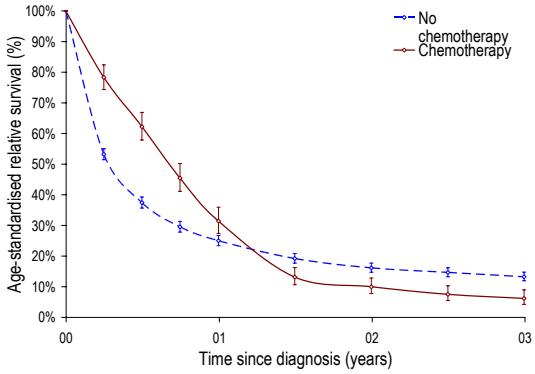
* Refers to tumour directed treatment only

Figure. 11.18: Age-standardised relative survival for lung cancer patients by treatment: 1996 & 2001

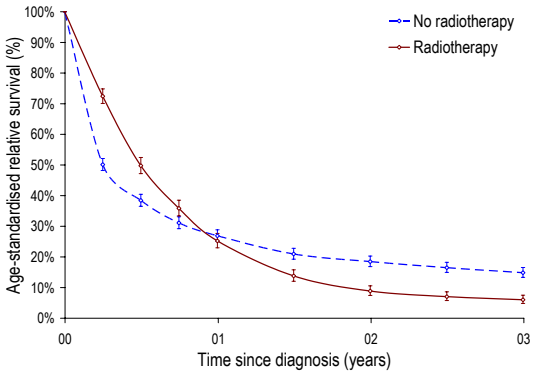
(a) Surgery



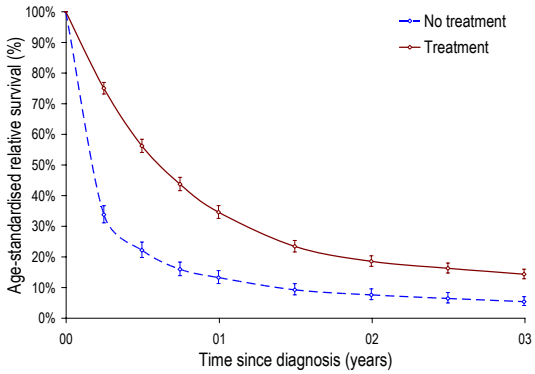
(b) Chemotherapy



(c) Radiotherapy



(d) Any tumour directed treatment



There was little difference in the survival experience of patients receiving any treatment, surgery or radiotherapy between Northern Ireland and Republic of Ireland. However, three-year (age-standardised) relative survival for patients receiving chemotherapy was higher in Northern Ireland by 6.7% (p=0.034). Additionally differences in survival between patients receiving and not receiving chemotherapy, which were significant in Ireland as a whole and Republic of Ireland were not significant in Northern Ireland. (Tab. 11.11)

Interaction between factors

The differences observed between the different factors in this section may in part be due to their relationship to other factors (e.g. differences in survival by cell type may be related to the stage at diagnosis). Modelling of excess mortality allows investigation of difference while adjusting for other possible factors. This process illustrates similar conclusions for most factors as those drawn from direct examination of survival rates. There was a strong relationship between excess mortality and age, stage at diagnosis and receipt of treatment, and a weaker but significant relationship with sex. Surprisingly cell type was not a factor, probably due to a relationship with stage at diagnosis. Adjusting for all these factors demonstrates that excess mortality was higher in Republic of Ireland than in Northern Ireland. (Tab. 11.12)

Table 11.12: Excess hazard ratios for lung cancer patients by patient and tumour characteristics: 1996 & 2001

	Excess hazard ratio		Excess hazard ratio
Male	1.00	**Microscopically verified**	1.00
Female	0.81 (0.72, 0.91)	**Clinical basis**	1.25 (0.64, 2.44)
		Unknown basis	1.07 (0.38, 2.98)
Age 15-44	1.00		
Age 45-54	2.67 (1.31, 5.46)	**No treatment**	1.00
Age 55-64	3.56 (1.82, 6.95)	**Treatment**	0.59 (0.51, 0.68)
Age 65-74	3.88 (2.00, 7.56)		
Age 75+	4.19 (2.14, 8.21)	**Diagnosed in 1996**	1.00
		Diagnosed in 2001	0.94 (0.84, 1.04)
Stage I	1.00		
Stage II	1.76 (1.34, 2.31)	**Northern Ireland**	1.00
Stage III	2.67 (2.13, 3.35)	**Republic of Ireland**	1.21 (1.07, 1.35)
Stage IV	4.06 (3.19, 5.16)		
Stage unknown	3.03 (2.45, 3.74)		
Non-small cell	1.00		
Small cell	0.90 (0.70, 1.15)		
Unspecified cell type	0.77 (0.40, 1.51)		

11.4: Mortality

Lung cancer was the leading cause of male cancer death in Ireland during 2000-2004 and the second largest cause of cancer death among women behind breast cancer, making up 24.4% of all male and 16.7% of all female cancer deaths. In total there were 2,340 deaths per year with the number of male deaths 62% higher than the number of female deaths. In the absence of other deaths males had a 4.4% risk of dying from lung cancer before the age of 75 compared to 2.3% for females. (Tab. 11.13)

Age-standardised rates (EASMRs) among males were twice those of females (p<0.001) in 2000-2004. For each sex the EASMRs did not differ significantly between Northern Ireland and Republic of Ireland, however the percentage difference was significantly higher than 0% for females indicating that female mortality was higher in Northern Ireland than Republic of Ireland during 2000-2004 (p=0.041). (Tab. 11.13)

Table 11.13: Summary statistics for deaths from lung cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	488	314	802	959	578	1,538	1,447	893	2,340
% of all cancer deaths (ex. NMSC)	26.0%	17.6%	21.9%	23.7%	16.3%	20.2%	24.4%	16.7%	20.8%
Rank (ex. NMSC)	1	1	1	1	2	1	1	2	1
Median age at death	72	72	72	71	73	72	71	73	72
Cumulative risk (Aged 0 to 74)	4.6%	2.4%	3.4%	4.3%	2.2%	3.2%	4.4%	2.3%	3.3%
Crude rate per 100,000 persons	58.9	36.2	47.3	49.3	29.4	39.3	52.2	31.5	41.7
EASMR ± 95% CI	58.6 ±2.3	29.0 ±1.5	41.4 ±1.3	55.9 ±1.6	27.0 ±1.0	39.8 ±0.9	56.8 ±1.3	27.7 ±0.8	40.3 ±0.7
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							4.9% ±5.2	7.2% ±6.9	3.9% ±4.1

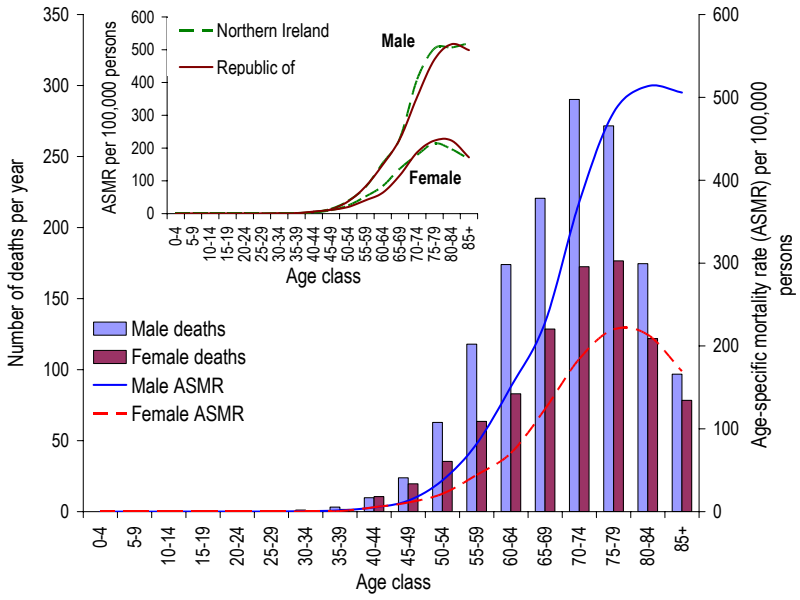
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

11.4.1: Age distribution

The number of deaths per year from lung cancer in Ireland in 2000-2004 peaked in the 70-74 age class for males and 75-79 age class for women with 290 and 177 deaths per year respectively. These totals represented 20.0% of male and 19.8% of female lung cancer deaths. (Fig. 11.19)

Age specific mortality rates (ASMR) climbed steadily to a maximum of 514 male deaths per 100,000 aged 80-84 and 220 female deaths per 100,000 aged 75-79 in 2000-2004. The age distribution was similar for both Northern Ireland and Republic of Ireland, although for Northern Ireland the maximum male ASMR age class was 85+. (Fig. 11.19)

Figure 11.19: Number of deaths per year from lung cancer by sex and age with age-specific mortality rate (ASMR) per 100,000 persons: 2000-2004

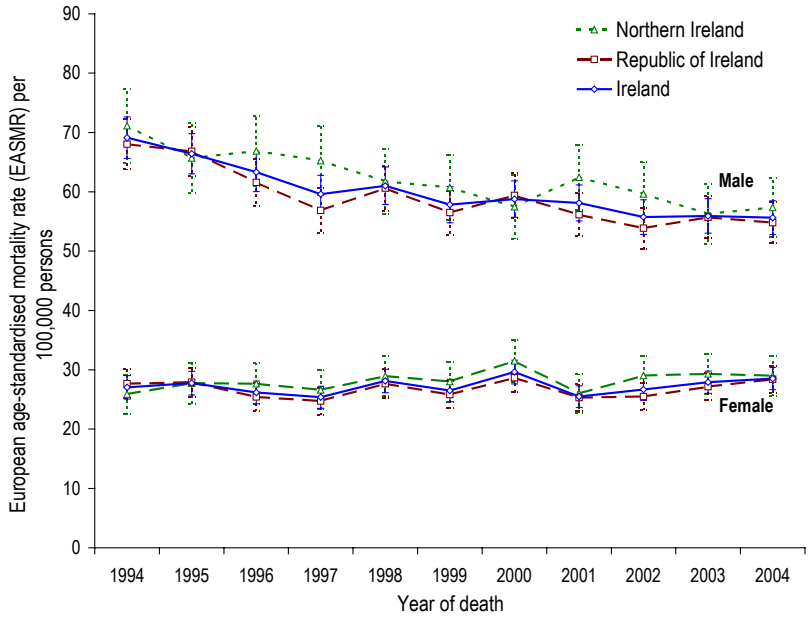


11.4.2: Trends

Between 1994 and 2004 lung cancer mortality rates in Ireland decreased for males with an annual percentage change of -4.5% (p=0.005) during 1994-1997 and a smaller but still significant decrease during 1997-2004 of -1.2% (p=0.004). This corresponded to lung cancer deaths falling by 6.0 deaths per year for males during the eleven-year period. For females there was no significant change in EASMRs during 1994-2004, however the number of deaths increased for females by 15.2 deaths each year as a result of demographic change. (Fig. 11.20)

Both Northern Ireland and Republic of Ireland demonstrated similar trends with decreases in male EASMRs and no significant change in female EASMRs. Neither country on its own demonstrated the change in trend in 1997 for male EASMRs with constant annual percentage changes of 2.0% (p<0.001) and 2.1% (p<0.001) respectively throughout the eleven-year period. Overall male deaths fell by 1.6 per year in Northern Ireland and 4.4 deaths per year in Republic of Ireland, while female deaths rose by 6.3 per year in Northern Ireland and 8.9 per year in Republic of Ireland. (Fig. 11.20)

Figure 11.20: Trends in European age-standardised mortality rates (EASMR) for lung cancer by sex and country: 1994-2004

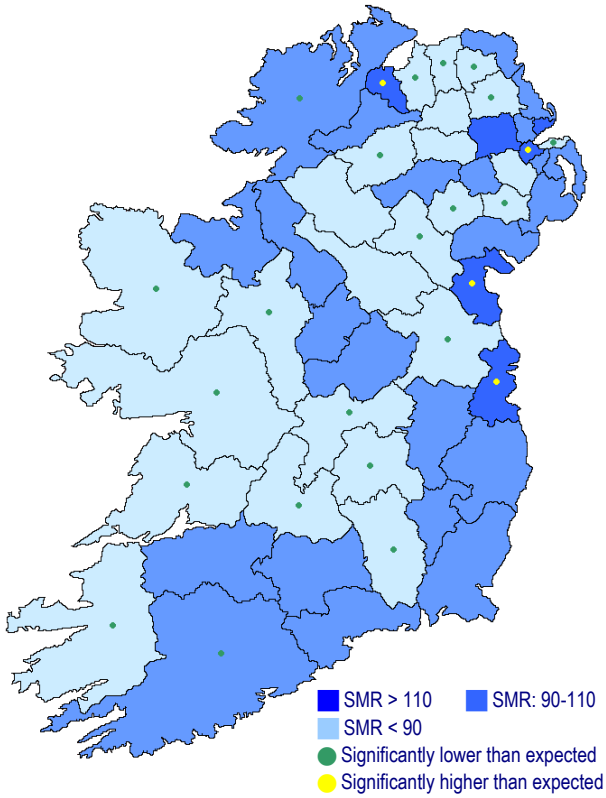


11.4.3: Geographic variations

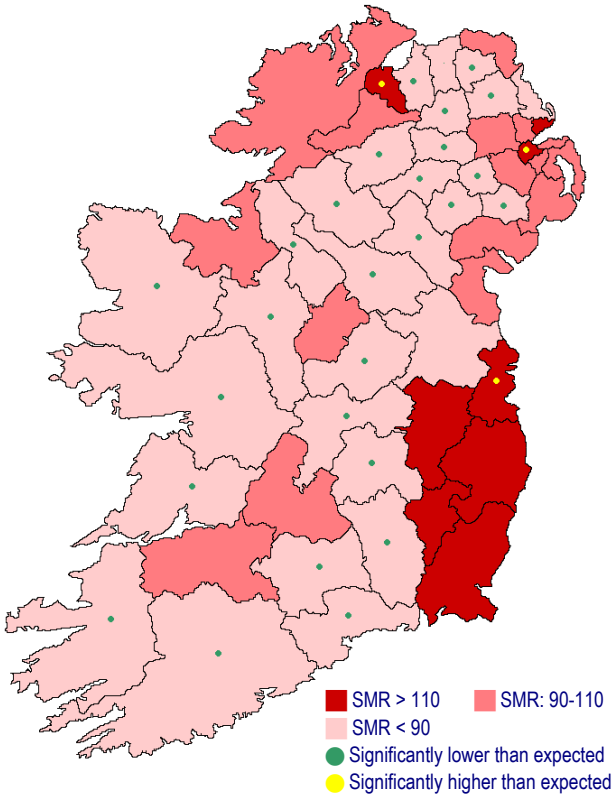
Mortality rates for lung cancer were similar to incidence rates and thus varied considerably by geographic area. For males the highest levels were in Belfast District Council with the lowest in County Roscommon. Overall four counties/councils had higher male mortality rates than Ireland as a whole; while 21 counties/councils were lower than average. Of the four higher than average geographic areas, three contained the major urban areas of Belfast, Dublin and Derry. Among females the counties/councils containing these areas were the only three areas with significantly higher lung cancer mortality rates. Of the 53 counties/councils 26 had female lung cancer mortality rates that were lower than for the whole of Ireland, with Ballymoney and Cookstown district councils having the lowest. (Fig. 11.21)

Figure 11.21: Significant differences in county/council standardised mortality ratios for lung cancer compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female



11.5: Prevalence

At the end of 2004 there were 3,223 people living in Ireland who had been diagnosed with lung cancer during 1994-2004, which was 11.6% of all lung cancers diagnosed during this period. Only 775 of these people were originally diagnosed in 1994-1999, 5.3% of those diagnosed during these years. (Tab. 11.14)

Table 11.14: Prevalence of lung cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

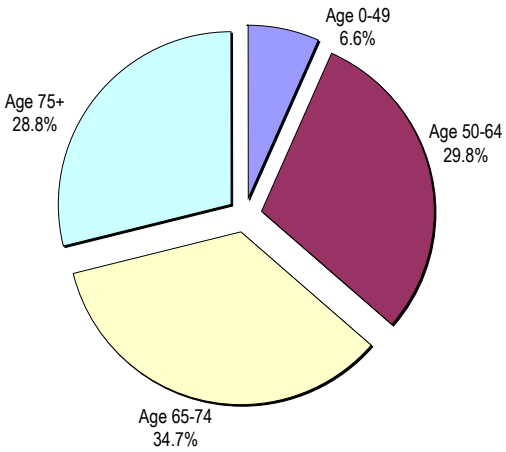
		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	638	10.5%	484	17.8%
	Female	468	12.6%	356	20.2%
	All persons	1,106	11.3%	840	18.8%
Republic of Ireland	Male	1,184	10.4%	885	16.8%
	Female	933	14.1%	723	21.8%
	All persons	2,117	11.8%	1,608	18.7%
Ireland	Male	1,822	10.5%	1,369	17.1%
	Female	1,401	13.5%	1,079	21.2%
	All persons	3,223	11.6%	2,448	18.7%

Among those diagnosed in 2000-2004 with lung cancer there were 2,448 people still alive at the end of 2004, only 18.7% of all those diagnosed since 2000. Of these 55.9% were male and 65.7% were resident in Republic of Ireland. (Tab. 11.14)

11.5.1: Age distribution

The median age for a member of the population living with lung cancer at the end of 2004 and diagnosed since 2000 was 69 years of age, with 34.7% aged 65-74. Only a small proportion of people living with the disease were aged under 50 (6.6%). (Fig. 11.22)

Figure 11.22: Prevalence of lung cancer in Ireland at the end of 2004 by age for patients diagnosed in 2000-2004

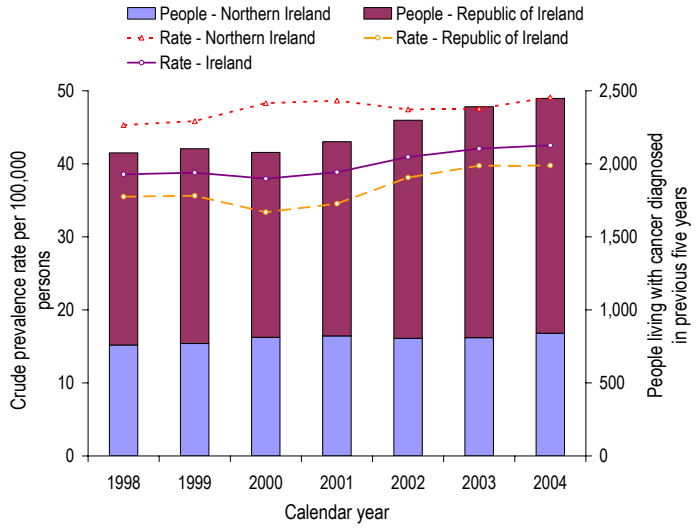


11.5.2: Trends

The number of people alive at the end of each year who have had a diagnosis of lung cancer within the previous five years increased between 1998 and 2004 by an average of 68 per year.

The majority of the increase occurred in Republic of Ireland where there was an increase of 57 people per year living with the disease compared to an annual increase of 11 in Northern Ireland. (Fig. 11.23)

Figure 11.23: Number of people (and crude rate per 100,000 persons) living with lung cancer at the end of each calendar year, who were diagnosed within the previous five-years by calendar year and country



The majority of this increase was likely due to increases in the population, particularly in Republic of Ireland. However crude rates also increased over the seven years by 1.9% each year (p=0.007). The increase in rates was slightly higher in Republic of Ireland than in Northern Ireland with significant increases of 2.5% (p=0.042) and 1.1% (p=0.047) per year. At the end of 2004 the number of living people with lung cancer diagnosed since 2000 per 100.000 people was 23.5% greater in Northern Ireland than Republic of Ireland. (Fig. 11.23)

11.6: Discussion

The lung was one the largest organ in the body and along with the trachea (windpipe) and bronchi (the air pipes connecting the windpipe to the lung) form the respiratory system that is used for breathing. Lung cancer is considered to be cancer of the trachea, bronchi and lung although cancer of the trachea and bronchi is rare. The most common symptoms of this cancer include frequent coughing, shortness of breath, coughing up phlegm with signs of blood in it, an ache or pain when breathing or coughing, loss of appetite, fatigue and weight loss.[83]

Cigarette smoking is implicated in more than 90% of lung cancer cases, with the length of time that a person has smoked being the most important factor.[84,85] The number of cigarettes smoked per day and the type of cigarette (e.g. filtered or low tar) are also secondary factors.[84] Breathing in second-hand cigarette smoke also increases the risk of developing lung cancer but not as much as first-hand smoking.[86] Other factors associated with lung cancer are exposure to asbestos, radon gas and industrial products such as arsenic, zinc, nickel, uranium, chromium and polycyclic hydrocarbons.[87] Past lung diseases that have caused scarring of the lung, such as tuberculosis, also increase the risk of getting lung cancer.[88]

Worldwide lung cancer is the most common cancer with trends and geographic patterns following the prevalence of smoking. It has increased rapidly since the beginning of the 20th century, prior to which it was a rare disease. It is higher worldwide in deprived areas due to the relationship between deprivation and tobacco use.[89] However mortality from the disease is now beginning to fall due to reduction in cigarette smoking. In Ireland these patterns are mostly present with the exception that mortality among females has yet to fall while female incidence rates are still climbing reflecting the increased use of cigarettes among young women since the 1980s.

Survival from the disease is very poor although it is higher for those who are diagnosed early. However this is difficult to achieve as symptoms usually present late and non-invasive diagnostic approaches (e.g. radiology) are not always conclusive. No effective population based screening processes thus exist resulting in a high percentage of patients diagnosed at a late stage.

Surgery is a potentially effective treatment for those who are diagnosed early, however only a small percentage of patients are suitable for this procedure. Radiotherapy and chemotherapy can be used as an alternative however despite short term benefits the toxic nature of these treatments only provides a survival advantage to a small number of patients while survival is shortened for others.

The best approach for combating lung cancer thus remains prevention, with eradication of smoking in the population having the greatest potential for reduction the risk of lung cancer. However enormous difficulties are involved in this task and it involves many organisations including Government, education and health.

Chapter 12:

Malignant melanoma (C43)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 292 male and 444 female cases diagnosed in Ireland each year.*
  - *Incidence rates increased each year during 1994-2004 by 4.0% among males and 2.4% among females.*
  - *Incidence rates were higher than the average for all Ireland during 1994-2004 for males and females in Dublin and Cork, for males in North Down and for females in Waterford and South Tipperary.*
  - *During 2000-2004 incidence rates for melanoma increased with increasing affluence.*
  - *Male incidence rates were low compared to the EU, USA, Canada and Australia. Among females incidence rates were higher than those in the UK, EU and Canada but were similar to those in USA.*
  - *During 2000-2004 there were 59 male and 60 female deaths from malignant melanoma in Ireland.*
  - *Among males mortality rates increased in Ireland during 1994-2000 by 5.2% per year while there was no significant change among females.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival for patients diagnosed in 2000-2004 was estimated to be 77.8% for males and 91.6% for females.*
  - *There was no change in survival for males or females between 1994-1996 and 1997-1999.*
  - *Northern Ireland had some of the highest survival rates in Europe for patients diagnosed in 1995-1999. Republic of Ireland had better female survival compared to Europe, but had average survival for males.*
  - *At the end of 2004 there were 5,443 people living in Ireland who had been diagnosed with malignant melanoma during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Male incidence rates were similar in both countries while female incidence rates were 10.7% lower in Northern Ireland compared to Republic of Ireland.*
  - *There was no significant variation in survival for males between the two countries; however female five-year (age-standardised) relative survival was 6.2% higher in Northern Ireland than Republic of Ireland.*
  - *Female mortality rates were 26.0% lower in Northern Ireland than Republic of Ireland; however there was no significant difference between the two countries for males.*
  - *At the end of 2004 the number of people living with the disease per 100,000 persons, having been diagnosed in 2000-2004, was 4.5% greater in Northern Ireland than Republic of Ireland.*

12.1: Incidence

During 2000-2004 there were on average 292 male and 444 female cases of malignant melanoma diagnosed in Ireland each year. It was the only cancer where female cases exceeded male cases by a considerable margin (excluding breast cancer and NMSC). It was the eleventh most common male and sixth most common female cancer contributing 2.7% and 4.2% of all cancer cases (excluding NMSC) respectively. (Tab. 12.1)

European age-standardised incidence rates (EASIR) were lower among males than females by 25.0% during 2000-2004 with the magnitude of this difference lower in Northern Ireland (18.7%) than Republic of Ireland (27.8%). Male EASIRs were however similar in both countries while female EASIRS were 10.7% lower in Northern Ireland compared to Republic of Ireland (p=0.012). The odds of developing the disease were similar in both countries with a 1 in 115 chance for males throughout Ireland developing the disease before the age of 75 and a 1 in 84 chance for females. (Tab. 12.1)

Table 12.1: Summary statistics for incidence of malignant melanoma: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	91	132	223	201	312	513	292	444	736
% of all cancer cases (ex. NMSC)	2.8%	3.8%	3.3%	2.6%	4.4%	3.5%	2.7%	4.2%	3.4%
Rank (ex. NMSC)	10	7	7	11	5	6	11	6	6
Median age at diagnosis	61	59	60	60	58	58	60	58	59
Cumulative risk (Aged 0 to 74)	0.9%	1.1%	1.0%	0.9%	1.2%	1.0%	0.9%	1.2%	1.0%
Crude rate per 100,000 persons	11.0	15.2	13.2	10.3	15.8	13.1	10.5	15.6	13.1
EASIR ± 95% CI	11.4 ±1.0	14.0 ±1.1	12.6 ±0.8	11.3 ±0.7	15.6 ±0.8	13.5 ±0.5	11.3 ±0.6	15.1 ±0.6	13.2 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							0.5% ±11.2	-10.7% ±8.4	-6.1% ±6.7

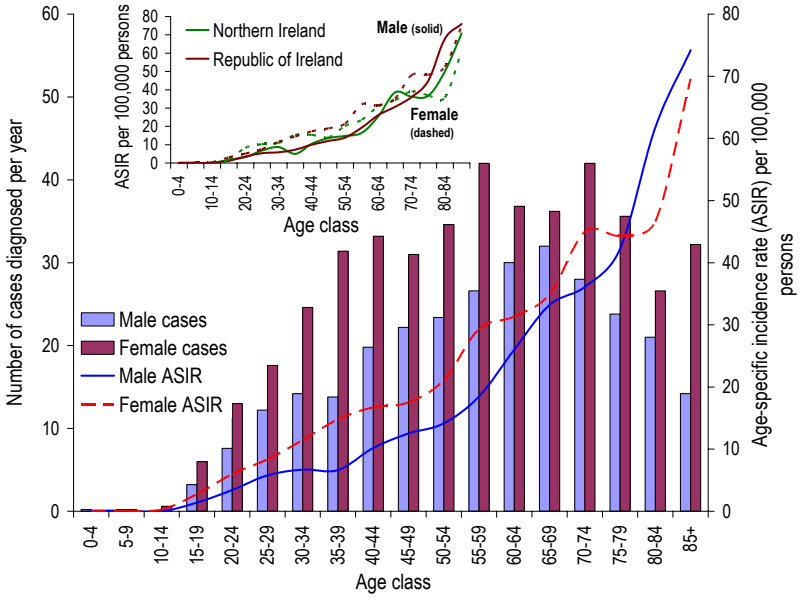
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

12.1.1: Age distribution

Cases of malignant melanoma were less clustered around elderly patients compared to most cancer sites, although the median age of diagnosis was 59 years. Diagnosis of this disease was on average earlier among females than males with cases highest in the 55-59 age class among females and in the 65-69 age class among males. (Fig. 12.1)

Despite the more even spread of cases by age, age specific incidence rates (ASIR) climbed steadily with age to a maximum of 74.2 cases per 100,000 males and 69.6 cases per 100,000 females in the 85 and over age class. Female ASIRs were higher than male ASIRs except for those aged 75 and over. (Fig. 12.1)

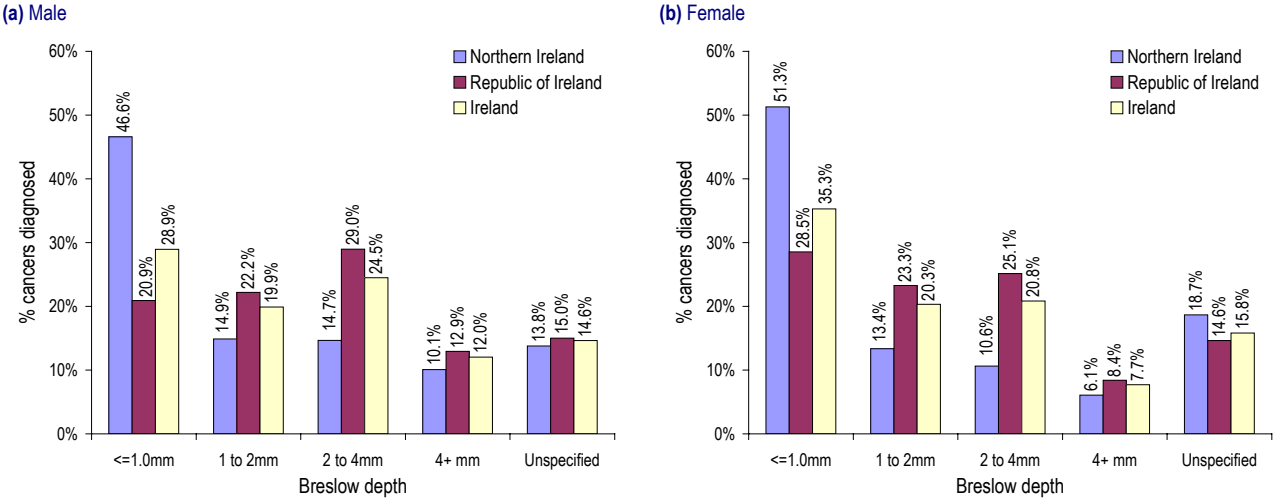
Figure 12.1: Number of cases of malignant melanoma diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



12.1.2: Breslow depth

Approximately one third of cases of malignant melanoma diagnosed during 2000-2004 had a Breslow depth of below 1mm. This proportion varied by gender with 28.9% of males and 35.3% of females diagnosed at this early stage. There was a large variation in the proportion of patients diagnosed at a low Breslow depth between Northern Ireland and Republic of Ireland with 46.6% of males and 51.3% of females diagnosed in Northern Ireland with a Breslow depth of below 1mm compared to 20.9% of males and 28.5% of

Figure 12.2: Breslow depth of malignant melanoma diagnosed in Ireland: 2000-2004



females in Republic of Ireland. However the proportion diagnosed at a later stage (>4mm) or with an unspecified Breslow depth was similar in both countries. (Fig. 12.2)

12.1.3: Trends

European age-standardised incidence rates (EASIR) for malignant melanoma in Ireland increased during 1994-2004 by an annual average of 4.0% (p=0.0001) among males and 2.4% (p=0.006) among females. This translated to an annual increase of 14.2 male and 15.6 female cases per year as a result of population change and increases in the proportion of older people. (Fig. 12.3, Tab. 12.2)

The upward trend in malignant melanoma was apparent in both Republic of Ireland and Northern Ireland for both males and females. Among males EASIRs increased by 3.5% (p=0.008) per year in Northern Ireland and by 4.3% (p<0.001) per year in

Figure 12.3: Trends in European age-standardised incidence rates (EASIR) for malignant melanoma by sex and country: 1994-2004

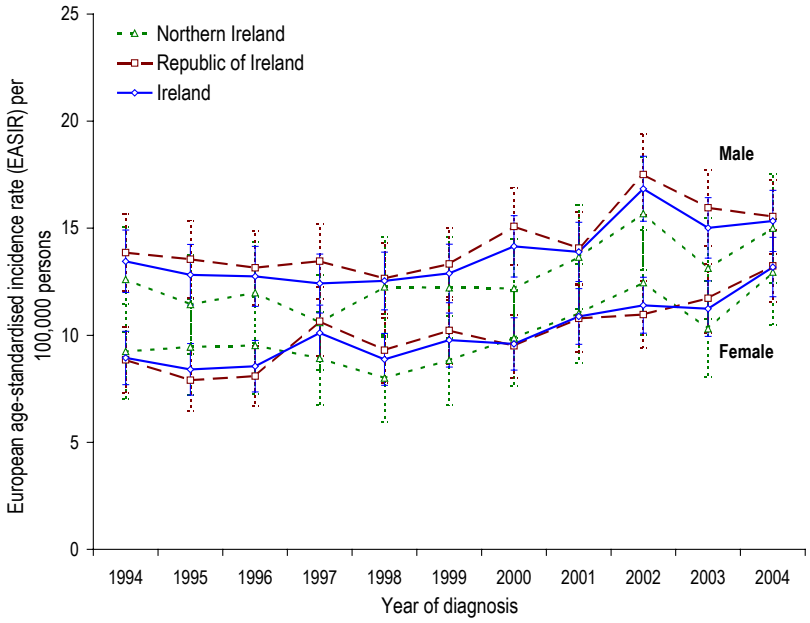
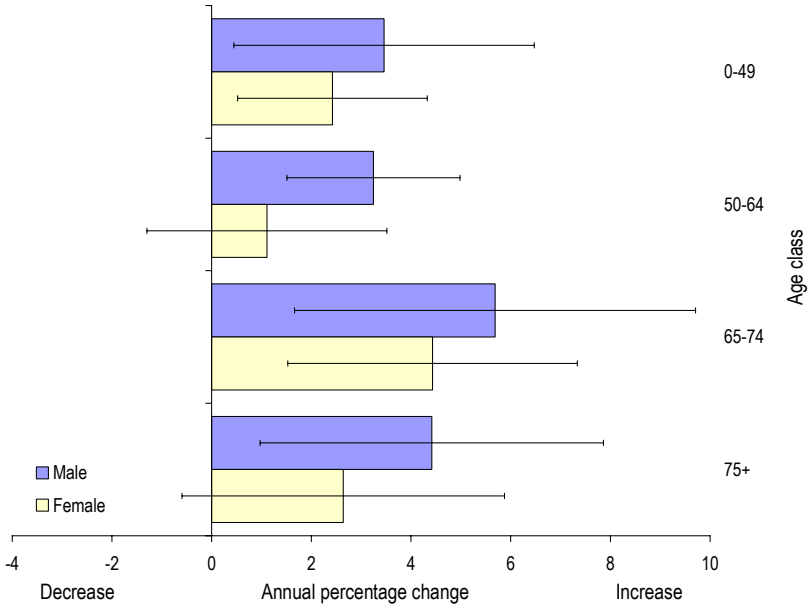


Table 12.2: Number of cases and European age-standardised incidence rates (EASIR) for malignant melanoma by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	68	9.2 ±2.2	135	8.9 ±1.5	203	8.9 ±1.2	110	12.6 ±2.4	240	13.9 ±1.8	350	13.5 ±1.5
1995	69	9.5 ±2.3	123	7.9 ±1.4	192	8.4 ±1.2	101	11.4 ±2.3	234	13.5 ±1.8	335	12.8 ±1.4
1996	70	9.5 ±2.3	129	8.1 ±1.4	199	8.6 ±1.2	105	12.0 ±2.4	232	13.2 ±1.7	337	12.8 ±1.4
1997	67	8.9 ±2.2	171	10.7 ±1.6	238	10.1 ±1.3	94	10.6 ±2.2	238	13.5 ±1.8	332	12.4 ±1.4
1998	61	8.0 ±2.0	150	9.3 ±1.5	211	8.9 ±1.2	117	12.3 ±2.3	238	12.7 ±1.7	355	12.5 ±1.3
1999	70	8.8 ±2.1	166	10.2 ±1.6	236	9.8 ±1.3	110	12.2 ±2.3	252	13.3 ±1.7	362	12.9 ±1.4
2000	76	9.9 ±2.2	164	9.5 ±1.5	240	9.6 ±1.2	113	12.2 ±2.3	282	15.1 ±1.8	395	14.2 ±1.4
2001	88	11.0 ±2.3	187	10.8 ±1.6	275	10.9 ±1.3	130	13.7 ±2.4	277	14.1 ±1.7	407	13.9 ±1.4
2002	101	12.5 ±2.4	197	11.0 ±1.5	298	11.4 ±1.3	146	15.7 ±2.6	350	17.5 ±1.9	496	16.8 ±1.5
2003	83	10.3 ±2.2	212	11.7 ±1.6	295	11.2 ±1.3	128	13.1 ±2.4	329	16.0 ±1.8	457	15.0 ±1.4
2004	109	13.0 ±2.5	245	13.2 ±1.7	354	13.2 ±1.4	142	15.0 ±2.5	321	15.5 ±1.7	463	15.3 ±1.4

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 12.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for malignant melanoma by sex and age: 1994-2004



Republic of Ireland. Among females EASIRs increased by 2.6% (p=0.010) per year in Northern Ireland and by 2.3% (p=0.011) per year in Republic of Ireland. The magnitude of the trends did not differ significantly in each country; however the change in EASIRs translated to an annual increase of 7.9 cases per year in Northern Ireland compared to 22.0 in Republic of Ireland. (Fig. 12.3, Tab. 12.2)

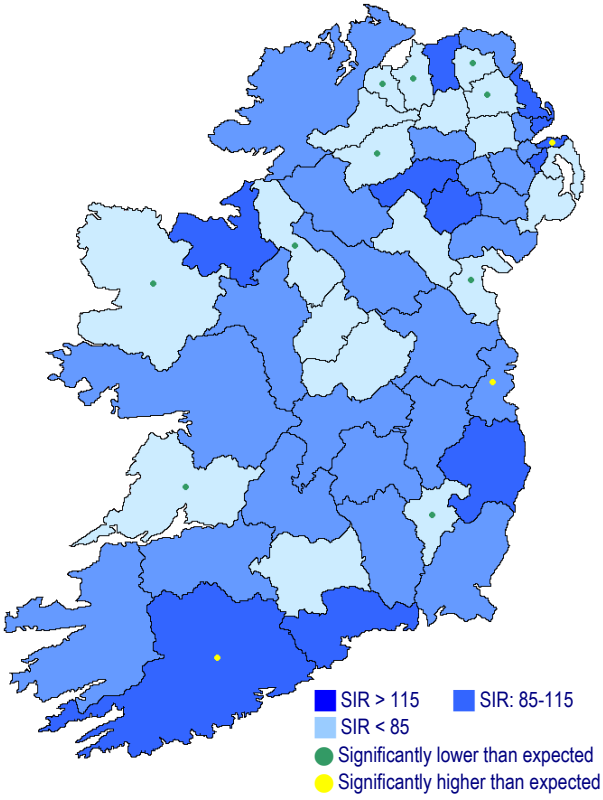
The increasing trends carried over to each age group for males and females although the increases for females aged 50-64 and 75 and over were not statistically significant. The largest increases were for males and females aged 65-74 with annual increases in EASIRs of 5.7% (p=0.01) for males and 4.4% (p=0.007) for females. (Fig. 12.4)

12.1.4: Geographic variations

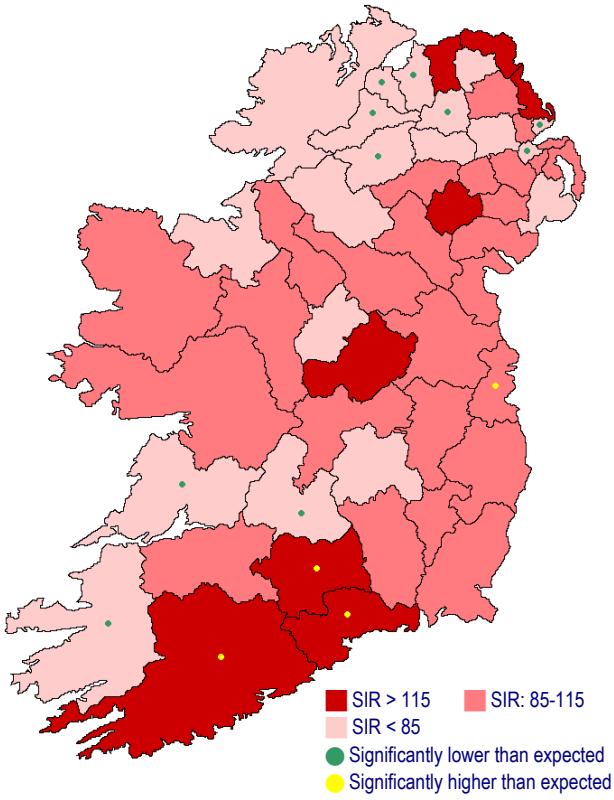
Incidence rates of malignant melanoma during 1994-2004 were significantly higher than the average for all Ireland for males and females in Dublin and Cork. They were also higher for males in North Down and for females in Waterford and South Tipperary. In Belfast there were 12 male and 19 female cases diagnosed on average each year compared to 51 male and 85 female cases annually in Dublin. Sixteen councils/counties had lower than average incidence of melanoma for either males or females. Among these four (Derry, Louth, Clare and Omagh) had significantly lower levels for both sexes. (Fig. 12.5)

Figure 12.5: Significant differences in county/council standardised incidence ratios for malignant melanoma compared to Ireland as a whole: 1994-2004

(a) Male



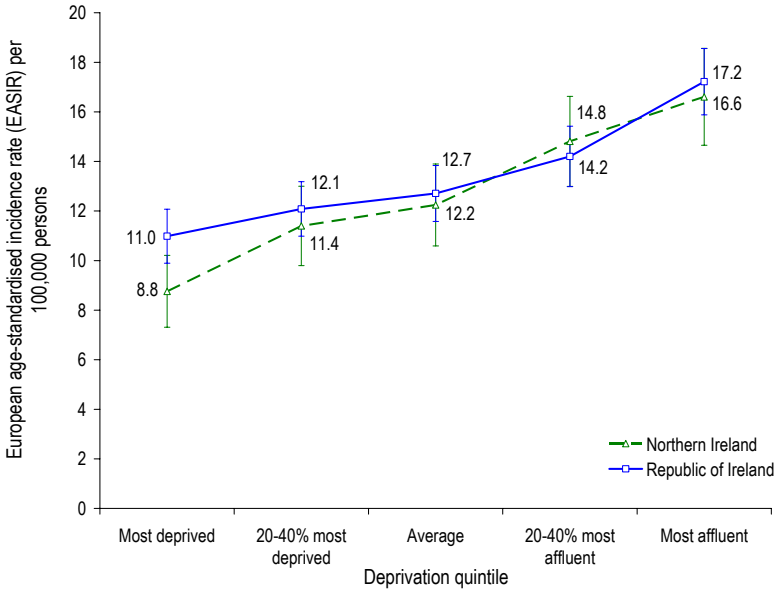
(b) Female



12.1.5: Socio-economic factors

In both Northern Ireland and Republic of Ireland incidence rates for melanoma increased with increasing affluence. European age-standardised rates (EASIR) were 47.3% lower among Northern Ireland's 20% most deprived population than among the 20% most affluent population. Similarly there was a 36.2% difference between EASIRs for the 20% of the population living in the most deprived areas compared to the most affluent areas in Republic of Ireland. EASIRs of melanoma among the 20% most deprived population of Northern Ireland were 20.3% lower than those in the 20% most deprived population of Republic of Ireland. (Fig.12.6)

Figure 12.6: European age-standardised incidence rates (EASIR) for malignant melanoma by country specific deprivation quintile: 2000-2004

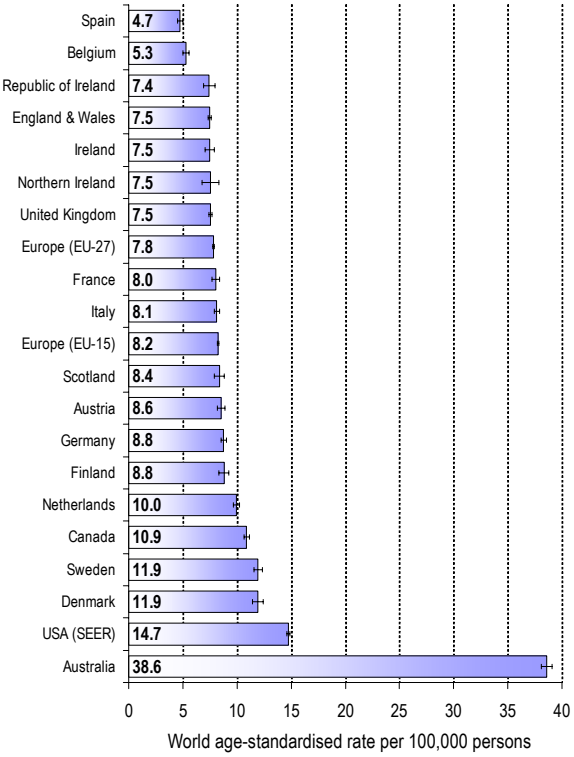


12.1.6: International comparisons

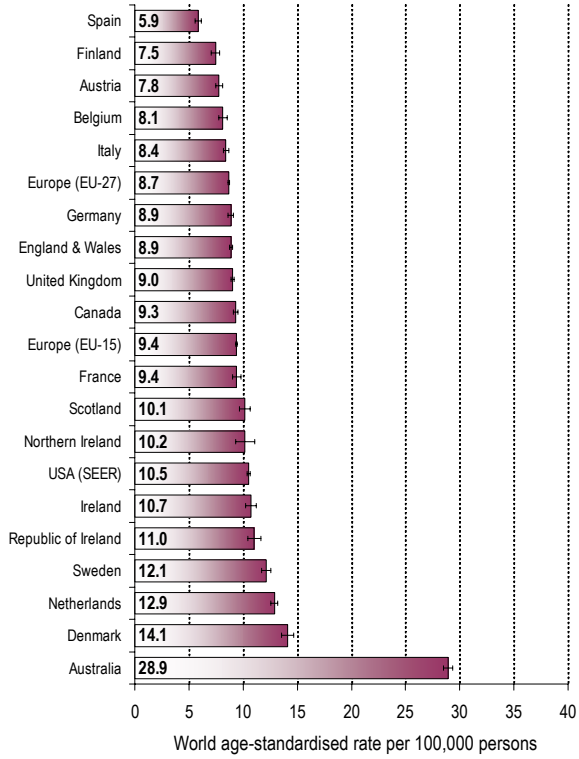
Among males incidence rates of malignant melanoma during 1998-2000 were low in Ireland compared to the European Union (15 countries), USA, Canada and Australia, which had extremely high incidence rates of the disease. Among females however incidence rates of melanoma were higher than those in the UK, European Union (15 countries) and Canada. They were however similar to those in USA. (Fig. 12.7)

Figure 12.7: International comparisons of world age-standardised incidence rates for malignant melanoma: 1998-2000

(a) Male



(b) Female



Source: IARC[90]

12.2: Survival

Relative survival (age-standardised) from malignant melanoma was excellent with an estimated 96.0% of patients diagnosed in 2000-2004 surviving one year and 86.3% surviving five years. (Fig. 12.8, Tab. 12.3)

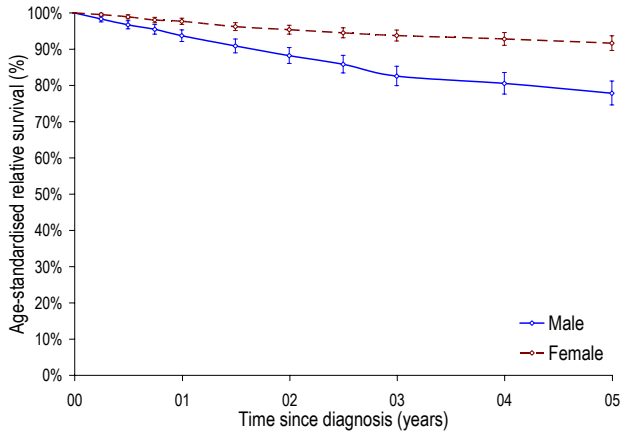
Table 12.3: Age-standardised relative survival for malignant melanoma patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	92.4% (89.4%, 95.4%)	97.8% (96.2%, 99.3%)	95.5% (93.9%, 97.1%)
	Republic of Ireland	94.3% (92.4%, 96.2%)	97.7% (96.7%, 98.7%)	96.3% (95.3%, 97.3%)
	Ireland	93.7% (92.1%, 95.3%)	97.7% (96.8%, 98.5%)	96.0% (95.2%, 96.9%)
5-year	Northern Ireland	80.9% (75.4%, 86.9%)	96.0% (92.6%, 99.5%)	89.8% (86.7%, 93.0%)
	Republic of Ireland	76.3% (72.4%, 80.4%)	89.7% (87.3%, 92.2%)	84.7% (82.5%, 86.9%)
	Ireland	77.8% (74.6%, 81.2%)	91.6% (89.7%, 93.7%)	86.3% (84.5%, 88.1%)

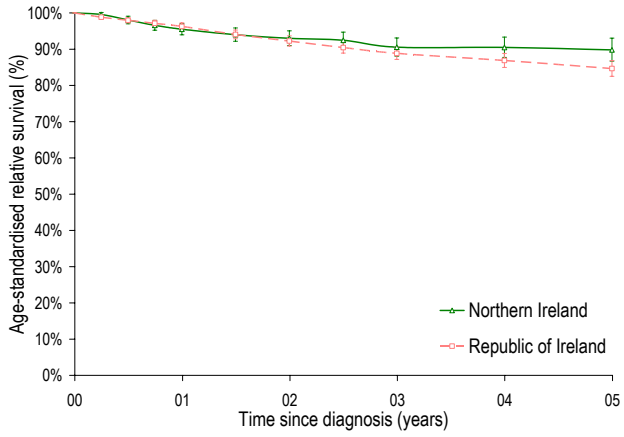
Survival varied by sex for patients diagnosed in 2000-2004 with five-year (age-standardised) relative survival 77.8% for males compared to 91.6% for females (p<0.001). Additionally, while there was no significant variation in survival for males between Northern Ireland and Republic of Ireland, five-year (age-standardised) relative survival for females with malignant melanoma was 6.2% (p=0.039) higher in Northern Ireland than Republic of Ireland. (Fig. 12.8, Tab. 12.3)

Figure 12.8: Age-standardised relative survival for malignant melanoma patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



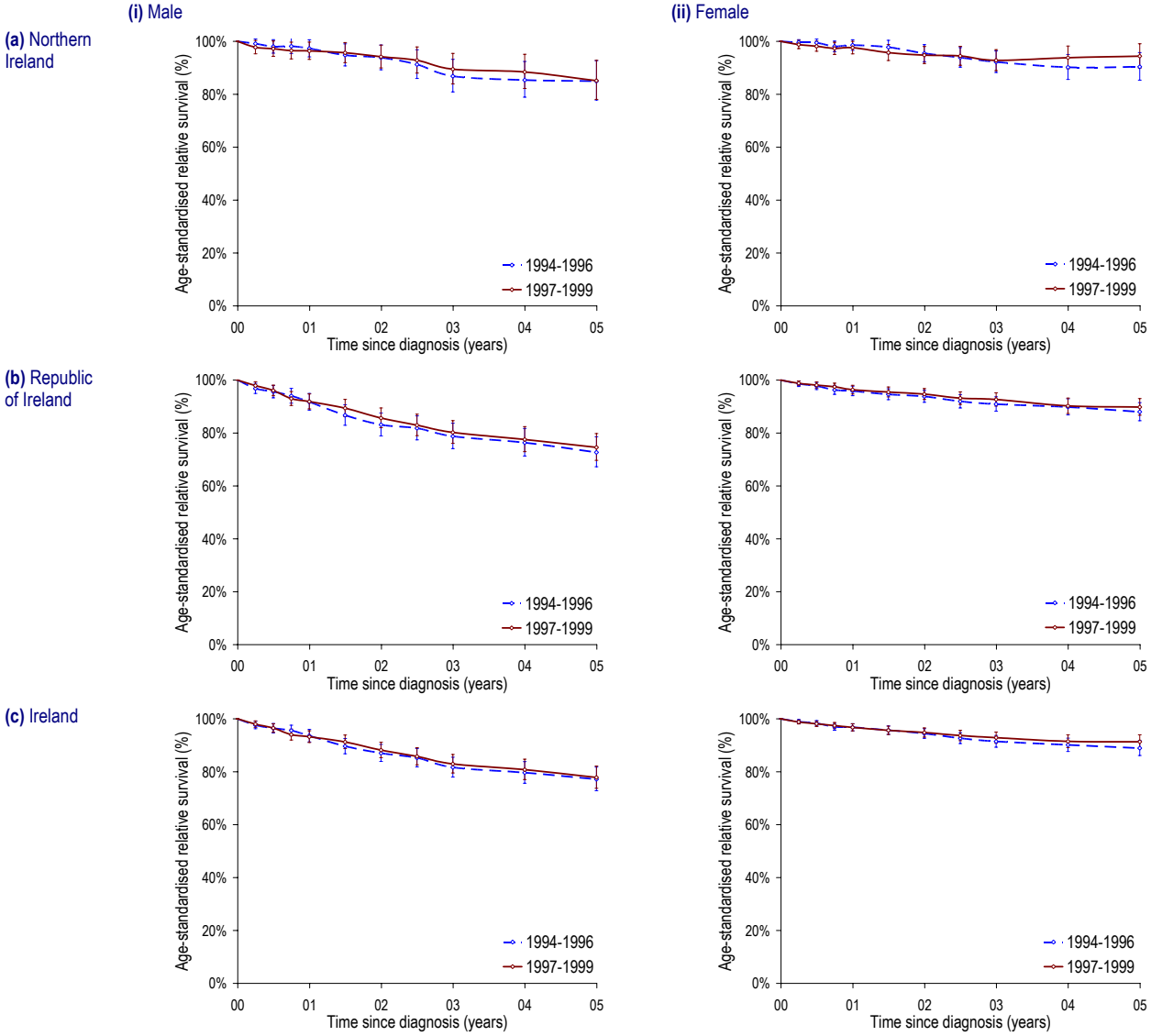
12.2.1: Changes in survival over time

There was no significant variation in one or five-year (age-standardised) relative survival for males or females between those diagnosed with malignant melanoma in 1994-1996 and 1997-1999. This was apparent in Northern Ireland and Republic of Ireland as well as Ireland as a whole. However the significant differences present in the estimates for female patients diagnosed in 2000-2004 between Northern Ireland and Republic of Ireland were not apparent in the actual values for five-year (age-standardised) relative survival for patients diagnosed in 1994-1996 and 1997-1999. (Fig. 12.9, Tab. 12.4)

Table 12.4: Age-standardised relative survival for malignant melanoma patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	98.0% (96.2%, 99.8%)	97.2% (95.4%, 99.2%)	88.5% (84.3%, 92.9%)	91.0% (87.1%, 95.2%)
	Republic of Ireland	94.4% (92.8%, 96.1%)	94.6% (93.1%, 96.1%)	82.6% (79.7%, 85.7%)	83.8% (81.1%, 86.7%)
	Ireland	95.6% (94.4%, 96.9%)	95.4% (94.2%, 96.6%)	84.7% (82.3%, 87.1%)	86.1% (83.8%, 88.4%)
Male	Northern Ireland	97.3% (94.1%, 100.6%)	96.4% (93.2%, 99.7%)	84.9% (77.8%, 92.7%)	85.1% (78.1%, 92.8%)
	Republic of Ireland	91.8% (88.7%, 95.0%)	91.9% (89.1%, 94.8%)	72.7% (67.2%, 78.6%)	74.6% (69.7%, 79.8%)
	Ireland	93.6% (91.3%, 96.0%)	93.2% (91.0%, 95.5%)	77.2% (72.8%, 81.8%)	77.8% (73.7%, 82.1%)
Female	Northern Ireland	98.6% (96.6%, 100.6%)	97.6% (95.3%, 100.0%)	90.4% (85.3%, 95.8%)	94.4% (89.9%, 99.1%)
	Republic of Ireland	95.9% (94.1%, 97.7%)	96.4% (94.8%, 98.0%)	88.0% (84.7%, 91.5%)	89.8% (86.7%, 93.0%)
	Ireland	96.8% (95.5%, 98.2%)	96.8% (95.4%, 98.1%)	88.9% (86.2%, 91.8%)	91.3% (88.8%, 94.0%)

Figure 12.9: Age-standardised relative survival for malignant melanoma patients by sex, country and period of diagnosis: 1994-1999



12.2.2: Observed survival

Observed survival includes causes of death other than melanoma and was considerably lower than age-standardised relative survival for patients diagnosed in 1997-1999, suggesting that almost as many patients died from causes unrelated to melanoma as from the disease itself. Five-year observed survival was 74.8% for patients diagnosed in 1997-1999, with a 14.5% (p<0.001) difference between male and females and a 6.4% (p=0.039) difference for all persons between Northern Ireland and Republic of Ireland. Observed survival did not change significantly between 1994-1996 and 1997-1999. (Tab. 12.5)

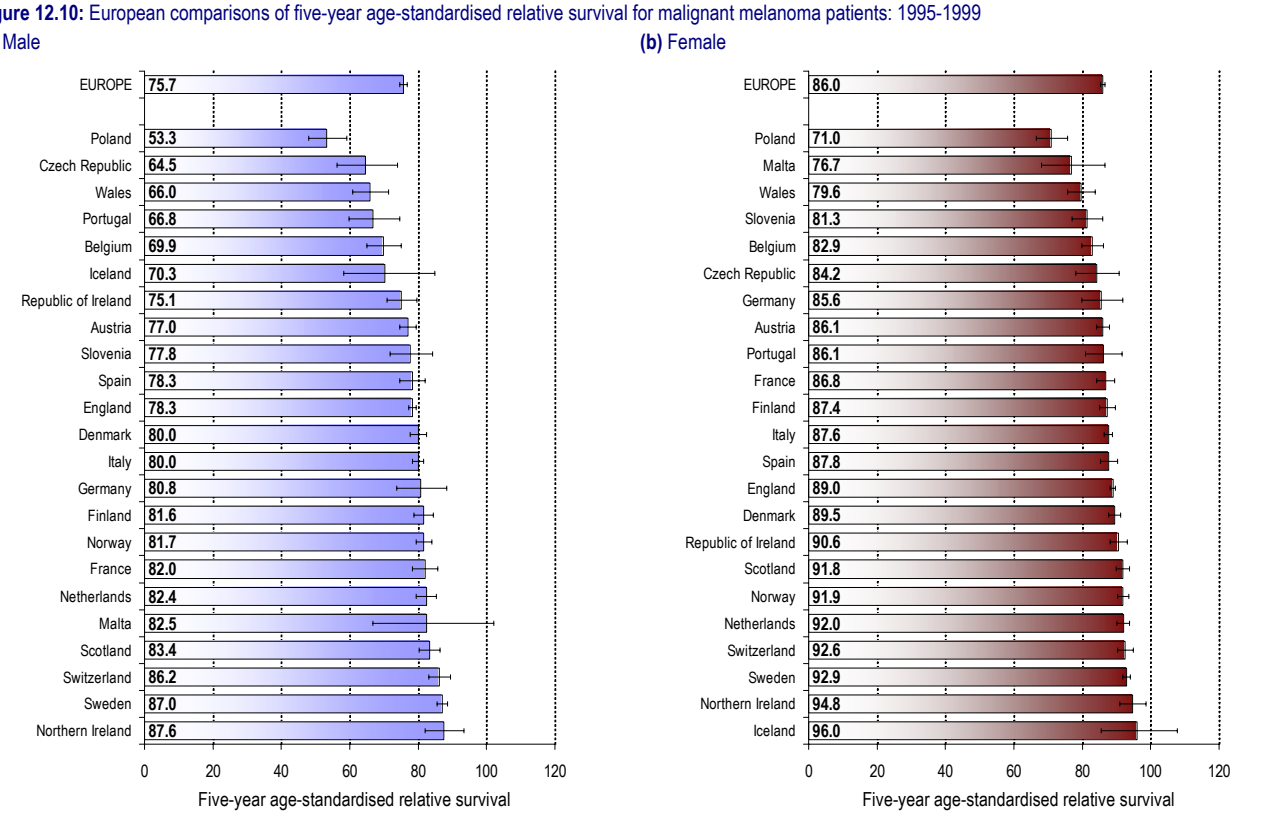
Table 12.5: Observed survival for malignant melanoma patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	95.9% (94.2%, 97.6%)	94.5% (92.5%, 96.5%)	79.4% (76.0%, 83.0%)	79.2% (75.8%, 82.9%)
	Republic of Ireland	91.9% (90.2%, 93.5%)	91.9% (90.3%, 93.4%)	71.6% (68.9%, 74.3%)	72.8% (70.4%, 75.4%)
	Ireland	93.2% (91.9%, 94.4%)	92.7% (91.4%, 93.9%)	74.1% (72.0%, 76.3%)	74.8% (72.7%, 76.9%)
Male	Northern Ireland	95.0% (92.1%, 98.1%)	92.6% (88.9%, 96.4%)	75.6% (69.9%, 81.8%)	71.4% (65.3%, 78.2%)
	Republic of Ireland	87.8% (84.5%, 91.1%)	88.9% (86.1%, 91.8%)	59.6% (54.8%, 64.7%)	63.6% (59.4%, 68.1%)
	Ireland	90.3% (87.9%, 92.7%)	89.9% (87.7%, 92.3%)	65.2% (61.4%, 69.2%)	65.9% (62.3%, 69.6%)
Female	Northern Ireland	96.4% (94.4%, 98.5%)	95.6% (93.3%, 97.9%)	81.9% (77.7%, 86.3%)	83.9% (80.0%, 88.1%)
	Republic of Ireland	94.1% (92.4%, 95.9%)	93.8% (92.1%, 95.6%)	78.1% (75.1%, 81.2%)	78.9% (75.9%, 81.9%)
	Ireland	94.8% (93.5%, 96.2%)	94.4% (93.0%, 95.8%)	79.3% (76.8%, 81.8%)	80.4% (78.0%, 82.9%)

12.2.3: European comparisons

In the recent EUROCARE-IV study comparing European-wide five-year (age-standardised) relative survival for patients diagnosed in 1995-1999, Northern Ireland had some of the highest survival rates for malignant melanoma in Europe, with rates significantly higher than the European average for males and females. Republic of Ireland also had better survival compared to Europe as a whole for females, however for males survival was average, being similar to that for all countries in Europe combined. (Tab. 12.10)

Figure 12.10: European comparisons of five-year age-standardised relative survival for malignant melanoma patients: 1995-1999



Source: EUROCARE-IV[91]

12.3: Mortality

During 2000-2004 there were 59 male and 60 female deaths from malignant melanoma in Ireland. It was the fifteenth most common male cause of cancer death contributing 1.0% of all male deaths from cancer (excluding NMSC), with a risk of dying from the disease before age 75 of 0.2%. Among females it was the eighteenth most common cause of death from cancer contributing 1.1% of all female deaths from cancer (excluding NMSC), with a risk of dying from the disease before age 75 of 0.1%. (Tab. 12.6)

European age-standardised mortality rates (EASMR) were 26.6% higher among males than females, with the male/female difference in Northern Ireland 65.1% and no significant difference between males and females in Republic of Ireland. During 2000-2004 female

Table 12.6: Summary statistics for deaths from malignant melanoma: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	20	16	36	40	43	83	59	60	119
% of all cancer deaths (ex. NMSC)	1.0%	0.9%	1.0%	1.0%	1.2%	1.1%	1.0%	1.1%	1.1%
Rank (ex. NMSC)	15	18	18	15	18	17	15	18	17
Median age at death	63	74	67	60.5	69	65	62	70	66
Cumulative risk (Aged 0 to 74)	0.2%	0.1%	0.1%	0.2%	0.1%	0.2%	0.2%	0.1%	0.2%
Crude rate per 100,000 persons	2.4	1.9	2.1	2.0	2.2	2.1	2.1	2.1	2.1
EASMR ± 95% CI	2.5 ±0.5	1.5 ±0.3	1.9 ±0.3	2.3 ±0.3	2.0 ±0.3	2.1 ±0.2	2.3 ±0.3	1.8 ±0.2	2.1 ±0.2
% difference (NI vs ROI) ± 95% CI							8.8% ±26.8	-26.0% ±20.0	-9.7% ±16.2

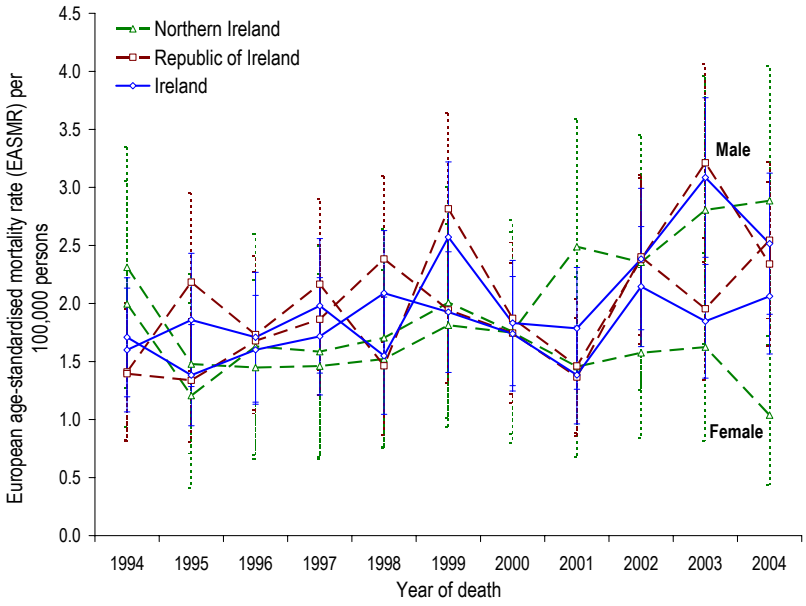
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

EASMRs were 26.0% lower in Northern Ireland than Republic of Ireland; however there was no significant difference between the two countries for males. (Tab. 12.6)

12.3.1: Trends

Among males European age-standardised mortality rates increased in Ireland during 1994-2000 by 5.2% (p=0.01) per year, which was equivalent to an annual increase of 3.4 deaths per year. While the annual percentage change in EASMRs in each country was positive, only the trend in Northern Ireland was significant with male EASMRs increasing by 6.7% (p=0.001) each year. (Fig. 12.11)

Figure 12.11: Trends in European age-standardised mortality rates (EASMR) for malignant melanoma by sex and country: 1994-2004



Among females EASMRs in Ireland did not change significantly during 1994-2004, equivalent to an increase of 2.3 deaths per year. This was also the case in Northern Ireland. However in Republic of Ireland EASMRs for females with malignant melanoma increased by 4.4% (p=0.038) per year. The absolute number of female deaths from the disease remained static in Northern Ireland over the eleven-year period, while in Republic of Ireland they increased by 2.5 deaths per year. (Tab. 12.11)

12.4: Prevalence

At the end of 2004 there were 5,443 people living in Ireland who had been diagnosed with malignant melanoma during 1994-2004, which was 77.4% of all malignant melanoma patients diagnosed during this period. The majority of these (3,190 people) were diagnosed in the 2000-2004 period, which was 86.7% of all those diagnosed within these five years. (Tab. 12.7)

Table 12.7: Prevalence of malignant melanoma in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	638	74.0%	377	82.5%
	Female	1,091	84.2%	601	91.2%
	All persons	1,729	80.1%	978	87.6%
Republic of Ireland	Male	1,299	69.1%	825	82.1%
	Female	2,415	80.7%	1,387	89.0%
	All persons	3,714	76.2%	2,212	86.3%
Ireland	Male	1,937	70.7%	1,202	82.2%
	Female	3,506	81.7%	1,988	89.6%
	All persons	5,443	77.4%	3,190	86.7%

The majority of those alive at the end of 2004 having been diagnosed within the previous five years were female (1,988 females compared to 1,202 males) while 978 survivors were resident in Northern Ireland compared to 2,212 in Republic of Ireland. At the end of 2004 the number of people living with malignant melanoma per 100,000 persons, having been diagnosed with the disease in the previous five years, was 4.5% greater in Northern Ireland than Republic of Ireland. (Tab. 12.7)

12.5: Discussion

Melanoma is a form of skin cancer, which usually presents as moles or lesions on the skin that can be seen to be changing size, shape or colour, are itchy or painful, or bleed or are inflammed.[92]

Exposure to ultra-violet radiation from sunshine or sunbeds is the principal risk factor associated with melanoma.[93] A reduction in the risk of developing this skin cancer can thus be achieved by spending time in the shade between 11am and 3pm, making sure you never burn, covering up with T shirt, hat and sunglasses and using factor 15+ sunscreen.[94] The use of sunbeds also causes malignant melanoma, with sunbed tans not providing any additional protection from sun exposure.[95] The level of risk of developing skin cancer through over exposure to the sun or sunbeds depends upon skin type, with those with fairer skin that sunburns easily being more at risk.[93] The number of moles on the skin also affects the risk of developing malignant melanoma, with the risk increasing as the number of moles increases.[94] A weakened immune system, some skin conditions (solar keratosis, xeroderma pigmentosum, Gorlin's syndrome) or severe burns and skin ulcers can also increase risk.[94]

Worldwide there are approximately 160,000 cases of malignant melanoma diagnosed each year, with geographic variations related to susceptibility to skin damage from UV exposure. This translates to higher incidence among Caucasian populations with 80% of cases occurring in developed countries. In Ireland incidence of the disease is increasing, possibly due to a combination of increases in foreign travel and sun bed use, but also as a result of improvements in diagnostic techniques and awareness of the disease. Prevention programmes thus have a significant role to play in combating the increases in this disease. These programmes exist in both countries and focus on educating the public on the dangers of sun exposure. While these have proven moderately successful many sections of the community retain misconceptions about safety in the sun and fail to take adequate precautions. Further effort in this area is thus required with parents and adolescents particularly in need of education as the skin damage which leads to melanoma in later life can result from UV exposure in the first 20 years of life.

Surgery is the primary treatment for the disease with survival usually excellent. However surgical treatment is related to the thickness of the tumour and whether or not it has metastasised. In the latter event survival can be much poorer although chemotherapy remains an option for advanced disease. Despite the high survival melanoma patients can still suffer from unpleasant side effects even if they are completely cured. This usually takes the form of disfigurement from surgery which in many cases is reduced by follow up plastic surgery, a stressful event for the patient.

Chapter 13:

Breast cancer (female only; C50)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *Most common female cancer diagnosed in Ireland during 2000-2004 with an average of 3,095 cases each year.*
  - *Incidence rates during 1994-1997 were static however from 1997 onwards they increased by 2.3% per year.*
  - *Incidence rates increased with increasing affluence during 2000-2004.*
  - *Dublin, North Down and Kildare had significantly higher incidence rates compared to Ireland as a whole.*
  - *Incidence rates during 1998-2000 were lower than in the EU (15 countries), UK, USA, Canada and Australia.*
  - *During 2000-2004 there were on average 947 deaths per year in Ireland.*
  - *Mortality rates decreased by 2.0% per year in Ireland between 1994 and 2004.*

- *TREATMENT*
  - *In 2001 surgery was the most common form of treatment received (86.1%), followed by radiotherapy (65.4%), hormone therapy (56.6%) and chemotherapy (46.4%). Only 4.0% of patients received no form of tumour directed treatment.*
  - *Compared to 1996 the use of surgery increased in Ireland by 3.4%, chemotherapy use increased by 16.0% and radiotherapy use increased by 14.8%, while hormone therapy use decreased by 11.4%.*
  - *Lower levels of treatment occurred in Ireland during 1996 and 2001 among those with another or unspecified cell type (compared to a ductal or lobular neoplasm), among those aged 75 and over (compared to aged 15-44) and those diagnosed at stage III, stage IV or unstaged (compared to stage I).*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival in 2000-2004 was estimated to be 77.6%.*
  - *Five-year (age-standardised) relative survival improved in Ireland by 3.7% between 1994-1996 and 1997-1999*
  - *Survival in Republic of Ireland in 1995-1999 was lower than in Europe while there was no difference for Northern Ireland.*
  - *Survival varied by age, cell type, stage at diagnosis and receipt of treatment. However variations in age and cell type were partially explained by their relationship to other factors, particular stage and receipt of treatment.*
  - *There were 21,874 people alive at the end of 2004 having been diagnosed with breast cancer during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were 3.5% lower in Northern Ireland than in Republic of Ireland during 2000-2004.*
  - *During 2001 5.6% more patients received radiotherapy and 28.8% more received hormone therapy in Northern Ireland than Republic of Ireland, while 11.2% more patients received chemotherapy in Republic of Ireland.*
  - *Having adjusted for age, stage and cell type there was no difference in receipt of treatment between the two counties.*
  - *Five-year (age-standardised) relative survival during 2000-2004 was similar in Northern Ireland and Republic of Ireland.*
  - *Between 1994-1996 and 1997-1999 five-year (age-standardised) relative survival in Republic of Ireland increased by 4.4%, while there was no significant improvement in Northern Ireland between the two periods.*
  - *For those aged 55-64 five-year relative survival during 1997-1999 was 8.1% higher in Northern Ireland.*
  - *There was no difference in excess mortality between Northern Ireland and Republic of Ireland during 1996 & 2001.*
  - *Mortality rates were 11.5% lower in Northern Ireland than Republic of Ireland during 2000-2004.*
  - *At the end of 2004 the number of people living with breast cancer diagnosed since 2000-2004 per 100,000 people was 9.8% greater in Northern Ireland than Republic of Ireland.*

13.1: Incidence

Breast cancer was the most common female cancer diagnosed in Ireland during 2000-2004 with an average of 3,095 cases each year. It made up 29.4% of all female cancers (excluding NMSC) with 109.1 cases diagnosed per year per 100,000 women of the population. The risk of developing the disease before the age of 75 was high at 8.7% which corresponds to a 1 in 12 chance of developing the disease. (Tab. 13.1)

Table 13.1: Summary statistics for incidence of female breast cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of cases per year	994	2,101	3,095
% of all cancer cases (ex. NMSC)	28.8%	29.8%	29.4%
Rank (ex. NMSC)	1	1	1
Median age at diagnosis	60	59	59
Cumulative risk (Aged 0 to 74)	8.4%	8.8%	8.7%
Crude rate per 100,000 persons	114.5	106.7	109.1
EASIR ± 95% CI	108.2 ±3.1	112.2 ±2.2	110.8 ±1.8
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-3.5% ±3.3

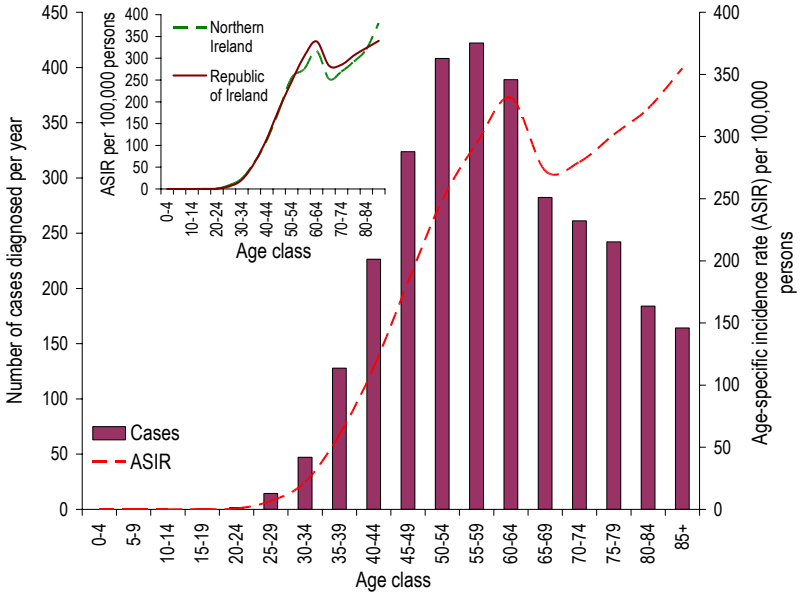
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

European age-standardised incidence rates (EASIR) were 3.5% (p=0.038) lower in Northern Ireland than in Republic of Ireland during the 2000-2004 period although the actual number of cases per 100,000 of the population was higher in Northern Ireland – a result of the higher proportion of older people in Northern Ireland. (Tab. 13.1)

13.1.1: Age distribution

Half of the females diagnosed with breast cancer in 2000-2004 were diagnosed with the disease before the age of 59 making the age distribution of patients slightly younger than for most cancers. The largest number of cases occurred in the 55-59 age class with 422 cases per year, 13.6% of all breast cancers diagnosed. (Fig. 13.1)

Figure 13.1: Number of cases of female breast cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

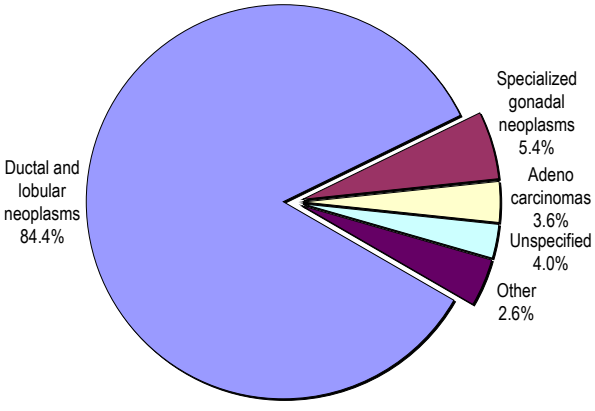


Age-specific incidence rates (ASIR) for breast cancer rose steadily with age until the 60-64 age class after which there was a decrease for the 65-69 year olds before climbing steadily again to a maximum of 354.9 cases per 100,000 females aged 85 and over. This pattern was apparent in both Northern Ireland and Republic of Ireland, although ASIRs for those aged 85 and over were higher in Northern Ireland. ASIRs for those aged 55 to 79 were higher in the Republic of Ireland with no major difference for those aged under 55. (Fig. 13.1)

13.1.2: Cell type

The majority (84.4%) of breast cancers diagnosed during 2000-2004 in Ireland were ductal and lobular neoplasms with a further 4.0% having an unspecified cell type. The distribution of breast cancers by cell type was similar in both countries with 5.2% unspecified in Northern Ireland compared to 3.4% unspecified in Republic of Ireland. (Fig. 13.2)

Figure 13.2: Types of female breast cancer diagnosed in Ireland: 2000-2004



13.1.3: Trends

Trends in European age-standardised incidence rates (EASIR) of breast cancer in Ireland during 1994-2004 were broken into two separate components. During 1994-1997 EASIRs were static with no significant change. From 1997 onwards however, EASIRs for breast cancer increased by 2.3% (p<0.001) per year. During 1994-2004 the combination of these trends and demographic change resulted in an average annual increase of 99 cases per year. (Fig. 13.3; Tab 13.2)

Both Northern Ireland and Republic of Ireland exhibited the increasing trends although unlike all of Ireland there was no significant change in the direction of the trend in 1998. (Fig. 13.3; Tab 13.2)

Figure 13.3: Trends in European age-standardised incidence rates (EASIR) for female breast cancer by country: 1994-2004

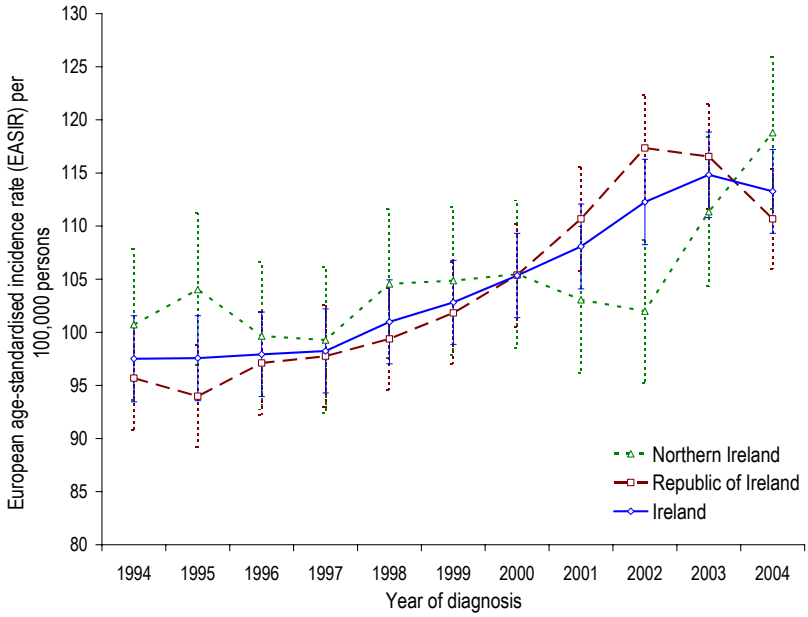
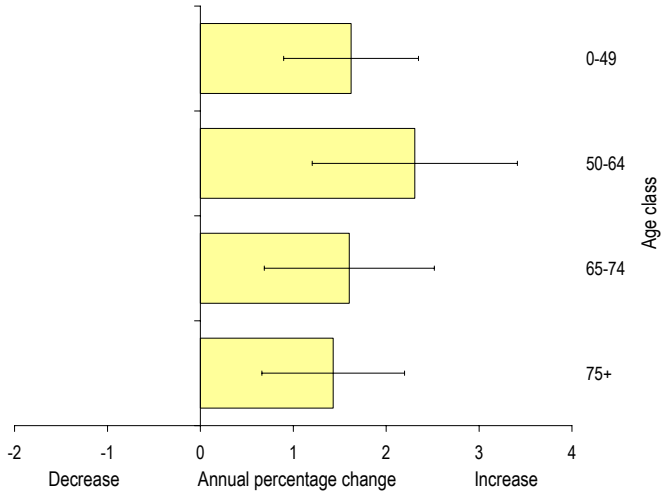


Table 13.2: Number of cases and European age-standardised incidence rates (EASIR) for female breast cancer by year of diagnosis and country: 1994-2004

	Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	833	100.7 ±7.1	1,535	95.7 ±4.9	2,368	97.5 ±4.1
1995	878	104.0 ±7.2	1,558	94.0 ±4.8	2,436	97.6 ±4.0
1996	848	99.7 ±7.0	1,629	97.1 ±4.9	2,477	97.9 ±4.0
1997	855	99.3 ±6.9	1,665	97.8 ±4.8	2,520	98.2 ±3.9
1998	910	104.6 ±7.0	1,739	99.4 ±4.8	2,649	101.0 ±4.0
1999	938	104.9 ±7.0	1,793	101.8 ±4.8	2,731	102.8 ±4.0
2000	942	105.5 ±7.0	1,904	105.4 ±4.8	2,846	105.3 ±4.0
2001	920	103.1 ±6.9	2,032	110.7 ±4.9	2,952	108.1 ±4.0
2002	946	102.0 ±6.7	2,179	117.3 ±5.0	3,125	112.3 ±4.0
2003	1,027	111.4 ±7.0	2,220	116.5 ±4.9	3,247	114.8 ±4.0
2004	1,133	118.8 ±7.2	2,172	110.7 ±4.7	3,305	113.3 ±3.9

EASIR: European age-standardised incidence rate with 95% CI

Figure 13.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for female breast cancer by sex and age: 1994-2004



In Northern Ireland EASIRs increased by 1.2% (p=0.010) each year while in Republic of Ireland the increase was 2.3% (p<0.001) per year. In terms of cases diagnosed this translated to annual increases of 23.2 cases per year in Northern Ireland and 76.2 cases per year in Republic of Ireland. (Fig. 13.3; Tab 13.2)

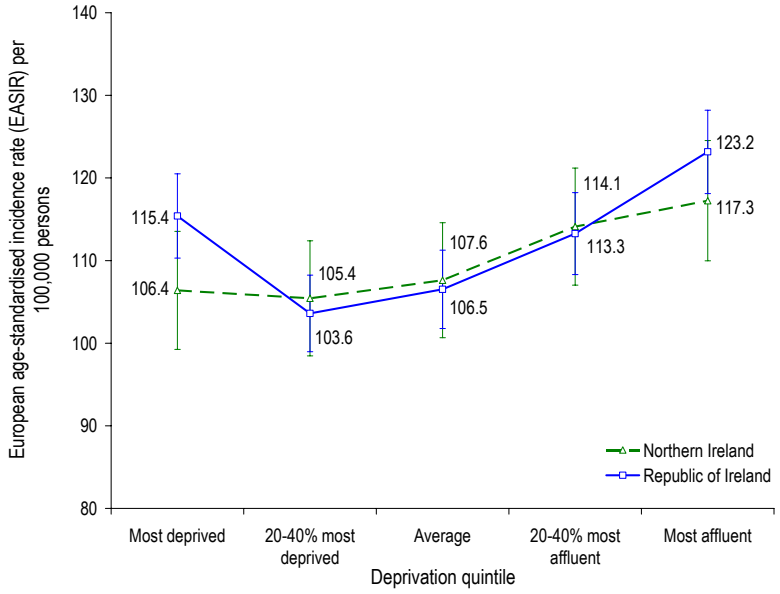
The increasing trend in Ireland was apparent for all age groups (0-49, 50-64, 65-74, 75+) during 1994-2004. The largest increase was among the 50-64 age group with an annual percentage change in EASIRs of 2.3% (p=0.001). The change from static to increasing rates noted for all persons was not observed for the separate age groups. (Fig.13.4)

13.1.4: Socio-economic variations

In Northern Ireland there was no significant difference between the EASIRs of the 20% of the population living in the most deprived areas and the 20% of the population living in the most affluent areas. However the general trend during 2000-2004 was one of increasing rates with increasing affluence with a 2.8% (p=0.024) increase between consecutive deprivation quintiles.

In Republic of Ireland EASIRs in the 20% of the population living in the most deprived areas were higher than the equivalent population in Northern Ireland (p=0.039). However there was a sharp decrease between this population and the 20-40% most deprived, after which EASIRs increased steadily with increasing affluence. EASIRs for the 20-40% most deprived population in Republic of Ireland were 15.9% (p<0.001) lower than those in the 20% most affluent population. (Fig. 13.5)

Figure 13.5: European age-standardised incidence rates (EASIR) for female breast cancer by country specific deprivation quintile: 2000-2004



13.1.5: Geographic variations

Dublin, North Down and Kildare all had significantly higher incidence of breast cancer compared to the incidence rates in Ireland as a whole. In particular Dublin was 9.9% higher than expected with an average of 586 cases per year. Ireland's other major urban area, Belfast, had levels of breast cancer than were similar to the average in Ireland with 166 cases per year. Galway, Lisburn, Mayo, South Tipperary, Ballymena, Clare, Cookstown and Donegal all had lower than expected levels of the disease. (Fig. 13.6)

Figure 13.6: Significant differences in county/council standardised incidence ratios for female breast cancer compared to Ireland as a whole: 1994-2004

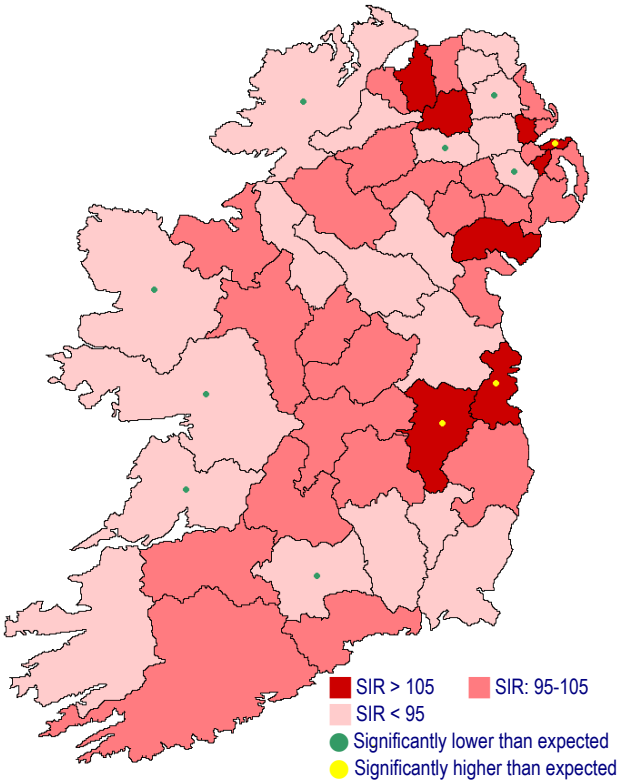
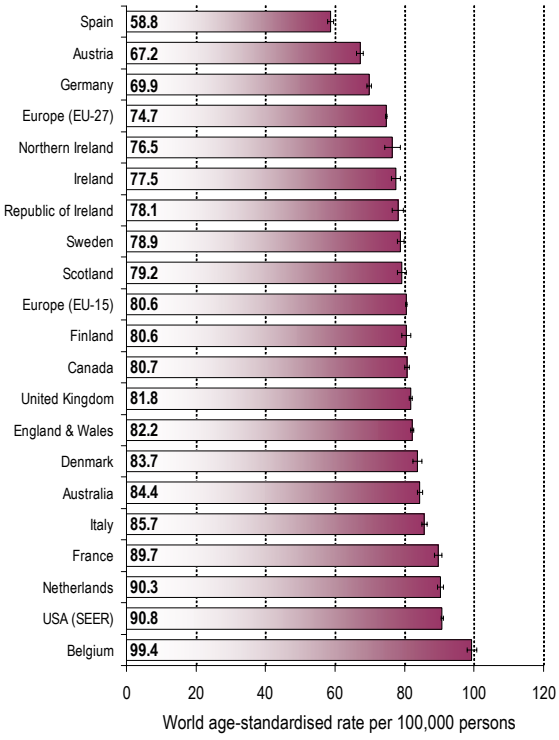


Figure 13.7: International comparisons of world age-standardised incidence rates for female breast cancer: 1998-2000



Source: IARC[96]

13.1.6: International comparisons

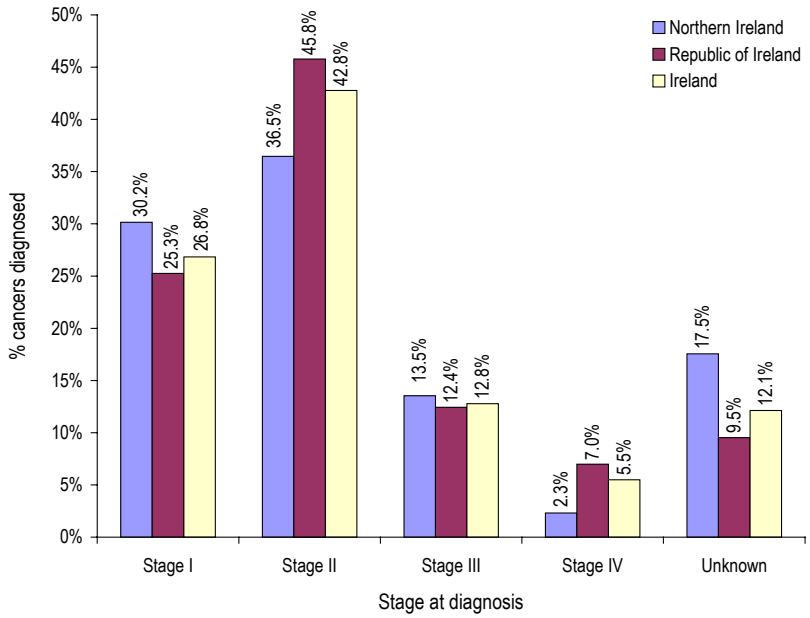
Incidence rates of breast cancer in Ireland during 1998-2000 were some of the lowest in Western Europe being 3.8% lower than in the European Union (15 countries) and 5.2% lower than in UK. They were also lower than rates in USA, Canada and Australia. However when newer members of the EU, which are mostly from Eastern Europe, were included incidence rates of breast cancer in Ireland were 3.6% higher than in the EU (27 countries). (Fig. 13.7)

13.2: Treatment

13.2.1: Stage at diagnosis

Staging of female breast cancer in 2000-2004 was very good with 87.9% of patients in Ireland assigned a stage at diagnosis. This was significantly higher than the 80.8% staged in 1997-1999 ($p<0.001$). The proportion of patients with an unknown stage was 8.0% higher in Northern Ireland than Republic of Ireland ($p<0.001$). (Fig. 13.8)

Figure 13.8: Stage at diagnosis for female breast cancer patients by country: 2000-2004



The overall distribution of stage among patients differed between the two countries, primarily as a result of the different number of patients with staging information ($\chi^2=620.2$, $p<0.001$), although excluding unstaged cases still resulted in different staging distributions ($\chi^2=285.2$, $p<0.001$). Only the proportion assigned to stage III in 2000-2004 was similar in each country (NI: 13.5%, ROI: 12.4%). (Fig. 13.8)

13.2.2: Treatment received

In 2001 there were 2,869 female patients aged 15-99 with a diagnosis of breast cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 2,423 patients diagnosed in 1996.

In 2001 surgery was the most common form of treatment received by female breast cancer patients in Ireland (86.1%), followed by radiotherapy (65.4%), hormone therapy (56.6%) and chemotherapy (46.4%). Only a small percentage of patients (4.0%) received no form of tumour directed treatment. (Fig. 13.9)

Compared to 1996 the use of surgery increased in Ireland by 3.4% ($p=0.001$), chemotherapy use increased by 16.0% ($p<0.001$) and radiotherapy use increased by 14.8% ($p<0.001$), while the proportion of patients treated by hormone therapy decreased by 11.4% ($p<0.001$). There was however no significant change in the proportion of patients receiving no form of tumour directed treatment. The increase in use of radiotherapy was observed in both Northern Ireland (12.2%) and Republic of Ireland (16.4%), as were the increase in the use of chemotherapy (NI: 14.8%; ROI: 16.0%), the increase in the use of surgery (NI: 5.4%; ROI: 2.5%) and the decrease in treatment using hormone therapy (NI: 5.7%; ROI: 13.1%). (Fig. 13.9)

Figure. 13.9: Tumour directed treatment received by female breast cancer patients by year of diagnosis and country: 1996 & 2001

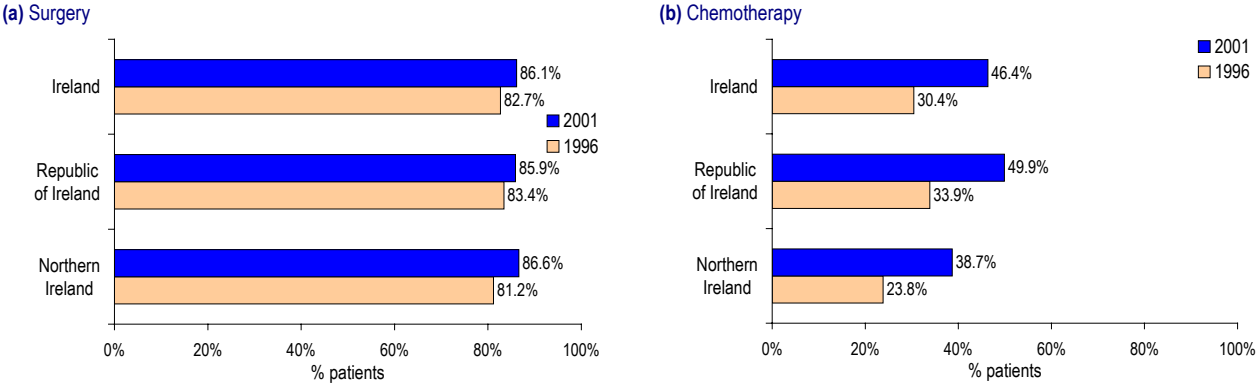
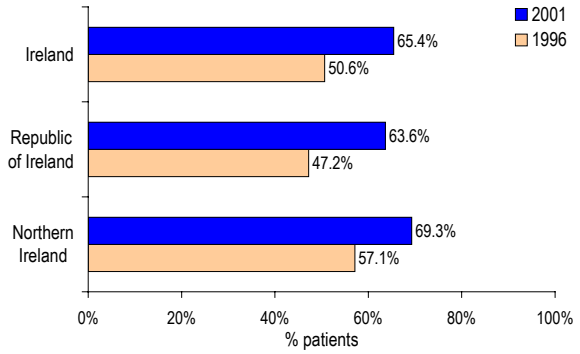
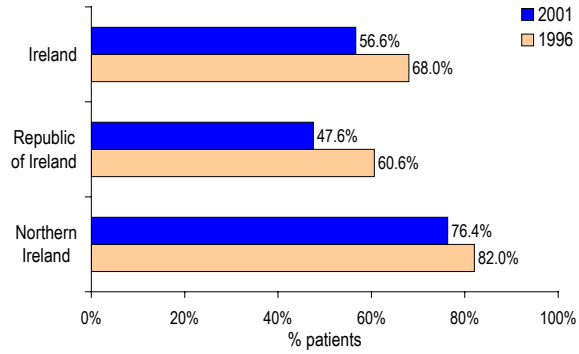


Figure 13.9 cont….

(c) Radiotherapy

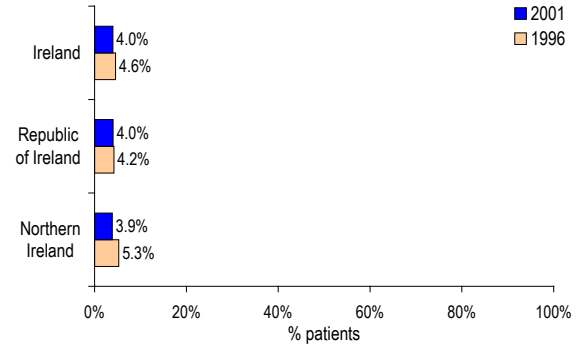


(d) Hormone therapy



During 2001 the proportion of patients receiving each treatment type except surgery differed significantly in Northern Ireland and Republic of Ireland; with 5.7% (p=0.003) more patients receiving radiotherapy and 28.8% (p<0.001) more receiving hormone therapy in Northern Ireland, while 11.2% (p<0.001) more patients received chemotherapy in Republic of Ireland. The percentage of patients receiving no tumour directed treatment was similar in both countries. (Fig. 13.9)

(e) No tumour directed treatment



Treatment combinations

In Ireland as a whole 82.9% of female breast cancer patients diagnosed in 2001 received more than one type of treatment. This was higher than the 79.2% of patients diagnosed in 1996 (p=0.001). Between 1996 and 2001 the use of surgery and hormone therapy together decreased by 9.7% (p<0.001) while the use of surgery, chemotherapy and radiotherapy together increased by 11.4% (p<0.001). Use of all four types of treatment in combination increased by 5.8% between the two years (p<0.001). (Tab. 13.3)

The favoured treatment combinations in Northern Ireland during 2001 were surgery, radiotherapy and hormone therapy together (31.2%) or all four types of treatment together (22.7%). In Republic of Ireland, while these combinations were also used frequently (13.8% and 14.0% respectively), the combination of surgery, chemotherapy and radiotherapy was more common (23.1%). The differences between the two countries in the proportions of patients receiving these combinations were statistically significant (p<0.001). Overall the distribution of treatment combinations differed between the two countries (χ^2=417.1, p<0.001). (Tab. 13.3)

Table 13.3: Tumour directed treatment received by female breast cancer patients by country and year of diagnosis: 1996 & 2001

	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	7.4%	4.1%	8.3%	6.8%	8.0%	6.0%
Chemotherapy only	0.5%	0.6%	0.6%	1.2%	0.5%	1.0%
Radiotherapy only	0.2%	0.2%	1.5%	0.9%	1.1%	0.7%
Hormone therapy only	6.3%	6.2%	6.8%	5.2%	6.6%	5.5%
Surgery and chemotherapy	0.5%	1.4%	6.0%	5.9%	4.1%	4.5%
Surgery and radiotherapy	1.3%	3.0%	7.4%	9.4%	5.3%	7.4%
Surgery and hormone therapy	18.0%	11.7%	20.5%	9.0%	19.6%	9.9%
Chemotherapy and radiotherapy	0.7%	0.6%	0.8%	1.1%	0.8%	0.9%
Chemotherapy and hormone therapy	0.5%	0.2%	0.2%	0.3%	0.3%	0.3%
Radiotherapy and hormone therapy	4.4%	1.1%	1.8%	0.9%	2.7%	0.9%
Surgery, chemotherapy and radiotherapy	2.0%	9.9%	10.5%	23.1%	7.6%	19.0%
Surgery, chemotherapy and hormone therapy	4.4%	2.7%	6.1%	3.9%	5.5%	3.5%
Surgery, radiotherapy and hormone therapy	33.2%	31.2%	15.6%	13.8%	21.6%	19.3%
Chemotherapy, radiotherapy and hormone therapy	0.8%	0.7%	0.6%	0.5%	0.7%	0.5%
Surgery, chemotherapy, radiotherapy and hormone therapy	14.4%	22.7%	9.0%	14.0%	10.9%	16.7%
No tumour directed treatment	5.3%	3.9%	4.2%	4.0%	4.6%	4.0%
Total patients	835	905	1,588	1,964	2,423	2,869

13.2.3: Patient characteristics and factors influencing treatment

Among female breast cancer patients diagnosed in 1996 and 2001 there was no significant difference in the likelihood of receiving treatment between Northern Ireland and Republic of Ireland once factors such as age, stage and cell type were adjusted for. However treatment of female breast cancer patients was slightly less common in 2001 than 1996 in Republic of Ireland but was more common in 2001 than 1996 in Northern Ireland. (Tab. 13.4)

Not having a cell type specified reduced the likelihood of receipt of treatment throughout Ireland relative to those with ductal or lobular breast cancer, while those with a breast cancer other than a ductal or lobular neoplasm were also less likely to receive treatment in Republic of Ireland. In Ireland those diagnosed at stage III or IV or unstaged were less likely to receive treatment than those diagnosed at stage I, although the difference for stage III patients was not significant in Northern Ireland. The basis of diagnosis was also a factor in treatment receipt in Northern Ireland with patients diagnosed by clinical opinion less likely than those diagnosed by microscopic verification to receive treatment. This was not the case in Republic of Ireland. In Republic of Ireland those aged 75 and over were less likely to receive treatment than those aged 15-44. This result however was not significant in Northern Ireland. Socio-economic status (based upon deprivation quintile) was not a factor in receipt of treatment once adjusted for other factors. (Tab. 13.4)

Table 13.4: Number and percentage of female breast cancer patients diagnosed in 1996 and 2001 receiving tumour directed treatment by patient and tumour characteristics with relative risk ratios derived using logistic regression

	Northern Ireland			Republic of Ireland			Ireland		
	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)
Age 15-44	223	97.8%	1.00	528	98.7%	1.00	751	98.4%	1.00
Age 45-54	420	96.4%	1.00 (0.95,1.02)	847	98.0%	1.00 (0.97,1.01)	1,267	97.5%	0.99 (0.97,1.01)
Age 55-64	435	97.7%	1.01 (0.97,1.02)	893	98.2%	1.00 (0.98,1.01)	1,328	98.0%	1.00 (0.98,1.01)
Age 65-74	308	96.4%	1.01 (0.97,1.02)	625	95.8%	0.99 (0.95,1.00)	933	96.0%	0.99 (0.97,1.00)
Age 75+	354	89.3%	1.01 (0.97,1.02)	659	87.9%	0.97 (0.92,1.00)*	1,013	88.4%	0.99 (0.96,1.00)
Stage I	587	99.3%	1.00	737	99.5%	1.00	1,324	99.4%	1.00
Stage II	723	99.3%	1.00 (0.98,1.01)	1,662	99.2%	1.00 (0.98,1.00)	2,385	99.2%	1.00 (0.99,1.00)
Stage III	133	97.7%	0.99 (0.92,1.00)	445	96.2%	0.98 (0.93,1.00)*	578	96.5%	0.98 (0.95,1.00)*
Stage IV	104	91.3%	0.97 (0.89,1.00)*	246	82.5%	0.91 (0.76,0.97)*	350	85.1%	0.93 (0.85,0.97)*
Stage unknown	193	69.9%	0.76 (0.51,0.91)*	462	85.3%	0.94 (0.84,0.98)*	655	80.8%	0.91 (0.82,0.96)*
Microscopically verified	1,682	97.2%	1.00	3,432	97.5%	1.00	5,114	97.4%	1.00
Clinical basis	54	46.3%	0.95 (0.84,1.00)*	97	53.6%	1.01 (0.98,1.02)	151	51.0%	0.98 (0.94,1.00)
Other basis	4	25.0%	0.97 (0.63,1.02)	23	39.1%	1.00 (0.95,1.02)	27	37.0%	0.98 (0.90,1.01)
Ductal & lobular	1,371	98.2%	1.00	2,920	98.4%	1.00	4,291	98.3%	1.00
Other cell type	241	95.9%	1.00 (0.98,1.01)	492	94.1%	0.98 (0.95,0.99)*	733	94.7%	0.99 (0.97,1.00)*
Unspecified cell type	128	65.6%	0.93 (0.83,0.98)*	140	50.0%	0.67 (0.41,0.86)*	268	57.5%	0.87 (0.78,0.93)*
20% most affluent	352	95.5%	1.00	780	95.9%	1.00	1,132	95.8%	1.00
20-40% most affluent	346	96.8%	0.99 (0.92,1.03)	617	95.5%	0.99 (0.95,1.01)	963	96.0%	0.99 (0.96,1.01)
Average	339	96.8%	1.01 (0.95,1.03)	646	97.7%	1.02 (0.99,1.03)	985	97.4%	1.01 (0.99,1.03)
20-40% most deprived	343	93.3%	0.99 (0.91,1.02)	658	96.0%	1.00 (0.96,1.02)	1,001	95.1%	0.99 (0.96,1.01)
20% most deprived	346	95.4%	1.00 (0.93,1.03)	599	94.7%	0.99 (0.95,1.01)	945	94.9%	0.99 (0.96,1.01)
Unknown	14	85.7%	0.94 (0.56,1.03)	252	94.8%	1.01 (0.96,1.03)	266	94.4%	1.00 (0.96,1.02)
Diagnosed in 1996	835	94.7%	1.00	1,588	95.8%	1.00	2,423	95.4%	1.00
Diagnosed in 2001	905	96.1%	1.03 (1.01,1.04)*	1,964	96.0%	0.97 (0.94,0.99)*	2,869	96.0%	0.98 (0.96,1.00)*
Northern Ireland	1,740	95.5%					1,740	95.5%	1.00
Republic of Ireland				3,552	95.9%		3,552	95.9%	1.00 (0.98,1.01)
All patients	1,740	95.5%		3,552	95.9%		5,292	95.7%	

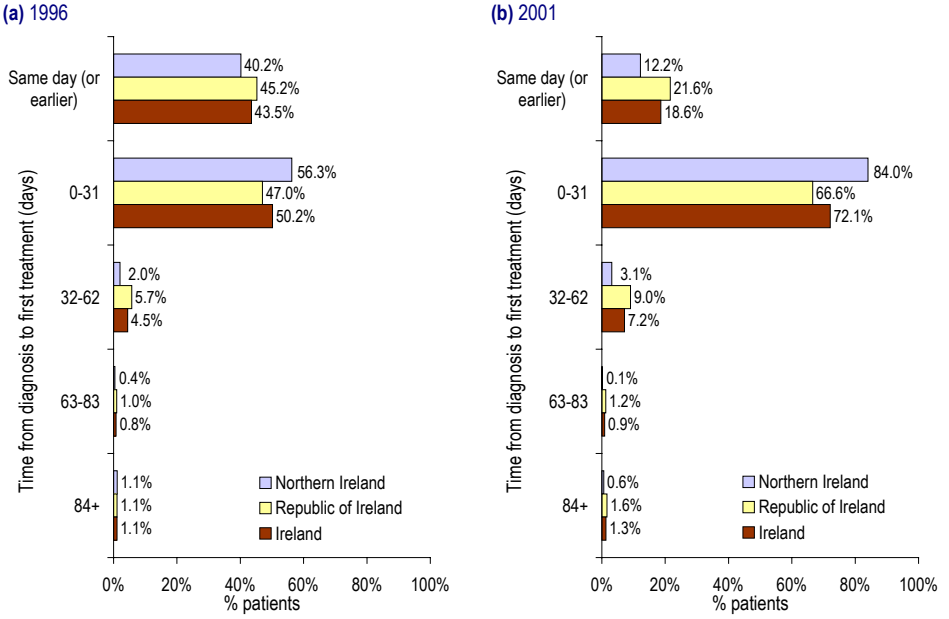
* Significantly different from baseline group (p<0.05)

13.2.4: Waiting times

Among female breast cancer patients diagnosed in 2001 in Ireland 90.7% of those who received tumour directed treatment were treated within 31 days of diagnosis. This was a decrease of 3.0% on the 1996 proportion (p=0.005).

Waiting time between diagnosis and treatment differed between Northern Ireland and Republic of Ireland (χ^2=123.5, p<0.001). In particular Northern Ireland had 8.0% more patients treated within 31 days (p<0.001).

Figure 13.10: Time between diagnosis and first treatment by country for female patients diagnosed with breast cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

The proportion of patients in Republic of Ireland waiting less than 31 days fell 4.1% (p=0.004) between 1996 and 2001 while those waiting 32-61 days increased by 3.3% (p=0.009). There was no significant change in waiting time in Northern Ireland. (Fig. 13.10)

13.3: Survival

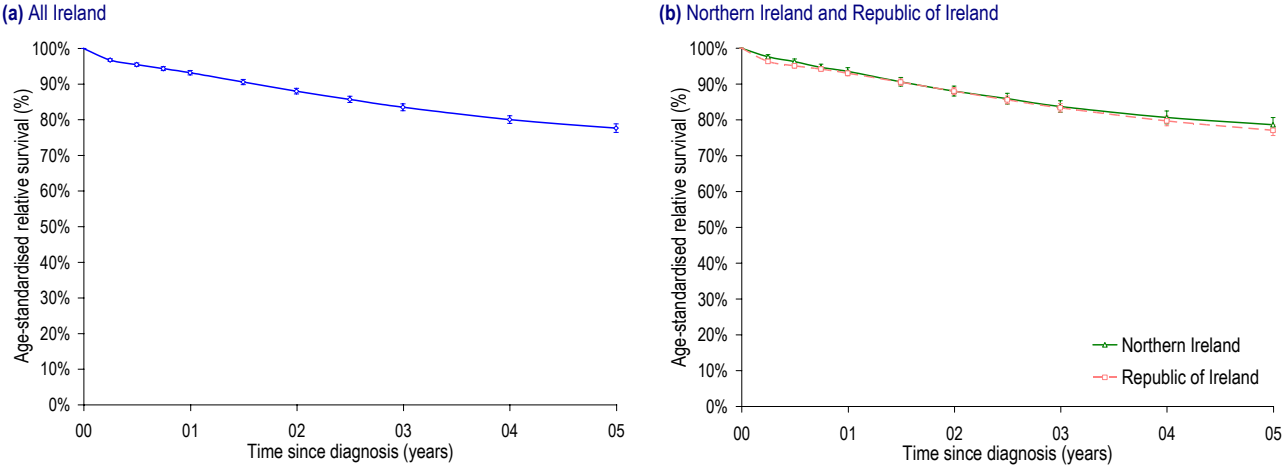
One-year (age-standardised) relative survival (age-standardised) for female patients diagnosed with breast cancer in 2000-2004 was 93.2%, while at the five-year point it was 77.6%. (Fig. 13.11, Tab. 13.5)

Table 13.5: Age-standardised relative survival for female breast cancer patients by country: 2000-2004 period analysis five-year estimates

	Age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
1-year	93.5% (92.5%, 94.6%)	93.0% (92.3%, 93.8%)	93.2% (92.6%, 93.8%)
5-year	78.6% (76.7%, 80.6%)	77.1% (75.6%, 78.6%)	77.6% (76.4%, 78.8%)

Survival from breast cancer did not vary significantly by country during the five-year period with five-year (age-standardised) relative survival estimated to be 78.6% in Northern Ireland compared to 77.1% in Republic of Ireland, a 1.5% difference that was not statistically significant (p=0.385). (Fig. 13.5, Tab. 13.11)

Figure 13.11: Age-standardised relative survival for female breast cancer patients: 2000-2004 period analysis estimates



13.3.1: Changes in survival over time

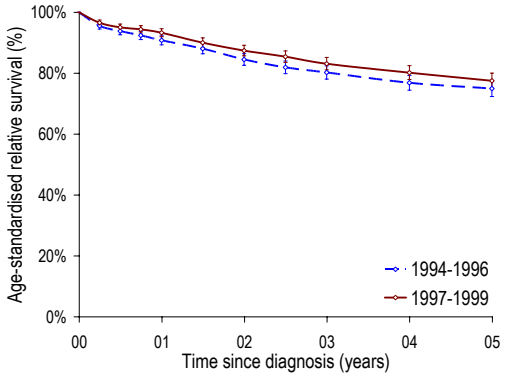
Five-year (age-standardised) relative survival for female patients diagnosed with breast cancer in 1994-1996 was 4.7% (p=0.046) higher in Northern Ireland than Republic of Ireland. Since that time there has been improvement in survival from breast cancer in Republic of Ireland with five-year (age-standardised) relative survival increasing by 4.4% (p=0.029) to 74.7% for patients diagnosed in 1997-1999. There was no significant improvement in Northern Ireland between the two periods despite a 2.5% increase, with survival in Northern Ireland during 1997-1999 no longer significantly higher than in Republic of Ireland, although a non-significant difference of 2.8% (p=0.179) remained. Overall five-year (age-standardised) relative survival improved in Ireland by 3.7% (p=0.019) between 1994-1996 and 1997-1999. (Fig. 13.12, Tab. 13.6)

Table 13.6: Age-standardised relative survival for female breast cancer patients by country and period of diagnosis: 1994-1999

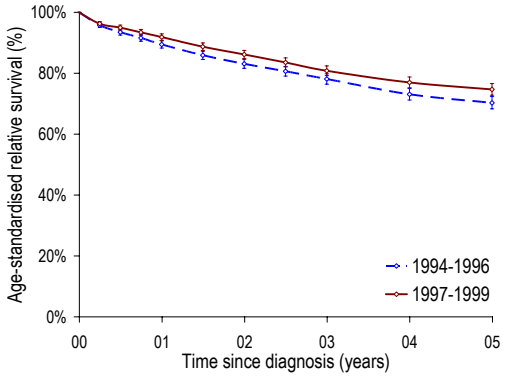
	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	90.8% (89.4%, 92.3%)	93.3% (92.0%, 94.6%)	75.0% (72.4%, 77.6%)	77.5% (75.1%, 80.0%)
Republic of Ireland	89.5% (88.3%, 90.7%)	91.9% (90.8%, 93.0%)	70.3% (68.3%, 72.4%)	74.7% (72.8%, 76.6%)
Ireland	90.0% (89.0%, 90.9%)	92.4% (91.6%, 93.2%)	72.0% (70.4%, 73.6%)	75.7% (74.2%, 77.2%)

Figure 13.12: Age-standardised relative survival for female breast cancer patients by country and period of diagnosis: 1994-1999

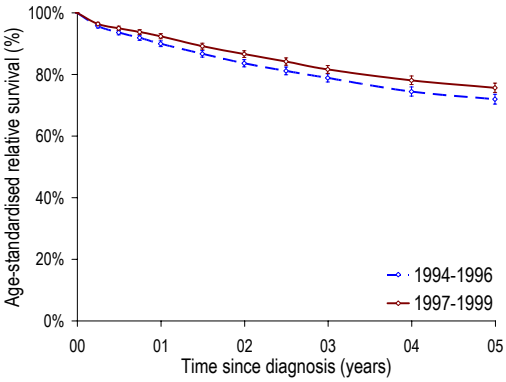
(a) Northern Ireland



(b) Republic of Ireland



(c) Ireland



13.3.2: Observed survival

Observed survival from female breast cancer for those diagnosed in 1997-1999 was 92.2% after one year and 70.1% after five years. During 1997-1999 this value did not vary by country; however five-year observed survival was higher in Northern Ireland than Republic of Ireland during 1994-1996. Five-year observed survival also improved in Republic of Ireland and Ireland as a whole between 1994-1996 and 1997-1999, however there was no significant change in Northern Ireland. (Tab. 13.7)

Table 13.7: Observed survival for female breast cancer patients by country and period of diagnosis: 1994-1999

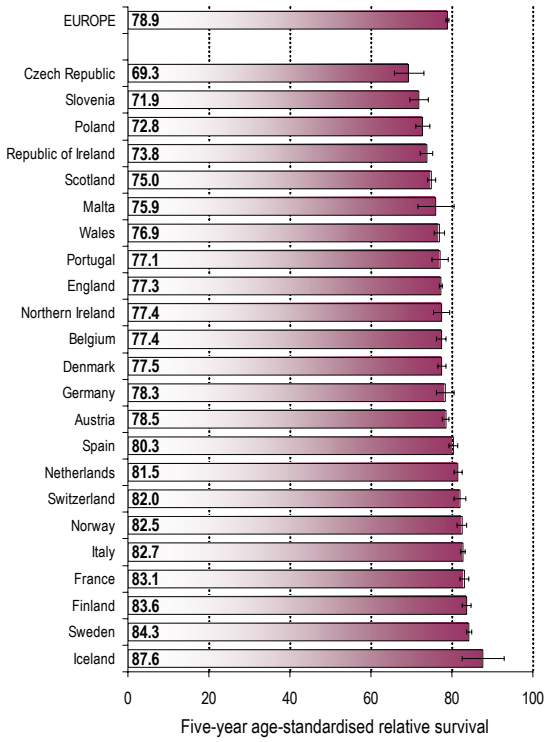
	Observed survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	90.5% (89.4%, 91.7%)	92.6% (91.6%, 93.6%)	68.6% (66.8%, 70.4%)	71.1% (69.4%, 72.8%)
Republic of Ireland	89.9% (89.1%, 90.8%)	92.0% (91.2%, 92.7%)	64.8% (63.4%, 66.2%)	69.7% (68.4%, 70.9%)
Ireland	90.1% (89.4%, 90.8%)	92.2% (91.6%, 92.8%)	66.1% (65.0%, 67.2%)	70.1% (69.1%, 71.2%)

13.3.3: European comparisons

Five-year (age-standardised) relative survival from breast cancer for female patients diagnosed in 1995-1999 in Republic of Ireland was 5.1% (p<0.001) lower than the European average of 78.9%. There was no significant difference in five-year (age-standardised)

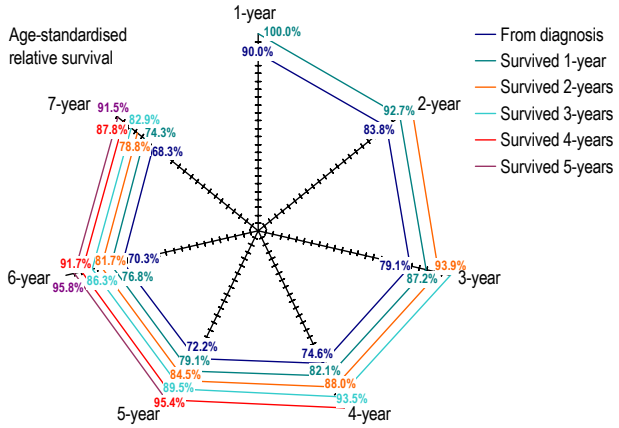
relative survival between Northern Ireland and the European average. Survival in Northern Ireland was similar to that in UK; however survival in Republic of Ireland was lower than that in England and Wales, although it was similar to that in Scotland. (Fig. 13.13)

Figure 13.13: European comparisons of five-year age-standardised relative survival for female breast cancer patients: 1995-1999



Source: EUROCARE-IV[97]

Figure 13.14: Conditional survival from female breast cancer: Overall relative survival for patients who have already survived a given amount of time: 1994-1996.



13.3.4: Conditional survival

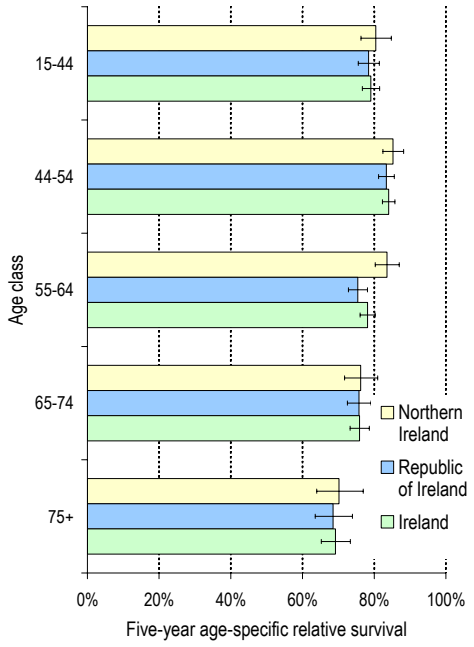
Long-term survival from female breast cancer in Ireland was moderate for patients diagnosed in 1994-1996, with seven-year relative survival from diagnosis 68.3%. However among those patients surviving two years (83.8%), 78.8% went on to survive a further five years (excluding other causes of death), which was almost 7% higher than five-year relative survival from diagnosis. However while this indicates that the longer a patient survives the greater the long-term survival probability, there was no “cure” point for female breast cancer apparent with only 91.5% of females surviving two years after having already survived five years. (Fig. 13.14)

13.3.5: Factors influencing survival

Age

Five-year relative survival for females diagnosed in 1997-1999 with breast cancer in Ireland was 9.9% (p=0.003) higher among those aged 15-44 than 75 and over, while the difference between those aged 45-54 and 75 and over was 14.9% (p<0.001). Differences of this magnitude were also apparent in both countries within Ireland. (Fig. 13.15)

Figure 13.15: Five-year age-specific relative survival for female breast cancer patients by sex and country: 1997-1999



For patients diagnosed in 1997-1999 with breast cancer five-year (age-standardised) relative survival for those aged 15-64 was 5.3% (p=0.006) higher in Northern Ireland than Republic of Ireland, while there was no significant difference between countries for those aged 65 and over. In particular five-year relative survival for those aged 55-64 was 8.1% (p=0.008) higher in Northern Ireland. (Fig. 13.15, Tab. 13.8)

In Republic of Ireland five-year (age-standardised) relative survival for those aged 15-64 improved between 1994-1996 and 1997-1999 by 4.0% (p=0.024). There was no improvement for those aged 65 and over, nor was there any change for either age group in Northern Ireland. (Tab. 13.8)

Table 13.8: Five-year age-standardised relative survival for female breast cancer patients by country, age and period of diagnosis: 1994-1999

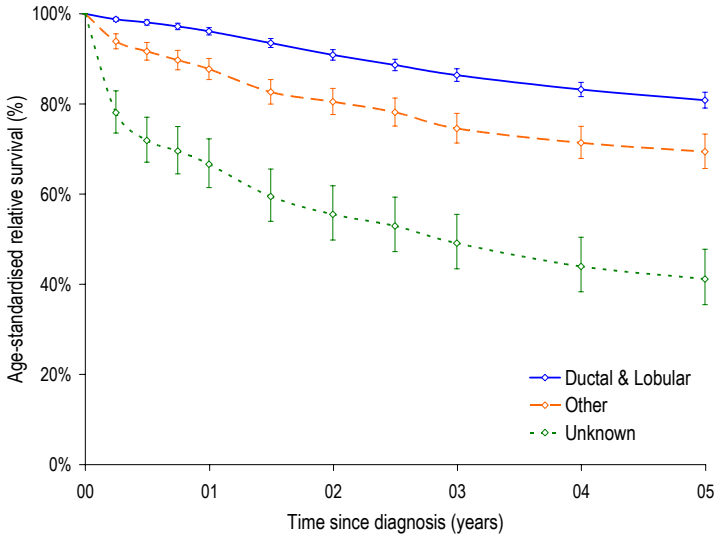
	Five-year age-standardised relative survival (95% CI)			
	15-64		65+	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	81.6% (79.4%, 83.9%)	83.5% (81.4%, 85.7%)	70.2% (66.1%, 74.4%)	73.2% (69.3%, 77.3%)
Republic of Ireland	74.2% (72.4%, 76.1%)	78.2% (76.6%, 79.9%)	67.5% (64.3%, 70.8%)	72.1% (69.1%, 75.3%)
Ireland	76.9% (75.5%, 78.3%)	80.0% (78.7%, 81.3%)	68.4% (65.9%, 71.0%)	72.5% (70.2%, 75.0%)

Cell type

For patients diagnosed during 1997-1999 in Ireland, and Northern Ireland and Republic of Ireland separately, five-year (age-standardised) relative survival was higher among those with a ductal and lobular neoplasm compared to those with another type, which in turn was higher than for those with an unspecified cell type. (Fig. 13.16)

Five-year (age-standardised) relative survival for patients diagnosed with a ductal or lobular breast cancer during 1997-1999 was 5.7% (p=0.027) higher in Northern Ireland than Republic of Ireland. There was no significant difference for the other breast cancer types despite a 14.7% difference for those with an unspecified cell type. (Tab. 13.9)

Figure 13.16: Age-standardised relative survival for female breast cancer patients by cell type: 1997-1999



Between 1994-1996 and 1997-1999 there was no significant change in five-year (age-standardised) relative survival for any type of breast cancer. (Tab. 13.9)

Table 13.9: Five-year age-standardised relative survival for female breast cancer patients by cell type and period of diagnosis: 1994-1999

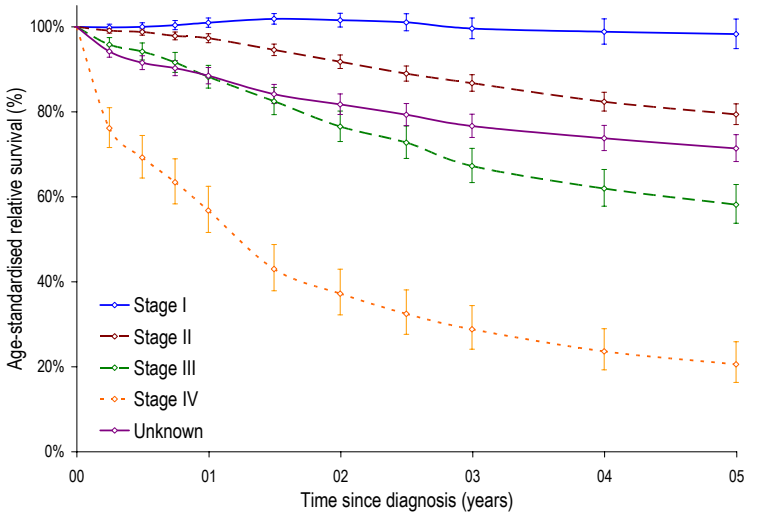
	Five-year age-standardised relative survival (95% CI)					
	Ductal & Lobular		Other		Unspecified	
	1994-1996	1997-1999	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	82.8% (79.6%, 86.2%)	84.5% (81.7%, 87.4%)	74.8% (69.2%, 81.0%)	70.6% (64.7%, 77.1%)	52.4% (46.5%, 59.1%)	47.0% (39.5%, 56.0%)
Republic of Ireland	75.1% (72.7%, 77.6%)	78.8% (76.6%, 81.0%)	69.1% (64.7%, 73.9%)	68.8% (64.2%, 73.7%)	27.1% (20.4%, 36.0%)	32.3% (25.0%, 41.6%)
Ireland	77.7% (75.7%, 79.7%)	80.8% (79.1%, 82.6%)	71.2% (67.7%, 75.0%)	69.4% (65.7%, 73.3%)	45.4% (40.6%, 50.7%)	41.2% (35.5%, 47.8%)

Stage

For patients diagnosed in 1997-1999 survival from breast cancer varied considerably by stage at diagnosis, with five-year (age-standardised) relative survival from stage I disease 98.3% compared to 20.6% from stage IV disease. Survival for patients without a stage assigned was approximately half way between that for patients diagnosed at stage II and stage III, at 71.4%. (Fig. 13.17, Tab. 13.10)

There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland for patients diagnosed at any stage during 1997-

Figure 13.17: Age-standardised relative survival for female breast cancer patients by stage: 1997-1999



1999. However survival for patients with an unspecified stage at diagnosis was 10.2% (p=0.024) higher in Republic of Ireland than in Northern Ireland. (Fig. 13.17, Tab.13.10)

Table 13.10: Three-year age-standardised relative survival for female breast cancer by stage and country: 1997-1999

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
Stage I	97.1% (91.8%, 102.7%)	99.2% (94.8%, 103.9%)	98.3% (94.9%, 101.8%)
Stage II	80.7% (76.7%, 85.0%)	78.3% (75.3%, 81.4%)	79.4% (77.0%, 81.9%)
Stage III	58.7% (49.6%, 69.4%)	58.0% (53.1%, 63.4%)	58.2% (53.8%, 62.9%)
Stage IV	16.7% (6.3%, 44.4%)	20.4% (16.2%, 25.8%)	20.6% (16.3%, 25.9%)
Unknown	66.5% (62.3%, 71.0%)	76.7% (72.3%, 81.4%)	71.4% (68.3%, 74.6%)

Treatment

Receipt of treatment was a factor in survival for patients diagnosed in 1996 and 2001; however this is a reflection not only of the effectiveness of the treatment but of the selection of patients who receive the treatment and the reasons for its application (e.g. curative intent or pain relief). For female breast cancer patients diagnosed in Ireland in 1996 and 2001 those receiving any form of treatment had three-year (age-standardised) relative survival of 84.3% compared to 42.1% for those not receiving any tumour directed treatment, a significant difference of 42.2% (p<0.001). (Fig. 13.18, Tab. 13.11)

Table 13.11: Three-year age-standardised relative survival for female breast cancer by treatment type: 1996 & 2001

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
No surgery	53.9% (47.3%, 61.4%)	50.8% (45.9%, 56.2%)	51.9% (47.9%, 56.3%)
Surgery	88.3% (85.5%, 91.2%)	89.8% (87.9%, 91.9%)	89.3% (87.6%, 90.9%)
No chemotherapy	84.8% (82.1%, 87.5%)	83.0% (81.0%, 85.1%)	83.7% (82.1%, 85.4%)
Chemotherapy	66.7% (55.6%, 80.1%)	81.5% (75.5%, 88.0%)	78.2% (72.7%, 84.2%)
No radiotherapy	77.6% (73.7%, 81.8%)	78.1% (75.5%, 80.8%)	77.9% (75.7%, 80.1%)
Radiotherapy	87.0% (83.4%, 90.7%)	86.0% (83.2%, 88.9%)	86.4% (84.2%, 88.7%)
No hormone therapy	70.0% (64.1%, 76.4%)	77.7% (74.6%, 80.9%)	75.9% (73.1%, 78.7%)
Hormone therapy	85.2% (82.5%, 88.1%)	84.4% (82.1%, 86.7%)	84.7% (83.0%, 86.5%)
No treatment*	57.7% (45.5%, 73.2%)	33.1% (25.3%, 43.4%)	42.1% (35.1%, 50.5%)
Treatment*	83.5% (80.9%, 86.2%)	84.7% (82.9%, 86.7%)	84.3% (82.8%, 85.9%)

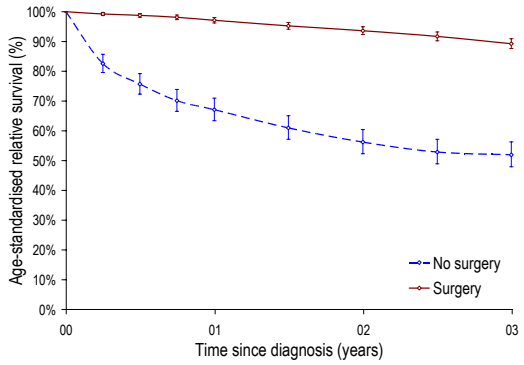
* Refers to tumour directed treatment only

Receipt of surgery had the greatest impact on survival from breast cancer with a 37.4% difference in three-year (age-standardised) relative survival between those receiving and not receiving surgery. Both radiotherapy and hormone therapy also had positive impacts on survival with an 8.5% (p<0.001) difference in three-year (age-standardised) relative survival between those receiving and not receiving radiotherapy and an 8.8% (p<0.001) difference between those receiving and not receiving hormone therapy. However there was no significant difference in three-year (age-standardised) relative survival between those who did and did not receive chemotherapy. (Fig. 13.18, Tab. 13.11)

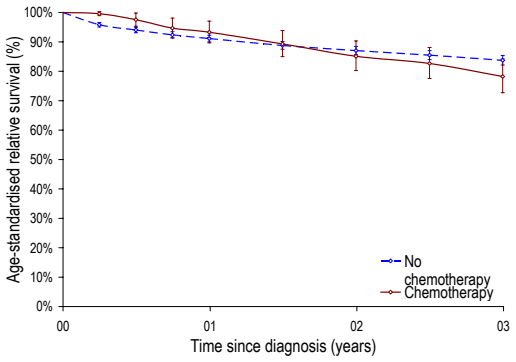
There was no significant difference in the survival experience of patients receiving any treatment, surgery, chemotherapy or radiotherapy between Northern Ireland and Republic of Ireland. However, three-year (age-standardised) relative survival for patients receiving no form of tumour directed treatment was higher in Northern Ireland by 24.6% (p=0.033). Additionally while chemotherapy had little impact on survival in Ireland as a whole

Figure. 13.18: Age-standardised relative survival for female breast cancer patients by treatment: 1996 & 2001

(a) Surgery



(b) Chemotherapy



(c) Radiotherapy

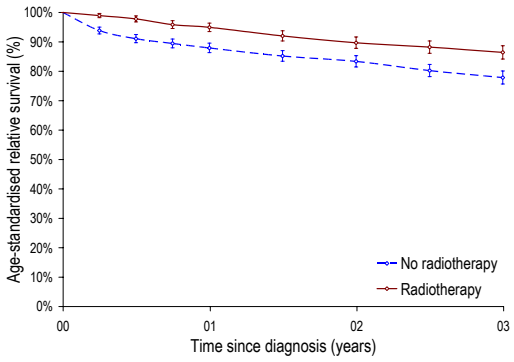
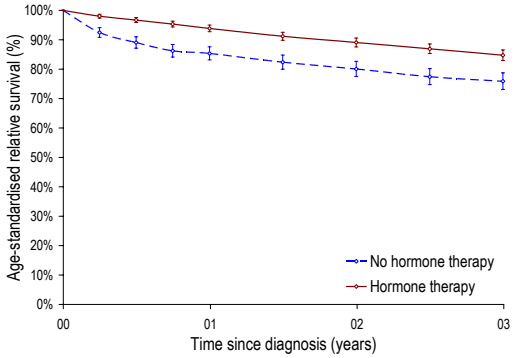
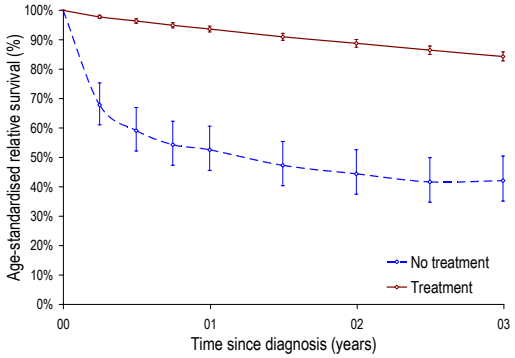


Figure. 13.18 cont…

(d) Hormone therapy



(e) No tumour directed treatment



or in Republic of Ireland, in Northern Ireland patients receiving chemotherapy had three-year (age-standardised) relative survival that was 17.9% (p=0.017) lower than those who did not receive it. (Fig. 13.18, Tab. 13.11)

Interaction between factors

The differences observed between different factors may in part be due to interactions with other factors. Modelling of excess mortality allows investigation of differences between patient groups while adjusting for other possible factors. This process illustrates that survival from breast cancer was dominated by stage and receipt of treatment with only small variations which were not statistically significant in age and cell type. Adjusting for all factors demonstrates that excess mortality was lower in 2001 than 1996 but that there was no significant difference between Republic of Ireland and Northern Ireland. (Tab. 13.12)

Table 13.12: Excess hazard ratios for female breast cancer patients by patient and tumour characteristics: 1996 & 2001

	Excess mortality		Excess mortality
Age 15-44	1.00	Microscopically verified	1.00
Age 45-54	0.76 (0.60, 0.96)	Not microscopically verified	1.02 (0.29, 3.64)
Age 55-64	0.93 (0.74, 1.16)	Unknown basis	2.35 (0.33, 16.97)
Age 65-74	1.25 (0.99, 1.59)		
Age 75+	1.14 (0.83, 1.57)	No treatment	1.00
		Treatment	1.56 (0.66, 3.67)
Stage I & II	1.00		
Stage III	3.90 (3.22, 4.72)	Year 1996	1.00
Stage IV	10.25 (8.14, 12.91)	Year 2001	0.74 (0.62, 0.88)
Stage unknown	1.67 (1.27, 2.20)		
		Northern Ireland	1.00
Ductal & Lobular	1.00	Republic of Ireland	1.07 (0.89, 1.28)
Other cell	0.92 (0.73, 1.17)		
Not specified cell	1.02 (0.46, 2.27)		

13.4: Mortality

During 2000-2004 there were on average 947 deaths per year in Ireland as a result of breast cancer. It was the most common cause of cancer death in Ireland for women, although in Northern Ireland it was second to lung cancer. It made up 17.7% of all female deaths as a result of cancer. The odds of a female resident in Ireland dying from the disease before the age of 75, assuming the absence of other causes of death was 1 in 41. (Tab. 13.13)

Mortality from the disease was higher in Republic of Ireland than Northern Ireland with European age-standardised mortality rates (EASMR) 11.5% (p<0.001) lower in Northern Ireland. (Tab. 13.13)

Table 13.13: Summary statistics for deaths from female breast cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of deaths per year	297	650	947
% of all cancer deaths (ex. NMSC)	16.7%	18.3%	17.7%
Rank (ex. NMSC)	2	1	1
Median age at death	69	67	68
Cumulative risk (Aged 0 to 74)	2.2%	2.5%	2.4%
Crude rate per 100,000 persons	34.2	33.0	33.4
EASMR ± 95% CI	28.7 ±1.5	32.5 ±1.1	31.2 ±0.9
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-11.5% ±5.7

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

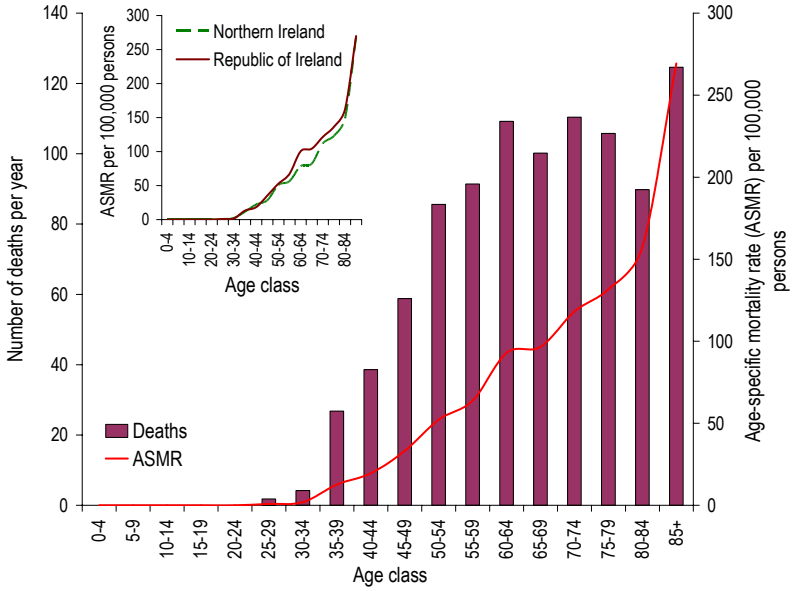
13.4.1: Age distribution

The number of deaths from breast cancer each year during 2000-2004 was highest among those aged 85 and over with 125 deaths per year, making up 13.2%

of all breast cancer deaths. The median age at death was 68 years of age. (Fig. 13.19)

Age-specific mortality rates (ASMR) were also highest among those aged 85 and over with 269.3 deaths per 100,000 persons in this age class. The distribution of ASMRs was similar in both Northern Ireland and Republic of Ireland, although those in the 55-84 age groups were slightly higher in Republic of Ireland. (Fig. 13.19)

Figure 13.19: Number of deaths from female breast cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



13.4.2: Trends

European age-standardised mortality rates (EASMR) from breast cancer fell by 2.0% (p=0.001) per year in Ireland between 1994 and 2004. This corresponded to a decrease of 1.3 deaths per year. (Fig. 13.20)

The decline in breast cancer mortality was slightly steeper in Northern Ireland than Republic of Ireland, albeit not by a statistically significant amount. EASMRs fell in Northern Ireland by 2.3% (p=0.019) each year compared to 1.9% (p=0.013) in Republic of Ireland. Adding the effects of population growth and ageing, deaths decreased by 2.1 per year in Northern Ireland while they increased by 0.8 in Republic of Ireland. (Fig. 13.20)

Figure 13.20: Trends in European age-standardised mortality rates (EASMR) for female breast cancer by country: 1994-2004

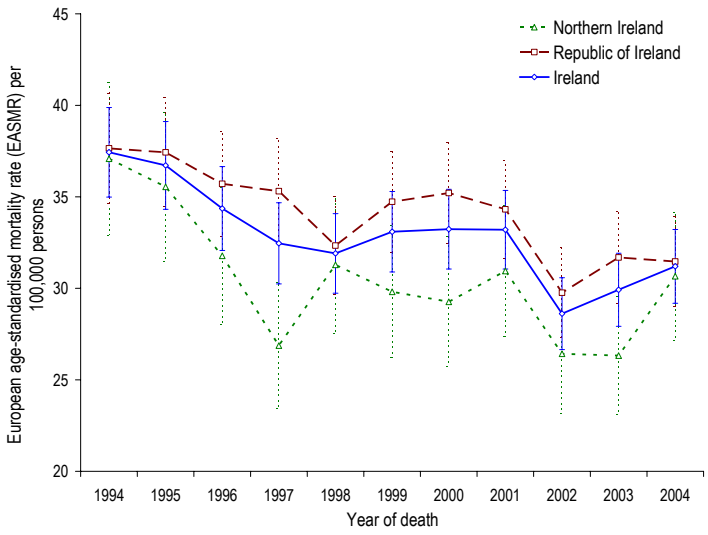
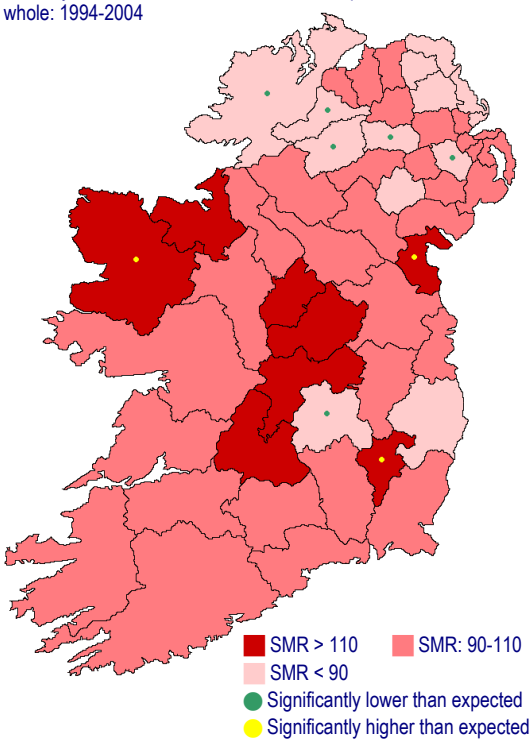


Figure 13.21: Significant differences in county/council standardised mortality ratios for female breast cancer compared to Ireland as a whole: 1994-2004



13.4.3: Geographic variations

Counties Carlow, Louth and Mayo had significantly higher levels of breast cancer than in Ireland as a whole, with a further cluster of counties in central Ireland having standardised mortality ratios above 110%, albeit not significantly higher than the 100% for all Ireland. Lower than expected mortality from the disease was present in Donegal, Lisburn, Laois, Omagh, Cookstown and Strabane. (Fig. 13.21)

13.5: Prevalence

Incidence of breast cancer in Ireland during 2000-2004 was high, as was survival, thus prevalence of breast cancer was also quite high with 21,874 people alive at the end of 2004 having been diagnosed with the disease since 1994. Restricting the definition of prevalence to diagnosis within five years (i.e. diagnosed in 2000-2004), the number of people alive at the end of 2004 with breast cancer was 13,053, 84.3% of those diagnosed during this period. (Tab. 13.14)

Table 13.14: Prevalence of female breast cancer in Ireland at the end of 2004 by country and period of diagnosis

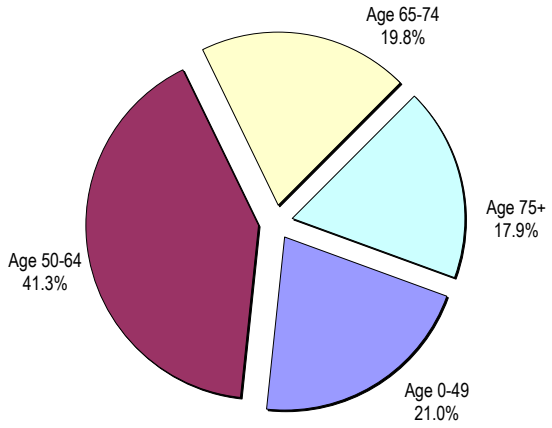
	Diagnosed 1994-2004		Diagnosed 2000-2004	
	Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	7,317	71.5%	4,186	84.3%
Republic of Ireland	14,557	71.3%	8,867	84.4%
Ireland	21,874	71.4%	13,053	84.3%

Of these 13,053, there were 4,186 survivors in Northern Ireland compared to 8,867 in Republic of Ireland. (Tab. 13.14)

13.5.1: Age distribution

Prevalence of breast cancer in Ireland was more common among those aged 50-64 making up 41.3% of people living with the disease at the end of 2004. The other age groups (0-49, 65-74, 75+) all contributed approximately 20% to the prevalence total. (Fig. 13.22)

Figure 13.22: Prevalence of female breast cancer in Ireland at the end of 2004 by age for patients diagnosed in 2000-2004

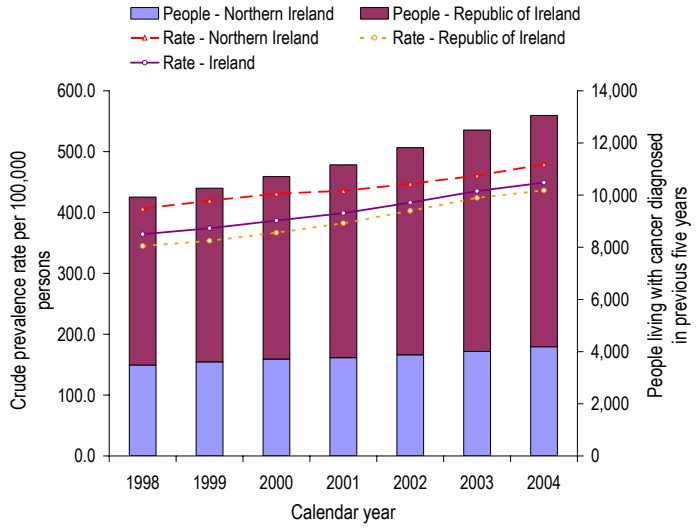


13.5.2: Trends

As a result of increases in incidence levels, improvements in survival, population growth, ageing of the population and reductions in mortality rates the number of people alive at the end of each year that had a diagnosis of breast cancer within the previous five years increased between 1998 and 2004 by an average of 534 per year. (Fig. 13.23)

The majority of the increase occurred in Republic of Ireland where there was an increase of 425 people per year living with the disease compared to an annual increase of 109 in Northern Ireland. Removing the effect of population growth using crude prevalence rates per 100,000 persons illustrates that the number of people alive at the end of each calendar year after a diagnosis of colorectal cancer within the previous five-years increased in Northern Ireland by 2.6% each year, a smaller increase than the 4.2% increase in Republic of Ireland. However at the end of 2004 the number of people per 100,000 living with breast cancer diagnosed since 2000 was 9.8% greater in Northern Ireland than Republic of Ireland, which was likely a factor of the older average age of the population in Northern Ireland, the slightly higher survival and the slightly higher crude incidence rates. (Fig. 13.23)

Figure 13.23: Number of females (and crude rate per 100,000 persons) living with breast cancer at the end of each calendar year, who were diagnosed within the previous five-years by calendar year and country



13.6: Discussion

Breast cancer occurs primarily among females, although a small number of males develop the disease. Lumps in the breast are the most common symptom although the majority of such lumps are not malignant breast cancer. Other symptoms include blood discharge from the nipple, swelling in the area of the armpit or a change in the shape of the breast or nipple.[98]

Reproductive history is related to the risk of developing breast cancer. An early menarche (first period), late menopause, late first birth or nulliparity (never giving birth) all increase the risk of getting breast cancer.[99] The use of breast-feeding can have a protective effect.[99] Exposure to oestrogen through Hormone Replacement Therapy can also increase breast cancer risk.[100] There is some evidence that obesity in post-menopausal women contributes to an increased risk,[101] while 4-5 hours of exercise per week may have a protective effect against breast cancer although evidence is not conclusive.[102] Alcohol consumption is related to breast cancer, with women who do not drink having a lower risk of developing breast cancer compared to those who do. The greater the amount of alcohol consumed per week, the greater the risk of breast cancer.[103] Personal histories of breast cancer can also increase the risk of developing a second breast cancer although the use of tamoxifen can reduce this risk.[104] Additionally a significant family history, such as having a mother diagnosed with breast cancer before age 40 or having two or more close relatives on the same side diagnosed with breast cancer, may result in an increased risk of developing the disease.[105] Approximately 5% of breast cancers are inherited via faulty genes, usually BRCA1 or BRCA2, the presence of which can significantly increase the life time risk of developing breast cancer. The presence of these faulty genes can be detected and are accompanied by a strong family history of the disease.[106]

Globally breast cancer is the leading cancer among women with over one million cases diagnosed annually. It is more common among developed countries as a result of its relationship to genetics, lifestyle and environment with incidence rates lowest in Africa and Asia. However while incidence of the disease has increased over the last 20 years in most countries, the level of increase is greater in developing countries than among the most affluent. Mortality from the disease however has fallen over the last couple of decades as a result of better treatment and diagnostic techniques. There are currently 412,000 deaths per year from the disease with survival generally much better in developed countries.

Surgery is the primary treatment used in combating the disease with follow up chemotherapy, radiotherapy or hormone therapy used depending upon the stage of disease, risk of recurrence or size of tumour. Survival is generally very good for patients not experiencing metastases (stage IV).

As with most cancers early diagnosis improves survival prospects, and awareness of symptoms, particularly lumps in the breast, among the general population increases the likelihood of early diagnosis. Screening programmes also increase the possibility of early diagnosis with the aim of reducing mortality. Three yearly population based screening for women aged 50-65 has been in place in Northern Ireland since 1993, and is due to be extended to women aged up to 69. A similar programme was introduced for approximately half of the population in Republic of Ireland in 2000, with roll out across the country continuing.

Chapter 14:

Cervical cancer (C53)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 278 cases diagnosed in Ireland each year.*
  - *Median age at diagnosis among females was the youngest for any cancer site at 46 years of age during 2000-2004.*
  - *Incidence rates in Ireland did not change significantly between 1994 and 2004.*
  - *In both Northern Ireland and Republic of Ireland incidence rates decreased with increasing affluence during 2000-2004.*
  - *Belfast, Dublin Leitrim, Carrickfergus and Wicklow had significantly higher incidence rates than the average for all of Ireland during 1994-2004.*
  - *Incidence rates in Ireland during 1998-2000 were higher than those in the EU (15 countries), UK, Canada and Australia but were similar to those in USA.*
  - *There were on average 103 deaths in Ireland each year during 2000-2004.*
  - *There was no significant change in mortality rates during 1994-2004 in Ireland.*

- *TREATMENT*
  - *In 2001 surgery was the most common form of treatment received by patients in Ireland (60.9%), followed by radiotherapy (53.8%) and chemotherapy (39.5%), and with only 5.9% of patients receiving no form of tumour directed treatment.*
  - *Compared to 1996 the use of chemotherapy increased in Ireland by 33.4% with no significant change in use of surgery or radiotherapy. The proportion of patients receiving no tumour directed treatment decreased by 5.0%.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival was estimated to be 60.8% for patients diagnosed in 2000-2004.*
  - *There was no significant change in five-year (age-standardised) relative survival in Ireland between patients diagnosed in 1994-1996 and 1997-1999.*
  - *At the end of 2004 there were 1,928 people living in Ireland who had been diagnosed with cervical cancer during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates during 2000-2004 were 13.9% lower in Northern Ireland than Republic of Ireland.*
  - *Incidence rates did not change significantly in Republic of Ireland during 1994-2004, however in Northern Ireland they decreased by 2.3% per year.*
  - *There was no conclusive difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving any form of treatment although the proportion receiving no tumour directed treatment was 9.6% higher in Northern Ireland.*
  - *There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland for patients diagnosed in 2000-2004.*
  - *Mortality rates during 2000-2004 were 19.5% lower in Northern Ireland than in Republic of Ireland.*
  - *At the end of 2004 the number of people living with the disease diagnosed within the previous five years per 100,000 persons was 8.1% greater in Republic of Ireland than Northern Ireland.*

14.1: Incidence

During 2000-2004 there were on average 278 cases of cervical cancer diagnosed in Ireland each year with 199 of these in Republic of Ireland. For Ireland as a whole cervical cancer made up 2.6% of all female cancers (excluding NMSC), making it the eighth most common female cancer. The odds of a female developing the disease before the age of 75 were 1 in 130.

European age-standardised incidence rates (EASIR) for cervical cancer during 2000-2004 were 13.9% (p=0.007) lower in Northern Ireland than Republic of Ireland. (Tab. 14.1)

Table 14.1: Summary statistics for incidence of cervical cancer: 2000-2004

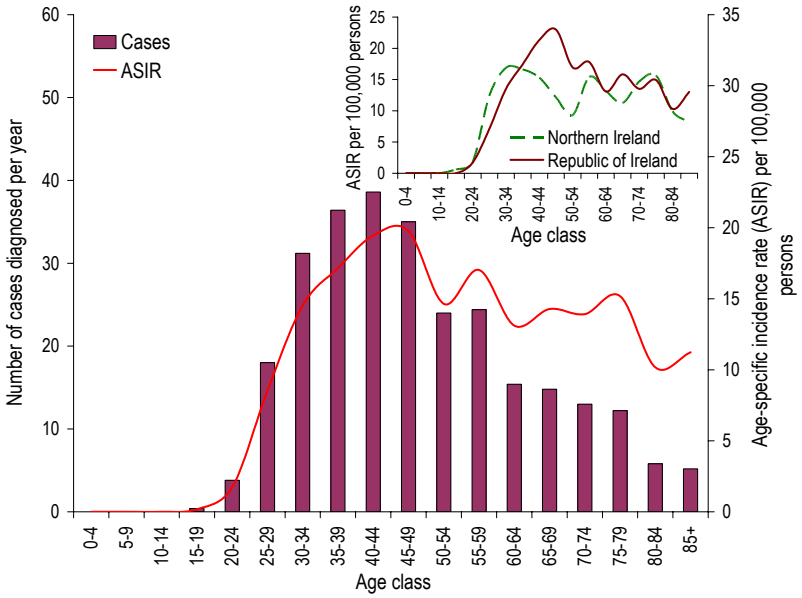
	Northern Ireland	Republic of Ireland	Ireland
Number of cases per year	80	199	278
% of all cancer cases (ex. NMSC)	2.3%	2.8%	2.6%
Rank (ex. NMSC)	10	8	8
Median age at diagnosis	45	46	46
Cumulative risk (Aged 0 to 74)	0.7%	0.8%	0.8%
Crude rate per 100,000 persons	9.2	10.1	9.8
EASIR ± 95% CI	8.9 ±0.9	10.4 ±0.7	9.9 ±0.5
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-13.9% ±10.2

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

14.1.1: Age distribution

Cervical cancer had the youngest median age at diagnosis among females for any cancer site at 46 years of age during 2000-2004. Cases peaked slightly earlier in the 40-44 age class with an average of 39 cases diagnosed each year, 13.9% of all cervical cancer cases. Despite the younger age of cervical cancer patients there were no children diagnosed with the disease during 2000-2004. (Fig. 14.1)

Figure 14.1: Number of cases of cervical cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

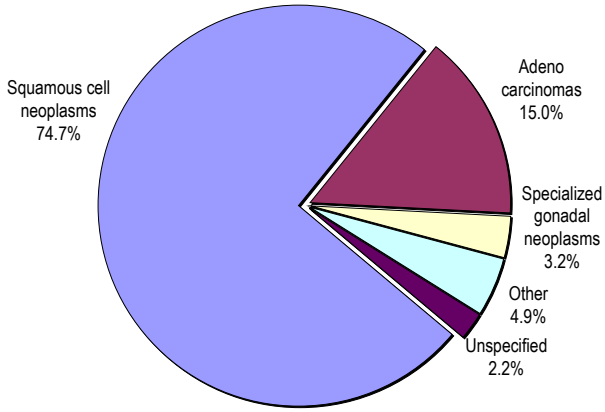


Age-specific incidence rates (ASIR) were highest among those aged 45 to 49 during 2000-2004 although there was considerable fluctuation in these rates between different age groups with the relationship between cervical cancer and age not as apparent as with other cancers. The age distribution was similar in Northern Ireland and Republic of Ireland; however ASIRs were highest among those aged 30-34 in Northern Ireland compared to those aged 45-49 in Republic of Ireland. (Fig. 14.1)

14.1.2: Cell type

The majority of cervical cancers diagnosed during 2000-2004 were squamous cell carcinomas, which made up 74.7% of all cervical cancers with a further 15.0% being adenocarcinomas. Only a small percentage (2.2%) of these cancers had an unspecified cell type. However while the percentage of cervical cancers with an unspecified cell type was similar in both countries (NI: 1.8%; ROI: 2.3%) the proportion of cervical cancers that were squamous cell carcinomas was higher in Republic of Ireland (77.2%) than Northern Ireland (68.3%). (Fig. 14.2)

Figure 14.2: Types of cervical cancer diagnosed in Ireland: 2000-2004



14.1.3: Trends

European age-standardised incidence rates (EASIR) of cervical cancer in Ireland did not change significantly between 1994 and 2004 although population growth and ageing caused an average increase of 2.4 cases diagnosed each year. (Fig. 14.3; Tab 14.2)

While EASIRs did not change significantly in Republic of Ireland during 1994-2004, cases increased by an average of 3.2 per year. Incidence rates of cervical cancer in Northern Ireland did however decrease by a significant amount, with an annual percentage change in EASIRs of -2.3% (p=0.041). This corresponded to an annual decrease of 0.8 cases per year in Northern Ireland. (Fig. 14.3; Tab 14.2)

Figure 14.3: Trends in European age-standardised incidence rates (EASIR) for cervical cancer by country: 1994-2004

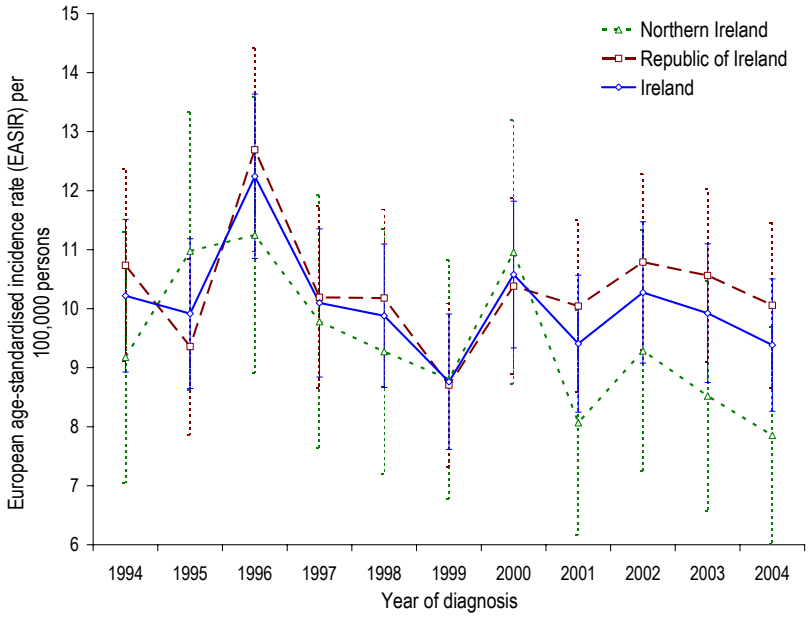
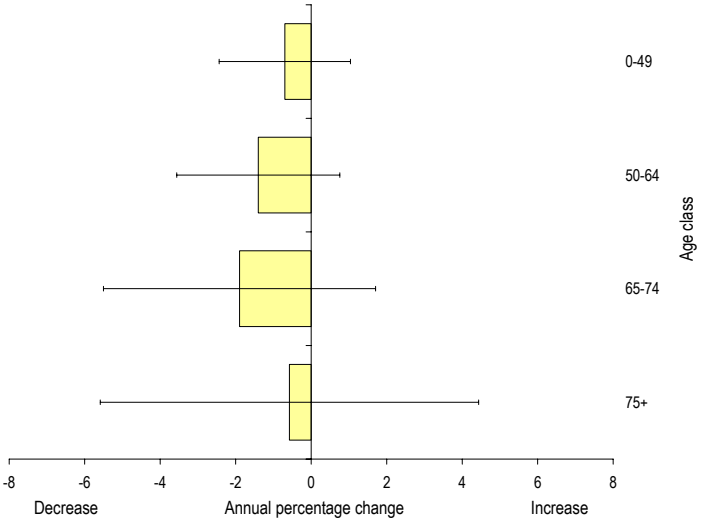


Table 14.2: Number of cases and European age-standardised incidence rates (EASIR) for cervical cancer by year of diagnosis and country: 1994-2004

	Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	75	9.2 ±2.1	174	10.7 ±1.6	249	10.2 ±1.3
1995	86	11.0 ±2.4	156	9.4 ±1.5	242	9.9 ±1.3
1996	93	11.2 ±2.3	214	12.7 ±1.7	307	12.2 ±1.4
1997	84	9.8 ±2.1	173	10.2 ±1.5	257	10.1 ±1.3
1998	80	9.3 ±2.1	183	10.2 ±1.5	263	9.9 ±1.2
1999	76	8.8 ±2.0	155	8.7 ±1.4	231	8.8 ±1.1
2000	96	11.0 ±2.2	191	10.4 ±1.5	287	10.6 ±1.2
2001	71	8.1 ±1.9	187	10.0 ±1.5	258	9.4 ±1.2
2002	82	9.3 ±2.0	208	10.8 ±1.5	290	10.3 ±1.2
2003	76	8.5 ±1.9	205	10.6 ±1.5	281	9.9 ±1.2
2004	73	7.9 ±1.8	202	10.1 ±1.4	275	9.4 ±1.1

EASIR: European age-standardised incidence rate with 95% CI

Figure 14.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for cervical cancer by age: 1994-2004



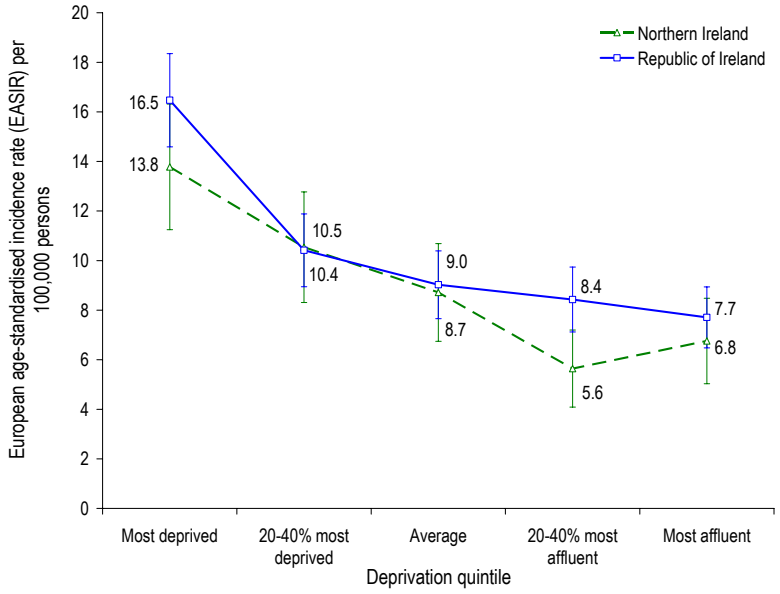
There were no significant trends in EASIRs for cervical cancer for any age group (0-49, 50-64, 65-74, 75+) during 1994-2004 in Ireland despite annual percentage changes of -1.9% (p=0.26) and -1.4% (p=0.18) for the 65-74 and 50-64 age classes respectively. (Fig. 14.4)

14.1.4: Socio-economic variations

In both Northern Ireland and Republic of Ireland incidence rates for cervical cancer decreased with increasing affluence. During 2000-2004 European age-standardised rates (EASIR) among Northern Ireland's 20% most deprived population were twice as high as those among the 20% most affluent population. Similarly EASIRs for the 20% of the population living in the most deprived areas

of Republic of Ireland were 113.7% higher than the 20% of the population resident in the most affluent areas. During the five-year period EASIRs for cervical cancer among the 20-40% most affluent population of Northern Ireland were 33.1% (p=0.003) lower than those in the 20% most deprived population of Republic of Ireland. (Fig.14.5)

Figure 14.5: European age-standardised incidence rates (EASIR) for cervical cancer by country specific deprivation quintile: 2000-2004



14.1.5: Geographic variations

Both Belfast and Dublin had significantly higher levels of cervical cancer than the average for all of Ireland during 1994-2004 with 18 and 62 cases diagnosed annually in Belfast and Dublin respectively. Leitrim, Carrickfergus and Wicklow also had higher than expected levels of the disease, while low levels were observed in Donegal, Galway, Mayo, Dungannon, Armagh, Down and Ballymoney. (Fig. 14.6)

14.1.6: International comparisons

Incidence rates of cervical cancer in Ireland during 1998-2000 were higher than those in the European Union (15-counties), UK, Canada and Australia. However they were similar to those in USA and lower than in the European Union (27-countries). However while these conclusions were also valid for Republic of Ireland, in Northern Ireland incidence rates were only significantly higher than those in Australia and lower than those in European Union (27 countries). (Fig.14.7)

Figure 14.6: Significant differences in county/council standardised incidence ratios for cervical cancer compared to Ireland as a whole: 1994-2004

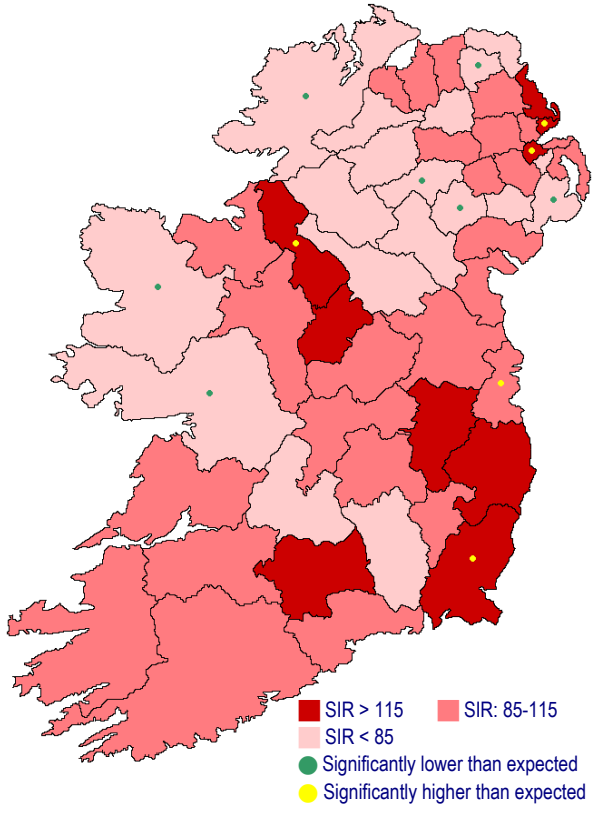
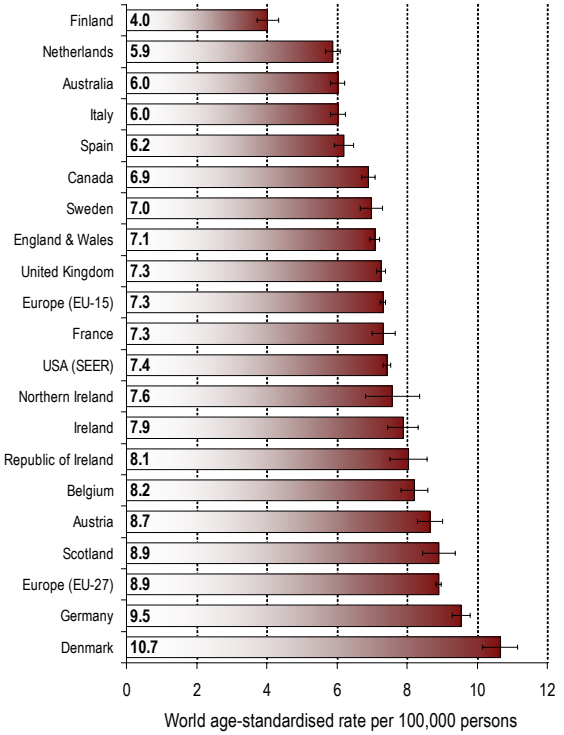


Figure 14.7: International comparisons of world age-standardised incidence rates for cervical cancer: 1998-2000



Source: IARC[107]

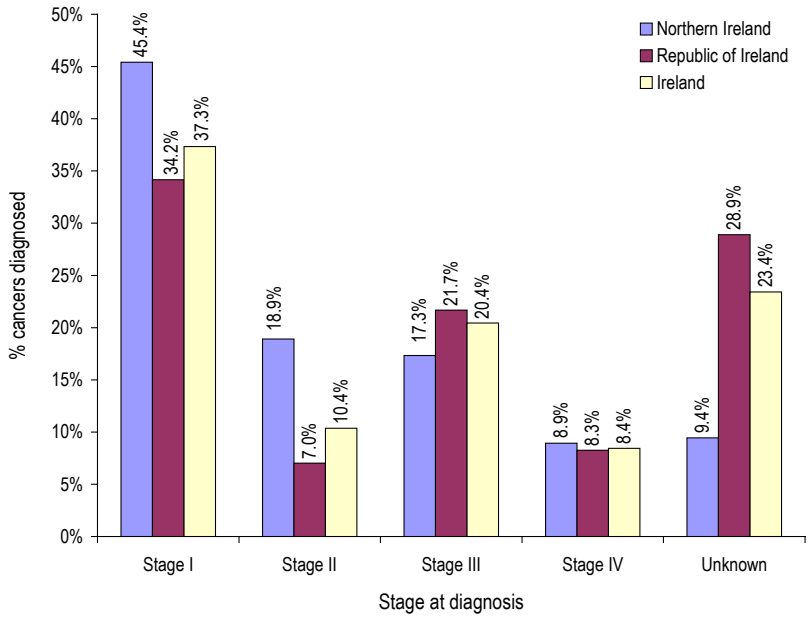
14.2: Treatment

14.2.1: Stage at diagnosis

Staging of cervical cancer in 2000-2004 was good with 76.6% of patients in Ireland assigned a stage at diagnosis. This was a significant improvement on the 68.6% staged in 1997-1999 ($p<0.001$). The proportion of patients with an unknown stage however differed between Northern Ireland and Republic of Ireland with 19.4% ($p<0.001$) more patients having a stage assigned in Northern Ireland. (Fig. 14.8)

The overall distribution of stage among patients also differed between the two countries ($\chi^2=144.1$, $p<0.001$), with the proportion assigned to stage I 11.2% and to stage II 11.9% higher in Northern Ireland ($p<0.001$). (Fig. 14.8)

Figure 14.8: Stage at diagnosis for cervical cancer patients by country: 2000-2004

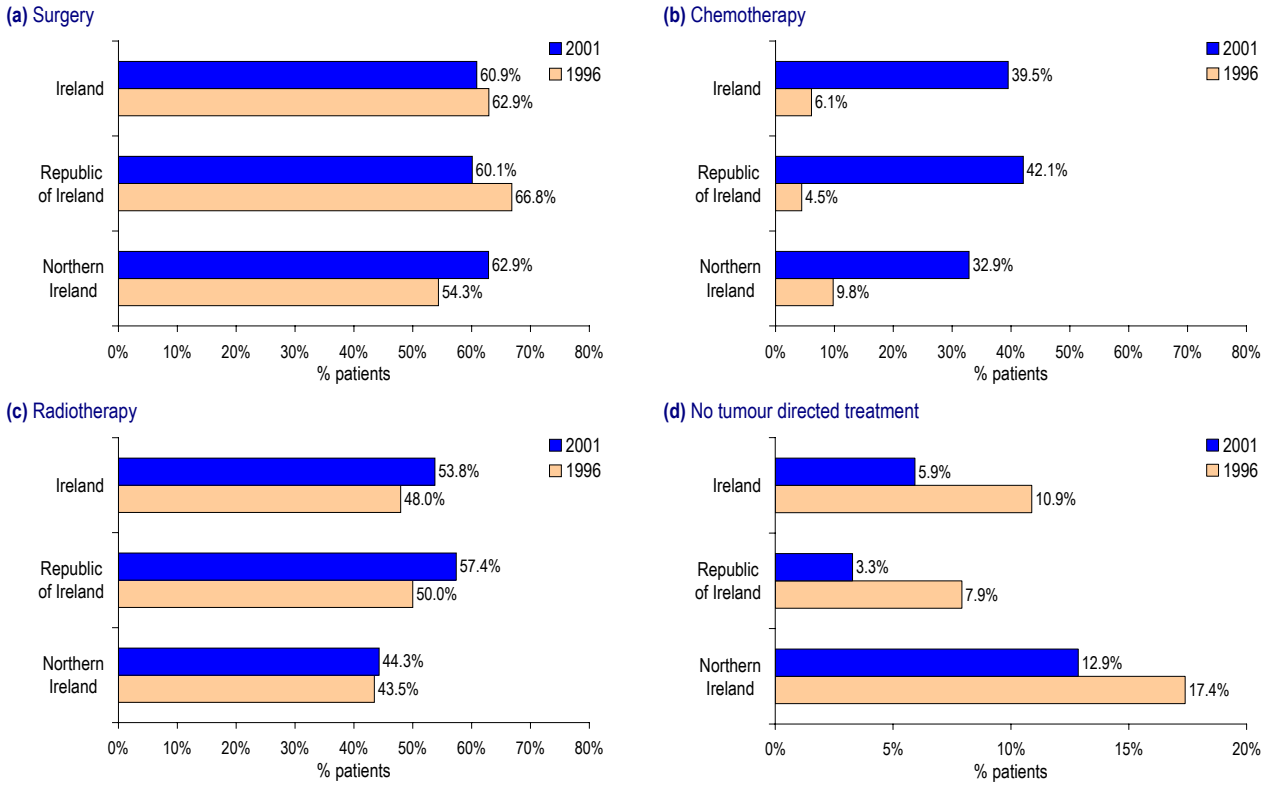


14.2.2: Treatment received

In 2001 there were 253 patients aged 15-99 with a diagnosis of cervical cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 294 patients diagnosed in 1996.

In 2001 surgery was the most common form of treatment received by cervical cancer patients in Ireland (60.9%), followed by radiotherapy (53.8%) and chemotherapy (39.5%) and with only 5.9% of patients receiving no form of tumour directed treatment.

Figure. 14.9: Tumour directed treatment received by cervical cancer patients by year of diagnosis and country: 1996 & 2001



Compared to 1996 chemotherapy use increased in Ireland by 33.4% (p<0.001) with no significant change in radiotherapy or surgery use despite a 5.8% increase in the number of patients receiving radiotherapy (p=0.176). The increase in the use of chemotherapy was apparent in both Northern Ireland (23.1%, p<0.001) and Republic of Ireland (37.6%, p<0.001). The proportion of patients receiving no tumour directed treatment decreased by 5.0% (p=0.039) between the two years. (Fig. 14.9)

Despite differences of 9.2% and 13.1% in the proportion of patients receiving chemotherapy and radiotherapy respectively, due to the small number of patients involved there was no conclusive difference between Northern Ireland and Republic of Ireland in the proportion of patients receiving any particular treatment type. The proportion receiving no tumour directed treatment was however 9.6% higher in Northern Ireland than Republic of Ireland (p=0.004). (Fig. 14.9)

Treatment combinations

In Ireland 43.5% of cervical cancer patients diagnosed in 2001 received more than one type of treatment, which was a 16.9% increase on the 26.5% of patients diagnosed in 1996 (p<0.001). This was driven by a 17.7% (p<0.001) increase in the use of chemotherapy and radiotherapy and a 15.2% (p<0.001) increase in the use of these two treatments plus surgery. (Tab. 14.3)

While there were no significant differences in the use of any particular treatment combination, Northern Ireland and Republic of Ireland had different overall distributions of treatment combinations (χ^2=26.8, p<0.001) that were primarily driven by differences in the proportion of patients receiving combined chemotherapy and radiotherapy or no tumour directed treatment. (Tab. 14.3)

Table 14.3: Tumour directed treatment received by cervical cancer patients by country and year of diagnosis: 1996 & 2001

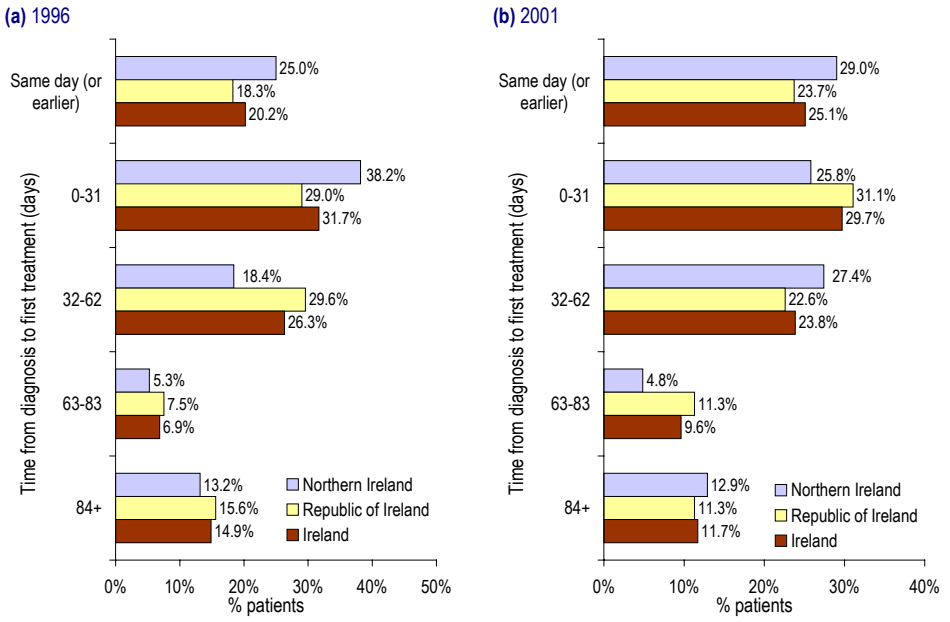
	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	39.1%	42.9%	41.6%	38.3%	40.8%	39.5%
Chemotherapy only	0.0%	0.0%	0.0%	1.1%	0.0%	0.8%
Radiotherapy only	19.6%	10.0%	22.8%	10.4%	21.8%	10.3%
Surgery and chemotherapy	0.0%	0.0%	0.5%	0.0%	0.3%	0.0%
Surgery and radiotherapy	14.1%	1.4%	23.3%	6.0%	20.4%	4.7%
Chemotherapy and radiotherapy	8.7%	14.3%	2.5%	25.1%	4.4%	22.1%
Surgery, chemotherapy and radiotherapy	1.1%	18.6%	1.5%	15.8%	1.4%	16.6%
No tumour directed treatment	17.4%	12.9%	7.9%	3.3%	10.9%	5.9%
Total patients	92	70	202	183	294	253

14.2.3: Waiting times

Among cervical cancer patients diagnosed in 2001 in Ireland 54.8% of those who received tumour directed treatment were treated within 31 days of diagnosis, which was similar to the proportion in 1996. (Fig. 14.10)

Waiting time for patients between diagnosis and treatment was similar in Northern Ireland and Republic of Ireland during 2001 (χ^2=4.4, p=0.360). (Fig. 14.10)

Figure 14.10: Time between diagnosis and first treatment by country for patients diagnosed with cervical cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

14.3: Survival

Survival from cervical cancer in Ireland was moderate during 2000-2004 with five-year (age-standardised) relative survival (age-standardised) for female patients diagnosed with cervical cancer during this five-year period estimated to be 60.8%. (Fig. 14.11, Tab. 14.4)

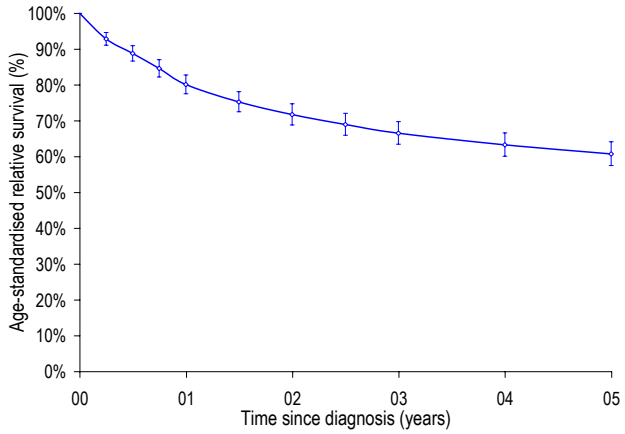
Table 14.4: Age-standardised relative survival for cervical cancer patients by country: 2000-2004 period analysis five-year estimates

	Age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
1-year	80.2% (75.8%, 85.0%)	80.4% (77.3%, 83.7%)	80.2% (77.6%, 82.8%)
5-year	59.4% (53.9%, 65.4%)	61.4% (57.5%, 65.6%)	60.8% (57.5%, 64.2%)

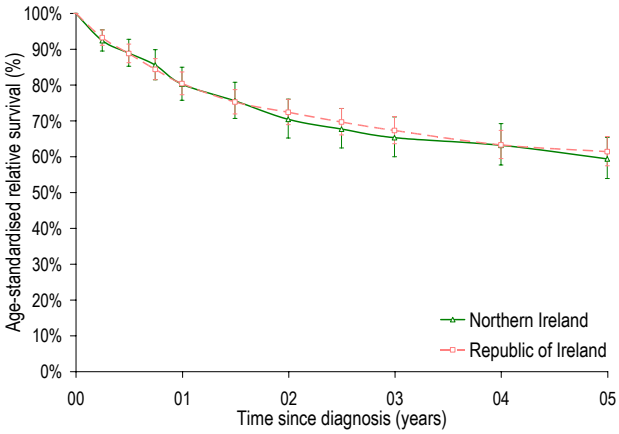
Five-year (age-standardised) relative survival from cervical cancer did not vary significantly by country for patients diagnosed in 2000-2004 with rates estimated to be 59.4% in Northern Ireland compared to 61.4% in Republic of Ireland. (Fig. 14.11, Tab. 14.4)

Figure 14.11: Age-standardised relative survival for cervical cancer patients: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



14.3.1: Changes in survival over time

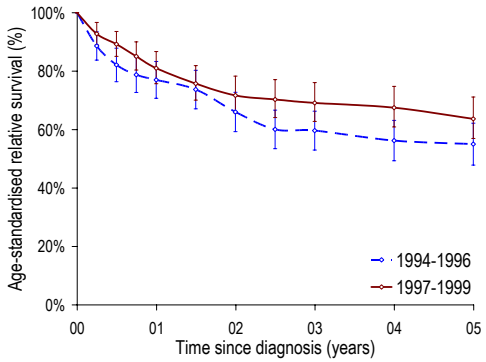
There was no conclusive improvement in five-year (age-standardised) relative survival for cervical cancer in Ireland between 1994-1996 and 1997-1999 despite an 8.5% increase, although this change did not reach statistical significance only by a small margin (p=0.052), a scenario also present in both Northern Ireland and Republic of Ireland where notable but not statistically significant increase in survival occurred. (Fig. 14.12, Tab. 14.5)

Table 14.5: Age-standardised relative survival for cervical cancer patients by country and period of diagnosis: 1994-1999

	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	77.0% (71.2%, 83.3%)	81.0% (75.7%, 86.7%)	55.0% (48.7%, 62.2%)	63.7% (57.0%, 71.2%)
Republic of Ireland	77.7% (73.3%, 82.3%)	81.3% (77.2%, 85.7%)	54.2% (48.9%, 60.1%)	61.6% (56.3%, 67.4%)
Ireland	77.3% (73.8%, 81.1%)	81.0% (77.7%, 84.5%)	53.4% (49.3%, 57.9%)	62.0% (57.8%, 66.5%)

Figure 14.12: Age-standardised relative survival for cervical cancer patients by country and period of diagnosis: 1994-1999

(a) Northern Ireland



(b) Republic of Ireland

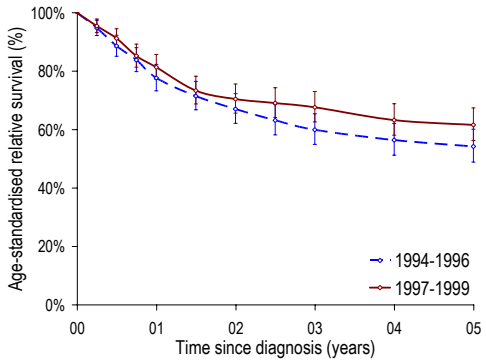


Figure 14.12 cont.
(c) Ireland

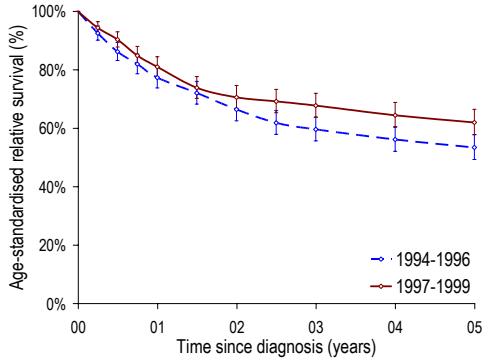


Table 14.6: Observed survival for cervical cancer patients by country and period of diagnosis: 1994-1999

	Observed survival (95% CI)	
	1-year	
	1994-1996	1997-1999
Northern Ireland	82.0% (77.4%, 86.9%)	83.5% (78.9%, 88.4%)
Republic of Ireland	81.9% (78.7%, 85.3%)	83.8% (80.6%, 87.1%)
Ireland	82.0% (79.3%, 84.7%)	83.7% (81.1%, 86.4%)
	5-year	
	1994-1996	1997-1999
Northern Ireland	60.8% (55.0%, 67.2%)	66.1% (60.3%, 72.4%)
Republic of Ireland	58.9% (54.9%, 63.3%)	63.4% (59.3%, 67.8%)
Ireland	59.5% (56.2%, 63.1%)	64.2% (60.9%, 67.8%)

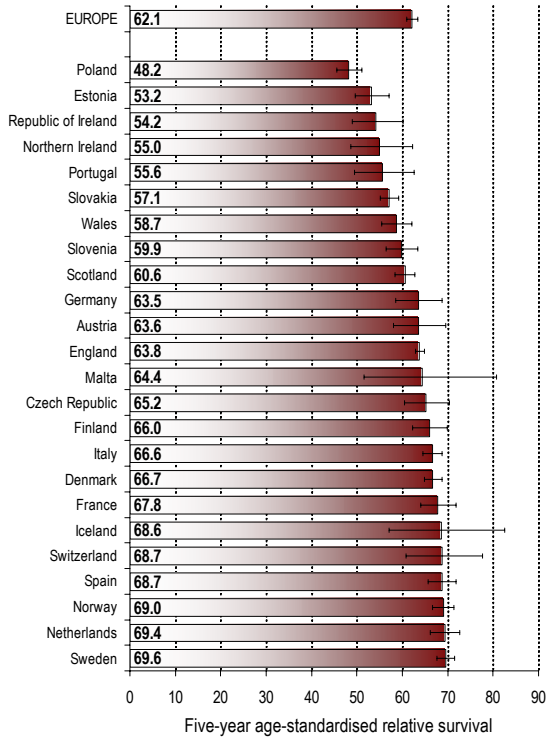
14.3.2: Observed survival

Observed survival from cervical cancer for those diagnosed in 1997-1999 was 83.7% after one year and 64.2% after five years, both of which were higher than the values for age-standardised relative survival. This is an unusual result as observed survival includes other causes of deaths, but occurred in this case as a result of the age-standardisation process giving more weight to survival among older patients. Neither one nor five-year observed survival varied by country; while changes in five-year observed survival between 1994-1996 and 1997-1999 were not statistically significant. (Tab. 14.6)

14.3.3: European comparisons

For patients diagnosed in 1994-1996 five-year (age-standardised) relative survival from cancer of the uterus in Republic of Ireland was 54.2% while in Northern Ireland it was 55.0%. Both of these values were significantly lower than the European average for patients diagnosed in 1990-1994 which was 62.1%. Compared to individual countries survival in Northern Ireland and Republic of Ireland was some of the worst in Europe. In particular it was significantly lower in both countries than in England, Italy, France, Netherlands and Spain. (Fig. 14.13)

Figure 14.13: European comparisons of five-year age-standardised relative survival for cervical cancer patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[108]

14.4: Mortality

During 2000-2004 there were on average 103 deaths from cervical cancer each year. This made up 1.0% of all female cancer deaths (excluding NMSC) making it the thirteenth most common female cancer death. The odds of a female dying from the disease, in the absence of other causes of death, were 1 in 356. (Tab. 14.7)

European age-standardised mortality rates (EASMR) from cervical cancer during 2000-2004 were 19.5% (p=0.017) lower in Northern Ireland than in Republic of Ireland with 30 deaths per year in Northern Ireland and 73 deaths per year in Republic of Ireland. (Tab. 14.7)

Table 14.7: Summary statistics for deaths from cervical cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of deaths per year	30	73	103
% of all cancer deaths (ex. NMSC)	0.9%	1.0%	1.0%
Rank (ex. NMSC)	14	11	13
Median age at death	63.5	57	59
Cumulative risk (Aged 0 to 74)	0.2%	0.3%	0.3%
Crude rate per 100,000 persons	3.4	3.7	3.6
EASMR ± 95% CI	3.1 ±0.5	3.8 ±0.4	3.6 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-19.5% ±16.0

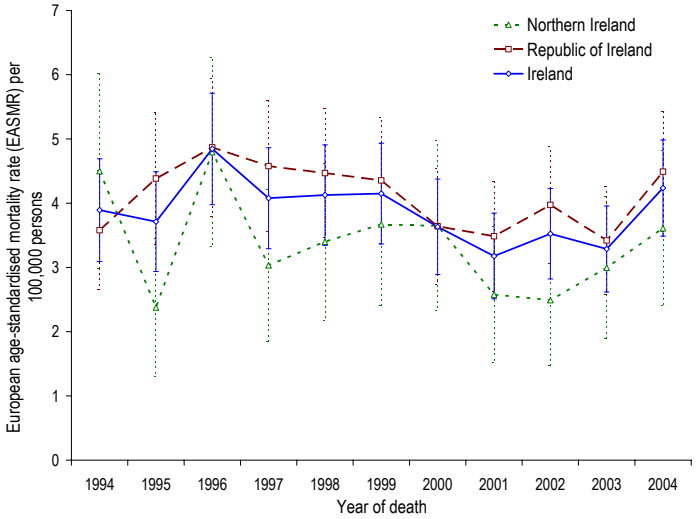
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

14.4.1: Trends

There was no significant change in European age-standardised mortality rates (EASMR) during 1994-2004 in Ireland, or in Northern Ireland or Republic of Ireland considered separately. (Fig. 14.14)

As a result of demographic change a small increase of 1 death from cervical cancer every two years was apparent in Ireland as a whole during 2000-2004. In Northern Ireland however there was a small decrease of 1 death every five years, while in Republic of Ireland deaths from cervical cancer increased by an average of 0.7 deaths each year. (Fig. 14.14)

Figure 14.14: Trends in European age-standardised mortality rates (EASMR) for cervical cancer by country: 1994-2004



14.5: Prevalence

At the end of 2004 there were 1,928 people living in Ireland who had been diagnosed with cervical cancer during 1994-2004, which was 65.6% of those diagnosed during this period. Among those diagnosed in 2000-2004 with cervical cancer there were 1,045 people still alive at the end of 2004, 75.1% of all those diagnosed since 2000. At the end of 2004 the number of people living with the disease diagnosed within the previous five years per 100,000 persons was 8.1% greater in Republic of Ireland than Northern Ireland. (Tab. 14.8)

Table 14.8: Prevalence of cervical cancer in Ireland at the end of 2004 by country and period of diagnosis

	Diagnosed 1994-2004		Diagnosed 2000-2004	
	Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	593	66.5%	296	74.4%
Republic of Ireland	1,335	65.2%	749	75.4%
Ireland	1,928	65.6%	1,045	75.1%

14.6: Discussion

The cervix is part of a women's reproductive system which connects the vagina to the womb. Most cancers of the cervix develop around the opening with bleeding from the vagina at times other than during a period being the most common symptom. Other symptoms include pain during sexual intercourse or an unpleasant smelling vaginal discharge.[109]

Infection with human papillomavirus (HPV), especially types 16 and 18, poses a high risk for the development of cervical cancer[110] although most HPV infections will not progress to cervical cancer. Sexual activity is indirectly related to the chance of developing cervical cancer as increased activity increases the possibility of contracting HPV or other sexually transmitted diseases.[111] Cigarette smoking and poor diet are also linked to an increased risk of developing cervical cancer, although while both factors only increase the risk directly by a small amount they can increase the risk by a larger margin in combination with HPV.[112] Use of the contraceptive pill is also a possible risk factor, although the increase in risk is small and may be related to the increased risk of HPV infection compared with other contraceptive measures.[113]

Cervical cancer is the second most common female cancer worldwide with approximately 470,000 cases diagnosed each year. Approximately 80% of these occur in developing counties with the highest incidence rates present in South America, Southern and Eastern Africa and India. However very low incidence rates are recorded in China and Western Asia, with low incidence rates also present in North America and Western Europe. In developed countries both incidence and mortality of the disease have declined considerably over the last 40 years. This is attributed to the success of screening programmes throughout developed countries which

screen the general population for indications of pre-malignant forms of cervical cancer, thereby allowing treatment before the development of full malignant cervical cancer. Within the context of this report it should thus be remembered that many hundreds of women are treated for non-malignant forms of cervical cancer and do not feature in the results reported in this chapter or in malignant cervical cancer incidence figures from countries around the world.

As with most cancers early detection improves survival prospects and also dictates treatment received. When caught at an early stage surgery, often combined with radiotherapy and/or chemotherapy are often used successfully with high survival rates for this scenario. For more advanced disease radiotherapy is applied with the addition of the use of chemotherapy in the event of advanced disease being a relatively new development. However the survival prospects for very advanced disease are poor and combinations of radiotherapy and chemotherapy are frequently used only for palliative reasons.

The existence of a cervical screening programme for all women aged 20-65 since 1989 has contributed to the reduction in cervical cancers in Northern Ireland being more marked in recent years. The National Cancer Screening Service launched a national, population-based cervical screening programme in Republic of Ireland in September 2008 for all women in Republic of Ireland aged 25 to 60. Screening will be provided every three years for women aged 25 to 44 and every five years for women aged 45 to 60. Prior to the introduction of this programme, cervical screening in Republic of Ireland, although widespread, was largely opportunistic.

Sexually transmitted infection remains the greatest causal factor with education of the young as to attitudes towards sexual activity having a high potential to reduce incidence rates further. Additionally the new HPV vaccine, introduced in Northern Ireland in 2008, promises a further reduction in the development of cervical cancer as a result of this virus.

Chapter 15:

Cancer of the uterus (C54-C55)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were 446 cases diagnosed each year between 2000 and 2004.*
  - *Incidence rates increased by 2.3% each year in Ireland between 1994 and 2004.*
  - *There was no significant relationship between deprivation and incidence rates during 2000-2004.*
  - *Incidence rates during 1994-2004 were higher than expected in Antrim district council and county Kildare compared to all of Ireland.*
  - *Ireland had some of the lowest incidence rates during 1998-2000 among developed countries.*
  - *There were on average 104 deaths from cancer of the uterus each year during 2000-2004.*
  - *There was no significant change in mortality rates during 1994-2004.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival for patients diagnosed in 2000-2004 was estimated to be 71.6%.*
  - *There was no significant change in age-standardised relative survival between patients diagnosed in 1994-1996 and 1997-1999.*
  - *There were 2,922 people alive at the end of 2004 after being diagnosed with cancer of the uterus during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were 12.9% greater in Northern Ireland than Republic of Ireland during 2000-2004.*
  - *During 1994-2004 incidence rates increased in Northern Ireland by 3.8% compared to 1.5% in Republic of Ireland.*
  - *Five-year (age-standardised) relative survival did not vary significantly by country.*
  - *There was no significant difference in mortality rates between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *There was no significant change in mortality rates during 1994-2004 in Republic of Ireland, however mortality rates increased in Northern Ireland by 3.6% per year.*
  - *At the end of 2004 the number of people living with cancer of the uterus having been diagnosed within the previous five years per 100,000 persons was 28.7% greater in Northern Ireland than Republic of Ireland.*

15.1: Incidence

Cancer of the uterus was the fifth most common female cancer in Ireland during 2000-2004 making up 4.2% of all female cases (excluding NMSC). On average there were 446 cases diagnosed each year which corresponded to 15.7 per 100,000 females in the population. Females had a cumulative risk of developing the disease before the age of 75 of 1.4%.

Incidence of the disease was higher in Northern Ireland than Republic of Ireland during 2000-2004 with European age standardised incidence rates (EASIR) 12.9% (p=0.012) greater in Northern Ireland. (Tab. 15.1)

Table 15.1: Summary statistics for incidence of cancer of the uterus: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of cases per year	161	285	446
% of all cancer cases (ex. NMSC)	4.7%	4.0%	4.2%
Rank (ex. NMSC)	5	6	5
Median age at diagnosis	65	63	64
Cumulative risk (Aged 0 to 74)	1.5%	1.3%	1.4%
Crude rate per 100,000 persons	18.5	14.5	15.7
EASIR ± 95% CI	17.2 ±1.2	15.2 ±0.8	15.9 ±0.7
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			12.9% ±10.1

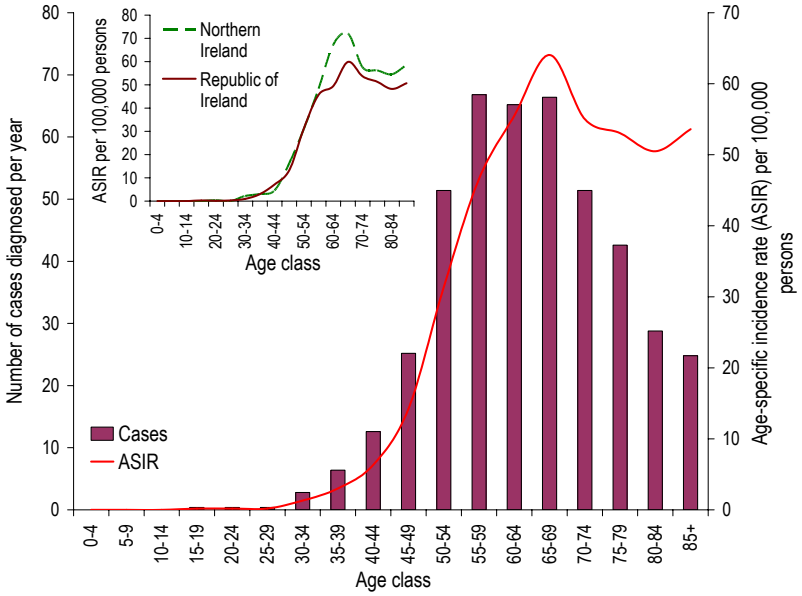
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

15.1.1: Age distribution

During 2000-2004 the median age at diagnosis for females with cancer of the uterus was 64 years of age with diagnosis occurring on average at a slightly later age in Northern Ireland than Republic of Ireland (NI: 65 years; ROI: 63 years). 15.0% of cases diagnosed in Ireland were among those aged 55-59 although those aged 60-64 and 65-69 also had a similar number of cases diagnosed each year. (Fig. 15.1)

Age-specific incidence rates (ASIR) were highest among those aged 65-69 in both Northern Ireland and Republic of Ireland although ASIRs were higher for this age class in Northern Ireland as were those for females aged 69 and over. (Fig. 15.1)

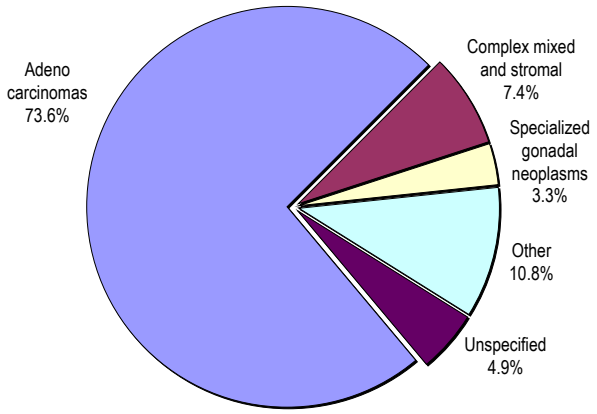
Figure 15.1: Number of cases of cancer of the uterus diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



15.1.2: Cell type

Adenocarcinomas were the most common cancer of the uterus diagnosed during 2000-2004 in Ireland constituting 73.6% of the total number of cases of this type of cancer. Cancers of the uterus with an unspecified cell type made up 4.9% of these cases with both Northern Ireland and Republic of Ireland having the same proportion unspecified. (Fig. 15.2)

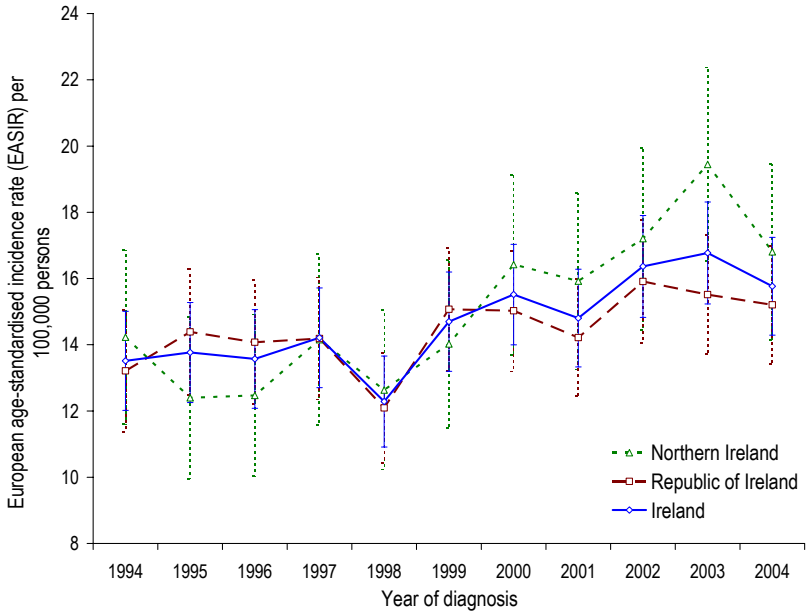
Figure 15.2: Types of cancer of the uterus diagnosed in Ireland: 2000-2004



15.1.3: Trends

Incidence of cancer of the uterus increased during 1994 and 2004 with European age-standardised incidence rates (EASIR) having increased by 2.3% (p=0.003) each year in Ireland. Both countries exhibited this rise although the magnitude of the increase was larger in Northern Ireland with an annual increase of 3.8% (p=0.001) in EASIRs compared to an annual increase of 1.5% (p=0.035) in Republic of Ireland. (Fig. 15.3, Tab 15.2)

Figure 15.3: Trends in European age-standardised incidence rates (EASIR) for cancer of the uterus by country: 1994-2004



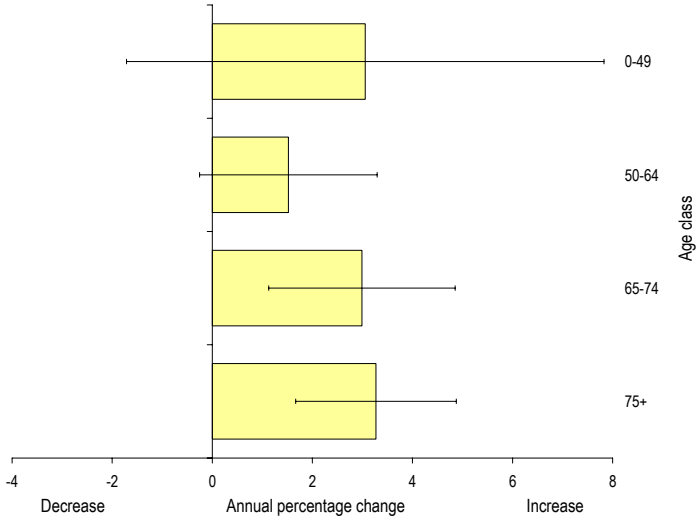
In terms of the number of cases the increasing incidence rates and changing population size and structure resulted in an additional 15.3 cases of cancer of the uterus being diagnosed each year in Ireland. Northern Ireland contributed 6.7 of these cases each year while Republic of Ireland had an annual increase of 8.6 cases. (Fig. 15.3, Tab 15.2)

Table 15.2: Number of cases and European age-standardised incidence rates (EASIR) for cancer of the uterus by year of diagnosis and country: 1994-2004

	Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	124	14.2 ±2.6	215	13.2 ±1.8	339	13.5 ±1.5
1995	109	12.4 ±2.4	234	14.4 ±1.9	343	13.8 ±1.5
1996	109	12.5 ±2.4	231	14.1 ±1.9	340	13.6 ±1.5
1997	125	14.2 ±2.6	239	14.2 ±1.9	364	14.2 ±1.5
1998	115	12.6 ±2.4	214	12.1 ±1.7	329	12.3 ±1.4
1999	126	14.0 ±2.5	264	15.1 ±1.9	390	14.7 ±1.5
2000	149	16.4 ±2.7	274	15.0 ±1.8	423	15.5 ±1.5
2001	147	15.9 ±2.7	262	14.2 ±1.8	409	14.8 ±1.5
2002	160	17.2 ±2.7	296	15.9 ±1.8	456	16.4 ±1.5
2003	182	19.4 ±2.9	299	15.5 ±1.8	481	16.8 ±1.5
2004	166	16.8 ±2.7	293	15.2 ±1.8	459	15.8 ±1.5

EASIR: European age-standardised incidence rate with 95% CI

Figure 15.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for cancer of the uterus by sex and age: 1994-2004



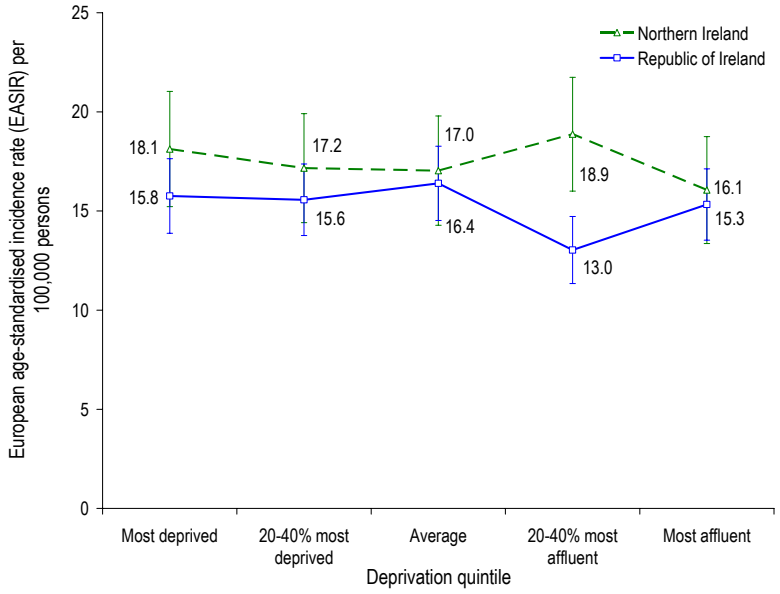
Positive annual percentage changes (APC) in EASIRs of cancer of the uterus were observed for all age groups during 1994-2004 although the changes were only significant for those aged 65-74 and 75 and over with increases of 3.0% (p=0.005) and 3.3% (p=0.001) respectively. For those aged 0-49 the APC was of a similar magnitude but was not a conclusive change (p=0.185) due to the small number of cases involved in the analysis. For those aged 50-64 there was an APC of 1.5% (p=0.085) which was also not statistically significant. (Fig. 15.4)

15.1.4: Socio-economic variations

During 2000-2004 there was no apparent relationship between incidence of cancer of the uterus and deprivation in either Northern Ireland or Republic of Ireland, with no significant difference between European age-standardised incidence rates (EASIR) for each

population quintile. EASIRs in the fourth deprivation quintile (representing the 20-40% most affluent population based upon the socio-economic characteristics of area of residence) were significantly higher in Northern Ireland than the equivalent population in Republic of Ireland. This however was in part related to higher incidence of cancer of the uterus in Northern Ireland as a whole. (Fig. 15.5)

Figure 15.5: European age-standardised incidence rates (EASIR) for cancer of the uterus by country specific deprivation quintile: 2000-2004



15.1.5: Geographic variations

Compared to all of Ireland incidence rates of cancer of the uterus during 1994-2004 were higher than expected in Antrim district council and county Kildare. Lower than expected rates were present in counties Dublin, Laois, Kilkenny and Meath. On average there were 25 cases of cancer of the uterus diagnosed in Belfast each year, while there was as average of 68 diagnosed in Dublin annually. (Fig. 15.6)

15.1.6: International comparisons

Ireland had some of the lowest incidence rates of cancer of the uterus during 1998-2000 among developed countries with world age-standardised incidence rates 7.0% lower than those in the UK, 16.1% lower than those in European Union (15 countries) and 40.8% lower than those in the USA. (Fig. 15.7)

Figure 15.6: Significant differences in county/council standardised incidence ratios for cancer of the uterus compared to Ireland as a whole: 1994-2004

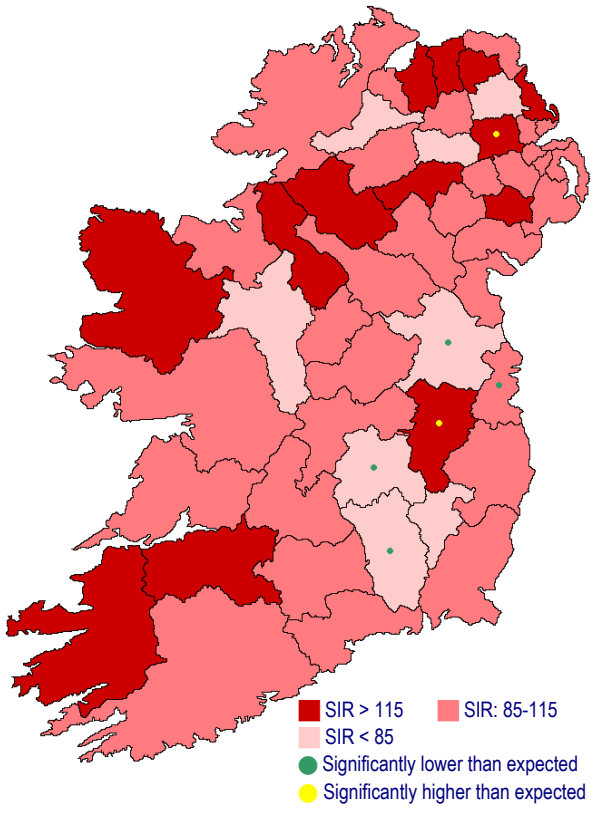
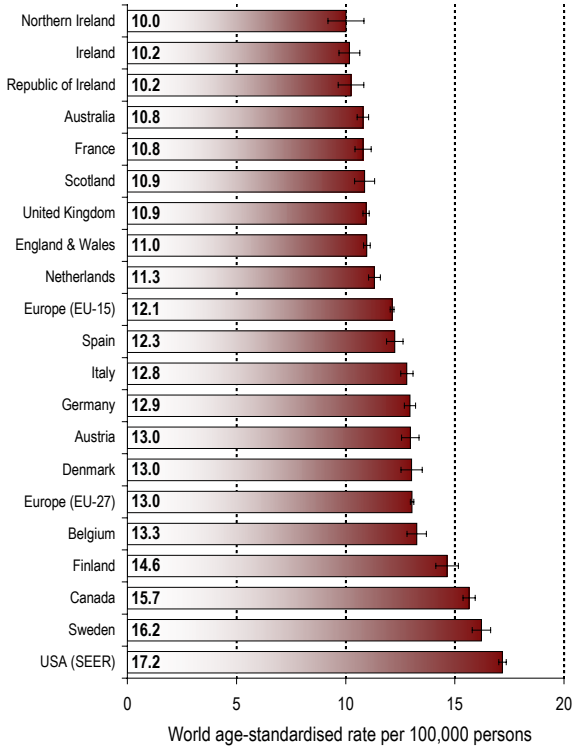


Figure 15.7: International comparisons of world age-standardised incidence rates for cancer of the uterus: 1998-2000



Source: IARC[114]

15.2: Survival

Survival from cancer of the uterus in Ireland was moderate during 2000-2004 with five-year (age-standardised) relative survival for female patients diagnosed with the disease during this five-year period estimated to be 71.6%. (Fig. 15.8, Tab. 15.3)

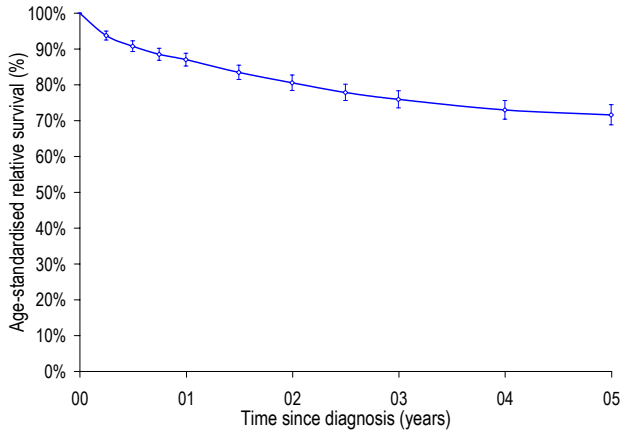
Table 15.3: Age-standardised relative survival for cancer of the uterus patients by country: 2000-2004 period analysis five-year estimates

	Age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
1-year	85.7% (82.7%, 88.7%)	88.0% (85.8%, 90.2%)	87.0% (85.3%, 88.8%)
5-year	69.0% (64.6%, 73.6%)	73.4% (69.9%, 77.0%)	71.6% (68.8%, 74.5%)

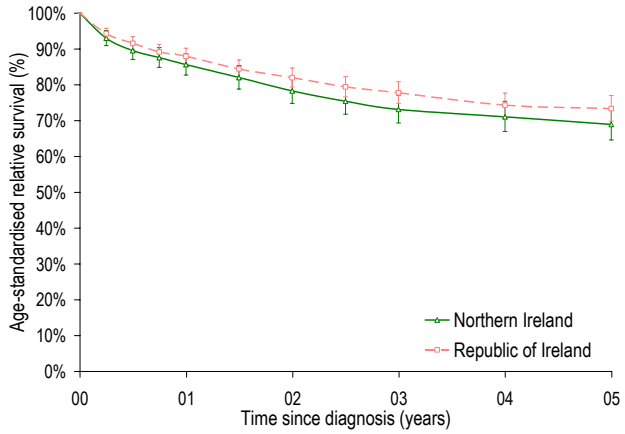
Five-year (age-standardised) relative survival from cancer of the uterus did not vary significantly by country for patients diagnosed in 2000-2004 with rates estimated to be 69.0% in Northern Ireland compared to 73.4% in Republic of Ireland, a difference of 4.4% that may be a result of random factors (p=0.285). (Fig. 15.8, Tab. 15.3)

Figure 15.8: Age-standardised relative survival for cancer of the uterus patients: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



15.2.1: Changes in survival over time

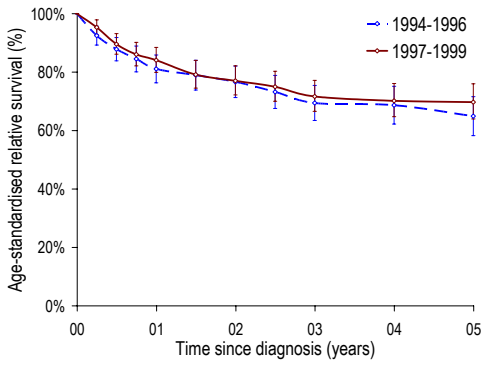
There was no significant change in either one or five-year (age-standardised) relative survival in Ireland for cancer of the uterus between 1994-1996 and 1997-1999 despite a change of 3.7% (p=0.330) at the five-year point. Likewise there was no significant change in Northern Ireland or Republic of Ireland considered separately. (Fig. 15.9, Tab. 15.4)

Table 15.4: Age-standardised relative survival for cancer of the uterus patients by country and period of diagnosis: 1994-1999

	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	81.1% (76.6%, 85.9%)	84.1% (79.9%, 88.5%)	64.9% (58.9%, 71.6%)	69.7% (64.0%, 76.0%)
Republic of Ireland	82.6% (79.3%, 86.1%)	86.1% (83.1%, 89.3%)	69.4% (64.6%, 74.4%)	72.2% (67.7%, 77.0%)
Ireland	82.0% (79.3%, 84.8%)	85.4% (82.9%, 87.9%)	67.6% (63.9%, 71.6%)	71.4% (67.8%, 75.1%)

Figure 15.9: Age-standardised relative survival for cancer of the uterus patients by country and period of diagnosis: 1994-1999

(a) Northern Ireland



(b) Republic of Ireland

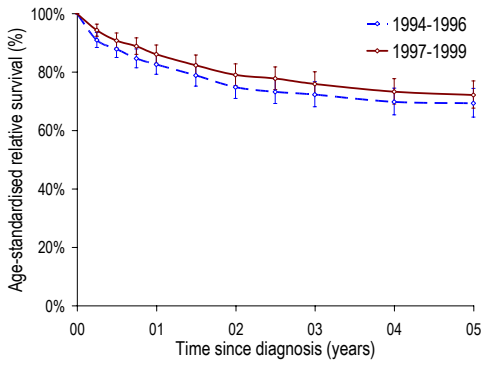


Figure 15.9 cont.
(c) Ireland

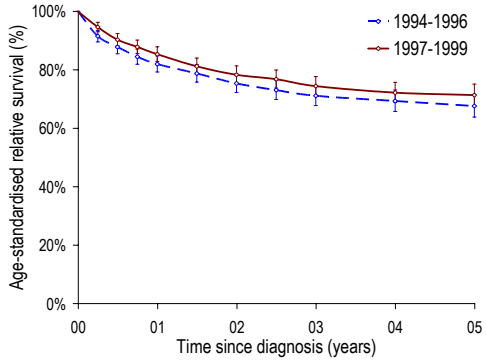


Table 15.5: Observed survival for cancer of the uterus patients by country and period of diagnosis: 1994-1999

	Observed survival (95% CI)	
	1-year	
	1994-1996	1997-1999
Northern Ireland	81.4% (77.2%, 85.8%)	83.6% (79.8%, 87.7%)
Republic of Ireland	82.9% (80.1%, 85.9%)	85.8% (83.2%, 88.6%)
Ireland	82.4% (80.1%, 84.9%)	85.1% (82.9%, 87.3%)
	5-year	
	1994-1996	1997-1999
Northern Ireland	60.9% (55.7%, 66.5%)	64.6% (59.7%, 69.9%)
Republic of Ireland	63.9% (60.3%, 67.7%)	67.0% (63.5%, 70.7%)
Ireland	62.9% (59.9%, 66.0%)	66.2% (63.3%, 69.2%)

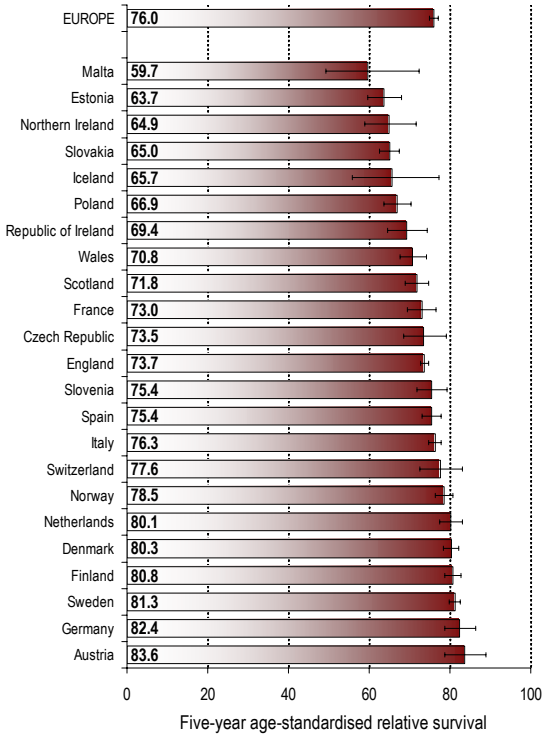
15.2.2: Observed survival

Observed survival from cancer of the uterus for those diagnosed in 1997-1999 was 85.1% after one year and 66.2% after five years, which was approximately 5% lower than the value for age-standardised relative survival, as observed survival includes other causes of deaths. Neither one nor five-year observed survival varied by country; while changes in five-year observed survival between 1994-1996 and 1997-1999 were not statistically significant. (Tab. 15.5)

15.2.3: European comparisons

Five-year (age-standardised) relative survival from cancer of the uterus in Europe for patients diagnosed in 1990-1994 ranged from 59.7% in Malta to 83.6% in Austria. The average among European countries was 76.0%. For patients diagnosed in 1994-1996 five-year (age-standardised) relative survival from cancer of the uterus was 69.4% in Republic of Ireland and 64.9% in Northern Ireland. Both were significantly lower than the 1990-1994 European average. Survival in Northern Ireland was also significantly lower than that in England, with many other European countries also having better survival from the disease than in both countries in Ireland. (Fig. 15.10)

Figure 15.10: European comparisons of five-year age-standardised relative survival for cancer of the uterus patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[115]

15.3: Mortality

During 2000-2004 there were on average 104 deaths from cancer of the uterus each year. This made up 1.0% of all female cancer deaths (excluding NMSC) making it the twelfth most common female cancer death. The odds of a female dying from the disease, in the absence of other causes of deaths, were 1 in 424. (Tab. 15.6)

European age-standardised mortality rates (EASMR) from cancer of the uterus during 2000-2004 did not differ significantly between Northern Ireland and Republic of Ireland although some weak evidence (p=0.067) existed for higher mortality rates in Northern Ireland. (Tab. 15.6)

Table 15.6: Summary statistics for deaths from cancer of the uterus: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of deaths per year	40	65	104
% of all cancer deaths (ex. NMSC)	1.2%	0.9%	1.0%
Rank (ex. NMSC)	9	14	12
Median age at death	74	74	74
Cumulative risk (Aged 0 to 74)	0.3%	0.2%	0.2%
Crude rate per 100,000 persons	4.6	3.3	3.7
EASMR ± 95% CI	3.6 ±0.5	2.9 ±0.3	3.2 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			21.1% ±22.5

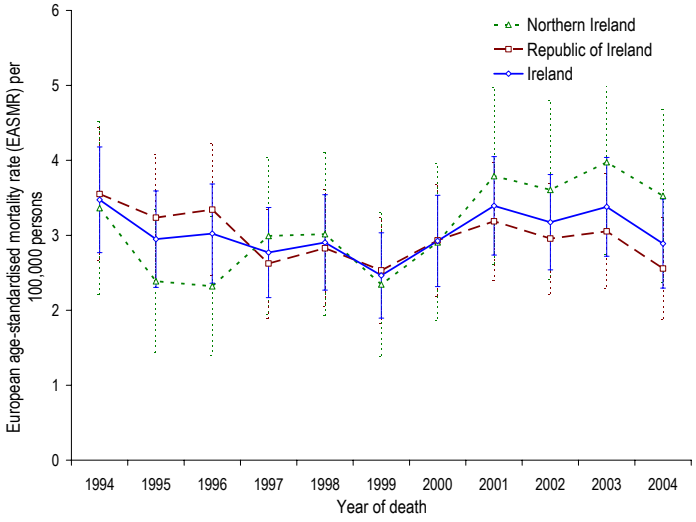
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

15.3.1: Trends

There was no significant change in European age-standardised mortality rates (EASMR) during 1994-2004 in Ireland as a whole, or in Republic of Ireland, however EASMRs increased in Northern Ireland by 3.6% (p=0.037) per year. (Fig. 15.11)

In Republic of Ireland the actual number of deaths per year from cancer of the uterus remained virtually static with an average increase of one death every three years between 1994 and 2004. In Northern Ireland the increase in EASMRs and the growth and ageing of the population resulted in an annual increase of 1.2 deaths from the disease. (Fig. 15.11)

Figure 15.11: Trends in European age-standardised mortality rates (EASMR) for cancer of the uterus by country: 1994-2004



15.4: Prevalence

Between 1994 and 2004 there were 4,333 people diagnosed with cancer of the uterus. 67.4% of these patients (2,922 people) were still alive at the end of 2004, with 1,710 of these diagnosed in the 2000-2004 period. At the end of 2004 the number of people living with cancer of the uterus diagnosed within the previous five years per 100,000 persons was 28.7% greater in Northern Ireland than Republic of Ireland. (Tab. 15.7)

Table 15.7: Prevalence of cancer of the uterus in Ireland at the end of 2004 by country and period of diagnosis

	Diagnosed 1994-2004		Diagnosed 2000-2004	
	Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	1,007	66.6%	609	75.7%
Republic of Ireland	1,915	67.9%	1,101	77.3%
Ireland	2,922	67.4%	1,710	76.8%

15.5: Discussion

The uterus (or womb) is the part of the woman's reproductive system where a baby grows during pregnancy. Cancer of the uterus, which is sometimes known as endometrial cancer, is associated with several symptoms depending upon how advanced the cancer is. The most common symptom at an early stage is vaginal bleeding after menopause or between periods. At a later stage the presence of cancer of the uterus can be associated with loss of appetite or weight, tiredness, sickness, constipation, more frequent urinating or pain in the back of the legs.[116]

Females who are obese and/or have a diet high in fat have a higher risk of developing cancer of the body of the uterus than females who have a healthy weight and/or a balanced diet.[117] Reproductive and menstrual history is also related to the development of cancer of the uterus. Having children is considered to be protective with the risk of endometrial cancer decreasing as the number of children given birth to increases.[118] A late menopause, early first period, irregular periods or longer than usual periods all increase risk.[119] The use of the contraceptive pill however has a protective effect.[120] The use of Hormone Replacement Therapy (HRT) has been linked to a rise in endometrial cancer,[121] as has the use of tamoxifen, although the benefits in preventing breast cancer outweigh the risk caused by its use.[122] Endometrial hyperplasia and polycystic ovary syndrome are also linked to an increased risk of developing cancer of the uterus.[123] Family history is also a factor as the inheritance of a faulty HNPCC (hereditary non-polyposis colorectal cancer) gene can increase the risk of developing several types of cancer including endometrial cancer.[123]

Cancer of the uterus affects approximately 189,000 women each year worldwide, with 45,000 deaths from the disease each year. The highest incidence rates of the disease occur in USA and Canada but it is also high in Europe, Australia and New Zealand. The lowest incidence rates are found in Africa and Asia. Most countries however are experiencing a decline in both incidence and

mortality of the disease or at least have stable rates. This makes the observed increase in Ireland particularly noteworthy and requires further examination as to the exact causes, although increases in obesity levels are a likely contributory factor.

The primary treatment for the disease is surgery with radiotherapy used as a follow up in some cases or in the event that the cancer is inoperable. Chemotherapy is used in the event of advance or metastatic disease, although survival for this stage of the disease in poor. Provided the disease is diagnosed at a relatively early stage however survival from the disease is very good. Early detection of symptoms is the most likely manner in which this can be achieved as this prompts histological sampling that can lead to a definite diagnosis of the disease at an early stage. The onus however is on women to make their GP aware of any possible symptoms of the disease.

Prevention strategies can also assist in the control of the disease due to its link with diet and obesity. Many general health strategies exist in order to prompt the general public into leading healthier lifestyles and if effective they will assist in reversing the increasing levels of cancer of the uterus in Ireland.

Chapter 16:

Ovarian cancer (including borderline; C56)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 561 cases diagnosed in Ireland each year.*
  - *During 2000-2004 11.9% of ovarian cancers diagnosed in Ireland were borderline cases.*
  - *Incidence rates in Ireland did not change significantly between 1994 and 2004.*
  - *During 2000-2004 there was no relationship between incidence rates and deprivation.*
  - *Incidence rates in Dungannon were higher than expected compared to the average in Ireland during 1994-2004.*
  - *During 1998-2000 Ireland had higher incidence rates (excluding borderline cancers) than in EU, USA and UK.*
  - *During 2000-2004 there was an average of 359 deaths each year in Ireland.*
  - *There was no significant change in mortality rates during 1994-2004 in Ireland during 1994-2004.*

- *TREATMENT*
  - *In 2001 surgery was the most common form of treatment received by patients in Ireland (71.4%), followed by chemotherapy (47.6%). Overall only 19.6% of patients received no form of tumour directed treatment.*
  - *Compared to 1996 the use of surgery increased in Ireland by 17.7%, while the proportion of patients receiving no tumour directed treatment decreased by 7.8%.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival for patients diagnosed during 2000-2004 was 35.8%.*
  - *There was no significant change in either one or five-year (age-standardised) relative survival in Ireland between 1994-1996 and 1997-1999.*
  - *Excluding borderline ovarian cancer, which has very high survival, five-year (age-standardised) relative survival was 28.9% for patients diagnosed in 1997-1999, 6.0% lower than when borderline ovarian cancer is included.*
  - *Five-year (age-standardised) relative survival for patients diagnosed in 1995-1999 was lower in Republic of Ireland than in Europe with Northern Ireland having similar survival to the European average.*
  - *At the end of 2004 there were 2,461 people living with ovarian cancer having been diagnosed in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *There was no significant difference in incidence rates between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *There was no significant difference in incidence rates for either non-borderline or borderline ovarian cancers between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *There were no significant differences between Northern Ireland and Republic of Ireland in the proportion of patients receiving any form of treatment or in the proportion receiving no tumour directed treatment during 2001.*
  - *Between 1996 and 2001 there was no significant change in surgery use in Northern Ireland while there was a 25.7% increase in Republic of Ireland.*
  - *Five-year (age-standardised) relative survival did not vary significantly by country for patients diagnosed in 2000-2004.*
  - *Mortality rates during 2000-2004 did not differ significantly between Northern Ireland and Republic of Ireland.*
  - *At the end of 2004 the number of people living with ovarian cancer diagnosed within the previous five years per 100,000 persons was 20.1% greater in Northern Ireland than Republic of Ireland.*

16.1: Incidence

During 2000-2004 there were on average 561 cases of ovarian cancer diagnosed in Ireland each year with 187 of these in Northern Ireland. It was the fourth most common female cancer throughout Ireland contributing 5.3% of all female cancers (excluding NMSC). The odds of a female developing the disease before the age of 75 were 1 in 62. (Tab. 16.1)

Incidence rates for ovarian cancer were similar in Northern Ireland and Republic of Ireland during 2000-2004 with no significant difference in European age-standardised incidence rates (EASIR). (Tab. 16.1)

Table 16.1: Summary statistics for incidence of ovarian cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of cases per year	187	374	561
% of all cancer cases (ex. NMSC)	5.4%	5.3%	5.3%
Rank (ex. NMSC)	4	4	4
Median age at diagnosis	64	62	62
Cumulative risk (Aged 0 to 74)	1.6%	1.6%	1.6%
Crude rate per 100,000 persons	21.5	19.0	19.8
EASIR ± 95% CI	19.6 ±1.3	19.5 ±0.9	19.5 ±0.7
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			0.9% ±8.2

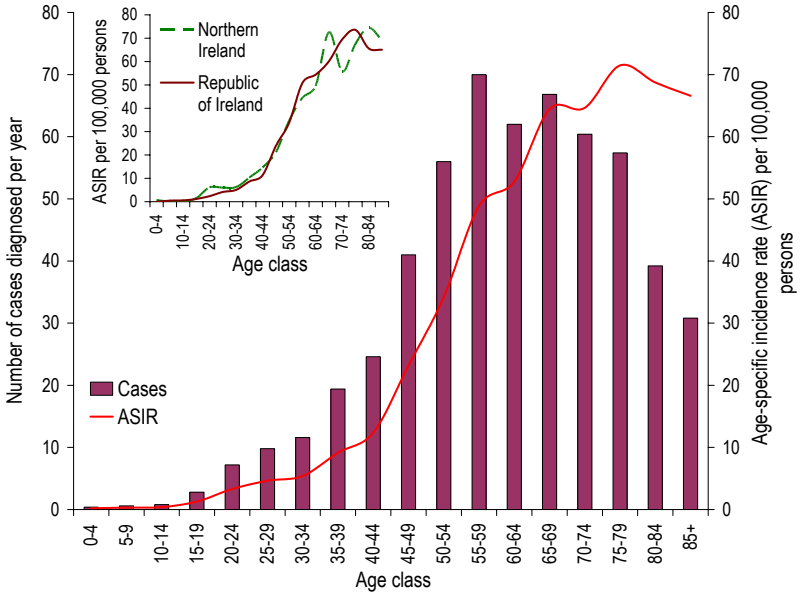
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

16.1.1: Age distribution

Ovarian cancers were diagnosed at a median age of 62 years during 2000-2004 in Ireland. Cases were at a maximum among those aged 55-59 with 70 cases per year contributing 12.5% to the ovarian cancer total. A similar number of cases however also occurred among those aged 65-69. On average there were two girls (aged 0-14) diagnosed each year with the disease between 2000 and 2004. (Fig. 16.1)

Age-specific incidence rates (ASIR) peaked among those aged 75-79 in Republic of Ireland and those aged 80-84 in Northern Ireland. However despite some fluctuation in ASIRs the general age distribution was similar in both countries. (Fig. 16.1)

Figure 16.1: Number of cases of ovarian cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



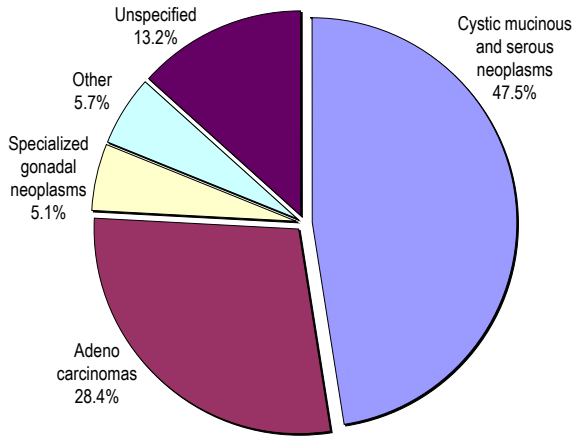
16.1.2: Cell type

Cystic mucinous and serous neoplasms made up 47.5% of all ovarian cancers diagnosed in Ireland during 2000-2004 with adenocarcinomas also making up a significant proportion (28.4%) and specialized gonodal neoplasms contributing 5.1%. A total of 13.2% however had an unspecified cell type with 14.9% unspecified in Northern Ireland compared to 12.4% in Republic of Ireland. (Fig. 16.2)

During 2000-2004 11.9% of ovarian cancers diagnosed in Ireland were borderline cases, with 494 non-borderline ovarian cancers and 67 borderline ovarian cancers diagnosed each year. This proportion was similar in both Northern Ireland and Republic of Ireland (NI: 11.8%; ROI: 11.9%). (Tab. 16.2)

There was no significant difference in European age-standardised incidence rates (EASIR) for either non-borderline

Figure 16.2: Types of ovarian cancer diagnosed in Ireland: 2000-2004



or borderline ovarian cancers between Northern Ireland and Republic of Ireland during 2000-2004. (Tab. 16.2)

Table 16.2: Summary statistics for incidence of ovarian cancer by non-borderline and borderline classification: 2000-2004

	Northern Ireland		Republic of Ireland		Ireland	
	Non-borderline	Borderline	Non-borderline	Borderline	Non-borderline	Borderline
Number of cases per year	165	22	330	45	494	67
Crude rate per 100,000 persons	19.0	2.5	16.7	2.3	17.4	2.3
EASIR ± 95% CI	17.1 ±1.2	2.6 ±0.5	17.1 ±0.8	2.4 ±0.3	17.1 ±0.7	2.4 ±0.3
% difference (NI vs ROI) ± 95% CI					-0.3% ±8.6	9.4% ±25.5

EASIR: European age-standardised incidence rate per 100,000 persons; SRR: Standardised rate ratio; CI: Confidence interval

16.1.3: Trends

European age-standardised incidence rates (EASIR) of ovarian cancer did not change significantly between 1994 and 2004 in Ireland as a whole or in Northern Ireland or Republic of Ireland considered separately. (Fig. 16.3, Tab 16.3)

As a result of population growth and ageing however the number of cases of ovarian cancer diagnosed each year in Ireland increased by an average of 12.6 cases. Both Northern Ireland and Republic of Ireland experienced this increase, with cases rising by an average of 4.3 cases per year in Northern Ireland and 8.3 cases per year in Republic of Ireland. (Fig. 16.3; Tab 16.3)

Figure 16.3: Trends in European age-standardised incidence rates (EASIR) for ovarian cancer by country: 1994-2004

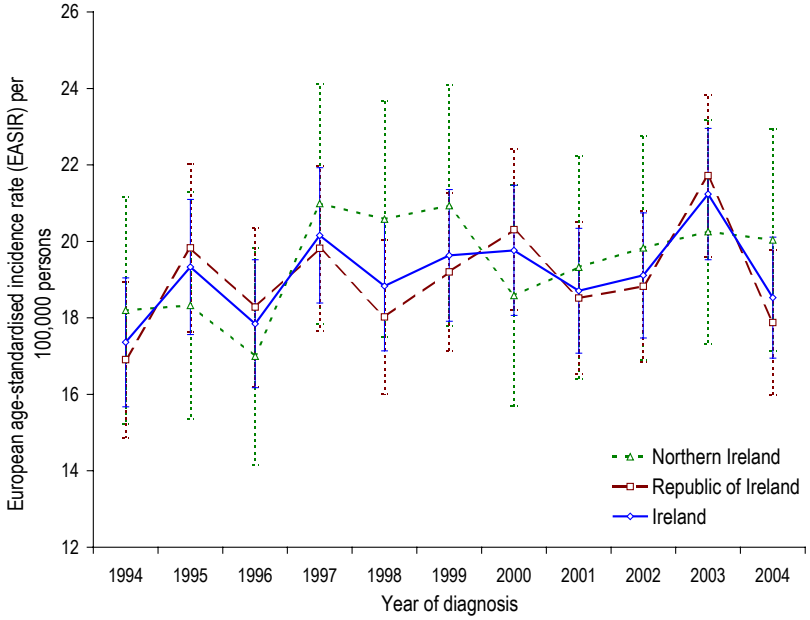
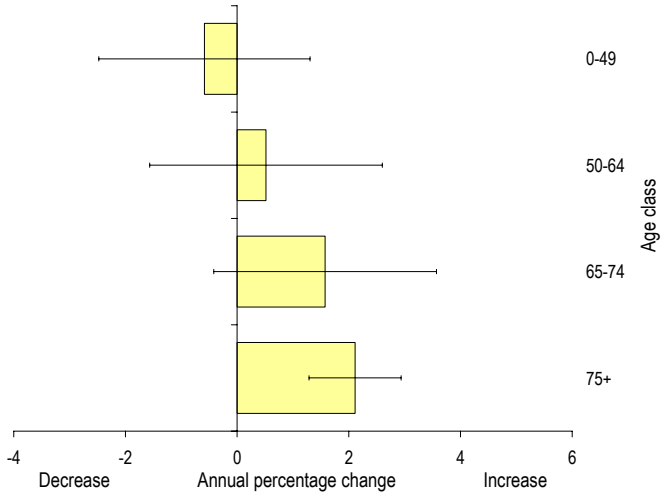


Table 16.3: Number of cases and European age-standardised incidence rates (EASIR) for ovarian cancer by year of diagnosis and country: 1994-2004

	Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	155	18.2 ±3.0	283	16.9 ±2.0	438	17.4 ±1.7
1995	156	18.3 ±3.0	335	19.8 ±2.2	491	19.3 ±1.8
1996	149	17.0 ±2.8	320	18.3 ±2.1	469	17.8 ±1.7
1997	184	21.0 ±3.1	346	19.8 ±2.1	530	20.2 ±1.8
1998	183	20.6 ±3.1	322	18.0 ±2.0	505	18.8 ±1.7
1999	178	20.9 ±3.2	349	19.2 ±2.1	527	19.6 ±1.7
2000	169	18.6 ±2.9	377	20.3 ±2.1	546	19.8 ±1.7
2001	179	19.3 ±2.9	352	18.5 ±2.0	531	18.7 ±1.6
2002	190	19.8 ±2.9	364	18.8 ±2.0	554	19.1 ±1.6
2003	198	20.3 ±2.9	420	21.7 ±2.1	618	21.2 ±1.7
2004	197	20.0 ±2.9	358	17.9 ±1.9	555	18.5 ±1.6

EASIR: European age-standardised incidence rate with 95% CI

Figure 16.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for ovarian cancer by age: 1994-2004



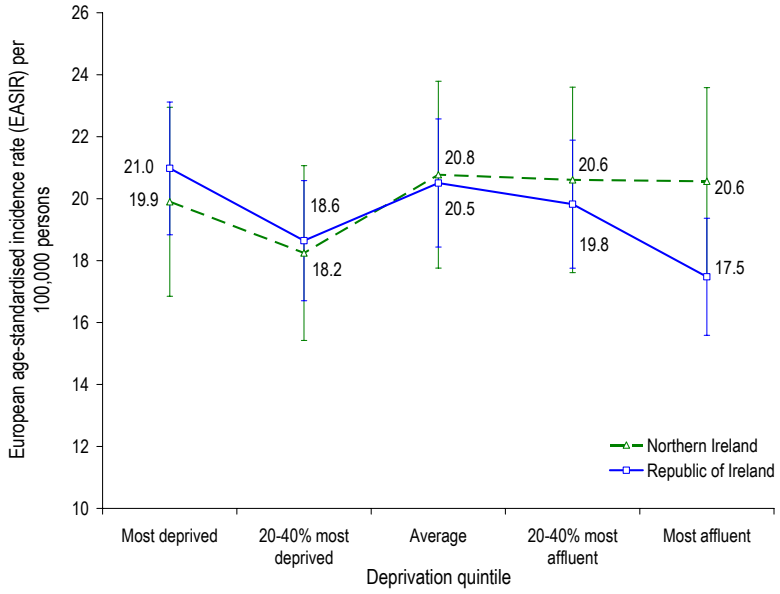
Despite European age-standardised incidence rates (EASIR) of ovarian cancer exhibiting no significant change in Ireland for all ages combined, significant changes were observed for those aged 75 and over, with EASIRs having increased between 1994 and 2004 by 2.1% each year ($p<0.001$). An increase of 1.6% was also observed among those aged 65-74 although this result was not statistically significant ($p=0.108$). There was no conclusive change in EASIRs for those aged 0-49 or 50-64. (Fig. 16.4)

16.1.4: Socio-economic variations

During 2000-2004 there was no apparent relationship between incidence of ovarian cancer and deprivation in either Northern Ireland or Republic of Ireland although a 20.0% difference, which was not statistically significant, existed between the 20% most deprived and 20% most affluent populations in Republic of Ireland (p=0.089). (Fig. 16.5)

Incidence rates of ovarian cancer for each deprivation quintile in Republic of Ireland were similar to those in Northern Ireland. (Fig. 16.5)

Figure 16.5: European age-standardised incidence rates (EASIR) for ovarian cancer by country specific deprivation quintile: 2000-2004



16.1.5: Geographic variations

There was very little variation in incidence rates of ovarian cancer among the councils/counties in Ireland during 1994-2004. The only significant variations were higher incidence rates compared to the average in Ireland in Dungannon and lower than expected rates in Louth. Neither Belfast nor Dublin had incidence rates that varied significantly from the expected number of cases with 31 cases diagnosed per year in Belfast compared to 96 in Dublin. (Fig. 16.6)

16.1.6: International comparisons

During 1998-2000 Ireland, particularly Northern Ireland, had some of the highest incidence rates of ovarian (excluding borderline) cancer among developed countries with world age-standardised incidence rates in Ireland 20.9% (p<0.001) higher than those in European Union (15 countries), 27.0% (p<0.001) higher than those in USA and 6.7% (p=0.015) higher than those in UK. (Fig. 16.7)

Figure 16.6: Significant differences in county/council standardised incidence ratios for ovarian cancer compared to Ireland as a whole: 1994-2004

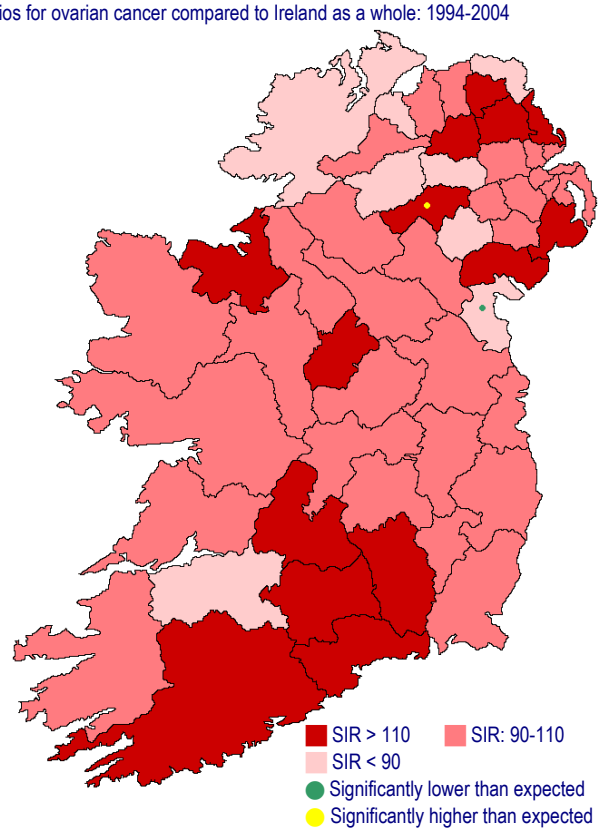
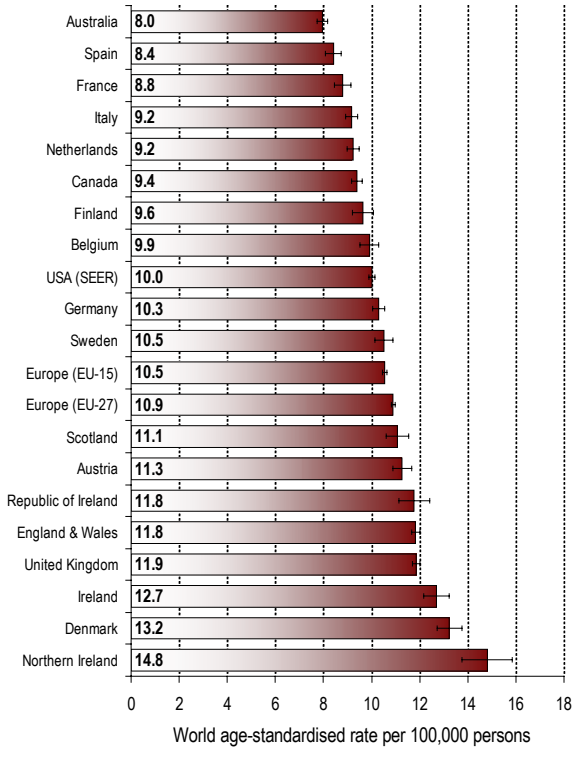


Figure 16.7: International comparisons of world age-standardised incidence rates for ovarian cancer (excluding borderline): 1998-2000



Source: IARC[124]

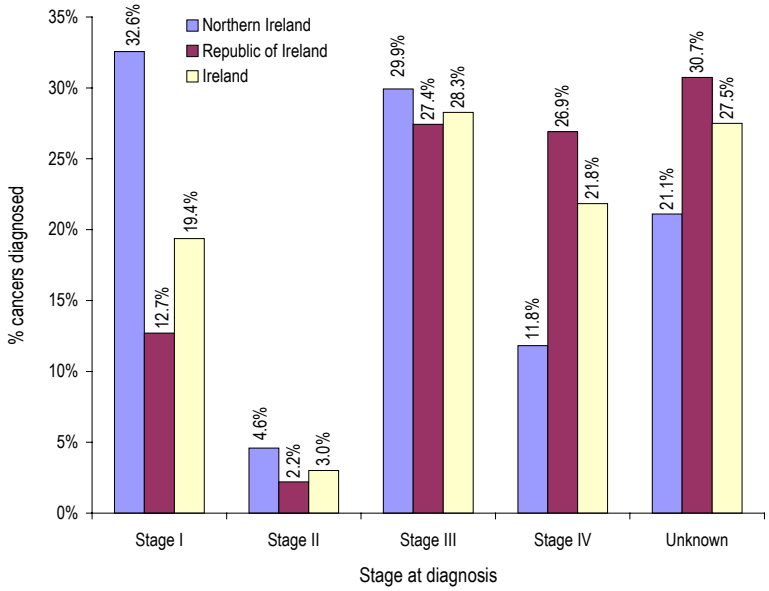
16.2: Treatment

16.2.1: Stage at diagnosis

Staging of ovarian cancer in 2000-2004 was good with 72.5% of patients in Ireland assigned a stage at diagnosis. This was a significant improvement on the 64.5% staged in 1997-1999 ($p<0.001$). The proportion of patients with an unknown stage however differed between Northern Ireland and Republic of Ireland with 9.6% more patients having a stage assigned in Northern Ireland ($p<0.001$). (Fig. 16.8)

The overall distribution of stage among patients also differed between the two countries, with the proportion assigned to stage I 19.9% higher in Northern Ireland with the proportion assigned to stage IV 15.1% higher in Republic of Ireland ($p<0.001$). (Fig. 16.8)

Figure 16.8: Stage at diagnosis for ovarian cancer patients by country: 2000-2004

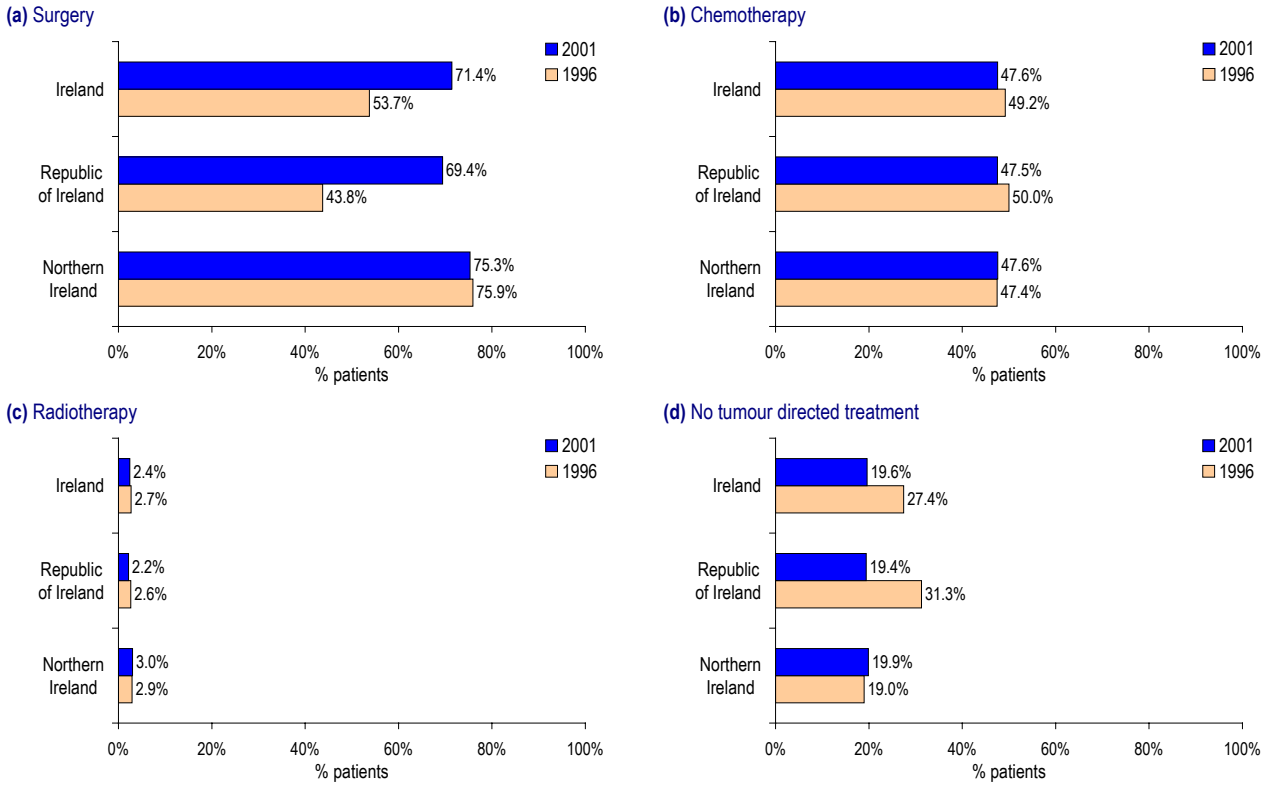


16.2.2: Treatment received

In 2001 there were 490 patients aged 15-99 with a diagnosis of ovarian cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 441 patients diagnosed in 1996.

In 2001 surgery was the most common form of treatment received by ovarian cancer patients in Ireland (71.4%), followed by chemotherapy (47.6%) with only a small proportion receiving radiotherapy (2.4%). Overall only 19.6% of patients received no form of tumour directed treatment. (Fig. 16.9)

Figure. 16.9: Tumour directed treatment received by ovarian cancer patients by year of diagnosis and country: 1996 & 2001



Compared to 1996 the use of surgery increased in Ireland by 17.7% (p<0.001), although this was driven by improvements in Republic of Ireland only, where there was a 25.7% (p<0.001) increase in surgery use. Consequently, the proportion of patients receiving no tumour directed treatment decreased by 7.8% (p=0.005), again driven by the changes in Republic of Ireland (11.8%, p<=0.001). (Fig. 16.9)

The increase in surgery use in Republic of Ireland between 1996 and 2001 brought treatment levels in line with that in Northern Ireland with no significant differences between Northern Ireland and Republic of Ireland in the proportion of patients receiving any form of treatment or in the proportion receiving no tumour directed treatment during 2001. (Fig. 16.9)

Treatment combinations

In Ireland 39.2% of ovarian cancer patients diagnosed in 2001 received more than one type of treatment, which was a 7.2% (p=0.022) increase on the 32.0% of patients diagnosed in 1996. This was a consequence of the increase in the use of surgery in Republic of Ireland that caused an 11.5% (p=0.002) increase in the use of surgery and chemotherapy in that country between the two years. The proportion of patients receiving more than one type of treatment did not change between 1996 and 2001 in Northern Ireland, nor where there any changes in Northern Ireland for specific combinations of treatment. (Tab. 16.4)

Both Northern Ireland and Republic of Ireland had a similar distribution of patients receiving different treatment combinations in 2001 (χ^2=11.2, p=0.129). (Tab. 16.4)

Table 16.4: Tumour directed treatment received by ovarian cancer patients by country and year of diagnosis: 1996 & 2001

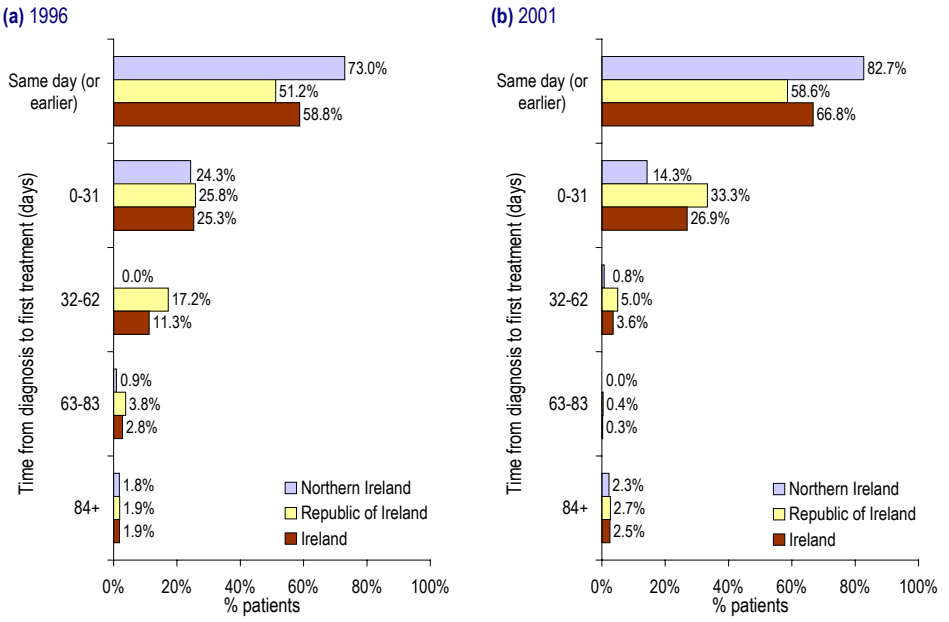
	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	32.8%	32.5%	17.8%	32.4%	22.4%	32.4%
Chemotherapy only	5.1%	4.8%	24.0%	10.2%	18.1%	8.4%
Radiotherapy only	0.0%	0.0%	0.0%	0.6%	0.0%	0.4%
Surgery and chemotherapy	40.1%	39.8%	24.3%	35.8%	29.3%	37.1%
Surgery and radiotherapy	0.7%	0.0%	1.0%	0.0%	0.9%	0.0%
Chemotherapy and radiotherapy	0.0%	0.0%	1.0%	0.3%	0.7%	0.2%
Surgery, chemotherapy and radiotherapy	2.2%	3.0%	0.7%	1.2%	1.1%	1.8%
No tumour directed treatment	19.0%	19.9%	31.3%	19.4%	27.4%	19.6%
Total patients	137	166	304	324	441	490

16.2.3: Waiting times

Among ovarian cancer patients diagnosed in 2001 in Ireland 93.7% of those who received tumour directed treatment were treated within 31 days of diagnosis, which was 9.6% higher than the proportion in 1996 (p=0.003). (Fig. 16.10)

A higher proportion of patients had waiting times in greater than same day categories in Republic of Ireland than Northern Ireland during 2001 (χ^2=33.0, p<0.001). (Fig. 16.10)

Figure 16.10: Time between diagnosis and first treatment by country for patients diagnosed with ovarian cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

16.3: Survival

Five-year (age-standardised) relative survival for female patients diagnosed with ovarian cancer during 2000-2004 was below average at 35.8%. (Fig. 16.11, Tab. 16.5)

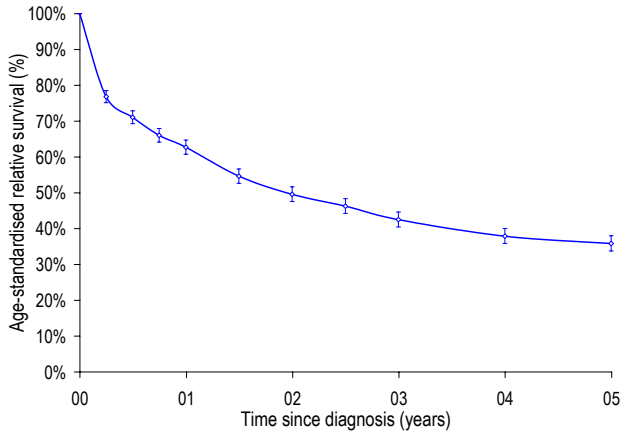
Table 16.5: Age-standardised relative survival for ovarian cancer patients by country: 2000-2004 period analysis estimates

	Age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
1-year	63.9% (60.7%, 67.3%)	62.2% (59.8%, 64.7%)	62.7% (60.8%, 64.7%)
5-year	39.2% (35.7%, 43.2%)	34.1% (31.6%, 36.8%)	35.8% (33.8%, 38.0%)

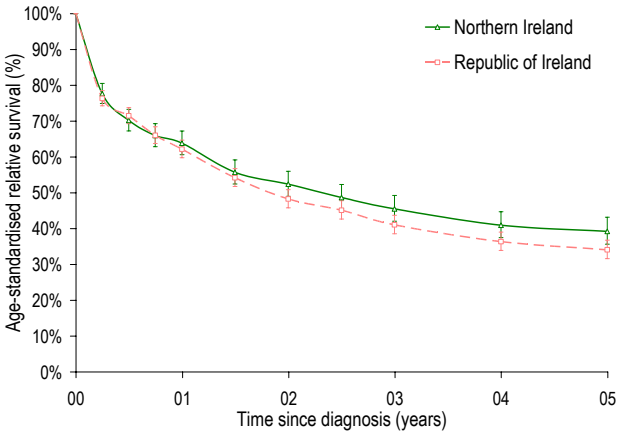
Five-year (age-standardised) relative survival from ovarian cancer did not vary significantly by country for patients diagnosed in 2000-2004 despite a 5.1% difference between the two countries that was possibly a result of random factors. (Fig. 16.11, Tab. 16.5)

Figure 16.11: Age-standardised relative survival for ovarian cancer patients: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



16.3.1: Changes in survival over time

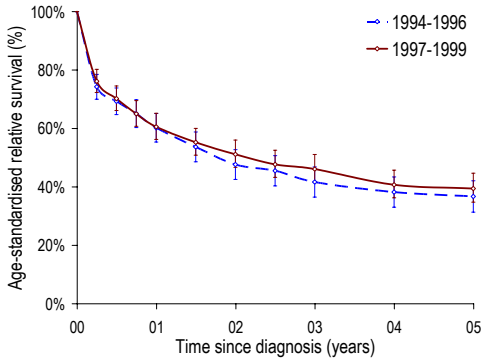
Ovarian cancer patients diagnosed in 1994-1996 experienced similar survival in Northern Ireland and Republic of Ireland, however while not statistically significant there was a 6.9% difference in five-year (age-standardised) relative survival between the two countries for patients diagnosed in 1997-1999. Despite this there was no significant change in either one or five-year (age-standardised) relative survival for ovarian cancer between 1994-1996 and 1997-1999 in Ireland or in either country considered separately. (Fig. 16.12, Tab. 16.6)

Table 16.6: Age-standardised relative survival for ovarian cancer patients by country and period of diagnosis: 1994-1999

	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	60.2% (55.7%, 65.1%)	60.6% (56.3%, 65.2%)	36.7% (32.0%, 42.1%)	39.4% (34.8%, 44.7%)
Republic of Ireland	58.7% (55.5%, 62.2%)	59.3% (56.2%, 62.6%)	36.2% (32.6%, 40.1%)	32.5% (29.5%, 35.9%)
Ireland	59.3% (56.7%, 62.1%)	59.8% (57.2%, 62.4%)	36.4% (33.5%, 39.5%)	34.9% (32.3%, 37.7%)

Figure 16.12: Age-standardised relative survival for ovarian cancer patients by country and period of diagnosis: 1994-1999

(a) Northern Ireland



(b) Republic of Ireland

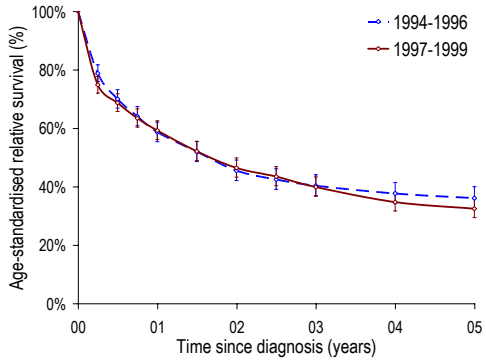
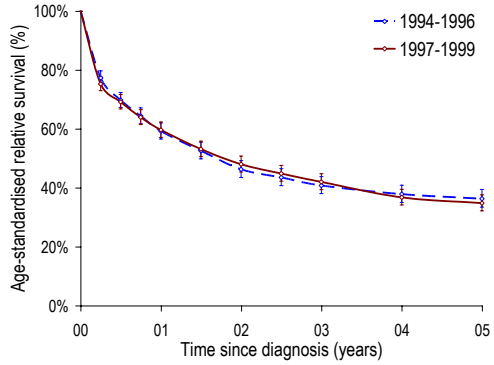


Figure 16.12 cont.

(c) Ireland



16.3.2: Borderline ovarian cancer

Excluding borderline ovarian cancer, which has very high survival, five-year (age-standardised) relative survival was 28.9% for patients diagnosed in 1997-1999, 6.0% lower than when borderline ovarian cancer is included. This value did not vary significantly by country despite five-year (age-standardised) relative survival 6.4% higher in Northern Ireland. There was no significant change in either one or five-year (age-standardised) relative survival for ovarian cancer, excluding borderline cases, between 1994-1996 and 1997-1999 in Ireland or in either country considered separately, despite suggestions of a decrease in Republic of Ireland. (Tab. 16.7)

Table 16.7: Age-standardised relative survival for non-borderline ovarian cancer by country and period of diagnosis: 1994-1999

	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	57.7% (53.1%, 62.6%)	57.6% (53.1%, 62.4%)	33.3% (28.7%, 38.5%)	33.1% (28.6%, 38.3%)
Republic of Ireland	56.2% (52.9%, 59.8%)	56.5% (53.3%, 60.0%)	31.9% (28.4%, 35.7%)	26.7% (23.7%, 30.0%)
Ireland	56.8% (54.1%, 59.7%)	56.9% (54.2%, 59.7%)	32.4% (29.6%, 35.5%)	28.9% (26.4%, 31.7%)

16.3.3: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by those diagnosed with cancer. Of those diagnosed in Ireland with ovarian cancer during 1997-1999 38.0% survived a minimum of five-years. There was no significant variation in observed survival between Republic of Ireland and Northern Ireland nor was there any change in one or five-year observed survival for ovarian cancer between 1994-1996 and 1997-1999 in either country. (Tab. 16.8)

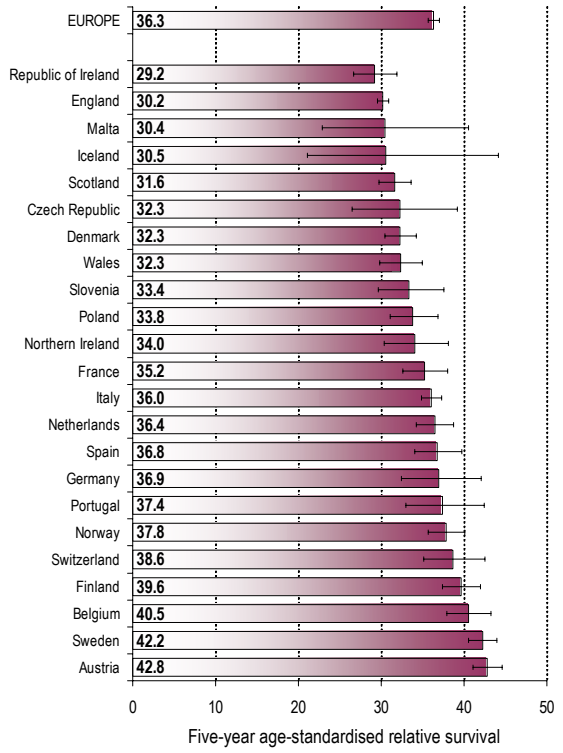
Table 16.8: Observed survival for ovarian cancer patients by country and period of diagnosis: 1994-1999

	Observed survival (95% CI)	
	1-year	
	1994-1996	1997-1999
Northern Ireland	64.0% (59.6%, 68.7%)	65.9% (62.0%, 70.1%)
Republic of Ireland	63.6% (60.5%, 66.8%)	64.3% (61.3%, 67.4%)
Ireland	63.7% (61.2%, 66.3%)	64.9% (62.5%, 67.3%)
	5-year	
	1994-1996	1997-1999
Northern Ireland	38.1% (33.8%, 42.9%)	40.6% (36.6%, 45.1%)
Republic of Ireland	37.5% (34.5%, 40.8%)	36.5% (33.6%, 39.7%)
Ireland	37.7% (35.2%, 40.4%)	38.0% (35.6%, 40.5%)

16.3.4: European comparisons

Five-year (age-standardised) relative survival from ovarian cancer in Europe for patients diagnosed in 1995-1999 was lowest in Republic of Ireland at 29.2%, with Northern Ireland having average survival at 34.0%. The average among all countries included in the EUROCARE-IV study was 36.3%. Only Republic of Ireland had five-year (age-standardised) relative survival significantly lower than this value, although survival in Republic of Ireland was equivalent to that in England and Scotland. (Fig. 16.13)

Figure 16.13: European comparisons of five-year age-standardised relative survival for non-borderline ovarian cancer patients: 1995-1999



Source: EUROCARE-IV[125]

16.4: Mortality

During 2000-2004 ovarian cancer was the fourth most common cause of female cancer death (excluding NMSC) with an average of 359 deaths each year. This cancer contributed 6.7% of all female cancer deaths (excluding NMSC) with a cumulative risk of dying from the disease before the age of 75, in the absence of other causes of deaths, of 1.0%. (Tab. 16.9)

European age-standardised mortality rates (EASMR) from ovarian cancer during 2000-2004 did not differ significantly between Northern Ireland and Republic of Ireland. (Tab. 16.9)

Table 16.9: Summary statistics for deaths from ovarian cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of deaths per year	116	243	359
% of all cancer deaths (ex. NMSC)	6.5%	6.8%	6.7%
Rank (ex. NMSC)	4	4	4
Median age at death	71	70	70
Cumulative risk (Aged 0 to 74)	0.9%	1.0%	1.0%
Crude rate per 100,000 persons	13.4	12.3	12.6
EASMR ± 95% CI	11.1 ±0.9	12.0 ±0.7	11.7 ±0.6
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-7.5% ±9.6

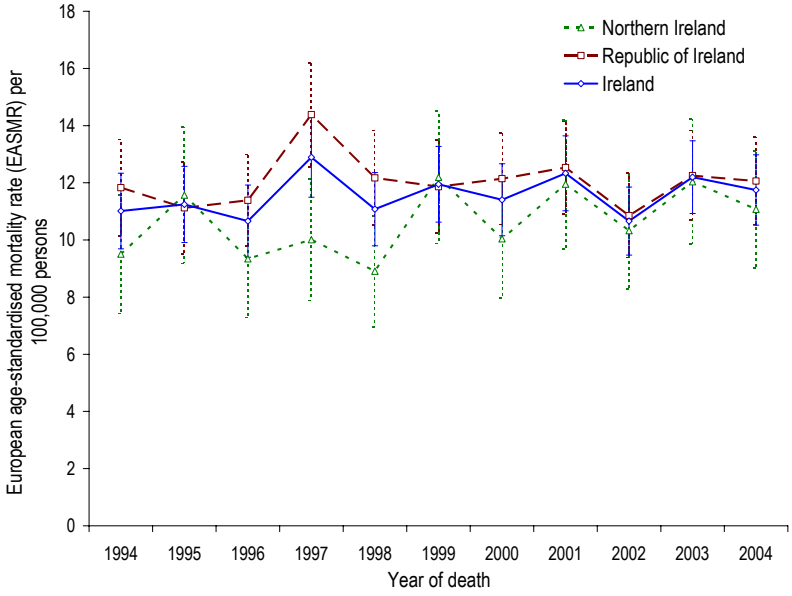
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

16.4.1: Trends

There was no significant change in European age-standardised mortality rates (EASMR) during 1994-2004 in either Ireland, or in Republic of Ireland or Northern Ireland considered separately. (Fig. 16.14)

As a result of population growth and ageing however, the actual number of deaths from ovarian cancer increased in Ireland by 8.3 deaths per year. In Northern Ireland the increase was 3.8 deaths per year compared to 4.6 deaths per year in Republic of Ireland. (Fig. 16.14)

Figure 16.14: Trends in European age-standardised mortality rates (EASMR) for ovarian cancer by country: 1994-2004



16.5: Prevalence

Between 1994 and 2004 there were 5,764 people diagnosed with ovarian cancer. 42.7% of these patients (2,461 people) were still alive at the end of 2004, with 1,498 of these diagnosed in the 2000-2004 period. At the end of 2004 the number of people living with ovarian cancer diagnosed within the previous five years per 100,000 persons was 20.1% greater in Northern Ireland than Republic of Ireland. (Tab. 16.10)

Table 16.10: Prevalence of ovarian cancer in Ireland at the end of 2004 by country and period of diagnosis

	Diagnosed 1994-2004		Diagnosed 2000-2004	
	Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	850	43.9%	510	54.7%
Republic of Ireland	1,611	42.1%	988	52.8%
Ireland	2,461	42.7%	1,498	53.4%

16.6: Discussion

A female's ovaries are responsible for the release of eggs on a monthly cycle and for the production of the female hormones oestrogen and progesterone. Symptoms of ovarian cancer range from pain in the abdomen at an early stage to irregular periods, loss of appetite, tiredness, sickness, constipation, abdominal swelling more frequent urination or back pain.[126]

Ovulatory history influences the risk of developing ovarian cancer, with the risk decreasing with the number of pregnancies[127] and being lower among those breast-feeding children.[128] Being infertile can increase the risk of developing ovarian cancer[127] although having a hysterectomy, tubal ligation[129] or using the contraceptive pill can lower the risk.[130] Females who have had an early first period or late menopause have a slightly elevated risk of developing cancer of the ovary.[131] Diet is also a factor in the development of ovarian cancer with a higher risk associated with obesity and poor nutrition.[132] About 1 in 20 ovarian cancers have a link to family history due to genetic factors associated with a faulty copy of the gene BRCA1. Only a small number of ovarian cancers are a result of this gene, which can be screened for.[133]

Globally there are approximately 190,000 cases and 114,000 deaths from ovarian cancer each year with incidence rates highest in Eastern Europe, USA and Canada and lowest in Africa and Asia. Control of the disease is particularly difficult due to its link with genetic and reproductive factors although some measure of reduction in incidence rates may be achievable through reduction of obesity levels.

Diagnosis of ovarian cancer is primarily through the use of biopsies which are prompted by ultrasonographies which in turn are prompted by women presenting to their GP. Surgery is the primary form of treatment although the method and type depends upon the stage at diagnosis. Chemotherapy is also used in more advanced cases with radiotherapy used in a small number of select cases where residual disease remains.

Chapter 17:

Prostate cancer (C61)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *The most common male cancer diagnosed in Ireland during 2000-2004 with an average of 2,750 cases each year.*
  - *Between 1997 and 2004 incidence rates of prostate cancer in Ireland increased by an average of 8.3% each year.*
  - *During 2000-2004 incidence rates increased steadily with increasing affluence.*
  - *During 1994-2004 11 counties in Republic of Ireland had significantly higher incidence rates than Ireland as a whole.*
  - *Compared to the EU, UK, Canada, Australia and USA incidence rates during 1998-2000 were low in Northern Ireland. Republic of Ireland however had higher rates than the EU and UK but had lower rates than USA, Canada and Australia.*
  - *During 2000-2004 there were on average 745 deaths per year in Ireland as a result of prostate cancer.*
  - *Mortality rates decreased by 1.0% (p=0.012) per year in Ireland between 1994 and 2004.*

- *TREATMENT*
  - *In 2001 hormone therapy was the most common form of treatment received in Ireland (43.8%), followed by surgery (38.5%) and radiotherapy (24.4%). Only 1.4% received chemotherapy while 20.1% received no form of tumour directed treatment.*
  - *Use of radiotherapy and hormone therapy increased between 1996 and 2001 in Ireland by 15.8% and 3.5% respectively while surgery use decreased by 18.3%. There was no change in the proportion of patients receiving no tumour directed treatment.*
  - *Lower levels of treatment occurred among patients with an unspecified cell type (compared to an adenocarcinoma) and those with no stage assigned (compared to stage I or II).*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival was estimated at 77.7% for patients diagnosed in 2000-2004.*
  - *Five-year (age-standardised) relative survival improved by 8.8% between 1994-1996 and 1997-1999.*
  - *In Republic of Ireland five-year (age-standardised) relative survival was 4.4% lower than the European average while the value in Northern Ireland was 14.9% lower.*
  - *Survival varied by age, cell type, stage at diagnosis and receipt of treatment.*
  - *There were 14,176 people alive at the end of 2004 having been diagnosed with prostate cancer in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were 34.3% lower in Northern Ireland than in Republic of Ireland during 2000-2004.*
  - *Surgery use was 11.5% higher in Republic of Ireland than Northern Ireland while radiotherapy use was 6.1% higher. Hormone therapy use was 13.6% higher in Northern Ireland, while the receipt of no tumour directed treatment was 8.5% higher.*
  - *The use of hormone treatment in Republic of Ireland increased by 6.2%, while there was no increase in Northern Ireland.*
  - *Receipt of treatment was more common in Republic of Ireland once factors such as age, stage and cell type were adjusted for.*
  - *Five-year (age-standardised) relative survival was 6.1% higher in Republic of Ireland than Northern Ireland in 2000-2004.*
  - *There was an improvement of 9.7% in five-year (age-standardised) relative survival in Republic of Ireland between 1994-1996 and 1997-1999, while there was no significant change in Northern Ireland.*
  - *There was no difference in excess mortality between Northern Ireland and Republic of Ireland during 1996 & 2001 once adjustments were made for age, stage, cell type, treatment and basis of diagnosis.*
  - *Mortality rates were 18.6% lower in Northern Ireland than Republic of Ireland during 2000-2004.*
  - *At the end of 2004 the number of people living with prostate cancer diagnosed since 2000 per 100,000 people was 24.9% lower in Northern Ireland than Republic of Ireland.*

17.1: Incidence

Prostate cancer was the most common male cancer diagnosed in Ireland during 2000-2004 contributing one quarter of all male cancers (excluding NMSC). There was an average of 2,750 cases each year with 99.1 cases diagnosed each year per 100,000 members of the male population. The odds of a male developing the disease before the age of 75 were relatively high compared to other cancers at 1 in 12. (Tab. 17.1)

Table 17.1: Summary statistics for incidence of prostate cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of cases per year	666	2,084	2,750
% of all cancer cases (ex. NMSC)	20.2%	27.1%	25.0%
Rank (ex. NMSC)	1	1	1
Median age at diagnosis	72	70	70
Cumulative risk (Aged 0 to 74)	6.3%	9.8%	8.7%
Crude rate per 100,000 persons	80.4	107.1	99.1
EASIR ± 95% CI	80.6 ±2.8	122.7 ±2.4	109.1 ±1.8
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-34.3% ±2.6

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

European age-standardised incidence rates (EASIR) were 34.3% (p<0.001) lower in Northern Ireland than in Republic of Ireland during the 2000-2004 period, a considerable difference partially explained by different levels of use of PSA testing in the two countries. (Tab. 17.1)

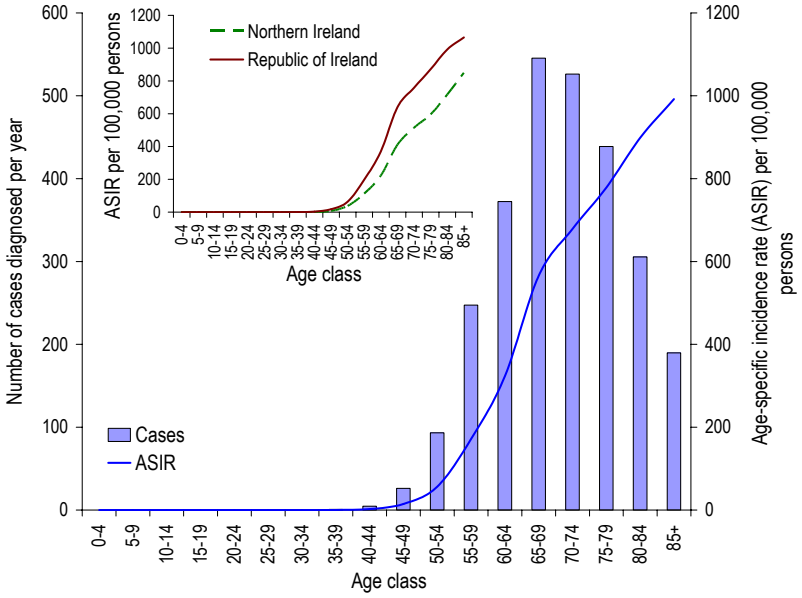
17.1.1: Age distribution

During 2000-2004 the median age at diagnosis for prostate cancer was 70 years, with only 7.4% of prostate cancer cases among those aged 60 or under. Cases peaked among those aged 65-69 with 19.8% of cases in this age group. (Fig. 17.1)

Age-specific incidence rates (ASIR) peaked in the 85 and over age class with similar age distributions in both Northern Ireland and Republic of Ireland. However while the general trend with age was similar in both countries ASIRs in Republic of Ireland were consistently higher than those in Northern Ireland for all age groups. (Fig. 17.1)

There were no children diagnosed with prostate cancer during 2000-2004. (Fig. 17.1)

Figure 17.1: Number of cases of prostate cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

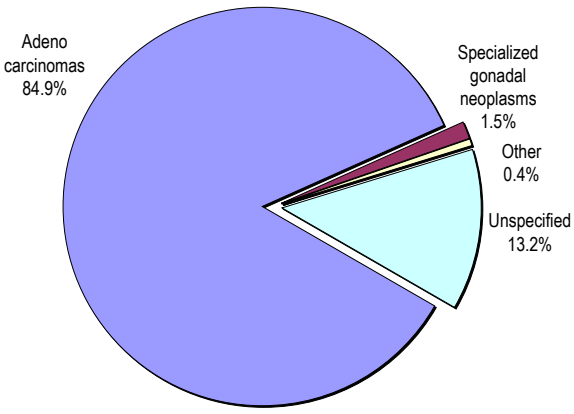


17.1.2: Cell type

The most common form of prostate cancer diagnosed in Ireland during 2000-2004 was adenocarcinomas, which contributed 84.9% of all cases. Specialized gonadal neoplasms made up a further 1.5%, however the majority of the remaining prostate cancers had an unspecified cell type (13.2%). (Fig. 17.2)

During 2000-2004 the percentage of prostate cancers with an unspecified cell type varied by a small margin between each country, with 17.3% unspecified in Northern Ireland compared to 11.9% unspecified in Republic of Ireland.

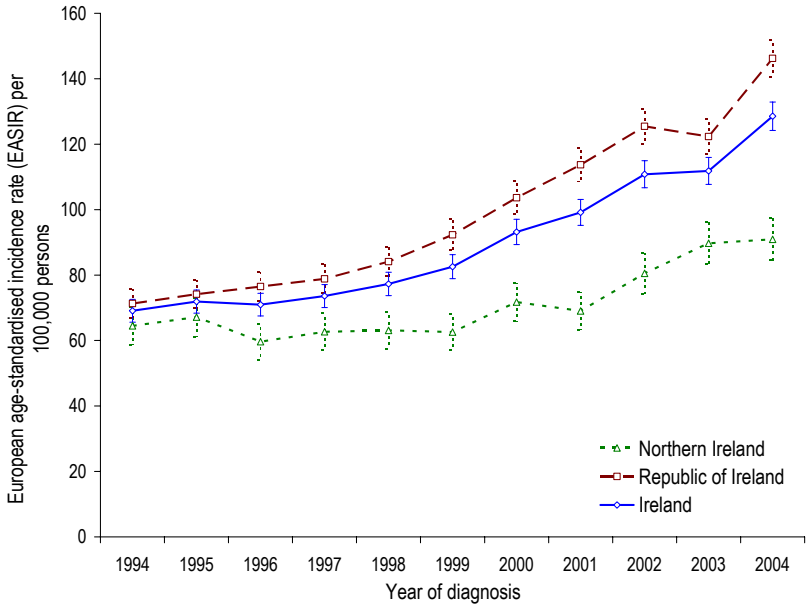
Figure 17.2: Types of prostate cancer diagnosed in Ireland: 2000-2004



17.1.3: Trends

Between 1994 and 1997 European age-standardised incidence rates (EASIR) of prostate cancer in Ireland did not change significantly. However, since 1997 EASIRs increased by an average of 8.3% each year (p<0.001), a considerable increase that corresponded to an annual growth of 227.1 cases per year (between 1997 and 2004). (Fig. 17.3, Tab. 17.2)

Figure 17.3: Trends in European age-standardised incidence rates (EASIR) for prostate cancer by country: 1994-2004



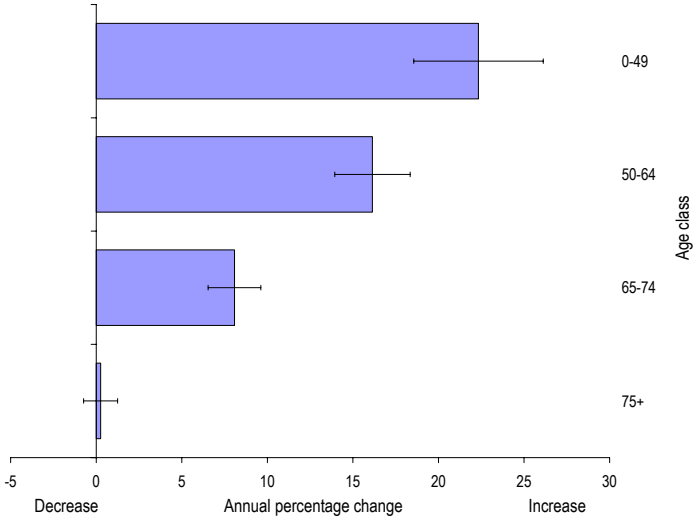
Both Northern Ireland and Republic of Ireland experienced large increases in the levels of prostate cancer; however the upward trend started at different periods of time in each country. In Northern Ireland EASIRs of prostate cancer were virtually static prior to 1999 with no significant change observed. Since 1999 however EASIRs increased steadily by an average of 8.2% (p=0.002), which as a result of population growth and ageing was equivalent to an annual increase of 45.1 cases per year (between 1999 and 2004). In Republic of Ireland however prostate cancer incidence rates climbed continuously since 1994, by an average of 7.8% (p<0.001) corresponding to an annual increase of 142.6 cases per year. (Fig. 17.3, Tab. 17.2)

Table 17.2: Number of cases and European age-standardised incidence rates (EASIR) for prostate cancer by year of diagnosis and country: 1994-2004

	Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	486	64.5 ±5.8	1,097	71.3 ±4.3	1,583	69.1 ±3.5
1995	511	67.1 ±5.9	1,159	74.1 ±4.4	1,670	71.9 ±3.5
1996	457	59.7 ±5.5	1,203	76.5 ±4.4	1,660	71.0 ±3.5
1997	488	62.7 ±5.6	1,261	78.8 ±4.4	1,749	73.6 ±3.5
1998	498	63.1 ±5.6	1,347	84.1 ±4.5	1,845	77.3 ±3.6
1999	496	62.6 ±5.6	1,487	92.3 ±4.7	1,983	82.6 ±3.7
2000	578	71.8 ±5.9	1,691	103.6 ±5.0	2,269	93.2 ±3.9
2001	559	69.0 ±5.8	1,894	113.7 ±5.2	2,453	99.2 ±4.0
2002	663	80.5 ±6.2	2,127	125.4 ±5.4	2,790	110.8 ±4.1
2003	754	89.7 ±6.5	2,113	122.3 ±5.2	2,867	111.8 ±4.1
2004	777	90.9 ±6.4	2,595	146.2 ±5.6	3,372	128.5 ±4.4

EASIR: European age-standardised incidence rate with 95% CI

Figure 17.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for prostate cancer by age: 1994-2004



Despite the magnitude of the increase in EASIRs not all age groups were affected by the change in prostate cancer levels. Among those aged 75 and over there was no significant change in EASIRs between 1994 and 2004. The remaining age groups (0-49, 50-64, 65-74) while each showing a significant increase differed in the degree to which they were affected by prostate cancer incidence. EASIRs rose among the 65-74 age class by 8.1% (p<0.001) each year compared to annual increases of 16.1% (p<0.001) and 22.3% (p<0.001) among those aged 50-64 and 0-49 respectively. (Fig. 17.4)

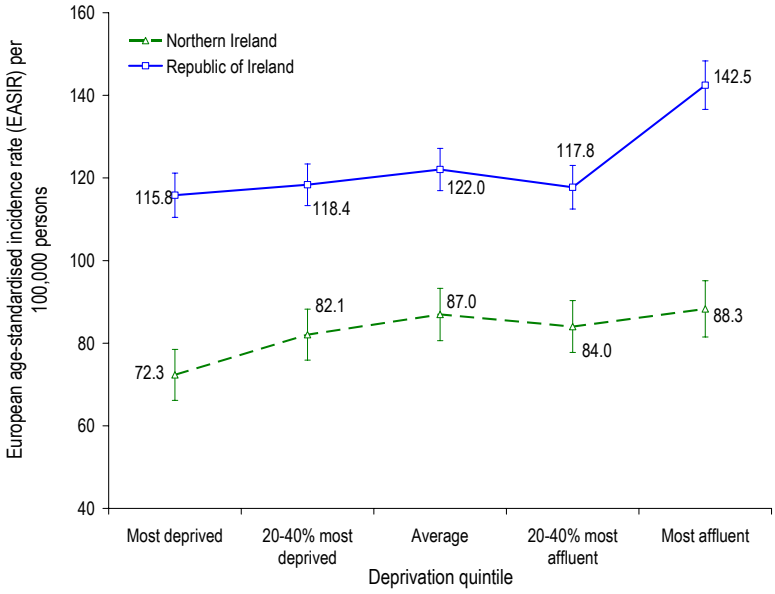
17.1.4: Socio-economic variations

In both Northern Ireland and Republic of Ireland prostate cancer was inversely related to deprivation during 2000-2004 with European age-standardised incidence rates (EASIR) climbing steadily with increasing affluence. In Northern Ireland EASIRs for the 20% of the population resident in the most deprived areas were 18.1% (p=0.016) lower than the 20% most

affluent population. In Republic of Ireland the 20% most deprived population had EASIRs of prostate cancer 18.7% (p<0.001) lower than the 20% most affluent population. (Fig. 17.5)

Given the higher incidence of prostate cancer in Republic of Ireland, EASIRs in each deprivation quintile were lower in Northern Ireland than Republic of Ireland; however the magnitude of the difference was largest for the 20% most deprived and 20% most affluent in each country. (Fig. 17.5)

Figure 17.5: European age-standardised incidence rates (EASIR) for prostate cancer by country specific deprivation quintile: 2000-2004



17.1.5: Geographic variations

Given that incidence rates of prostate cancer are much higher in Republic of Ireland than Northern Ireland, there were eleven counties in Republic of Ireland, including Dublin, with significantly higher incidence of prostate cancer than Ireland as a whole. Conversely, 18 of the 26 district councils in Northern Ireland, including Belfast, had lower than expected incidence rates of prostate cancer (based on the average for all of Ireland). However counties Limerick and South Tipperary also had lower than expected rates of the disease. (Fig. 17.6)

17.1.6: International comparisons

Compared to the European Union (15 and 27 countries), UK, Canada, Australia and USA incidence rates of prostate cancer during 1998-2000 were low in Northern Ireland, which had one of the lowest rates of prostate cancer in developed countries. Republic of Ireland however had higher rates than the EU and UK but had lower rates than USA, Canada and Australia. (Fig. 17.7)

Figure 17.6: Significant differences in county/council standardised incidence ratios for prostate cancer compared to Ireland as a whole: 1994-2004

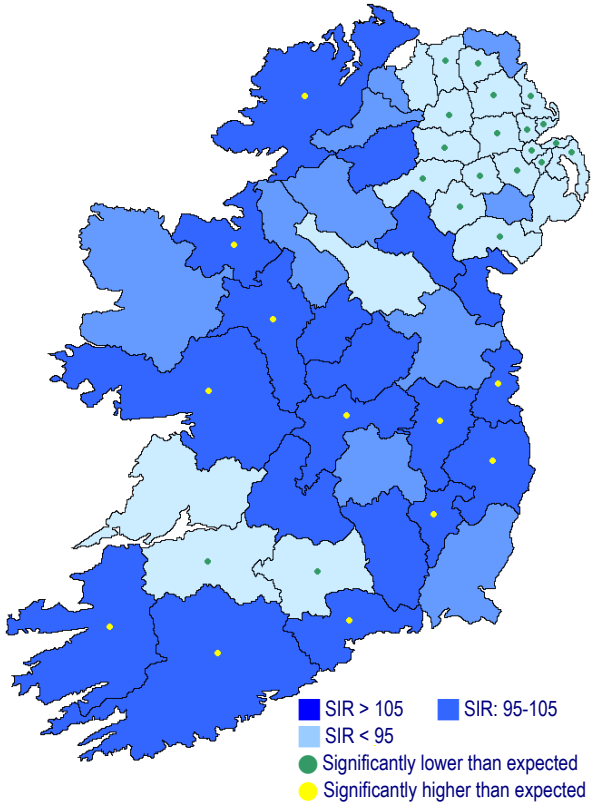
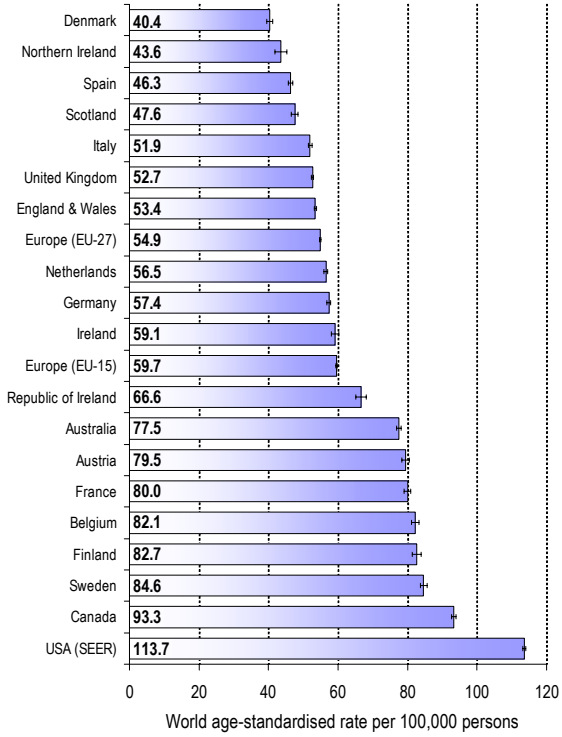


Figure 17.7: International comparisons of world age-standardised incidence rates for prostate cancer: 1998-2000



Source: IARC[134]

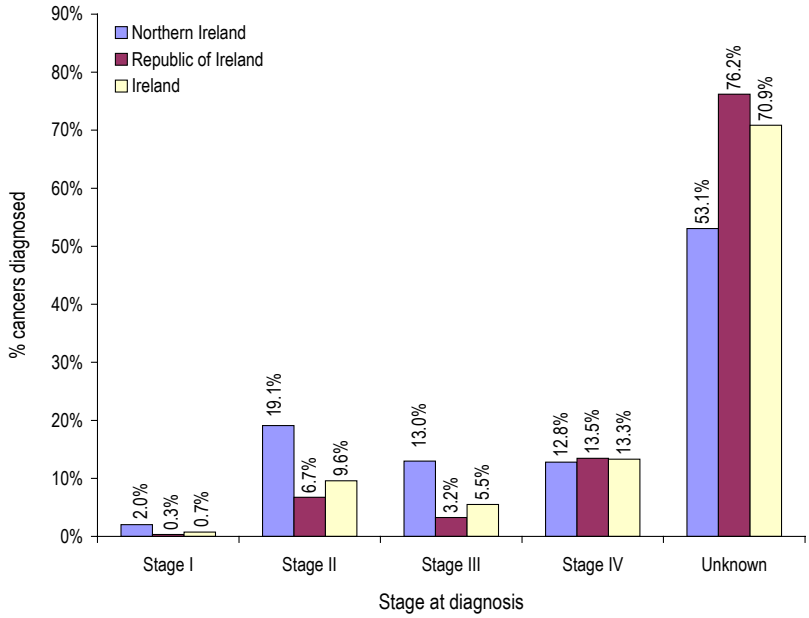
17.2: Treatment

In 2001 there were 2,335 patients aged 15-99 with a diagnosis of prostate cancer as their first (or only) cancer (measured from 1994) who were not registered by death certificate only (or by autopsy), and thus possibly received some form of treatment. This compares to 1,586 patients diagnosed in 1996.

17.2.1: Stage at diagnosis

Staging of prostate cancer in 2001 was poor with only 29.1% of patients in Ireland assigned a stage at diagnosis. This was similar to the 30.1% staged in 1996. The proportion of unstaged patients however differed between Northern Ireland and Republic of Ireland with 23.2% (p<0.001) more patients having a stage assigned in Northern Ireland, although these higher staging levels were valid only for those years (1996 & 2001) which had audits carried out in Northern Ireland. (Fig. 17.8)

Figure 17.8: Stage at diagnosis for prostate cancer patients by country: 2001



The overall distribution of stage among patients differed between the two countries, primarily as a result of the different number of patients with staging information (χ^2=366.5, p<0.001), although excluding unstaged cases still resulted in different staging distributions (χ^2=104.8, p<0.001). Only the proportion assigned to stage IV in 2001 was similar in each country (NI: 12.8%, ROI: 13.5%). (Fig. 17.8)

17.2.2: Treatment received

In 2001 hormone therapy was the most common form of treatment received by prostate cancer patients in Ireland (43.8%), followed by surgery (38.5%) and radiotherapy (24.4%). Only a small percentage received chemotherapy (1.4%) while 20.1% of patients received no form of tumour directed treatment. (Fig. 17.9)

Compared to 1996 the use of radiotherapy and hormone therapy increased in Ireland by 15.8% (p<0.001) and 3.6% (p=0.028) respectively, while the proportion treated by surgery decreased by 18.3% (p<0.001). There was no significant change in the proportion of patients receiving no tumour directed treatment although an increase of 5.7% (p=0.037) was observed in Northern Ireland. The increase in use of radiotherapy was observed in both Northern Ireland (13.0%) and Republic of Ireland (16.4%), as was the decrease in treatment using surgery (NI: 23.3%; ROI: 17.0%), however the increase in the use of hormone treatment only occurred in Republic of Ireland with a 6.1% (p=0.001) increase. (Fig. 17.9)

Figure. 17.9: Tumour directed treatment received by prostate cancer patients by year of diagnosis and country: 1996 & 2001

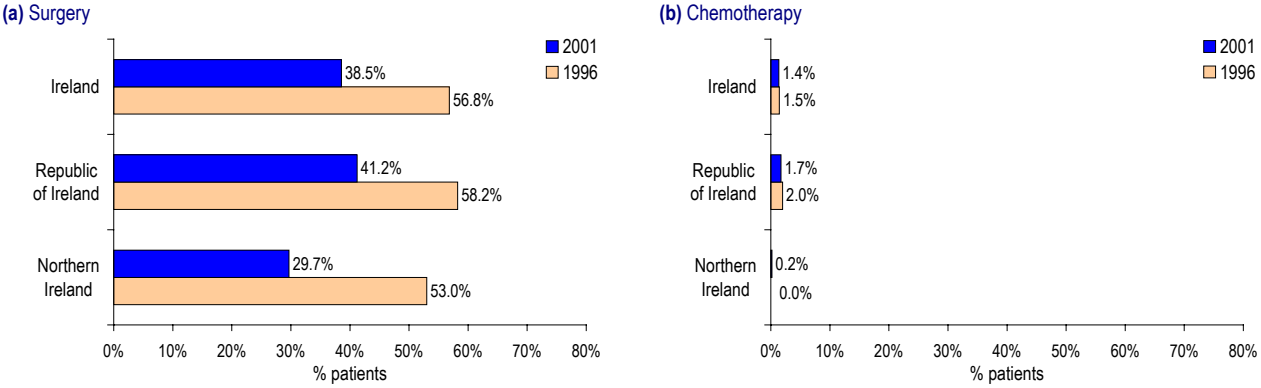
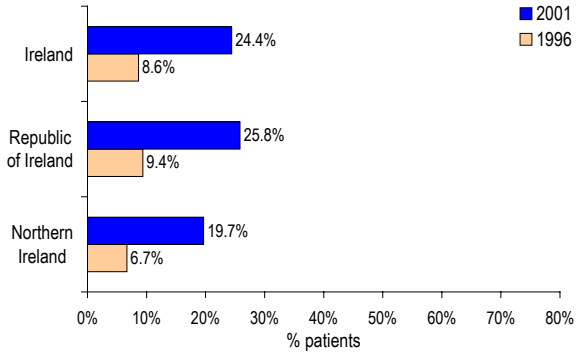
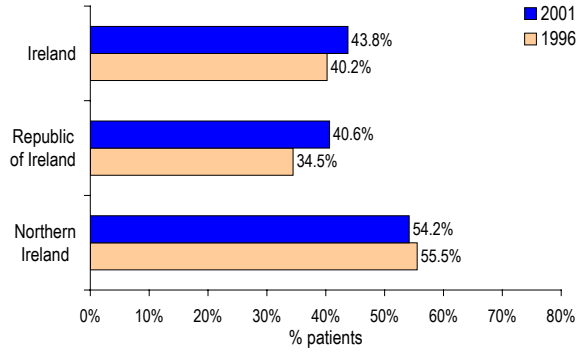


Figure 17.9 cont….

(c) Radiotherapy

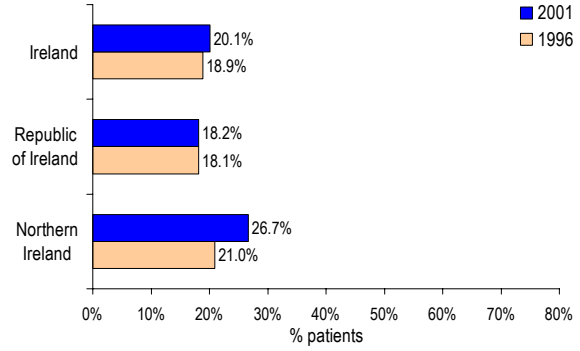


(d) Hormone therapy



The proportion of patients receiving each treatment type differed significantly in Northern Ireland and Republic of Ireland, with higher percentage of patients receiving surgery (11.5%) and/or radiotherapy (6.1%) in Republic of Ireland and 13.6% more patients receiving hormone therapy in Northern Ireland. The percentage of patients receiving no tumour directed treatment was 8.5% higher in Northern Ireland ($p<0.001$). (Fig. 17.9)

(e) No tumour directed treatment



Treatment combinations

In Ireland as a whole 25.6% of prostate cancer patients diagnosed in 2001 received more than one type of treatment. This was similar to the 24.0% of patients diagnosed in 1996 ($p>0.05$). Despite no change overall for treatment combinations, the use of surgery and hormone therapy together decreased by 8.1% ($p<0.001$) between 1996 and 2001 while the use of hormone therapy and radiotherapy together increased by 9.1% ($p<0.001$). Use of surgery on its own decreased by 10.4% ($p<0.001$) while use of radiotherapy on its own increased by 6.1% ($p<0.001$). (Tab. 17.3)

The favoured treatment combinations in both Northern Ireland and Republic of Ireland were surgery only, hormone therapy only, radiotherapy and hormone therapy, and surgery and hormone therapy, although the percentage of patients receiving these combinations differed between the two countries. Overall the distribution of treatment combinations differed between the two countries ($\chi^2=128.8$, $p<0.001$). (Tab. 17.3)

Table 17.3: Tumour directed treatment received by prostate cancer patients by country and year of diagnosis: 1996 & 2001

	Northern Ireland		Republic of Ireland		Ireland	
	1996	2001	1996	2001	1996	2001
Surgery only	21.0%	15.4%	40.4%	27.4%	35.1%	24.6%
Chemotherapy only	0.0%	0.2%	1.0%	0.4%	0.7%	0.4%
Radiotherapy only	1.4%	2.4%	2.5%	10.1%	2.2%	8.4%
Hormone therapy only	23.7%	26.7%	17.4%	19.2%	19.1%	20.9%
Surgery and chemotherapy	0.0%	0.0%	0.3%	0.0%	0.3%	0.0%
Surgery and radiotherapy	1.2%	1.1%	3.0%	3.1%	2.5%	2.7%
Surgery and hormone therapy	27.6%	11.3%	13.1%	8.4%	17.1%	9.0%
Chemotherapy and radiotherapy	0.0%	0.0%	0.3%	0.1%	0.2%	0.1%
Chemotherapy and hormone therapy	0.0%	0.0%	0.3%	0.6%	0.2%	0.4%
Radiotherapy and hormone therapy	0.9%	14.3%	2.2%	9.9%	1.8%	10.9%
Surgery, chemotherapy and radiotherapy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Surgery, chemotherapy and hormone therapy	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
Surgery, radiotherapy and hormone therapy	3.2%	1.9%	1.4%	2.1%	1.9%	2.0%
Chemotherapy, radiotherapy and hormone therapy	0.0%	0.0%	0.1%	0.3%	0.1%	0.3%
Surgery, chemotherapy, radiotherapy and hormone therapy	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%
No tumour directed treatment	21.0%	26.7%	18.1%	18.2%	18.9%	20.1%
Total patients	434	539	1,152	1,796	1,586	2,335

17.2.3: Patient characteristics and factors influencing treatment

Among prostate cancer patients diagnosed in 1996 and 2001 residents in Republic of Ireland were more likely to receive some form of treatment than those resident in Northern Ireland once factors such as age, stage and cell type were adjusted for. Additionally treatment of prostate cancer patients was less common in 2001 than 1996 in Northern Ireland but not in Republic of Ireland. (Tab. 17.4)

Not having a stage or cell type specified reduced the likelihood of receipt of treatment throughout Ireland. In Northern Ireland those diagnosed at stage III or IV were more likely to receive treatment than at stage I or II while the reverse was true in Republic of Ireland, although this conclusion needs taken in the context of poor levels of staging information. The basis of diagnosis was also a factor in treatment receipt in Northern Ireland but not in Republic of Ireland. Age however was not a factor in receipt of treatment in either country once adjusted for other factors, nor were socio-economic factors (based upon deprivation quintile). (Tab. 17.4)

Relative to those diagnosed in stage I or II, patients diagnosed at stage III or IV were more likely to receive treatment in Northern Ireland than Republic of Ireland. There were no other significant difference between the relative risk ratios for Northern Ireland and Republic of Ireland for prostate cancer patients diagnosed in 1996 and 2001 suggesting that other than known stage, the factors influencing treatment were similar in both countries. (Tab. 17.4)

Table 17.4: Number and percentage of prostate cancer patients diagnosed in 1996 and 2001 receiving tumour directed treatment by patient and tumour characteristics with relative risk ratios derived using logistic regression

	Northern Ireland			Republic of Ireland			Ireland		
	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)	Patients	% treated	Relative Risk (95% CI)
Age 15-44	29	82.8%	1.00	98	88.8%	1.00	127	87.4%	1.00
Age 45-54	155	79.4%	0.96 (0.66,1.11)	541	90.4%	1.03 (0.94,1.07)	696	87.9%	1.01 (0.92,1.07)
Age 55-64	349	82.8%	0.99 (0.73,1.13)	1,182	83.8%	0.97 (0.86,1.04)	1,531	83.5%	0.97 (0.88,1.04)
Age 65-74	337	72.1%	1.02 (0.78,1.14)	924	76.8%	0.94 (0.82,1.02)	1,261	75.6%	0.96 (0.85,1.03)
Age 75+	103	57.3%	0.97 (0.68,1.13)	203	67.5%	0.91 (0.76,1.01)	306	64.1%	0.93 (0.80,1.01)
Stage I or II	124	89.5%	1.00	192	94.8%	1.00	316	92.7%	1.00
Stage III or IV	234	89.7%	1.07 (1.01,1.09)*	607	85.0%	0.95 (0.86,1.00)*	841	86.3%	0.99 (0.94,1.02)
Stage unknown	615	67.8%	0.84 (0.68,0.95)*	2,149	79.8%	0.88 (0.76,0.96)*	2,764	77.1%	0.87 (0.79,0.94)*
Microscopically verified	772	85.9%	1.00	2,571	85.6%	1.00	3,343	85.6%	1.00
Clinical basis	186	38.7%	0.67 (0.27,1.00)*	316	59.5%	1.06 (0.88,1.13)	502	51.8%	0.99 (0.82,1.08)
Other basis	15	20.0%	0.51 (0.11,0.99)*	61	41.0%	0.99 (0.71,1.11)	76	36.8%	0.92 (0.68,1.06)
Adenocarcinoma	752	85.9%	1.00	2,472	86.0%	1.00	3,224	85.9%	1.00
Other cell type	22	90.9%	1.07 (0.80,1.14)	89	78.7%	0.92 (0.80,1.00)	111	81.1%	0.93 (0.82,1.01)
Unspecified cell type	199	36.2%	0.74 (0.33,1.03)	387	56.3%	0.55 (0.25,0.87)*	586	49.5%	0.61 (0.37,0.84)*
20% most affluent	179	76.5%	1.00	543	83.4%	1.00	722	81.7%	1.00
20-40% most affluent	210	76.2%	1.04 (0.90,1.14)	474	81.0%	0.98 (0.92,1.04)	684	79.5%	1.00 (0.94,1.05)
Average	211	75.4%	0.97 (0.82,1.09)	608	79.6%	0.97 (0.90,1.02)	819	78.5%	0.97 (0.91,1.02)
20-40% most deprived	198	77.8%	1.08 (0.94,1.17)	573	83.2%	1.02 (0.97,1.07)	771	81.8%	1.03 (0.98,1.07)
20% most deprived	156	75.6%	1.04 (0.88,1.15)	462	81.6%	1.00 (0.94,1.05)	618	80.1%	1.01 (0.95,1.06)
Unknown	19	52.6%	0.52 (0.24,0.87)*	288	82.6%	1.01 (0.93,1.06)	307	80.8%	0.98 (0.91,1.05)
Diagnosed in 1996	434	79.0%	1.00	1,152	81.9%	1.00	1,586	81.1%	1.00
Diagnosed in 2001	539	73.3%	0.84 (0.73,0.94)*	1,796	81.8%	0.97 (0.93,1.01)	2,335	79.9%	0.95 (0.90,0.98)*
Northern Ireland	973	75.8%					973	75.8%	1.00
Republic of Ireland				2,948	81.9%		2,948	81.9%	1.07 (1.03,1.11)*
All patients	973	75.8%		2,948	81.9%		3,921	80.4%	973

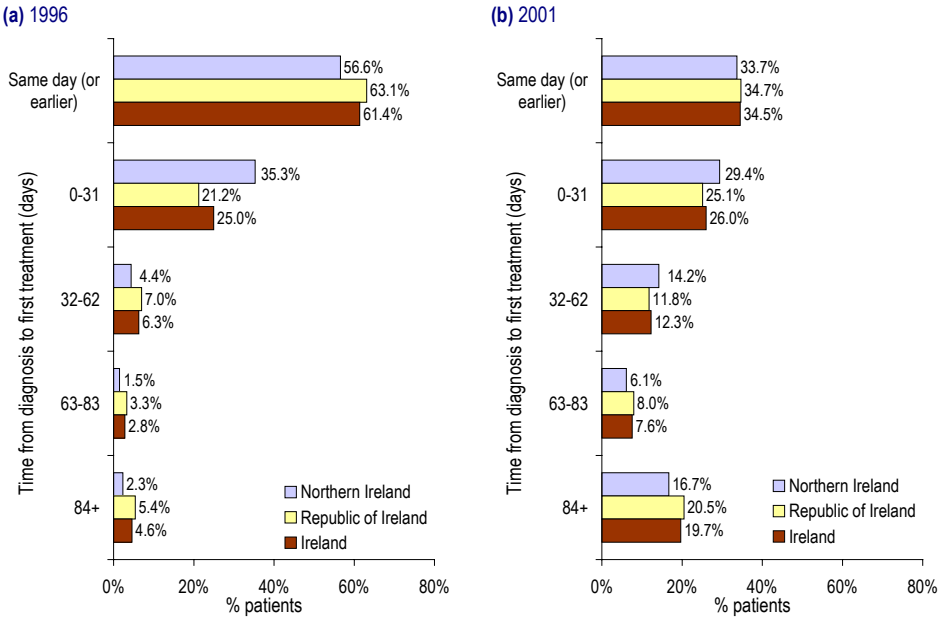
* Significantly different from baseline group (p<0.05)

17.2.4: Waiting times

Among prostate cancer patients diagnosed in 2001 in Ireland 60.5% of those who received tumour directed treatment were treated within 31 days of diagnosis. This was a decrease of 25.8% on the 1996 proportion (p<0.001).

Waiting time between diagnosis and treatment did not differ significantly between Northern Ireland and Republic of Ireland (χ^2=9.4, p=0.051). (Fig. 17.10)

Figure 17.10: Time between diagnosis and first treatment by country for patients diagnosed with prostate cancer: 1996 & 2001



Note: Treatment can occasionally occur prior to diagnosis when it is initially based upon clinical opinion, with a later, more definitive diagnosis made based upon microscopic verification

The proportion of patients in Northern Ireland waiting less than 31 days fell 28.8% between 1996 and 2001 (p<0.001) compared to 24.5% in Republic of Ireland while those waiting 32-61 days increased by 9.8% (p=0.001) in Northern Ireland and 4.8% (p=0.004) in Republic of Ireland. (Fig. 17.10)

17.3: Survival

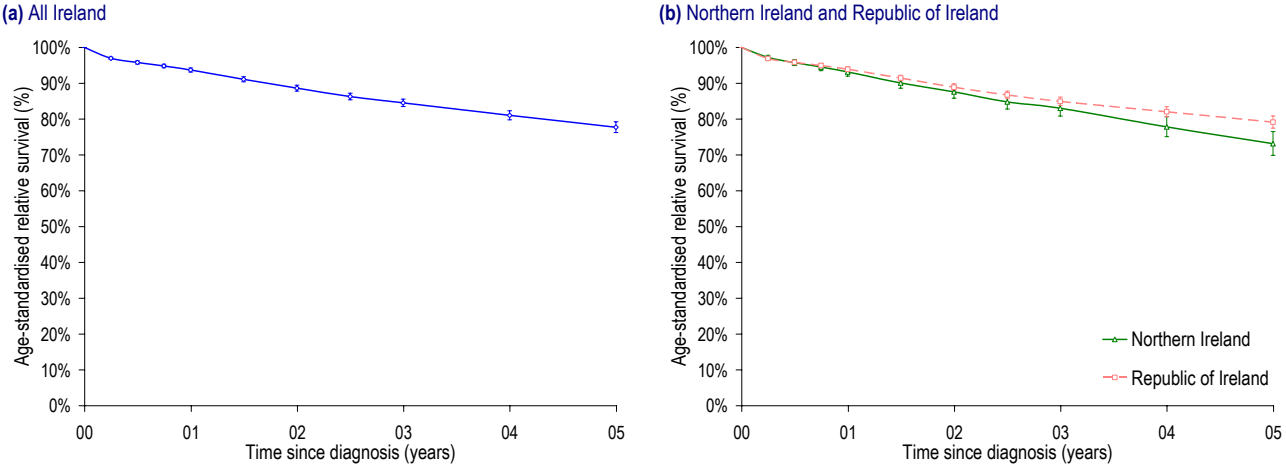
Survival from prostate cancer in Ireland was high with one-year (age-standardised) relative survival for patients diagnosed with prostate cancer in 2000-2004 estimated to be 93.7%, while five-year (age-standardised) relative survival was estimated at 77.7%. (Fig. 17.11, Tab. 17.5)

Table 17.5: Age-standardised relative survival for prostate cancer patients by country: 2000-2004 period analysis five-year estimates

	Age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
1-year	93.2% (92.0%, 94.3%)	93.9% (93.3%, 94.6%)	93.7% (93.2%, 94.3%)
5-year	73.1% (69.9%, 76.5%)	79.2% (77.5%, 80.9%)	77.7% (76.3%, 79.3%)

Five-year (age-standardised) relative survival from prostate cancer diagnosed in 2000-2004 was 6.1% (p=0.018) higher in Republic of Ireland than Northern Ireland, however one-year (age-standardised) relative survival was similar in both countries. (Fig. 17.11, Tab. 17.5)

Figure 17.11: Age-standardised relative survival for prostate cancer patients: 2000-2004 period analysis estimates



17.3.1: Changes in survival over time

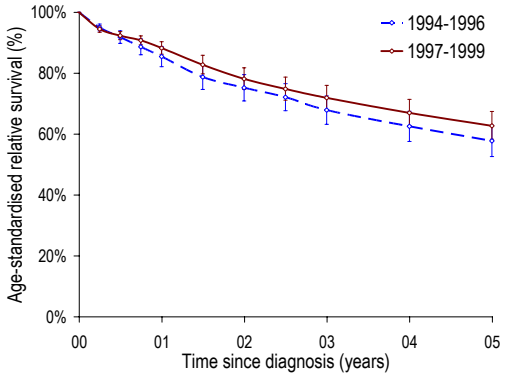
Five-year (age-standardised) relative survival for patients diagnosed with prostate cancer in Ireland improved by 8.8% (p<0.001) between 1994-1996 and 1997-1999. This was driven primarily by an improvement of 9.7% (p<0.001) in Republic of Ireland, as while an increase of 4.9% also occurred in Northern Ireland, this change was not statistically significant (p=0.307). The estimates of five-year (age-standardised) relative survival for those diagnosed in 2000-2004 suggest that this trend will continue, with further improvements in survival also significant in Northern Ireland. Caution should be exercised in the interpretation of improvements as they are linked to the increased use of PSA testing which while allowing earlier diagnosis (thereby increasing survival time) does not necessarily increase the proportion of patients who ultimately end up free of prostate cancer. (Fig. 17.12, Tab. 17.6)

Table 17.6: Age-standardised relative survival for prostate cancer patients by country and period of diagnosis: 1994-1999

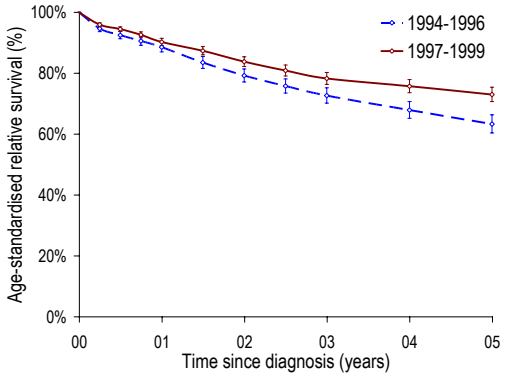
	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	85.5% (82.3%, 88.8%)	88.3% (86.2%, 90.4%)	57.8% (53.1%, 62.9%)	62.7% (58.4%, 67.5%)
Republic of Ireland	88.6% (87.0%, 90.1%)	90.3% (89.1%, 91.5%)	63.3% (60.4%, 66.3%)	73.0% (70.7%, 75.4%)
Ireland	87.7% (86.3%, 89.2%)	89.7% (88.7%, 90.8%)	61.7% (59.2%, 64.3%)	70.5% (68.5%, 72.7%)

Figure 17.12: Age-standardised relative survival for prostate cancer patients by country and period of diagnosis: 1994-1999

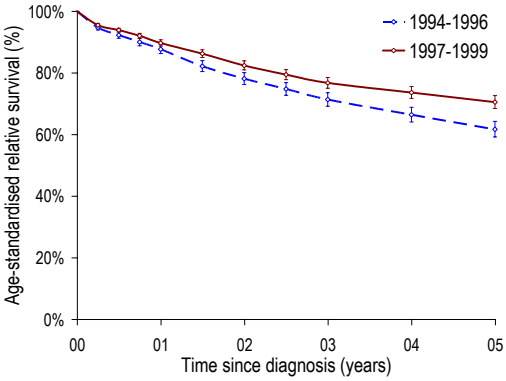
(a) Northern Ireland



(b) Republic of Ireland



(c) Ireland



17.3.2: Observed survival

Observed survival from prostate cancer for those diagnosed in 1997-1999 was 81.6% after one year and 49.5% after five years. This was lower than relative survival as with a median age at diagnosis of 70 years many prostate cancer patients die from causes related to old age rather than prostate cancer. During 1997-1999 five-year observed survival was 7.6% (p<0.001) higher in Republic of Ireland than Northern Ireland. Five-year observed survival also improved in Republic of Ireland and Ireland as a whole between 1994-1996 and 1997-1999 by 9.3% and 8.0% respectively, however there was no significant change in Northern Ireland. (Tab. 17.7)

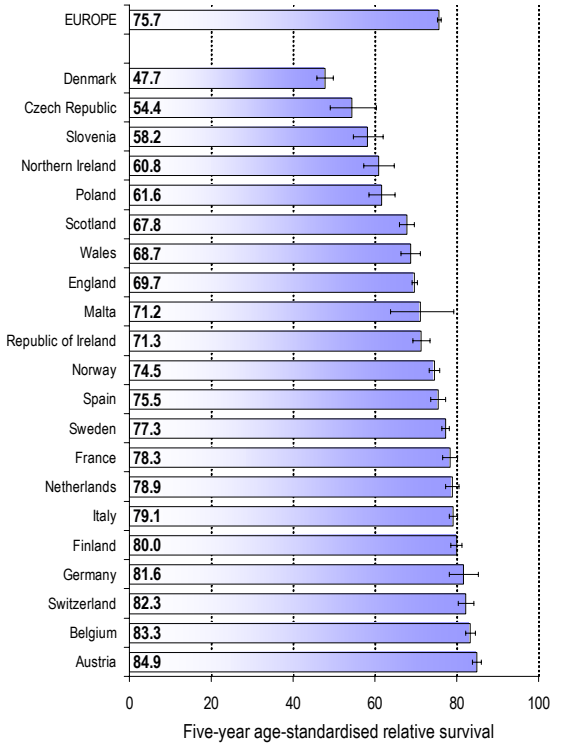
Table 17.7: Observed survival for prostate cancer patients by country and period of diagnosis: 1994-1999

	Observed survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	77.8% (75.6%, 80.0%)	78.5% (76.4%, 80.7%)	39.5% (37.0%, 42.1%)	44.0% (41.5%, 46.6%)
Republic of Ireland	80.4% (79.1%, 81.8%)	82.7% (81.5%, 83.9%)	42.3% (40.6%, 44.0%)	51.6% (50.0%, 53.2%)
Ireland	79.6% (78.5%, 80.8%)	81.6% (80.5%, 82.6%)	41.5% (40.1%, 42.9%)	49.5% (48.2%, 50.9%)

17.3.3: European comparisons

There was considerable variation among European countries in five-year (age-standardised) relative survival from prostate cancer for patients diagnosed in 1995-1999. In Republic of Ireland five-year (age-standardised) relative survival was 4.4% (p=0.001) lower than the European average of 75.7%, while the value in Northern Ireland was 14.9% (p<0.001) lower. Survival in Republic of Ireland was similar to that in England, Scotland and Wales; however survival in Northern Ireland was lower than in each of these countries. Only Denmark had significantly lower survival from prostate cancer than in Northern Ireland. The variation throughout Europe is likely related to different levels of use of PSA testing. (Fig. 17.13)

Figure 17.13: European comparisons of five-year age-standardised relative survival for prostate cancer patients: 1995-1999

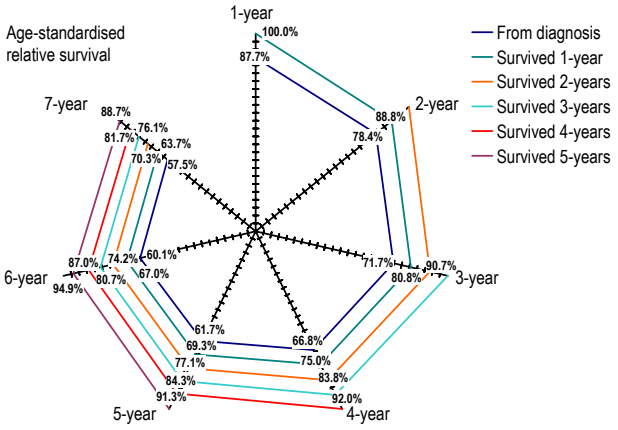


Source: EUROCARE-IV[135]

17.3.4: Conditional survival

Long-term survival from prostate cancer in Ireland was average for patients diagnosed in 1994-1996, with seven-year (age-standardised) relative survival from diagnosis 57.5%. However, the longer a patient survived since their diagnosis the greater the long-term survival possibility. For example, of the male patients surviving two years (78.4%), 70.3% went on to survive a further five years, contrasted with 61.7% surviving five-years from diagnosis. However despite these improvements no "cure" point for prostate cancer was apparent with only 88.7% of patients surviving a further two years after already surviving five-years. (Fig. 17.14)

Figure 17.14: Conditional survival from prostate cancer: Overall relative survival for patients who have already survived a given amount of time: 1994-1996.

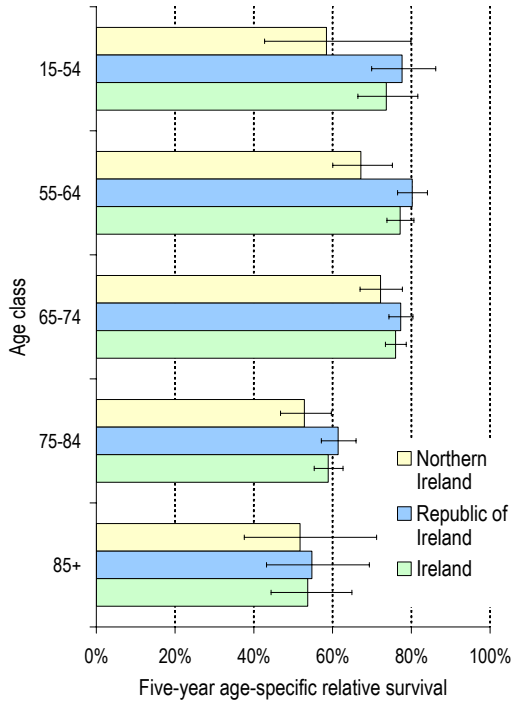


17.3.5: Factors influencing survival

Age

Five-year relative survival for males diagnosed in 1997-1999 with prostate cancer in Ireland was 20.0% (p=0.028) higher among those aged 15-54 than 85 and over. The difference in survival by age was less apparent in Northern Ireland than Republic of Ireland. Additionally five-year (age-standardised) relative survival for those aged 15-64 was 11.4% (p=0.010) higher in Republic of Ireland than Northern Ireland, while there was no significant difference between the two countries for those aged 65 and over. In particular five-year relative survival for those aged 55-64 was 13.0% (p=0.024) higher in Republic of Ireland. (Fig. 17.15, Tab. 17.8)

Figure 17.15: Five-year age-specific relative survival for prostate cancer patients by country: 1997-1999



In Republic of Ireland five-year (age-standardised) relative survival for those aged 15-64 improved between 1994-1996 and 1997-1999 by 12.6% (p<0.001). There was no improvement for those aged 65 and over, nor was there any change for either age group in Northern Ireland. (Tab. 17.8)

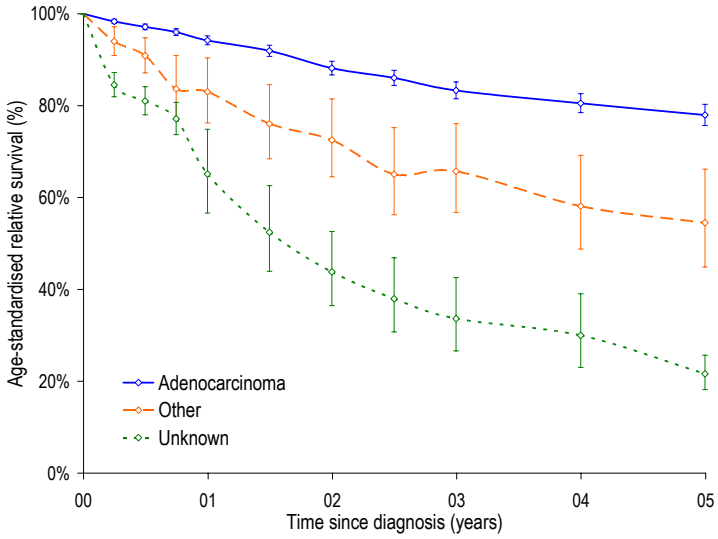
Table 17.8: Five-year age-standardised relative survival for prostate cancer patients by country, age and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)			
	15-64		65+	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	60.9% (54.7%, 67.7%)	66.9% (61.2%, 73.0%)	50.2% (44.5%, 56.6%)	52.6% (46.8%, 59.1%)
Republic of Ireland	65.7% (62.0%, 69.5%)	78.3% (75.6%, 81.2%)	57.5% (53.0%, 62.5%)	60.0% (55.8%, 64.6%)
Ireland	64.4% (61.3%, 67.7%)	75.8% (73.2%, 78.4%)	55.1% (51.5%, 58.9%)	57.8% (54.3%, 61.5%)

Cell type

For patients diagnosed with prostate cancer in Ireland during 1997-1999 five-year (age-standardised) relative survival was higher among those with an adenocarcinoma compared to those with another type, which in turn had better survival than for those with an unspecified cell type. (Fig. 17.16)

Figure 17.16: Age-standardised relative survival for prostate cancer patients by cell type: 1997-1999



For patients diagnosed in 1997-1999 five-year (age-standardised) relative survival was similar in Northern Ireland and Republic of Ireland for each prostate cancer cell type suggesting the overall difference between the two countries was related to the different proportion of cell types, particularly the proportion of unknowns. (Tab. 17.9)

Between 1994-1996 and 1997-1999 five-year (age-standardised) relative survival improved for adenocarcinomas by 9.7% (p<0.001) in Ireland with increases of 9.7% and 8.5% in Republic of Ireland and Northern Ireland respectively, although the change in Northern Ireland was not statistically significant. (Tab. 17.9)

Table 17.9: Five-year age-standardised relative survival for prostate cancer patients by cell type and period of diagnosis: 1994-1999

	Five-year age-standardised relative survival (95% CI)					
	Adenocarcinoma		Other		Unspecified	
	1994-1996	1997-1999	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	66.3% (60.8%, 72.2%)	74.8% (69.8%, 80.1%)	68.7% (53.3%, 88.4%)	49.1% (36.9%, 65.4%)	33.2% (23.9%, 46.0%)	16.7% (12.7%, 22.0%)
Republic of Ireland	69.0% (65.8%, 72.2%)	78.7% (76.2%, 81.4%)	51.0% (39.2%, 66.4%)	52.3% (41.3%, 66.2%)	26.6% (17.8%, 39.8%)	26.0% (20.6%, 32.8%)
Ireland	68.3% (65.5%, 71.1%)	78.0% (75.7%, 80.3%)	54.6% (43.4%, 68.6%)	54.5% (44.9%, 66.2%)	29.5% (22.5%, 38.5%)	21.6% (18.2%, 25.7%)

Stage

For patients diagnosed in 1997-1999 survival from prostate cancer varied depending upon the stage at diagnosis, with three-year (age-standardised) relative survival from stage I & II disease 96.6% compared to 54.9% from stage III & IV disease. Three-year (age-standardised) relative survival for patients without a stage assigned was 85.8%. (Fig. 17.17, Tab. 17.10)

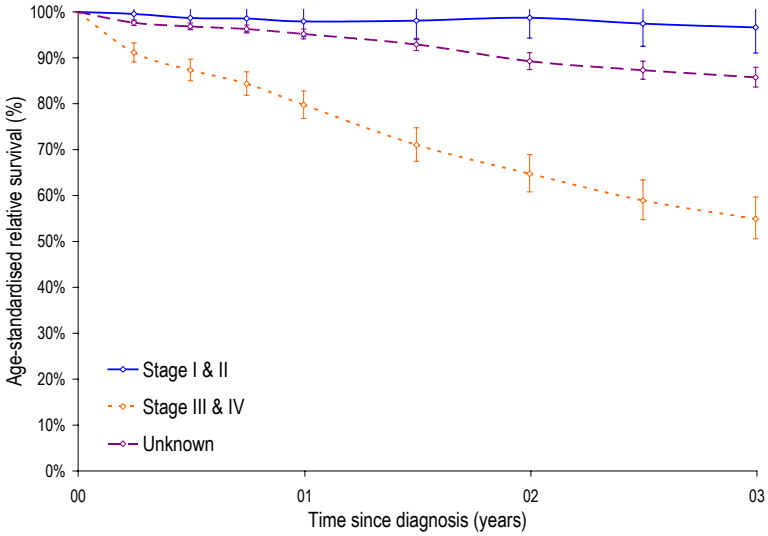
There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland for patients diagnosed at any stage during 1997-1999, although this may be a

Table 17.10: Three-year age-standardised relative survival for prostate cancer by stage and country: 1997-1999

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
Stage I & II	103.7% (98.2%, 109.5%)	93.4% (85.8%, 101.7%)	96.6% (91.0%, 102.5%)
Stage III & IV	62.3% (54.1%, 71.7%)	52.0% (47.0%, 57.6%)	54.9% (50.6%, 59.7%)
Unknown	78.2% (73.2%, 83.5%)	88.0% (85.7%, 90.4%)	85.8% (83.6%, 87.9%)

factor of the small number of cases assigned a stage at diagnosis. Three-year (age-standardised) relative survival for patients with an unspecified stage at diagnosis was however 9.8% (p=0.010) higher in Republic of Ireland than in Northern Ireland. (Fig. 17.17, Tab. 17.10)

Figure 17.17: Age-standardised relative survival for prostate cancer patients by stage: 1997-1999



Treatment

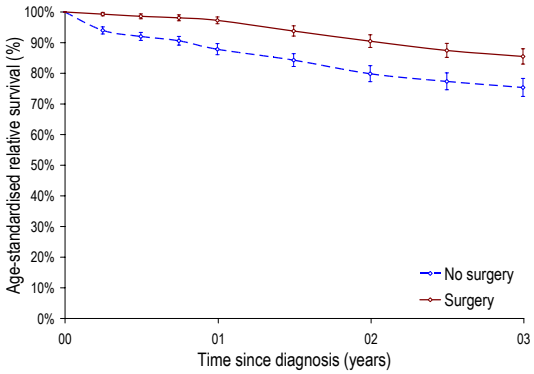
Survival of groups of patients receiving treatment was a factor both of the selection of patients who receive the treatment, the reasons for the treatment (e.g. curative intent or pain relief) and the effectiveness of the treatment itself. For prostate cancer patients diagnosed in Ireland in 1996 and 2001 those receiving any form of treatment had three-year (age-standardised) relative survival of 82.0% compared to 74.6% for those not receiving any tumour directed treatment, a significant difference of 7.4% (p=0.030). (Fig. 17.18, Tab. 17.11)

Receipt of surgery had a positive impact on survival from prostate cancer with a 10.2% (p<0.001) difference in three-year (age-standardised) relative survival between those receiving and not receiving surgery. Hormone therapy however only improved survival for patients in the first nine months after diagnosis; with three-year (age-standardised) relative survival among patients receiving hormone therapy 12.2% lower than among those not receiving this form of treatment. There was no significant difference in three-year (age-standardised) relative survival between those who did and did not receive radiotherapy. (Fig. 17.18, Tab. 17.11)

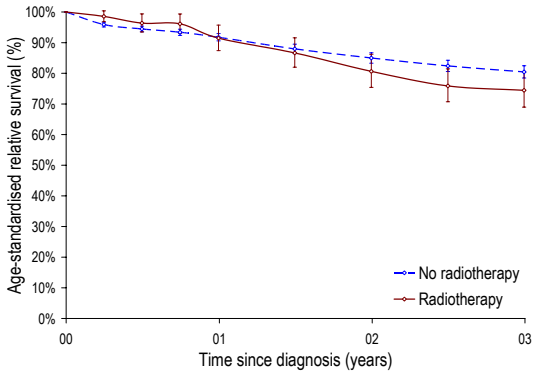
There was no significant difference in the survival experience of patients receiving any treatment, surgery, chemotherapy or hormone therapy between Northern Ireland and Republic of Ireland. However due to the smaller number of cases in each country when

Figure. 17.18: Age-standardised relative survival for prostate cancer patients by treatment: 1996 & 2001

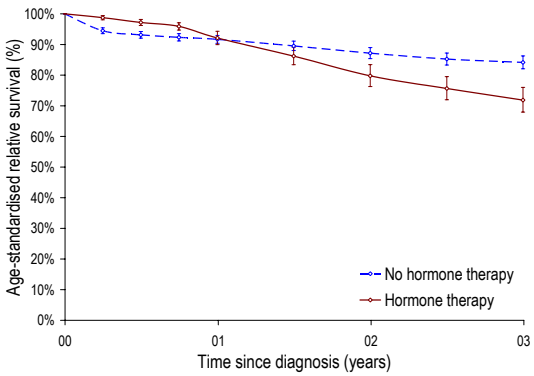
(a) Surgery



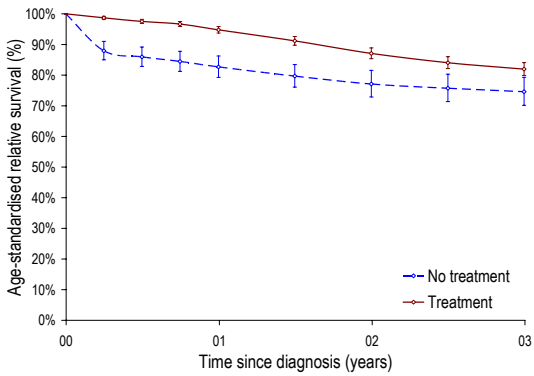
(b) Radiotherapy



(c) Hormone therapy



(d) No tumour directed treatment



considered separately significant differences between patients groups in Ireland as a whole were not always significant for Northern Ireland or Republic of Ireland. (Fig. 17.18, Tab. 17.11)

Table 13.11: Three-year age-standardised relative survival for prostate cancer by treatment type: 1996 & 2001

	Three-year age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
No surgery	73.5% (68.3%, 79.2%)	76.2% (72.8%, 79.8%)	75.3% (72.5%, 78.3%)
Surgery	82.9% (77.3%, 88.8%)	86.1% (83.3%, 88.9%)	85.5% (83.0%, 88.0%)
No radiotherapy	78.9% (74.9%, 83.0%)	81.0% (78.7%, 83.4%)	80.4% (78.5%, 82.5%)
Radiotherapy	70.1% (59.6%, 82.5%)	75.9% (69.5%, 82.9%)	74.4% (69.0%, 80.3%)
No hormone therapy	82.6% (78.4%, 87.1%)	84.8% (82.4%, 87.2%)	84.1% (82.1%, 86.3%)
Hormone therapy	70.4% (63.6%, 77.9%)	72.5% (67.8%, 77.5%)	71.9% (67.9%, 76.0%)
No treatment*	73.9% (65.5%, 83.4%)	75.5% (70.4%, 80.9%)	74.6% (70.2%, 79.3%)
Treatment*	79.3% (74.9%, 84.0%)	82.7% (80.3%, 85.1%)	82.0% (79.9%, 84.1%)

* Refers to tumour directed treatment only

Interaction between factors

Overall survival from prostate cancer in Republic of Ireland was higher than in Northern Ireland; however it has been suggested in this chapter that this was at least in part due to factors such as age at diagnosis and the type of prostate cancer diagnosed. Modelling of excess mortality allows investigation of this hypothesis by deriving excess mortality of one country relative to the other while adjusting for the factors thus far discussed. This process illustrates that survival from prostate cancer was influenced by stage and basis of diagnosis with other variations, albeit ones which were not statistically significant, in age, receipt of treatment and cell type. Adjusting for these factors demonstrate that excess mortality was lower in 2001 than 1996, reflecting survival improvements, but that there was no significant difference in excess mortality between Republic of Ireland and Northern Ireland. (Tab. 17.12)

Table 17.12: Excess hazard ratios for prostate cancer patients by patient and tumour characteristics: 1996 & 2001

	Excess mortality		Excess mortality
Age 15-44	1.00	Microscopically verified	1.00
Age 45-54	0.55 (0.33, 0.91)	Not microscopically verified	5.03 (1.46, 17.33)
Age 55-64	0.96 (0.61, 1.51)	Unknown basis	2.53 (0.63, 10.17)
Age 65-74	1.09 (0.67, 1.75)		
Age 75+	1.32 (0.70, 2.49)	Treatment	1.00
		No Treatment	1.56 (0.66, 3.67)
Staged	1.00		
Unstaged	0.41 (0.33, 0.51)	Year 1996	1.00
		Year 2001	0.74 (0.62, 0.88)
Adenocarcinoma	1.00		
Other cell type	1.70 (0.95, 3.03)	Northern Ireland	1.00
Not specified cell	0.84 (0.25, 2.89)	Republic of Ireland	1.06 (0.85, 1.33)

17.4: Mortality

During 2000-2004 there were on average 745 deaths per year in Ireland as a result of prostate cancer. It was the second most common cause of male cancer death in Ireland, although in Northern Ireland it was third most common. It made up 12.6% of all male deaths as a result of cancer. The cumulative risk of a male resident in Ireland dying from the disease before the age of 75, assuming the absence of other causes of death was 1.3%. (Tab. 17.13)

Mortality from the disease was higher in Republic of Ireland than Northern Ireland with European age-standardised mortality rates (EASMR) 18.6% ($p<0.001$) lower in Northern Ireland. (Tab. 17.13)

Table 17.13: Summary statistics for deaths from prostate cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of deaths per year	215	530	745
% of all cancer deaths (ex. NMSC)	11.4%	13.1%	12.6%
Rank (ex. NMSC)	3	2	2
Median age at death	79	79	79
Cumulative risk (Aged 0 to 74)	1.2%	1.3%	1.3%
Crude rate per 100,000 persons	25.9	27.3	26.9
EASMR ± 95% CI	25.5 ±1.6	31.4 ±1.2	29.4 ±1.0
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			-18.6% ±5.9

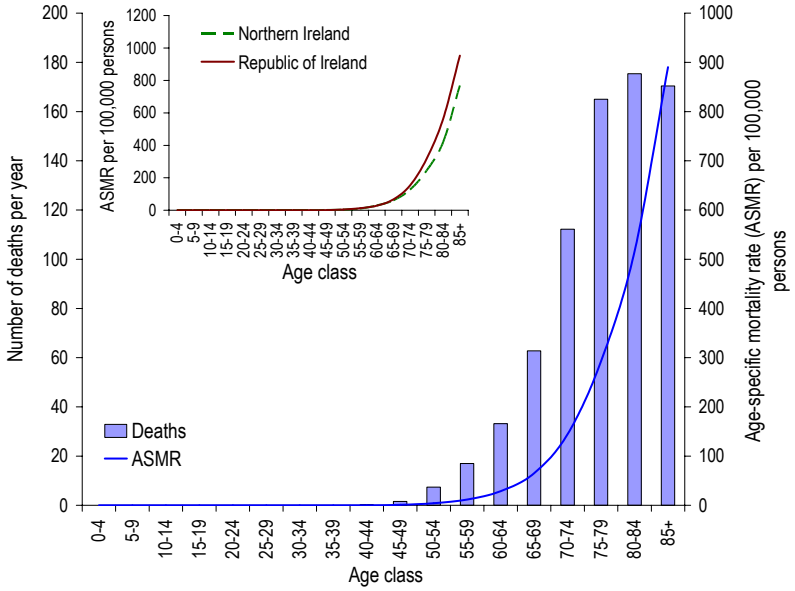
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

17.4.1: Age distribution

During 2000-2004 the median age at death from prostate cancer in Ireland was 79 years. The number of deaths per year peaked in the 80-84 age class with 175 deaths per year, 23.5% of all deaths from this disease. There were no deaths from the disease during the five-year period among those aged 44 and under. (Fig. 17.19)

Age-specific mortality rates (ASMR) were highest among those aged 85 and over with 890 deaths per 100,000 persons in this age class. While the general curve for ASMRs by five-year age group was similar in both Northern Ireland and Republic of Ireland, those in Republic of Ireland were consistently higher than in Northern Ireland for those aged 65 and over. (Fig. 17.19)

Figure 17.19: Number of deaths from prostate cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



17.4.2: Trends

European age-standardised mortality rates (EASMR) from prostate cancer decreased by 1.0% (p=0.012) per year in Ireland between 1994 and 2004. However due to demographic changes the number of deaths increased by an average of 3.6 per year. (Fig. 17.20)

Despite annual percentage changes in EASMRs of -1.1% (p=0.072) in Northern Ireland and -1.0% (p=0.059) in Republic of Ireland, neither country exhibited a significant change in mortality rates between 1994 and 2004. There was however an annual increase of 0.9 and 2.6 deaths per year in Northern Ireland and Republic of Ireland respectively. (Fig. 17.20)

Figure 17.20: Trends in European age-standardised mortality rates (EASMR) for prostate cancer by country: 1994-2004

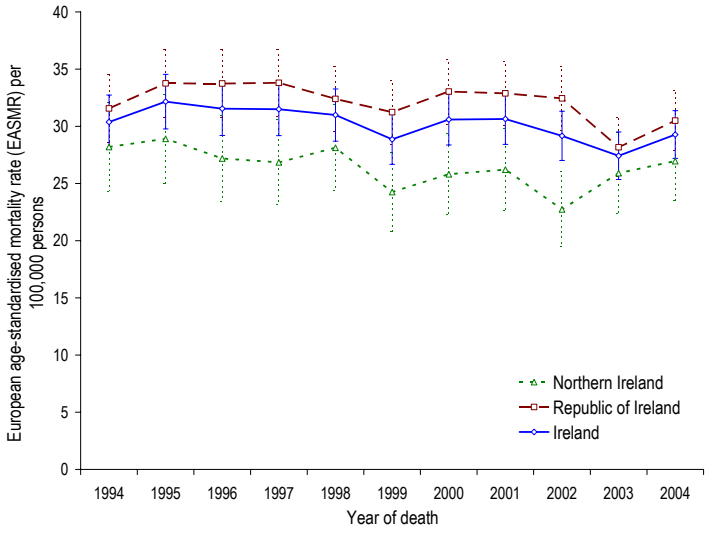
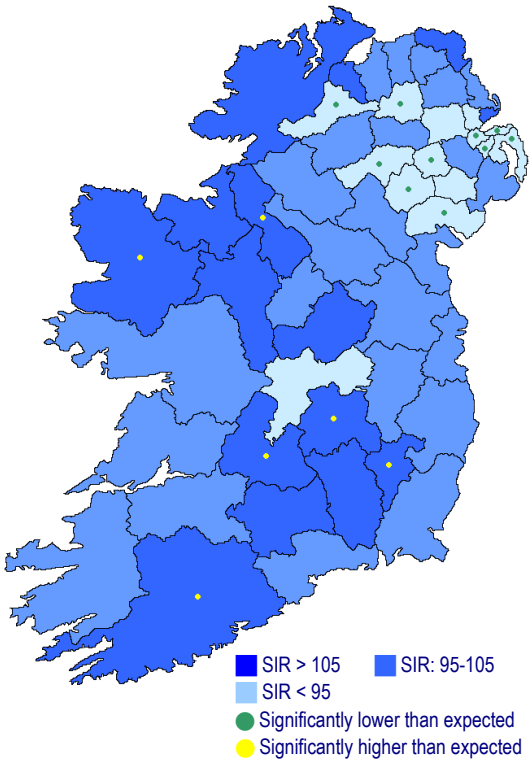


Figure 17.21: Significant differences in county/council standardised mortality ratios for prostate cancer compared to Ireland as a whole: 1994-2004



17.4.3: Geographic variations

Compared to Ireland as a whole mortality rates for prostate cancer during 1994-2004 were higher than expected in counties North Tipperary, Leitrim, Laois, Carlow, Mayo and Cork. County Dublin had 108 deaths per year, which was within the expected range, while Belfast had 35 deaths per year, which was lower than expected. A further nine district councils in Northern Ireland had lower than expected mortality from the disease, while there were no counties in Republic of Ireland with lower than expected mortality rates. (Fig. 17.21)

17.5: Prevalence

There were 14,176 people in Ireland diagnosed in 1994-2004 with prostate cancer who were still alive at the end of 2004. This constitutes 58.5% of all those diagnosed during the eleven-year period. A total of 10,685 of these people were diagnosed in the five years prior to the end of 2004. (Tab. 17.14)

Table 17.14: Prevalence of prostate cancer in Ireland at the end of 2004 by country and period of diagnosis

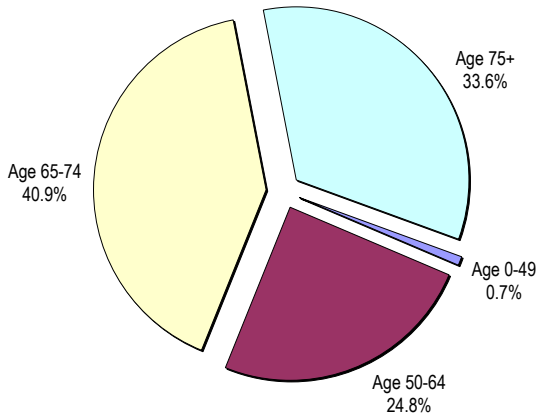
	Diagnosed 1994-2004		Diagnosed 2000-2004	
	Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	3,391	54.1%	2,544	76.4%
Republic of Ireland	10,785	60.0%	8,141	78.1%
Ireland	14,176	58.5%	10,685	77.7%

Of these 10,685, there were 2,544 survivors in Northern Ireland compared to 8,141 in Republic of Ireland. (Tab. 17.14)

17.5.1: Age distribution

Prevalence of prostate cancer in Ireland was more common among those aged 65-74 with 4,371 (40.9%) people alive at the end of 2004 having been diagnosed in 2000-2004. Those aged 50-64 made up a further 24.8% with those aged 75 and over contributing 33.6%. Only 0.7% of people living with the disease were aged 0-49. (Fig. 17.22)

Figure 17.22: Prevalence of prostate cancer in Ireland at the end of 2004 by age for patients diagnosed in 2000-2004

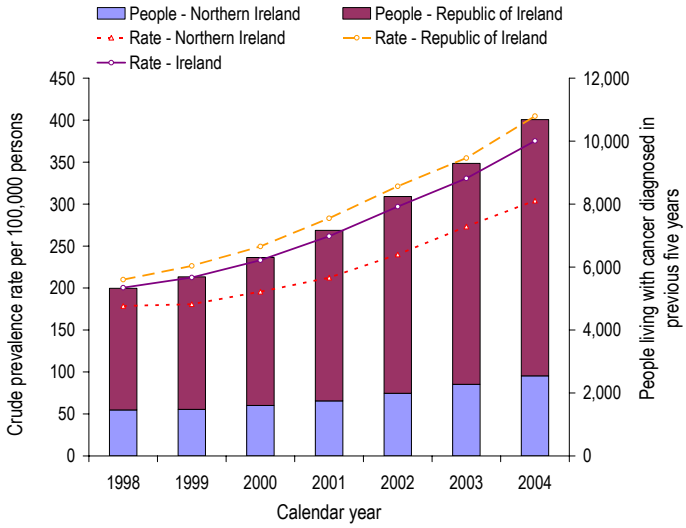


17.5.2: Trends

As a result of increases in incidence levels, improvements in survival, population growth, ageing of the population and reductions in mortality rates the number of people alive at the end of each year that had a diagnosis of prostate cancer within the previous five years increased between 1998 and 2004 by an average of 901 people per year. (Fig. 17.23)

The majority of the increase occurred in Republic of Ireland where there was an increase of 714 people per year living with the disease compared to an annual increase of 186 in Northern Ireland. Removing the effect of population growth using crude prevalence rates per 100,000 persons illustrates that the number of people alive at the end of each calendar year after a diagnosis of prostate cancer within the previous five-years increased in Northern Ireland by 9.8% each year, a smaller increase than the 11.8% increase in Republic of Ireland. As a result at the end of 2004 the number of living people with prostate cancer diagnosed since 2000 per 100,000 people was 24.9% lower in Northern Ireland than Republic of Ireland. This is likely a factor of the higher incidence rates and better survival rates, both a factor of higher PSA testing. (Fig. 17.23)

Figure 17.23: Number of males (and crude rate per 100,000 persons) living with prostate cancer at the end of each calendar year, who were diagnosed within the previous five-years by calendar year and country



17.6: Discussion

The prostate is a small gland in males which is found along the tube connecting the bladder to the penis. There are several possible urinary symptoms associated with cancer of this gland including difficulty or pain in passing urine, more frequent or urgent urination or passing blood in the urine. Pain in the back, hips or pelvis is also a possible side effect of prostate cancer.[136] However many older men have problems passing urine which are due to prostate enlargement but not cancer.

Increasing age is the most important risk factor in prostate cancer. Many men will develop prostate cancer in their life, especially as they age. Most will die from other diseases with, but not from, their prostate cancer. Family history is a strong risk factor in the development of prostate cancer, with the risk for males with a relative diagnosed with the disease being twice that of an average male.[137] This risk increases to three times the average if the relative is a brother and increases to four times the average if a father, brother or son was diagnosed before age 60.[138] A strong family history of breast cancer is also an indication of an increased risk as it may indicate the presence of the faulty BRCA1 or BRCA2 gene which can cause prostate cancer in men.[139,140] Other known, but relatively weak risk factors for prostate cancer are black ethnic race[141] and a diet with high animal fat consumption[142] and low levels of selenium.[141]

Globally there are approximately 543,000 cases of prostate cancer diagnosed each year with the highest incidence rates located in USA, Western Europe, South Africa and Australia. Incidence rates of the disease are climbing worldwide including those in Ireland. This is primarily a result of the use of prostate-specific antigen testing as a diagnostic approach, which in some countries such as USA, form the basis of a screening programme. However increases in incidence rates have also been observed in Asian countries where PSA testing is not applied suggesting that environment, genetic and lifestyle factors also influence incidence rate trends.

Mortality rates however have begun to see a decrease in some countries (Ireland, USA) while they have remained static in others. This has been accompanied by improvements in survival. This is also an artefact of the introduction of PSA testing with diagnosis being made at a point much closer to when the cancer first developed. This has the effect of increasing survival time from the date of diagnosis to death; however the actual time from the development of cancer to death may not have changed. The variation in the use of PSA testing throughout different countries explains the considerable variation in survival rates throughout the world and the differences between Northern Ireland and Republic of Ireland. PSA testing has been widespread in Republic of Ireland for a longer period of time than in Northern Ireland with the result that a higher proportion of prostate cancers were detected at an earlier time in their disease journey in the Republic of Ireland. This leads to lead-time bias in the calculation of survival. Trials are underway to determine the effectiveness of PSA testing as a population based screening programme.

Chapter 18:

Testicular cancer (C62)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *Between 2000 and 2004 there were 189 males diagnosed with testicular cancer each year.*
  - *Unlike most cancers testicular cancer is a disease found mostly in younger males with a median age at diagnosis during 2000-2004 of 32 years.*
  - *Incidence rates of testicular cancer increased between 1994 and 2004 by 3.6% per year.*
  - *Cork and Derry had significantly higher levels of testicular cancer during 1994-2004 than Ireland as a whole.*
  - *Incidence rates of testicular cancer in Ireland were similar during 1998-2000 to the rest of the European Union, but were higher than those in USA and Canada.*
  - *There were 9 deaths per year from the disease between 2000 and 2004*
  - *Between 1994 and 2004 mortality rates decreased by 5.1% per year.*

- *SURVIVAL AND PREVALENCE*
  - *Survival was excellent with an estimated 97.7% of patients diagnosed in 2000-2004 surviving one-year and 96.9% surviving five-years.*
  - *There was no significant change in survival between 1994-1996 and 1997-1999.*
  - *At the end of 2004 there were 1,676 people living in Ireland who had been diagnosed with testicular cancer in the 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates of testicular cancer were 17.2% higher in Northern Ireland than Republic of Ireland during 2000-2004.*
  - *In Republic of Ireland incidence rates increased by 3.9% per year compared to 3.3% per year in Northern Ireland.*
  - *There was no variation in survival between Northern Ireland and Republic of Ireland.*
  - *There was no variation in mortality rates between Northern Ireland and Republic of Ireland.*
  - *The number of people alive per 100,000 people at the end of 2004 who had been diagnosed with testicular cancer in the previous five years was 10.0% higher in Northern Ireland than Republic of Ireland.*

18.1: Incidence

Between 2000 and 2004 there were 189 males diagnosed each year in Ireland with testicular cancer with 128 of these people resident in Republic of Ireland. Testicular cancer was one of the less common cancers making up 1.7% of male cancers (excluding NMSC) during the period thereby ranking it as the fourteenth most common male cancer. The risk of developing the disease before the age of 75 was 0.5%. (Tab.18.1)

European age standardised incidence rates (EASIR) were 17.2% higher in Northern Ireland than Republic of Ireland during 2000-2004 (p=0.036). (Tab. 18.1)

Table 18.1: Summary statistics for incidence of testicular cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of cases per year	60	128	189
% of all cancer cases (ex. NMSC)	1.8%	1.7%	1.7%
Rank (ex. NMSC)	14	14	14
Median age at diagnosis	35	31	32
Cumulative risk (Aged 0 to 74)	0.5%	0.4%	0.5%
Crude rate per 100,000 persons	7.3	6.6	6.8
EASIR ± 95% CI	7.2 ±0.8	6.2 ±0.5	6.5 ±0.4
% difference (NI vs ROI) ± 95%CI (+ NI higher, - NI lower)			17.2% ±16.2

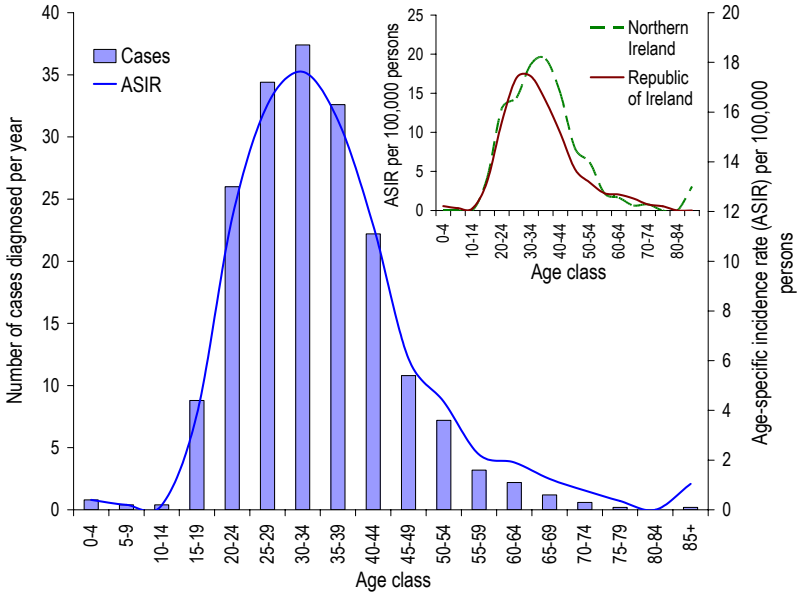
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

18.1.1: Age distribution

Unlike most cancers testicular cancer is a disease found mostly in younger males with a median age at diagnosis during 2000-2004 of 32 years. This however varied between Northern Ireland and Republic of Ireland with diagnosis on average four years younger in the later. (Tab. 18.1)

For males incidence of testicular cancer peaked in the 30-34 age class with 37 cases per year (19.8% of male cases). Age-specific incidence rates (ASIR) were also highest in this age class with 17.6 cases per 100,000 males aged 30-34. The age distribution varied by country with male ASIRs highest in Northern Ireland among those aged 35-39. (Fig. 18.1)

Figure 18.1: Number of cases of testicular cancer diagnosed per year by age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

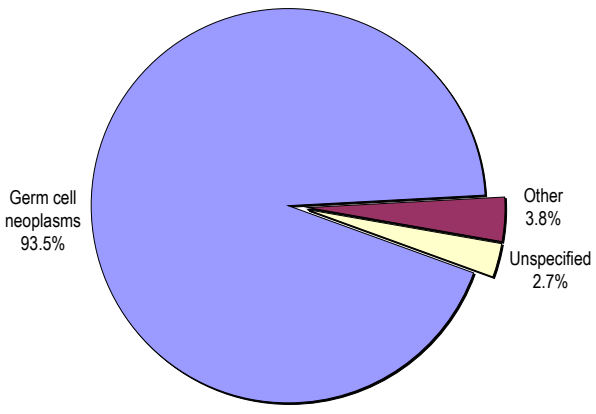


There were on average 2 boys (aged 0-14) diagnosed with testicular cancer each year during 2000-2004. (Fig. 18.1)

18.1.2: Cell type

Germ cell neoplasms were the most common form of testicular cancer diagnosed in Ireland during 2000-2004 making up 93.5% of the 189 testicular cancers diagnosed per year with a further 3.8% affecting another cell type (mostly trophoblastic neoplasms) and the remainder unspecified. There was very little variation in the distribution of cell type by country with 3.6% of cases having an unspecified cell type in Northern Ireland compared to 2.2% in Republic of Ireland. (Fig. 18.2)

Figure 18.2: Types of testicular cancer diagnosed in Ireland: 2000-2004



18.1.3: Trends

European age-standardised incidence rates (EASIR) for testicular cancer increased between 1994 and 2004 by 3.6% (p=0.001) per year. This corresponded to an annual increase of 8.3 cases per year as a result of demographic change. (Fig. 18.3, Tab. 18.2)

The significant increase in EASIRs was observed in both countries with the increase in rates slightly, but not significantly, higher in Republic of Ireland where EASIRs increased by 3.9% (p=0.013) per year compared to 3.3% (p=0.024) per year in Northern Ireland. (Fig. 18.3, Tab. 18.2)

Figure 18.3: Trends in European age-standardised incidence rates (EASIR) for testicular cancer by country: 1994-2004

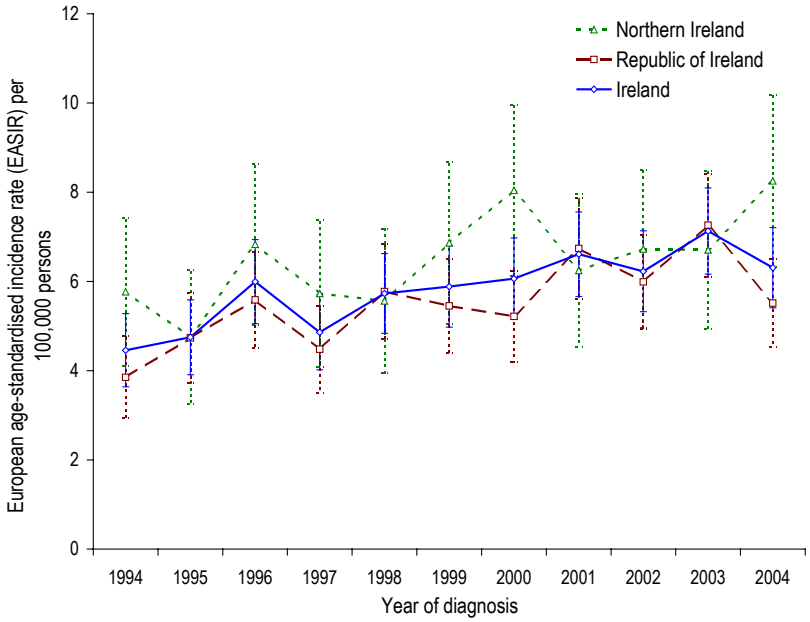


Table 18.2: Number of cases and European age-standardised incidence rates (EASIR) for testicular cancer by year of diagnosis and country: 1994-2004

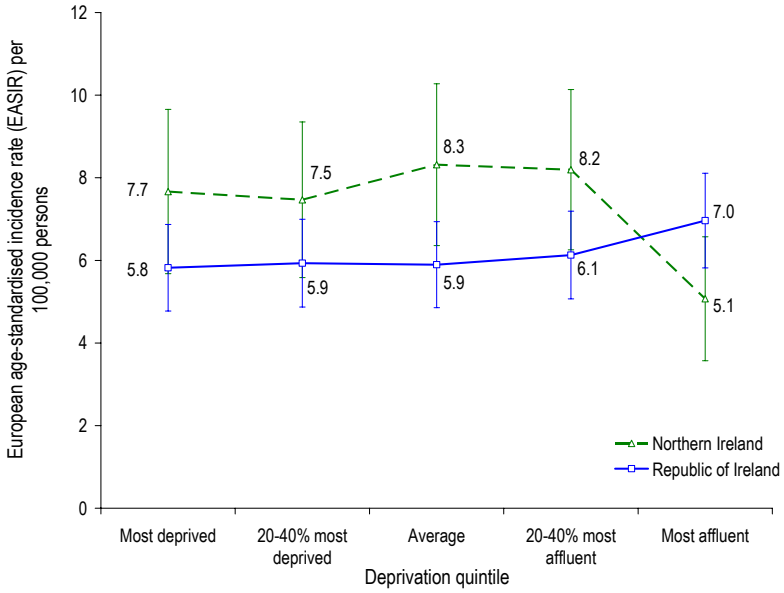
	Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	47	5.8 ±1.7	69	3.8 ±0.9	116	4.5 ±0.8
1995	39	4.8 ±1.5	86	4.7 ±1.0	125	4.7 ±0.8
1996	56	6.8 ±1.8	103	5.6 ±1.1	159	6.0 ±0.9
1997	47	5.7 ±1.7	82	4.5 ±1.0	129	4.9 ±0.8
1998	46	5.6 ±1.6	113	5.8 ±1.1	159	5.7 ±0.9
1999	56	6.9 ±1.8	106	5.5 ±1.0	162	5.9 ±0.9
2000	68	8.0 ±1.9	103	5.2 ±1.0	171	6.1 ±0.9
2001	52	6.2 ±1.7	137	6.7 ±1.1	189	6.6 ±0.9
2002	56	6.7 ±1.8	127	6.0 ±1.0	183	6.2 ±0.9
2003	56	6.7 ±1.8	154	7.3 ±1.2	210	7.1 ±1.0
2004	70	8.3 ±1.9	120	5.5 ±1.0	190	6.3 ±0.9

EASIR: European age-standardised incidence rate with 95% CI

18.1.4: Socio-economic variations

During 2000-2004 there was no apparent relationship between incidence of testicular cancer and deprivation in either Northern Ireland or Republic of Ireland, despite European age-standardised incidence rates (EASIR) 51.2% (p=0.145) higher among the 20% most deprived population compared to the 20% most affluent population in Northern Ireland. EASIRs among the 20% most affluent were significantly higher in Northern Ireland than the equivalent population in Republic of Ireland. (Fig. 18.4)

Figure 18.4: European age-standardised incidence rates (EASIR) for testicular cancer by country specific deprivation quintile: 2000-2004



18.1.5: Geographic variations

Cork and Derry had significantly higher incidence rates of testicular cancer diagnosed in 1994-2004 than Ireland as a whole. Lower incidence rates than expected were however apparent in counties Donegal and Laois along with Strabane district council. Both Belfast and Dublin had incidence rates within the expected range with 7 cases in Belfast and 33 cases in Dublin diagnosed each year during the eleven year period. (Fig. 18.5)

Figure 18.5: Significant differences in county/council standardised incidence ratios for testicular cancer compared to Ireland as a whole: 1994-2004

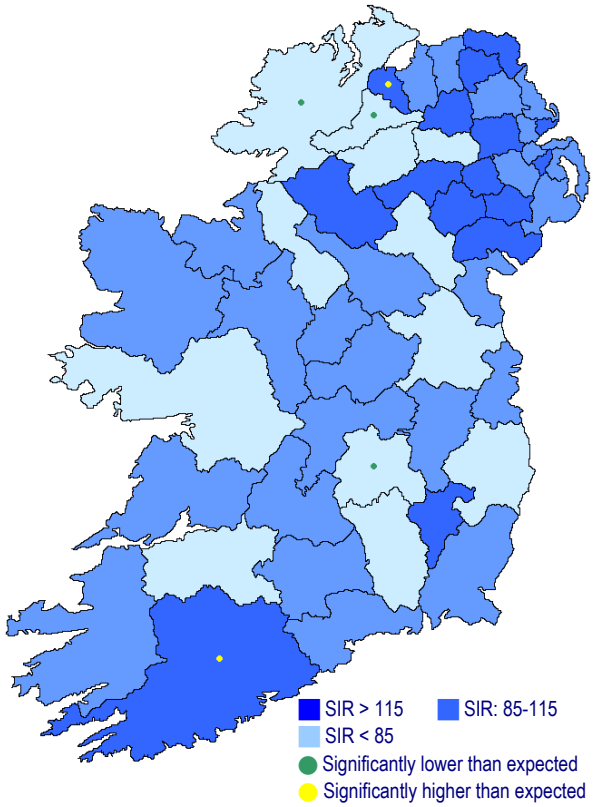
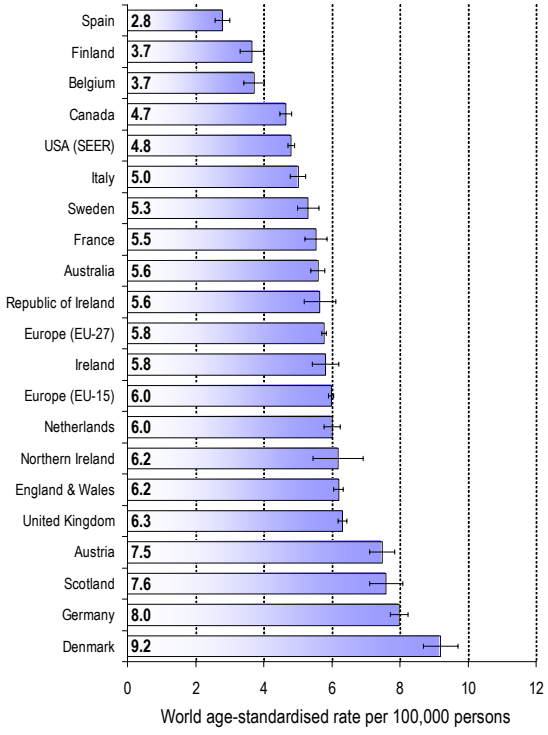


Figure 18.6: International comparisons of world age-standardised incidence rates for testicular cancer: 1998-2000



Source: IARC[143]

18.1.6: International comparisons

Incidence rates for testicular cancer in Ireland were average compared to other developed countries with no significant difference compared to the European Union during 1998-2000. However world age-standardised rates in Ireland were higher than those in USA and Canada while those in Republic of Ireland were lower than in UK. (Fig. 18.6)

18.2: Survival

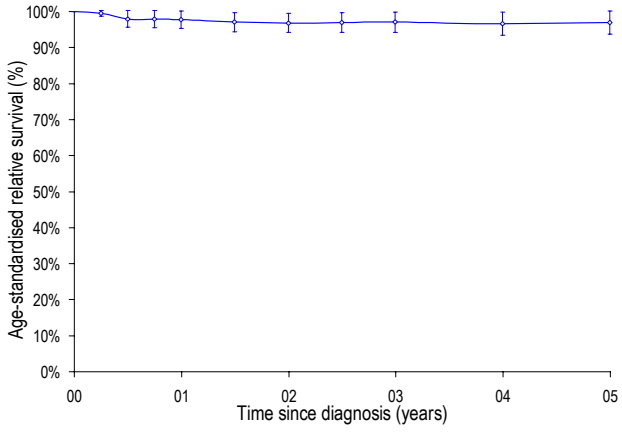
Relative survival (age-standardised) from testicular cancer was excellent with an estimated 97.7% of patients diagnosed in 2000-2004 surviving one-year and 96.9% surviving five years. (Fig. 18.7, Tab. 18.3)

Table 18.3: Age-standardised relative survival for testicular cancer patients by country: 2000-2004 period analysis five-year estimates

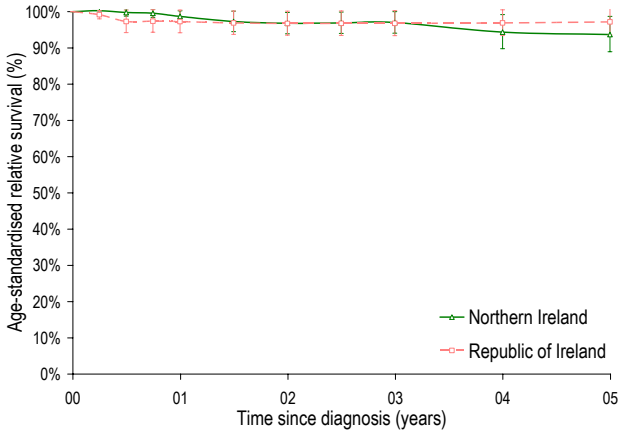
	Age-standardised relative survival (95% CI)		
	Northern Ireland	Republic of Ireland	Ireland
1-year	98.7% (97.2%, 100.2%)	97.3% (94.2%, 100.4%)	97.7% (95.3%, 100.2%)
5-year	93.7% (88.9%, 98.7%)	97.2% (93.6%, 100.9%)	96.9% (93.7%, 100.2%)

Figure 18.7: Age-standardised relative survival for testicular cancer patients: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



Survival did not vary significantly by country with five-year (age-standardised) relative survival estimated to be 97.2% in Republic of Ireland and 93.7% in Northern Ireland for patients diagnosed in 2000-2004, a 3.5% difference that was not statistically significant due to the small number of cases diagnosed annually. (Fig. 18.7, Tab. 18.3)

18.2.1: Changes in survival over time

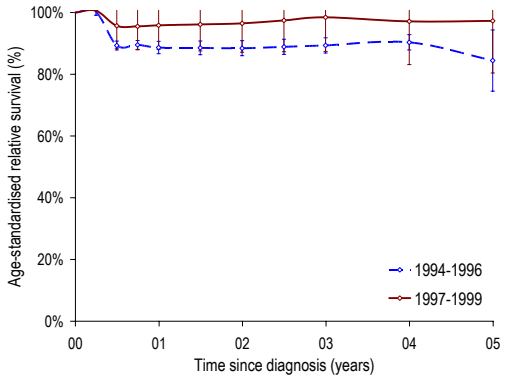
There was no significant change in survival for testicular cancer patients over time although five-year (age-standardised) relative survival for those diagnosed in 1997-1999 was 96.2% compared to 82.3% in 1994-1996. Differences of this magnitude were also observed in Northern Ireland and Republic of Ireland separately but as with all of Ireland differences did not reach statistical significance due to the small number of cases involved. (Fig. 18.8, Tab. 18.4)

Table 18.4: Age-standardised relative survival for testicular cancer patients by country and period of diagnosis: 1994-1999

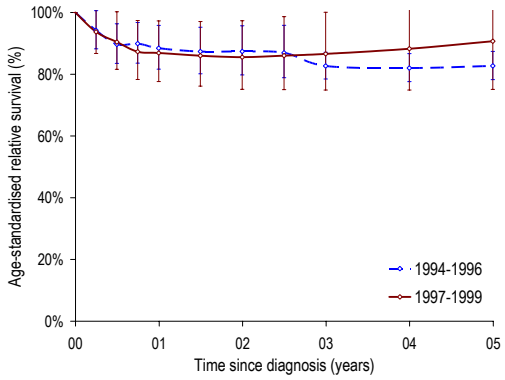
	Age-standardised relative survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	88.7% (86.7%, 90.7%)	95.9% (88.0%, 104.4%)	84.4% (75.6%, 94.4%)	97.3% (80.4%, 117.7%)
Republic of Ireland	88.5% (81.6%, 95.8%)	86.9% (77.6%, 97.3%)	82.7% (78.3%, 87.4%)	90.7% (75.1%, 109.6%)
Ireland	88.1% (83.2%, 93.2%)	91.9% (85.6%, 98.8%)	82.3% (76.2%, 88.9%)	96.2% (84.3%, 109.8%)

Figure 18.8: Age-standardised relative survival for testicular cancer patients by country and period of diagnosis: 1994-1999

(a) Northern Ireland



(b) Republic of Ireland



18.2.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by cancer patients. For those diagnosed in 1997-1999 in Ireland, observed survival from testicular cancer for those diagnosed in was 96.6% after one-year and 92.5% after five-years. This value did not vary significantly by country, nor was it significantly different from five-year observed survival for those diagnosed in 1994-1996. (Tab. 18.5)

(c) Ireland

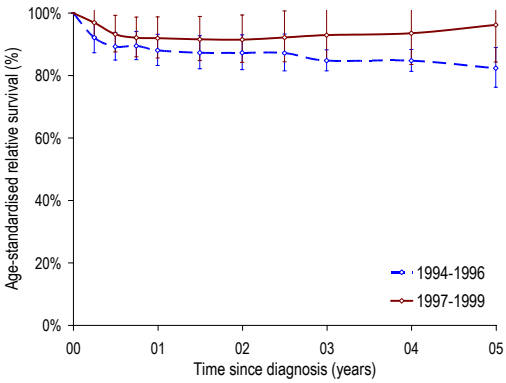


Table 18.5: Observed survival for testicular cancer patients by country and period of diagnosis: 1994-1999

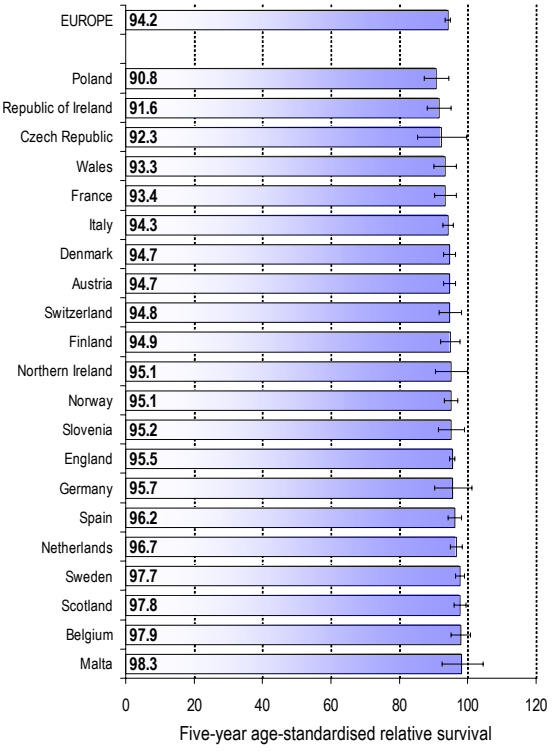
	Observed survival (95% CI)			
	1-year		5-year	
	1994-1996	1997-1999	1994-1996	1997-1999
Northern Ireland	95.7% (92.3%, 99.1%)	98.7% (96.8%, 100.0%)	92.8% (88.5%, 97.2%)	94.6% (91.1%, 98.3%)
Republic of Ireland	94.6% (91.8%, 97.4%)	95.5% (93.2%, 97.9%)	88.3% (84.5%, 92.3%)	91.4% (88.3%, 94.7%)
Ireland	94.9% (92.8%, 97.1%)	96.6% (94.9%, 98.3%)	89.9% (86.9%, 92.9%)	92.5% (90.1%, 95.0%)

18.2.3: European comparisons

Five-year (age-standardised) relative survival from testicular cancer for patients diagnosed in 1995-1999 was greater than 90% for all European countries included in the EUROCARE-IV study conducted in 2007. In particular the average value for all of Europe was 94.2%.

Republic of Ireland however had one of the lowest values in Europe for five-year (age-standardised) relative survival from testicular cancer at 91.6%. Although this value was not significantly different from the European average, it was significantly lower than the equivalent survival rates in Scotland and Sweden. There was no significant variation between five-year (age-standardised) relative survival in Northern Ireland and the European average, or with survival in any European country included in the study. (Fig. 18.9)

Figure 18.9: European comparisons of five-year age-standardised relative survival for testicular cancer patients: 1995-1999



Source: EUROCARE-IV[144]

18.3: Mortality

Testicular cancer was a rare cause of cancer death in Ireland making up 0.2% of all male cancer deaths (excluding NMSC) between 2000 and 2004. There were 9 deaths per year from the disease with one third of these occurring in Northern Ireland. There was no variation in European age standardised mortality rates (EASMR) between Northern Ireland and Republic of Ireland. (Tab. 18.6)

Table 18.6: Summary statistics for deaths from testicular cancer: 2000-2004

	Northern Ireland	Republic of Ireland	Ireland
Number of deaths per year	3	6	9
% of all cancer deaths (ex. NMSC)	0.2%	0.2%	0.2%
Median age at death	28	33	33
Cumulative risk (Aged 0 to 74)	0.03%	0.02%	0.02%
Crude rate per 100,000 persons	0.4	0.3	0.3
EASMR ± 95% CI	0.4 ±0.2	0.3 ±0.1	0.3 ±0.1
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)			18.9% ±77.9

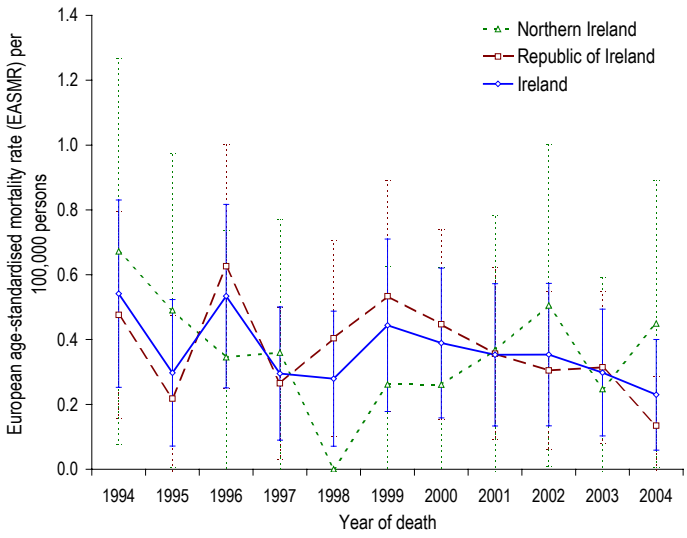
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

18.3.1: Trends

Between 1994 and 2004 European age-standardised mortality rates (EASMR) for testicular cancer in Ireland decreased by 5.1% per year (p=0.038) with the actual number of deaths falling by an average of one death every three years. (Fig. 18.10)

EASMRs however did not change significantly in either Northern Ireland or Republic of Ireland with only very small changes in the annual number of deaths observed – a decrease of one death every ten years in Northern Ireland and a decrease of one death every five years in Republic of Ireland. (Fig. 18.10)

Figure 18.10: Trends in European age-standardised mortality rates (EASMR) for testicular cancer by country: 1994-2004



18.4: Prevalence

Between 1994 and 2004 there were 1,793 people diagnosed with testicular cancer. Of these 93.5% (1,676 people) were still alive at the end of 2004. The majority of these (910 people) were diagnosed in the 2000-2004 period, which was 96.5% of all those diagnosed within these five years. 289 survivors were resident in Northern Ireland while 621 were resident in Republic of Ireland. At the end of 2004 the number of people living with testicular cancer diagnosed within the previous five years per 100,000 persons was 10.0% greater in Northern Ireland than Republic of Ireland. (Tab. 18.7)

Table 18.7: Prevalence of testicular cancer in Ireland at the end of 2004 by country and period of diagnosis

	Diagnosed 1994-2004		Diagnosed 2000-2004	
	Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	558	94.1%	289	95.7%
Republic of Ireland	1,118	93.2%	621	96.9%
Ireland	1,676	93.5%	910	96.5%

18.5: Discussion

The testicles are part of the male reproductive system that produces sperm for the purposes of fertilization. A lump is the most common symptom associated with testicular cancer although most lumps on the testicles are not cancer. A further symptom is usually a dull ache in either the affected testicle or in the abdomen.[145]

Most cases of testicular cancer have no detectable risk factor. However a history of undescended testes can increase risk by up to ten times.[146] The use of an operation to lower the testes reduces this risk, but the risk of developing cancer of the testes is still higher than average.[146] Infertility and fertility problems can increase risk[147] as can the inheritance of a faulty gene, TGCT1, which can increase risk up to five times and can result in family clusters of testicular cancer.[148] The probability of developing testicular cancer linked with infertility problems or genetic factors remains small.

Worldwide there are approximately 50,000 cases of testicular cancer diagnosed each year with incidence in developed countries, including Ireland, increasing. The reasons for this are not completely understood although improvements in diagnostic procedures are believed to be partly responsible.

Survival from the disease is very high due to the effectiveness of chemotherapy using cisplatin to combat the disease, which can show positive results even in some cases where testicular cancer has begun to metastasise. Since the development of this drug in the 1970s mortality from the disease has fallen dramatically and continues to fall in Ireland despite the already low number of deaths per year. Full control of this disease is thus possible given the effectiveness of treatment although early diagnosis maximises survival prospects. With no reliable screening processes in existence diagnosis must first start with the general population recognising symptoms although self-checking remains a controversial recommendation.

Chapter 19:

Kidney cancer (C64-C66; C68)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *Annually there were on average 349 male and 201 female cases diagnosed during 2000-2004.*
  - *Incidence rates increased between 1994 and 2004 by 2.4% for males and 2.6% for females.*
  - *Incidence among males was higher than expected during 1994-2004 in Coleraine, Offaly and Westmeath. Among females there were no geographic areas with higher than expected rates of the disease.*
  - *Incidence of the disease during 2000-2004 was positively related to deprivation.*
  - *Incidence rates in Ireland were higher than in UK for males but were lower than Europe, USA and Australia for males and females.*
  - *There were 170 male and 86 female deaths from the disease each year during 2000-2004.*
  - *Between 1994 and 2004 mortality rates increased among males by 3.8% per year while there was no change among females.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival was estimated to be 47.6% for patients diagnosed in 2000-2004 and was 9.0% higher for males than females.*
  - *There was no significant variation in one or five-year (age-standardised) relative survival for males or females between those diagnosed in 1994-1996 and 1997-1999.*
  - *At the end of 2004 there were 2,446 people living in Ireland who had been diagnosed with kidney cancer in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates did not differ significantly between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *During 1994-2004 incidence rates increased in Republic of Ireland by 3.6% per year among males and by 3.3% for females while there was no significant change in Northern Ireland.*
  - *Neither one nor five-year (age-standardised) relative survival varied significantly by country.*
  - *There was no significant difference in mortality rates between Northern Ireland and Republic of Ireland during 2000-2004.*
  - *The number of people living with kidney cancer per 100,000 persons was 9.3% higher in Northern Ireland than Republic of Ireland.*

19.1: Incidence

Annually there were on average 550 cancers of the kidney diagnosed during 2000-2004, with 63.4% of these among males. Overall this cancer accounted for 3.2% of all male and 1.9% of all female cancers (excluding NMSC) during the period. It was the ninth most common male cancer with the odds of a male member of the population developing the disease before the age of 75 being 1 in 89. This was in contrast to the 1 in 179 chance of a female developing the disease. Kidney cancer was the twelfth most common female cancer. (Tab. 19.1)

European age-standardised incidence rates (EASIR) varied by sex with male rates double those of females ($p<0.001$). The difference between males and females was slightly larger in the Republic of Ireland than in Northern Ireland; however EASIRs did not differ significantly between the two countries for either sex. (Tab. 19.1)

Table 19.1: Summary statistics for incidence of kidney cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	107	70	177	241	131	373	349	201	550
% of all cancer cases (ex. NMSC)	3.3%	2.0%	2.6%	3.1%	1.9%	2.5%	3.2%	1.9%	2.6%
Rank (ex. NMSC)	8	11	11	9	14	13	9	12	12
Median age at diagnosis	67	69	67	66	67	66	66	67	67
Cumulative risk (Aged 0 to 74)	1.1%	0.6%	0.8%	1.1%	0.6%	0.8%	1.1%	0.6%	0.8%
Crude rate per 100,000 persons	13.0	8.0	10.4	12.4	6.7	9.5	12.6	7.1	9.8
EASIR ± 95% CI	13.3 ±1.1	6.9 ±0.8	9.7 ±0.7	14.1 ±0.8	6.6 ±0.5	10.0 ±0.5	13.8 ±0.7	6.7 ±0.4	9.9 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-5.9% ±9.7	4.6% ±14.2	-3.0% ±7.9

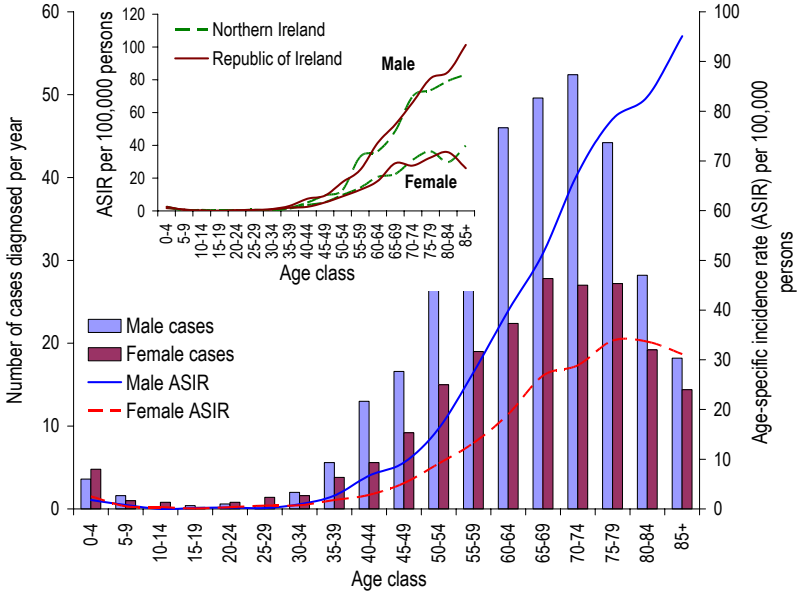
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

19.1.1: Age distribution

Half of the patients with kidney cancer in 2000-2004 were diagnosed with the disease before the age of 67 making the age distribution of patients slightly younger than most cancers. This was in part due to a small number of children aged 0-14 being diagnosed with the disease during the period – 5 boys and 7 girls each year. (Fig. 19.1)

The number of cases diagnosed each year was highest among males in the 70-74 age class with 52 cases per year, although age-specific incidence rates (ASIR) were highest among those aged 85 and over. Female cases however peaked among those aged 65-69 with 28 cases per year while female ASIRs were highest among those aged 75-79. (Fig. 19.1)

Figure 19.1: Number of cases of kidney cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

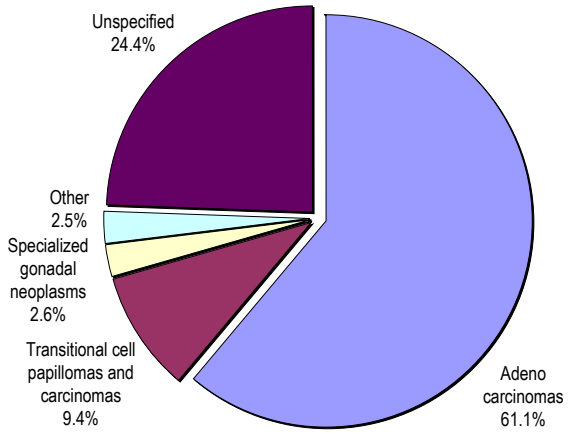


19.1.2: Cell type

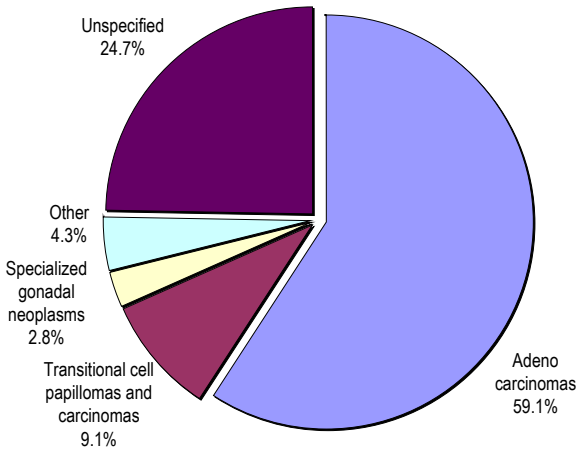
During 2000-2004 the majority of kidney cancers diagnosed were adenocarcinomas with 61.1% of males and 59.1% of females diagnosed with kidney cancer affected by this form of the disease. A further 9.4% of males and 9.1% of females had transitional cell papillomas or carcinomas; however 24.4% of males and 24.7% of females had an unspecified cell type. This percentage did not vary between Northern Ireland and Republic of Ireland (NI: 24.3%; ROI: 24.6%). (Fig. 19.2)

Figure 19.2: Types of kidney cancer diagnosed in Ireland: 2000-2004

(a) Male



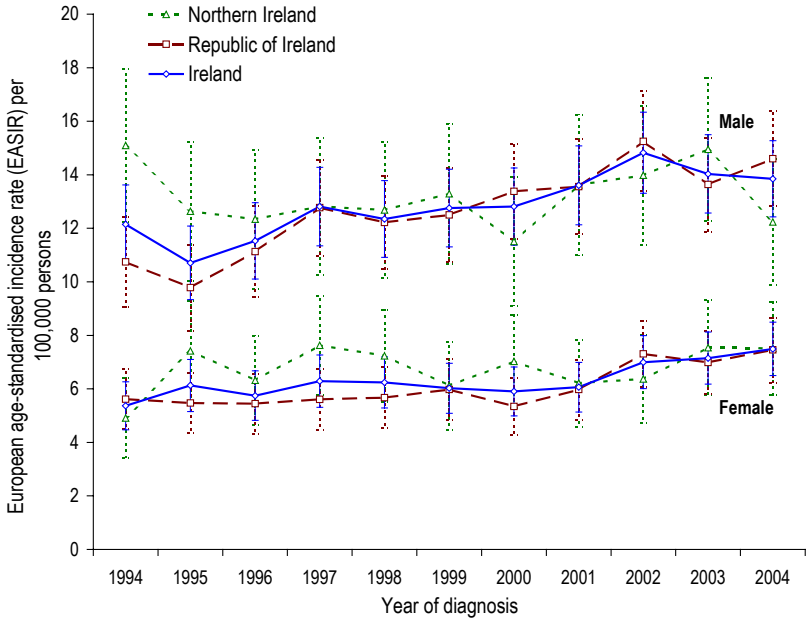
(b) Female



19.1.3: Trends

In Ireland rates of kidney cancer increased between 1994 and 2004 with an annual percentage change in European age-standardised incidence rates (EASIR) of 2.4% (p<0.001) for males and 2.6% (p=0.001) for females. Combined with the effects of population growth and ageing this resulted in a large annual change in the number of cases diagnosed per year, with average increases of 12.9 male and 6.9 female cases per year. (Fig. 19.3, Tab. 19.2)

Figure 19.3: Trends in European age-standardised incidence rates (EASIR) for kidney cancer by sex and country: 1994-2004



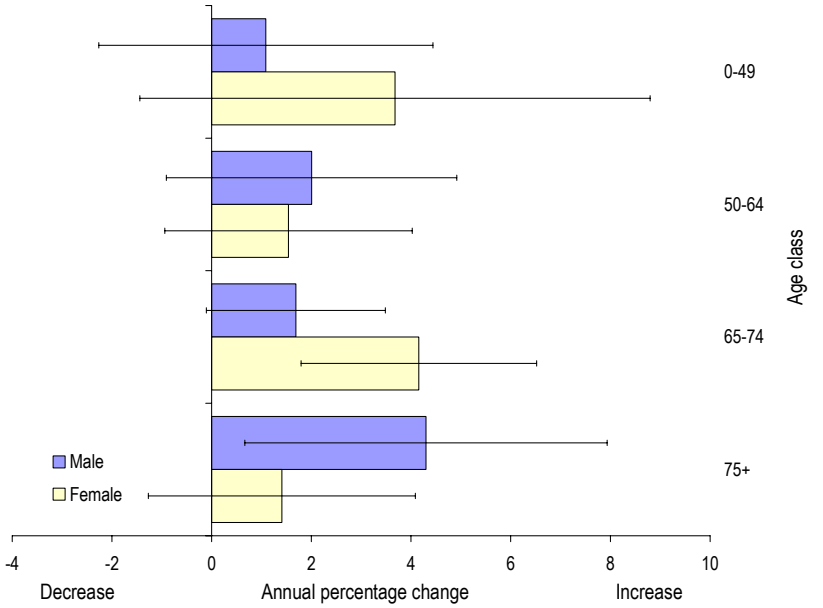
The increasing rates of kidney cancer were only observed in Republic of Ireland with rates in Northern Ireland remaining static. During the eleven-year period EASIRs rose in Republic of Ireland by 3.6% (p<0.001) per year among males and by 3.3% (p=0.001) for females. This translated to an annual increase of 11.3 male and 5.3 female cases per year. The remainder of the increase in the number of cases in Ireland was a result of demographic change in Northern Ireland, which caused a slight annual

Table 19.2: Number of cases and European age-standardised incidence rates (EASIR) for kidney cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	110	15.1 ±2.9	159	10.7 ±1.7	269	12.1 ±1.5	46	4.9 ±1.5	104	5.6 ±1.1	150	5.4 ±0.9
1995	92	12.6 ±2.6	147	9.8 ±1.6	239	10.7 ±1.4	66	7.4 ±1.9	99	5.5 ±1.1	165	6.1 ±1.0
1996	89	12.3 ±2.6	168	11.1 ±1.7	257	11.5 ±1.4	62	6.3 ±1.7	101	5.5 ±1.1	163	5.7 ±0.9
1997	97	12.8 ±2.6	200	12.8 ±1.8	297	12.8 ±1.5	72	7.6 ±1.8	100	5.6 ±1.1	172	6.3 ±1.0
1998	97	12.7 ±2.5	193	12.2 ±1.7	290	12.3 ±1.4	75	7.2 ±1.7	102	5.7 ±1.1	177	6.2 ±1.0
1999	101	13.3 ±2.6	200	12.5 ±1.7	301	12.8 ±1.5	58	6.1 ±1.7	114	6.0 ±1.1	172	6.0 ±0.9
2000	90	11.5 ±2.4	218	13.4 ±1.8	308	12.8 ±1.4	69	7.0 ±1.7	102	5.3 ±1.1	171	5.9 ±0.9
2001	105	13.6 ±2.6	228	13.6 ±1.8	333	13.6 ±1.5	61	6.2 ±1.6	117	6.0 ±1.1	178	6.1 ±0.9
2002	114	14.0 ±2.6	260	15.2 ±1.9	374	14.8 ±1.5	65	6.4 ±1.6	140	7.3 ±1.2	205	7.0 ±1.0
2003	123	15.0 ±2.7	238	13.6 ±1.7	361	14.0 ±1.5	76	7.5 ±1.8	145	7.0 ±1.2	221	7.2 ±1.0
2004	105	12.2 ±2.4	263	14.6 ±1.8	368	13.8 ±1.4	78	7.5 ±1.7	153	7.5 ±1.2	231	7.5 ±1.0

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 19.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for kidney cancer by sex and age: 1994-2004



increase in the annual number of cases despite the static incidence rates. (Fig. 19.3, Tab. 19.2)

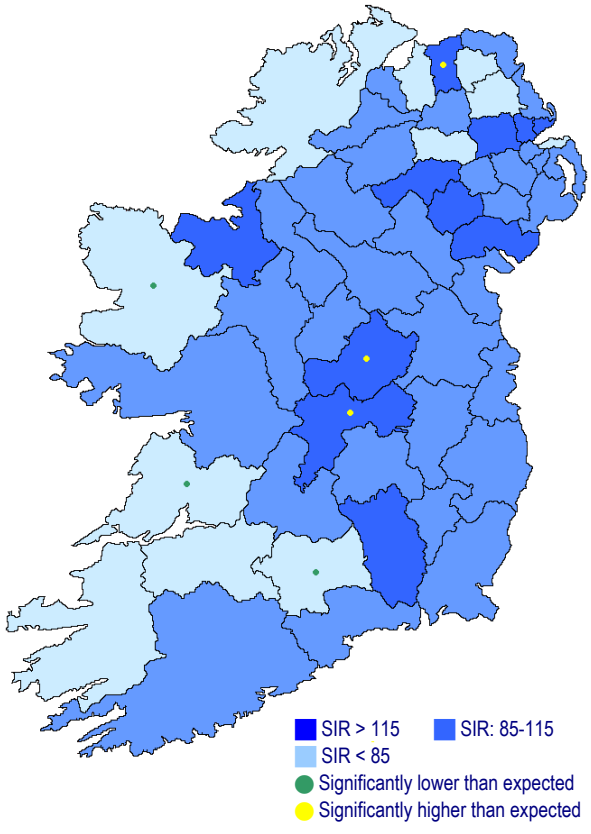
The increases in male kidney cancer EASIRs were largest among among those aged 75 and over with significant increases of 4.3% (p=0.021) each year. Among females however the largest increases were among those aged 0-49 and 65-74. While the changes in the 0-49 age group were not statistically significant due to the small number of cases, among the 65-74 age class EASIRs increased by 4.2% (p=0.003) each year. (Fig. 19.4)

19.1.4: Geographic variations

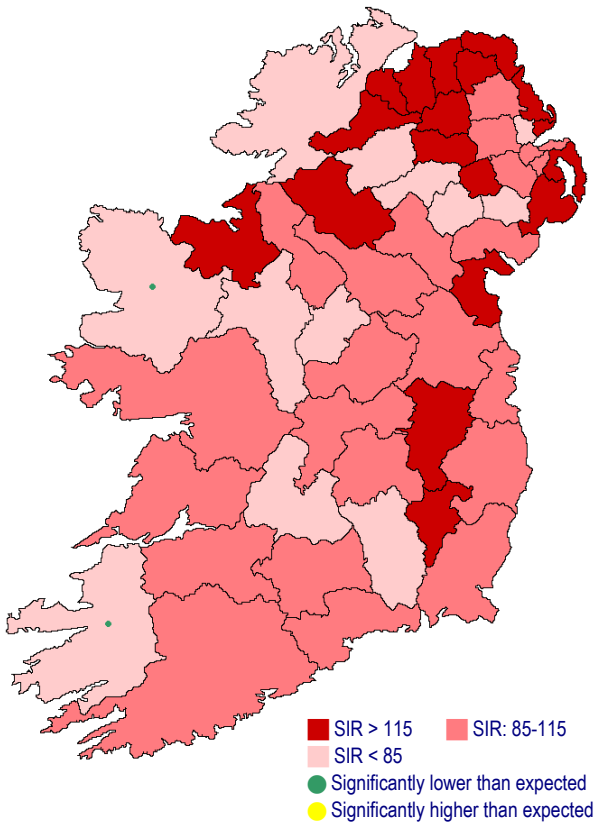
Compared to incidence rates for the whole of Ireland, kidney cancer among males was higher than expected during 1994-2004 in Coleraine district council and counties Offaly and Westmeath located in the centre of Ireland. Among females there were no geographic areas with higher than expected rates of the disease. Lower levels of kidney cancer were present for male and females resident in county Mayo. Additionally among males there were lower levels in Clare and South Tipperary while among females lower levels were present in Kerry. Neither Belfast nor Dublin had significantly higher or lower rates of the disease with 29 and 90 cases diagnosed per year respectively. (Fig. 19.5)

Figure 19.5: Significant differences in county/council standardised incidence ratios for kidney cancer compared to Ireland as a whole: 1994-2004

(a) Male



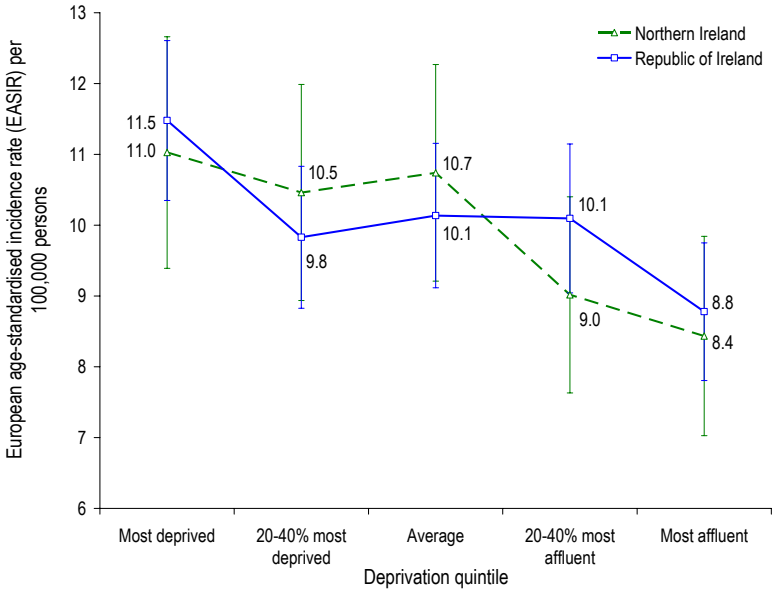
(b) Female



19.1.5: Socio-economic factors

In both Northern Ireland and Republic of Ireland incidence of kidney cancer was related to the socio-economic conditions of the geographic area that patients resided during 2000-2004. The strength of the relationship between deprivation and kidney cancers was similar in both countries with EASIRs in the most deprived areas 30.8% (p=0.002) higher than in the most affluent areas in Republic of Ireland compared to a 30.7% (p=0.041) difference in Northern Ireland. (Fig. 19.6)

Figure 19.6: European age-standardised incidence rates (EASIR) for kidney cancer by country specific deprivation quintile: 2000-2004



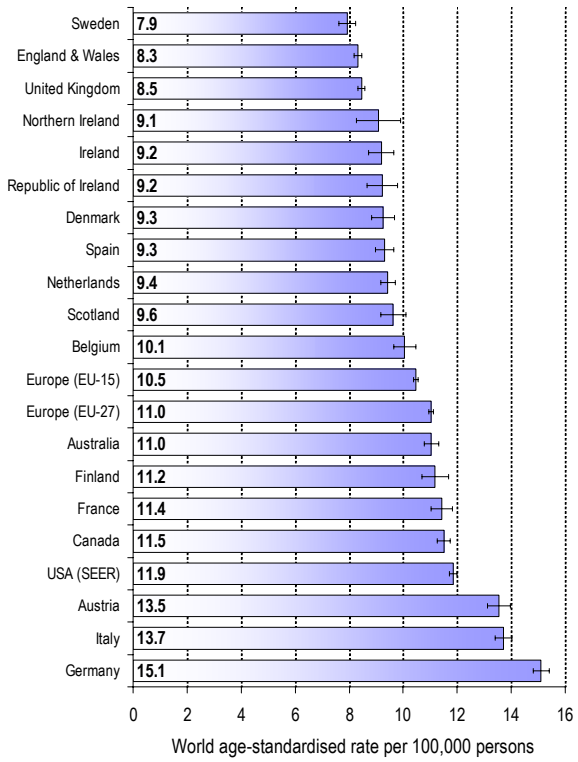
EASIRs in the most deprived areas of Northern Ireland were similar to those in the most deprived areas of Republic of Ireland. This was also the case for the other deprivation quintiles including the most affluent areas. (Fig. 19.6)

19.1.6: International comparisons

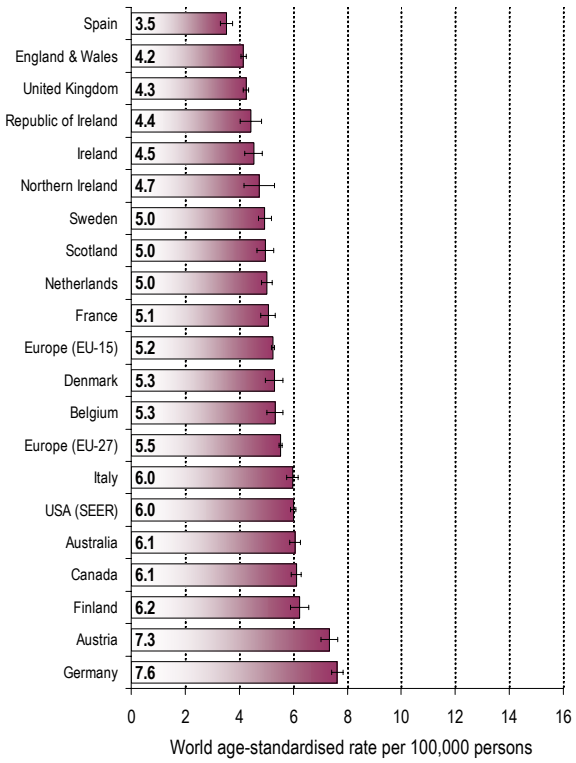
Compared to the European Union (15 and 27 countries) incidence of kidney cancer in Ireland for both males and females was low during 1998-2000. There was a larger difference in incidence rates compared to USA and Australia, with Ireland having the lower incidence rates. However kidney cancer levels in Ireland were higher for males than those found in the UK. This was driven by slightly higher incidence rates in the Republic of Ireland. (Fig. 19.7)

Figure 19.7: International comparisons of world age-standardised incidence rates for kidney cancer: 1998-2000

(a) Male



(b) Female



Source: IARC[149]

19.2: Survival

Five-year (age-standardised) relative survival from kidney cancer was estimated to be 47.6% for patients diagnosed in 2000-2004. (Fig. 19.11, Tab. 19.3)

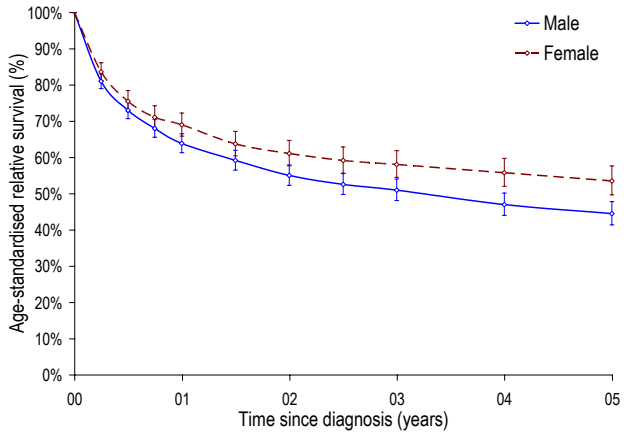
Table 19.3: Age-standardised relative survival for kidney cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	64.9% (60.4%, 69.7%)	68.4% (63.3%, 74.0%)	65.9% (62.5%, 69.5%)
	Republic of Ireland	63.5% (60.4%, 66.7%)	69.4% (65.6%, 73.5%)	65.5% (63.1%, 68.1%)
	Ireland	63.9% (61.3%, 66.6%)	69.0% (65.9%, 72.3%)	65.6% (63.6%, 67.7%)
5-year	Northern Ireland	47.4% (42.0%, 53.4%)	52.5% (46.4%, 59.5%)	48.8% (44.7%, 53.2%)
	Republic of Ireland	42.8% (39.1%, 46.9%)	54.4% (49.6%, 59.7%)	46.8% (43.8%, 50.1%)
	Ireland	44.5% (41.4%, 47.9%)	53.5% (49.7%, 57.7%)	47.6% (45.2%, 50.2%)

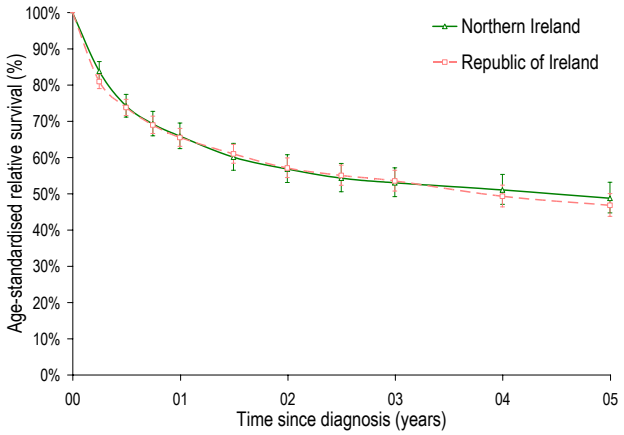
Five-year (age-standardised) relative survival was estimated to be 9.0% (p=0.014) higher for males than females diagnosed in 2000-2004. However a significant difference in survival between males and females was only observed in Republic of Ireland. Despite this neither one nor five-year (age-standardised) relative survival varied significantly by country. (Fig. 19.8, Tab. 19.3)

Figure 19.8: Age-standardised relative survival for kidney cancer patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



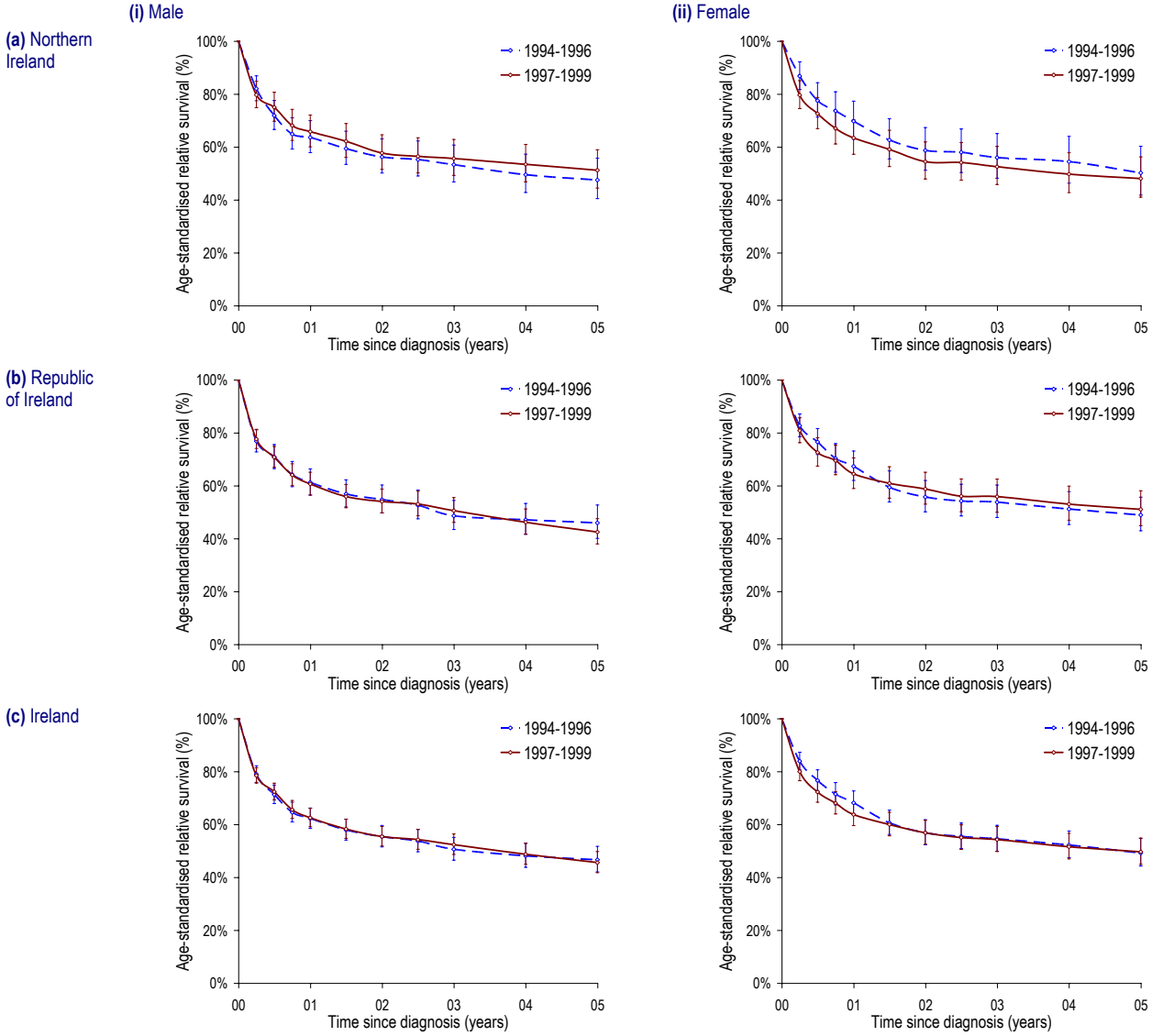
19.2.1: Changes in survival over time

There was no significant variation in one or five-year (age-standardised) relative survival from kidney cancer for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland or in Northern Ireland and Republic of Ireland considered separately. (Fig. 19.9, Tab. 19.4)

Table 19.4: Age-standardised relative survival for kidney cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	66.0% (61.5%, 70.8%)	64.3% (60.0%, 68.9%)	48.8% (43.3%, 55.0%)	50.2% (45.2%, 55.7%)
	Republic of Ireland	63.8% (60.3%, 67.5%)	62.2% (58.8%, 65.7%)	46.4% (42.2%, 50.9%)	45.8% (42.1%, 49.9%)
	Ireland	64.6% (61.8%, 67.6%)	63.0% (60.4%, 65.8%)	47.3% (44.0%, 50.9%)	47.5% (44.5%, 50.7%)
Male	Northern Ireland	63.7% (57.9%, 70.0%)	65.9% (60.1%, 72.2%)	47.6% (40.6%, 55.8%)	51.3% (44.6%, 59.1%)
	Republic of Ireland	61.3% (56.5%, 66.5%)	60.7% (56.6%, 65.2%)	46.0% (40.2%, 52.8%)	42.6% (38.1%, 47.6%)
	Ireland	62.3% (58.6%, 66.3%)	62.6% (59.2%, 66.2%)	46.7% (42.1%, 51.8%)	45.7% (41.8%, 49.9%)
Female	Northern Ireland	69.8% (63.0%, 77.4%)	63.5% (57.3%, 70.4%)	50.3% (41.9%, 60.3%)	48.1% (41.1%, 56.4%)
	Republic of Ireland	67.4% (62.1%, 73.2%)	64.6% (59.0%, 70.6%)	49.0% (43.0%, 55.8%)	51.1% (44.9%, 58.2%)
	Ireland	68.2% (64.0%, 72.7%)	63.8% (59.7%, 68.3%)	49.3% (44.4%, 54.8%)	49.7% (45.0%, 54.9%)

Figure 19.9: Age-standardised relative survival for kidney cancer patients by sex, country and period of diagnosis: 1994-1999



19.2.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by those diagnosed with cancer. Of those diagnosed in Ireland with kidney cancer during 1997-1999 42.1% survived a minimum of five years. There was no significant variation in observed survival by sex or by country. There was also no change in either one or five-year observed survival for kidney cancer between 1994-1996 and 1997-1999. (Tab. 19.5)

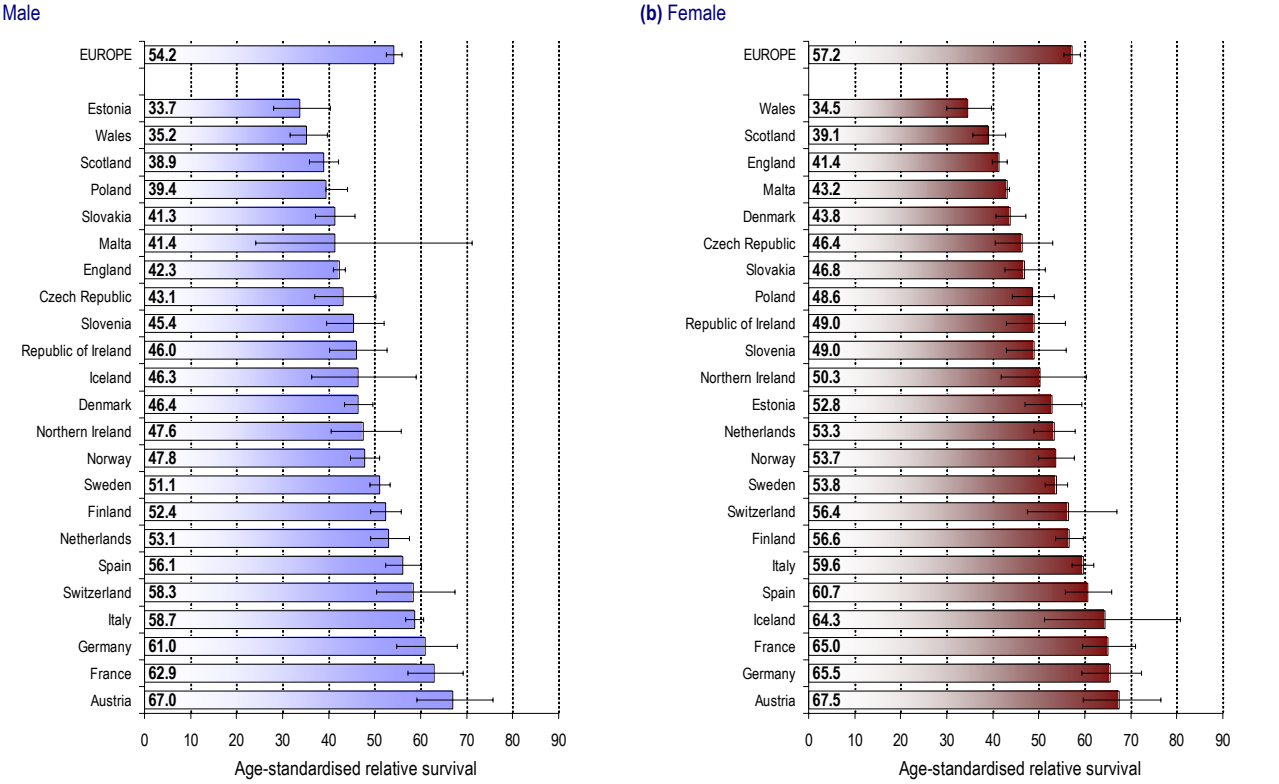
Table 19.5: Observed survival for kidney cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	63.4% (59.0%, 68.1%)	61.6% (57.3%, 66.3%)	40.3% (35.9%, 45.2%)	42.3% (38.0%, 47.1%)
	Republic of Ireland	61.9% (58.5%, 65.6%)	61.9% (58.6%, 65.4%)	39.9% (36.5%, 43.6%)	41.9% (38.7%, 45.5%)
	Ireland	62.5% (59.7%, 65.3%)	61.8% (59.2%, 64.5%)	40.0% (37.3%, 43.0%)	42.1% (39.4%, 44.9%)
Male	Northern Ireland	61.3% (55.7%, 67.3%)	63.4% (57.9%, 69.5%)	39.1% (33.7%, 45.4%)	43.8% (38.2%, 50.2%)
	Republic of Ireland	60.7% (56.3%, 65.4%)	60.3% (56.3%, 64.6%)	39.3% (35.0%, 44.2%)	38.9% (35.0%, 43.3%)
	Ireland	60.9% (57.4%, 64.6%)	61.4% (58.1%, 64.8%)	39.2% (35.8%, 43.0%)	40.5% (37.3%, 44.1%)
Female	Northern Ireland	67.1% (60.2%, 74.7%)	59.2% (52.6%, 66.6%)	42.2% (35.3%, 50.6%)	40.3% (33.9%, 47.9%)
	Republic of Ireland	63.8% (58.5%, 69.7%)	65.0% (59.6%, 70.9%)	40.8% (35.4%, 46.9%)	47.8% (42.2%, 54.1%)
	Ireland	65.0% (60.7%, 69.6%)	62.6% (58.3%, 67.1%)	41.3% (37.0%, 46.2%)	44.7% (40.4%, 49.5%)

19.2.3: European comparisons

Five-year (age-standardised) relative survival from kidney cancer in Europe for patients diagnosed in 1990-1994 was 54.2% for males and 57.2% for females. While this was apparently higher than the equivalent values in Northern Ireland and Republic of Ireland for patients diagnosed in 1994-1996, these differences were not statistically significant. However survival in Austria, France and Italy was significantly better for males than in both Northern Ireland and Republic of Ireland and than for females in Republic of Ireland. (Fig. 19.10)

Figure 19.10: European comparisons of five-year age-standardised relative survival for kidney cancer patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-IV[150]

19.3: Mortality

Kidney cancer was the eleventh commonest form of cancer death among males during 2000-2004 and was the fifteenth most common cause of female cancer death. With 170 male deaths per year it made up 2.9% of all cancer deaths (excluding NMSC) with a cumulative risk of death from this disease before age 75 of 0.5%. Among females there were 86 deaths per year thereby contributing 1.6% of all cancer deaths (excluding NMSC) with a cumulative risk of 0.2% of death from this disease before age 75. (Tab. 19.6)

Table 19.6: Summary statistics for deaths from kidney cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	55	32	87	115	54	169	170	86	256
% of all cancer deaths (ex. NMSC)	2.9%	1.8%	2.4%	2.9%	1.5%	2.2%	2.9%	1.6%	2.3%
Rank (ex. NMSC)	9	13	11	11	15	13	11	15	13
Median age at death	71	76	73	69	73	70	69	74	71
Cumulative risk (Aged 0 to 74)	0.5%	0.2%	0.3%	0.5%	0.2%	0.3%	0.5%	0.2%	0.3%
Crude rate per 100,000 persons	6.6	3.7	5.1	5.9	2.7	4.3	6.1	3.0	4.6
EASMR ± 95% CI	6.7 ±0.8	2.7 ±0.4	4.5 ±0.4	6.8 ±0.6	2.5 ±0.3	4.5 ±0.3	6.8 ±0.5	2.6 ±0.3	4.5 ±0.2
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-1.4% ±14.4	7.8% ±22.2	0.1% ±11.9

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

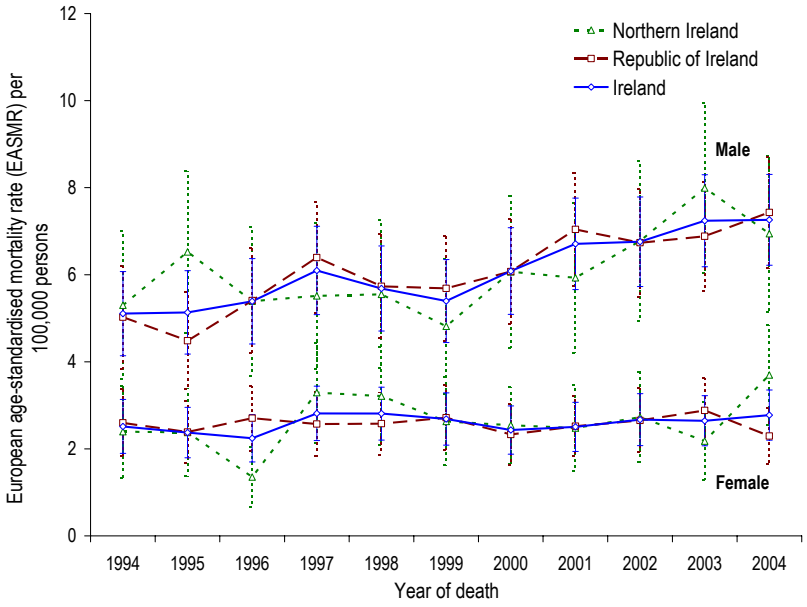
The number of deaths per year among males was almost double that among females with European age-standardised mortality rates (EASMR) higher among males by 161.4% (p<0.001). There was however no significant difference in EASMRs between Northern Ireland and Republic of Ireland during 2000-2004. (Tab. 19.6)

19.3.1: Trends

Between 1994 and 2004, European age-standardised mortality rates (EASMR) for kidney cancer increased among males by an average of 3.8% (p<0.001) per year. This translated to an annual increase of 8.0 deaths per year as a result of demographic change. Female EASMRs however did not change significantly during the eleven-year period although the actual number of deaths increased by 2.0 per year. (Fig. 19.11)

The increasing trend in male EASMRs was apparent in both Northern Ireland and Republic of Ireland with annual increases of 3.0% (p=0.025) and 4.1% (p<0.001) respectively. Female EASMRs did not change significantly in either country. (Fig. 19.11)

Figure 19.11: Trends in European age-standardised mortality rates (EASMR) for kidney cancer by sex and country: 1994-2004



19.4: Prevalence

Of the people diagnosed with kidney cancer during 1994-2004 45.3% (2,446 people) were still alive at the end of 2004 while of those diagnosed in 2000-2004 55.1% (1,515 people) were alive at the end of 2004. (Tab. 19.7)

The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed within the previous five-years (i.e. 2000-2004) was 9.3% greater in Northern Ireland than Republic of Ireland. (Tab. 19.7)

Table 19.7: Prevalence of kidney cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	483	43.0%	280	52.1%
	Female	334	45.9%	199	57.0%
	All persons	817	44.1%	479	54.1%
Republic of Ireland	Male	979	43.1%	630	52.2%
	Female	650	50.9%	406	61.8%
	All persons	1,629	45.9%	1,036	55.6%
Ireland	Male	1,462	43.0%	910	52.2%
	Female	984	49.1%	605	60.1%
	All persons	2,446	45.3%	1,515	55.1%

19.5: Discussion

The body contains two kidneys which are organs that filter the blood and create urine that is then stored in the bladder. Symptoms of the disease usually present at a later stage with the most common being blood in the urine or a lump in the area of one of the kidneys. Other less common symptoms include fever, side pain, loss of weight or appetite, raised blood pressure and tiredness.[151]

The risk of developing cancer of the kidney depends greatly on lifestyle factors, with tobacco use[152] and obesity[153] being significant risk factors with smokers being twice as likely as non-smokers to develop the disease.[154] Eating a well balanced diet is thought to lower the risk of developing this cancer type.[155] High blood pressure and kidney failure resulting in the use of regular dialysis are associated with increased risk of developing cancer of the kidney.[154] Some inherited diseases or conditions also increase kidney cancer risk (Von Hippel-Lindau (VHL) syndrome, tuberous sclerosis, Birt-Hogg-Dube syndrome, hereditary non-VHL clear cell renal cell cancer and hereditary papillary renal cell cancer) while some kidney cancers (familial kidney cancer) can be caused by inheriting faulty genes.[156] Chemicals and compounds such as asbestos, cadmium, trichloroethylene and dry cleaning solutions are also associated with increased risk of developing kidney cancer.[154] Consequently higher levels of incidence of kidney cancer are linked with those working in the petrochemical and iron and steel industries.[154] The use of some mild painkillers is also potentially linked to an increased risk of kidney cancer, although work is continuing into the types of painkiller that may induce an increased hazard.[154]

Incidence of kidney cancer varies throughout the world with the disease more common in developed countries due to its relationship to smoking and obesity. Overall however there are approximately 190,000 cases of kidney cancer diagnosed each year, with incidence of the disease having increased over the last decade. The disease is more common among males and the elderly; however the cancer can also occur in young adults.

Surgery is the most common form of treatment for kidney cancer with removal of the kidney, adjacent lymph nodes and adrenal gland resulting in high survival rates for the disease at an early stage. However detecting kidney cancer at an early stage is difficult due to the lack of obvious symptoms until later stages. Improvements in imaging make early detection of tumours possible allowing accurate diagnosis when symptoms do present, however no accurate screening method for kidney cancer currently exists. Other than surgery, radiotherapy has some success as a method of treatment, although chemotherapy has little impact.

Chapter 20:

Bladder cancer (C67)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *During 2000-2004 there were on average 466 male and 193 female cases diagnosed each year.*
  - *Among males incidence rates of bladder cancer decreased by 2.3% each year during 2000-2004 with no significant change in female incidence rates.*
  - *Incidence among males and females was significantly higher during 1994-2004 than throughout Ireland in Dublin. Among males incidence rates were also higher than expected in Belfast, Donegal and Wicklow.*
  - *During 2000-2004 incidence rates decreased with increasing affluence.*
  - *Incidence rates of bladder cancer in Ireland were some of the lowest among developed countries for both males and females during 1998-2000.*
  - *During 2000-2004 there was on average 163 male and 81 female deaths from bladder cancer in Ireland.*
  - *There was no significant change in mortality rates for males or females during 1994-2004.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival for patients diagnosed in 2000-2004 was estimated to be 68.1% with no significant variation by sex.*
  - *There was no significant variation in one or five-year (age-standardised) relative survival from bladder cancer for males or females between those diagnosed in 1994-1996 and 1997-1999.*
  - *At the end of 2004 there were 3,744 people living in Ireland who had been diagnosed with bladder cancer in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates for males and females were 11.0% and 24.2% lower in Northern Ireland than Republic of Ireland respectively, although these differences may be a result of different coding approaches.*
  - *Male incidence rates decreased in Republic of Ireland during 1994-2004 by 2.6% per year; however there was no significant change in Northern Ireland. Female incidence rates did not change in either country.*
  - *Five-year (age-standardised) relative survival was 8.5% higher for males and 15.4% higher than females in Republic of Ireland than in Northern Ireland. This may be the result of different coding approaches.*
  - *A significant difference exists in one-year (age-standardised) relative survival between males and females in Northern Ireland which does not exist in Republic of Ireland.*
  - *The number of people living with bladder cancer per 100,000 persons was 6.5% lower in Northern Ireland than Republic of Ireland.*

20.1: Incidence

During 2000-2004 there were on average 466 male and 193 female cases of bladder cancer diagnosed each year which corresponded to 4.2% of all male and 1.8% of all female cancers (excluding NMSC). It was the fifth most common male and thirteenth most common female cancer with the cumulative risk of a male developing the disease before the age of 75 being 1.3% compared to 0.5% among females. (Tab. 20.1)

The number of cases diagnosed annually was 141.1% higher among males than females, however the difference increased further once rates were adjusted for age, with male European age-standardised incidence rates (EASIRs) 211.2% higher than those for females. The difference between males and females was higher in Northern Ireland however EASIRs for both sexes were lower in Northern Ireland than Republic of Ireland by 11.0% (p=0.007) for males and 24.2% (p<0.001) for females. Different approaches to the coding of bladder cancer however cannot be ruled out as a reason for lower incidence rates in Northern Ireland. (Tab. 20.1)

Table 20.1: Summary statistics for incidence of bladder cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	141	56	197	325	137	462	466	193	659
% of all cancer cases (ex. NMSC)	4.3%	1.6%	2.9%	4.2%	1.9%	3.1%	4.2%	1.8%	3.1%
Rank (ex. NMSC)	7	15	9	4	12	8	5	13	8
Median age at diagnosis	72	75	73	72	73	72	72	73	72
Cumulative risk (Aged 0 to 74)	1.2%	0.4%	0.7%	1.4%	0.5%	0.9%	1.3%	0.5%	0.9%
Crude rate per 100,000 persons	17.0	6.5	11.6	16.7	7.0	11.8	16.8	6.8	11.7
EASIR ± 95% CI	16.9 ±1.3	4.9 ±0.6	9.9 ±0.6	19.0 ±0.9	6.4 ±0.5	11.9 ±0.5	18.3 ±0.8	5.9 ±0.4	11.2 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-11.0% ±8.0	-24.2% ±11.1	-16.9% ±6.4

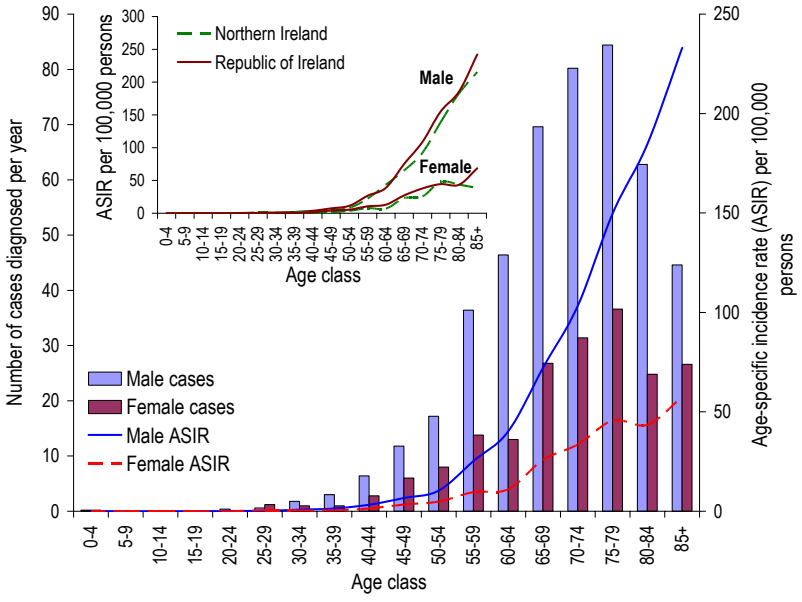
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

20.1.1: Age distribution

During 2000-2004 the median age for bladder cancer patients at diagnosis was 72 years. Cases peaked in the 75-79 age class for both males and females with an average of 84 male and 37 female cases diagnosed each year. This age class contributed 18.1% of all male and 18.9% of all female bladder cancer cases. (Fig. 20.1)

Age-specific incidence rates (ASIR) were considerably higher for males than females although both climbed steadily to a maximum value among those aged 85 and over. This maximum value was however over four times greater among males than females. (Fig. 20.1)

Figure 20.1: Number of cases of bladder cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

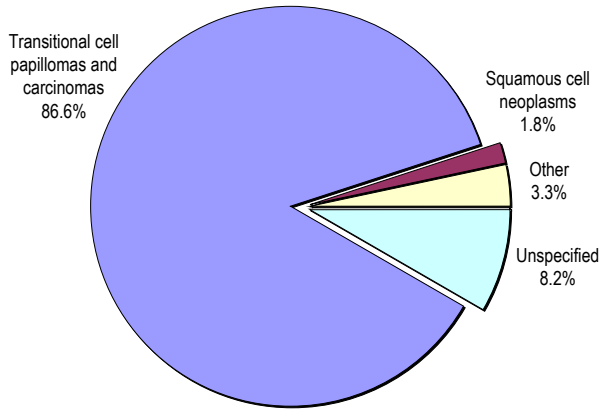


20.1.2: Cell type

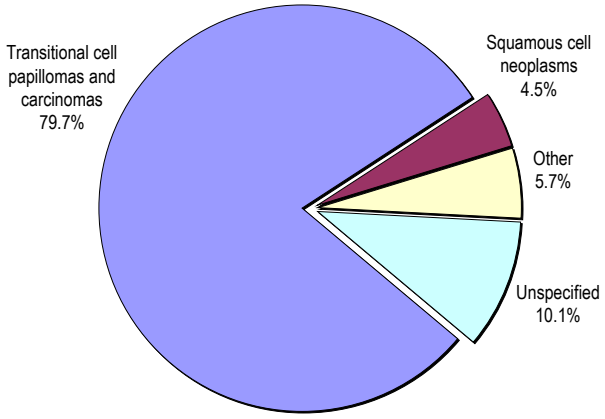
Among both males and females the majority of bladder cancers diagnosed during 2000-2004 were transitional cell papillomas and carcinomas, which made up 86.6% of all male and 79.7% of all female cases diagnosed in Ireland. Overall 8.2% of male and 10.1% of female cases had an unspecified cell type with only slight differences in this proportion between Northern Ireland (10.1%) and Republic of Ireland (8.3%). (Fig. 20.2)

Figure 20.2: Types of bladder cancer diagnosed in Ireland: 2000-2004

(a) Male



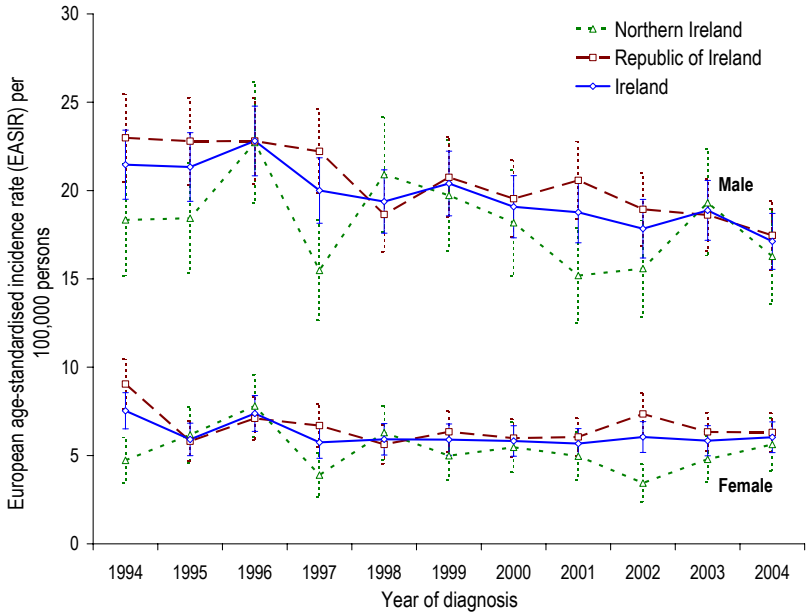
(b) Female



20.1.3: Trends

Among males European age-standardised incidence rates (EASIR) of bladder cancer in Ireland decreased by 2.3% (p=0.001) each year during 2000-2004 with an accompanying decrease of 2.7 cases diagnosed each year. The decreasing rates were only observed in Republic of Ireland with an annual decrease in EASIRs of 2.6% (p<0.001) corresponding to a decrease of 2.8 cases per year. There was no significant change in EASIRs in Northern Ireland with the annual average number of cases remaining constant over time. (Fig. 20.3, Tab. 20.2)

Figure 20.3: Trends in European age-standardised incidence rates (EASIR) for bladder cancer by sex and country: 1994-2004



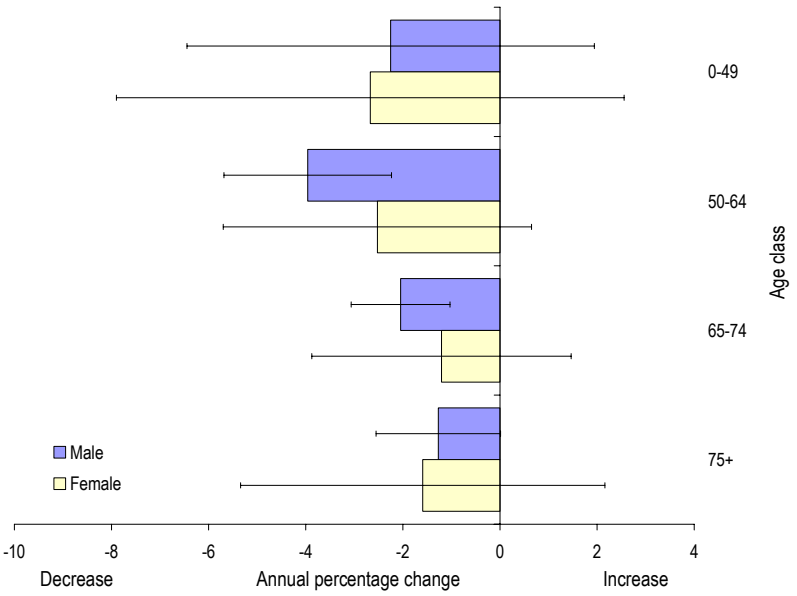
Female incidence rates (EASIR) of bladder cancer however did not change significantly during 1994-2004 in Ireland as a whole, or in each country. However while the number of cases diagnosed annually remained virtually static between 1994 and 2004 in Republic of Ireland, there was an annual decrease of 1.1 female cases per year in Northern Ireland as a result of population change. (Fig. 20.3, Tab. 20.2)

Table 20.2: Number of cases and European age-standardised incidence rates (EASIR) for bladder cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	133	18.3 ±3.2	347	23.0 ±2.5	480	21.5 ±2.0	57	4.7 ±1.3	172	9.0 ±1.4	229	7.5 ±1.0
1995	139	18.4 ±3.1	342	22.8 ±2.5	481	21.3 ±1.9	64	6.2 ±1.6	110	5.8 ±1.1	174	5.9 ±0.9
1996	174	22.7 ±3.4	355	22.8 ±2.4	529	22.8 ±2.0	85	7.8 ±1.8	138	7.1 ±1.2	223	7.4 ±1.0
1997	118	15.5 ±2.8	344	22.2 ±2.4	462	20.0 ±1.8	43	3.9 ±1.2	128	6.7 ±1.2	171	5.7 ±0.9
1998	162	20.9 ±3.3	298	18.6 ±2.1	460	19.4 ±1.8	72	6.3 ±1.5	111	5.6 ±1.1	183	5.9 ±0.9
1999	155	19.7 ±3.1	332	20.8 ±2.3	487	20.4 ±1.8	58	5.0 ±1.4	126	6.3 ±1.2	184	5.9 ±0.9
2000	144	18.2 ±3.0	317	19.5 ±2.2	461	19.1 ±1.8	63	5.5 ±1.4	127	6.0 ±1.1	190	5.8 ±0.9
2001	125	15.2 ±2.7	342	20.6 ±2.2	467	18.8 ±1.7	57	5.0 ±1.4	128	6.1 ±1.1	185	5.7 ±0.9
2002	128	15.6 ±2.7	328	18.9 ±2.1	456	17.8 ±1.7	44	3.4 ±1.1	155	7.3 ±1.2	199	6.0 ±0.9
2003	162	19.3 ±3.0	324	18.6 ±2.0	486	18.9 ±1.7	57	4.8 ±1.3	136	6.3 ±1.1	193	5.8 ±0.9
2004	145	16.3 ±2.7	314	17.5 ±1.9	459	17.1 ±1.6	60	5.6 ±1.5	139	6.3 ±1.1	199	6.0 ±0.9

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 20.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for bladder cancer by sex and age: 1994-2004



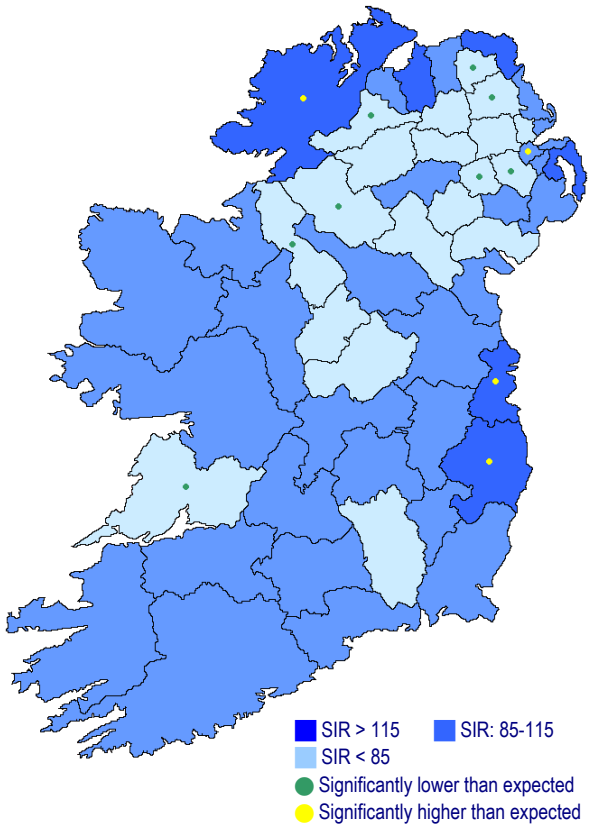
Trends in EASIRs of bladder cancer in Ireland for different female age groups were inconclusive during 1994-2004 with no significant change for any female age group. However while the changes were not statistically significant all age groups appeared to exhibit decreases in EASIRs, particularly the 50-64 age class. Among males there were significant decreases of 4.0% ($p<0.001$) and 2.0% ($p=0.001$) in the 50-64 and 65-74 age groups respectively while there were no significant changes among those aged 0-49 or 75 and over. (Fig. 20.4)

20.1.4: Geographic variations

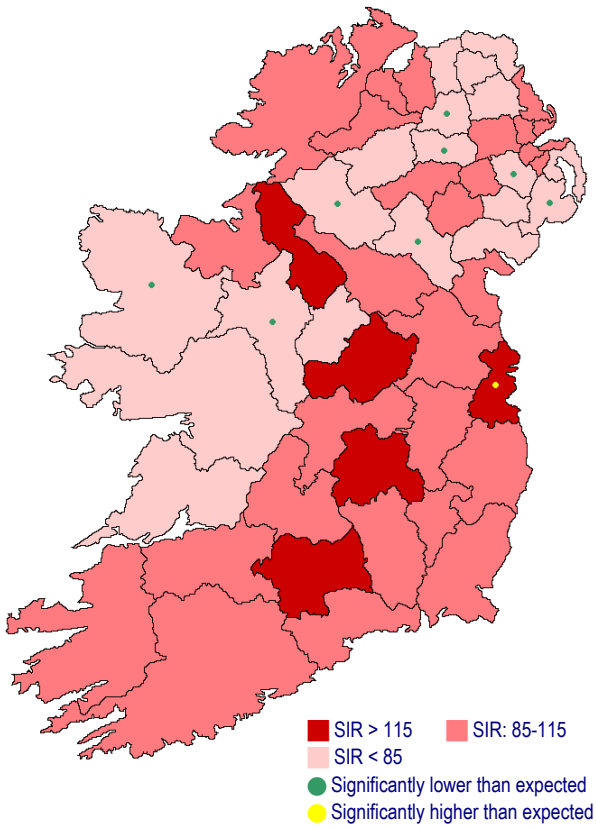
Incidence of bladder cancer among males and female was significantly higher in Dublin during 1994-2004 than the average rate throughout Ireland with an average of 95 male and 43 female cases each year. Among males incidence rates were also higher than expected in Belfast, Donegal and Wicklow. Lisburn and Fermanagh had lower than expected male and female rates. A further six counties/councils had lower than expected male incidence rates, and six counties/councils had lower than expected female rates of the disease. (Fig. 20.5)

Figure 20.5: Significant differences in county/council standardised incidence ratios for bladder cancer compared to Ireland as a whole: 1994-2004

(a) Male



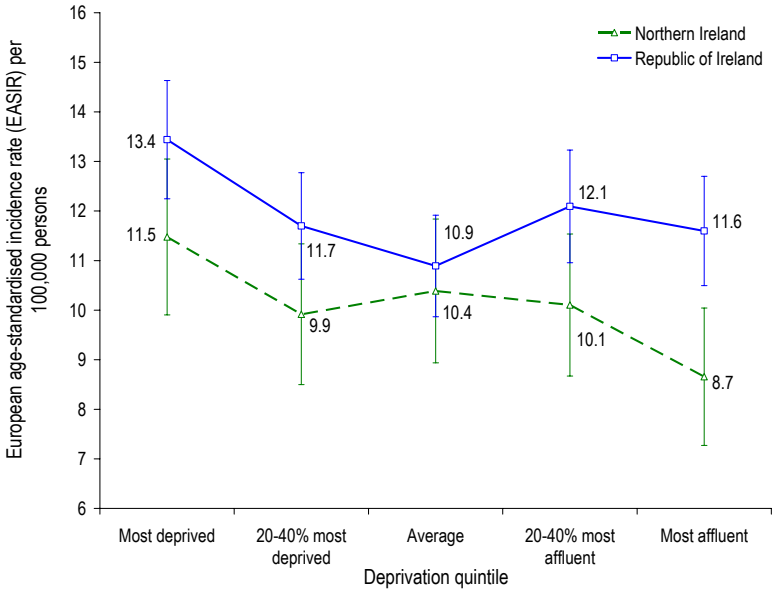
(b) Female



20.1.5: Socio-economic factors

In both Northern Ireland and Republic of Ireland there was no significant difference between the EASIRs for bladder cancer of the 20% of the population living in the most deprived areas and the 20% of the population living in the most affluent areas. However the general trend during 2000-2004 was one of decreasing rates with increasing affluence with an average decrease of 5.1% in Northern Ireland and an average decrease of 2.7% in Republic of Ireland between consecutive deprivation quintiles. (Fig. 20.6)

Figure 20.6: European age-standardised incidence rates (EASIR) for bladder cancer by country specific deprivation quintile: 2000-2004



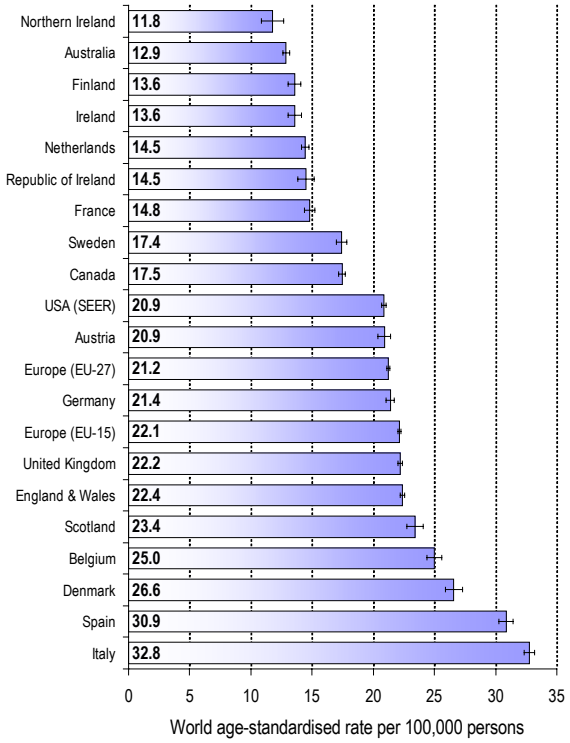
In Northern Ireland EASIRs among the 20% of the population living in the most deprived areas were 14.6% lower than among the equivalent population in Republic of Ireland, while a 25.3% difference existed between the 20% most affluent in each country. (Fig. 20.6)

20.1.6: International comparisons

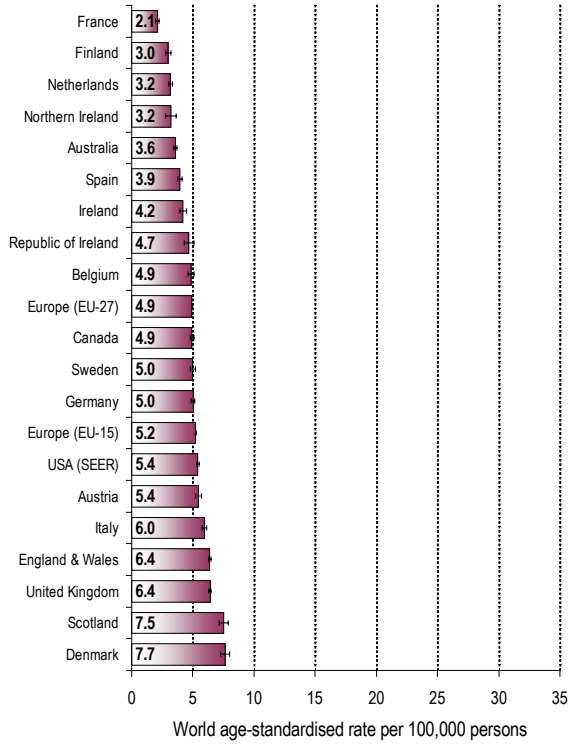
World age-standardised incidence rates (WASIR) of bladder cancer in Ireland were some of the lowest among developed countries for both males and females. In particular WASIRs were 38.5% ($p<0.001$) lower than those in European Union (15 countries) for males and 19.2% ($p<0.001$) lower for females. These comparisons however may be influenced by different approaches to the classification of bladder cancer in different cancer registries throughout the world. (Fig. 20.7)

Figure 20.7: International comparisons of world age-standardised incidence rates for bladder cancer: 1998-2000

(a) Male



(b) Female



Source: IARC[157]

20.2: Survival

Survival for patients diagnosed with bladder cancer during 2000-2004 was moderate with five-year (age-standardised) relative survival estimated (using the period approach) to be 68.1%. (Fig. 20.8, Tab. 20.3)

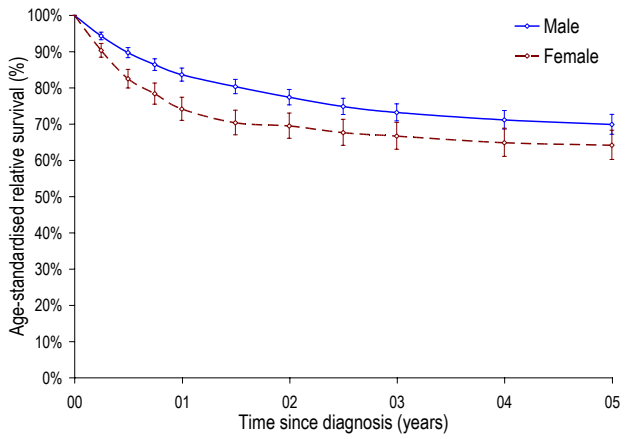
Table 20.3: Age-standardised relative survival for bladder cancer patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	83.8% (80.5%, 87.1%)	62.7% (55.6%, 70.7%)	77.9% (74.8%, 81.1%)
	Republic of Ireland	83.6% (81.5%, 85.8%)	78.3% (74.9%, 81.9%)	82.0% (80.2%, 83.8%)
	Ireland	83.7% (81.9%, 85.5%)	74.2% (71.1%, 77.4%)	80.8% (79.3%, 82.4%)
5-year	Northern Ireland	64.1% (59.4%, 69.1%)	52.7% (44.9%, 62.0%)	61.0% (56.9%, 65.4%)
	Republic of Ireland	72.6% (69.4%, 76.0%)	68.2% (63.6%, 73.0%)	71.1% (68.4%, 73.9%)
	Ireland	69.9% (67.2%, 72.7%)	64.2% (60.3%, 68.4%)	68.1% (65.9%, 70.4%)

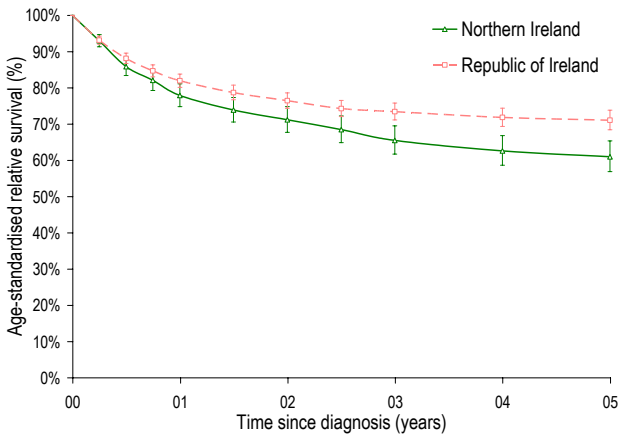
There was no significant variation in five-year (age-standardised) relative survival between males and females although differences were apparent after one-year. For both sexes survival from the disease was better in Republic of Ireland with five-year (age-standardised) relative survival 8.5% (p=0.040) higher for males and 15.4% (p=0.022) higher than females in Republic of Ireland than in Northern Ireland. Additionally one-year (age-standardised) relative survival was higher among males than females in Northern Ireland, a difference that did not exist in Republic of Ireland. Different approaches to the coding of bladder cancer cannot be ruled out as a reason for apparently better survival in Republic of Ireland. (Fig. 20.11, Tab. 20.4)

Figure 20.8: Age-standardised relative survival for bladder cancer patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



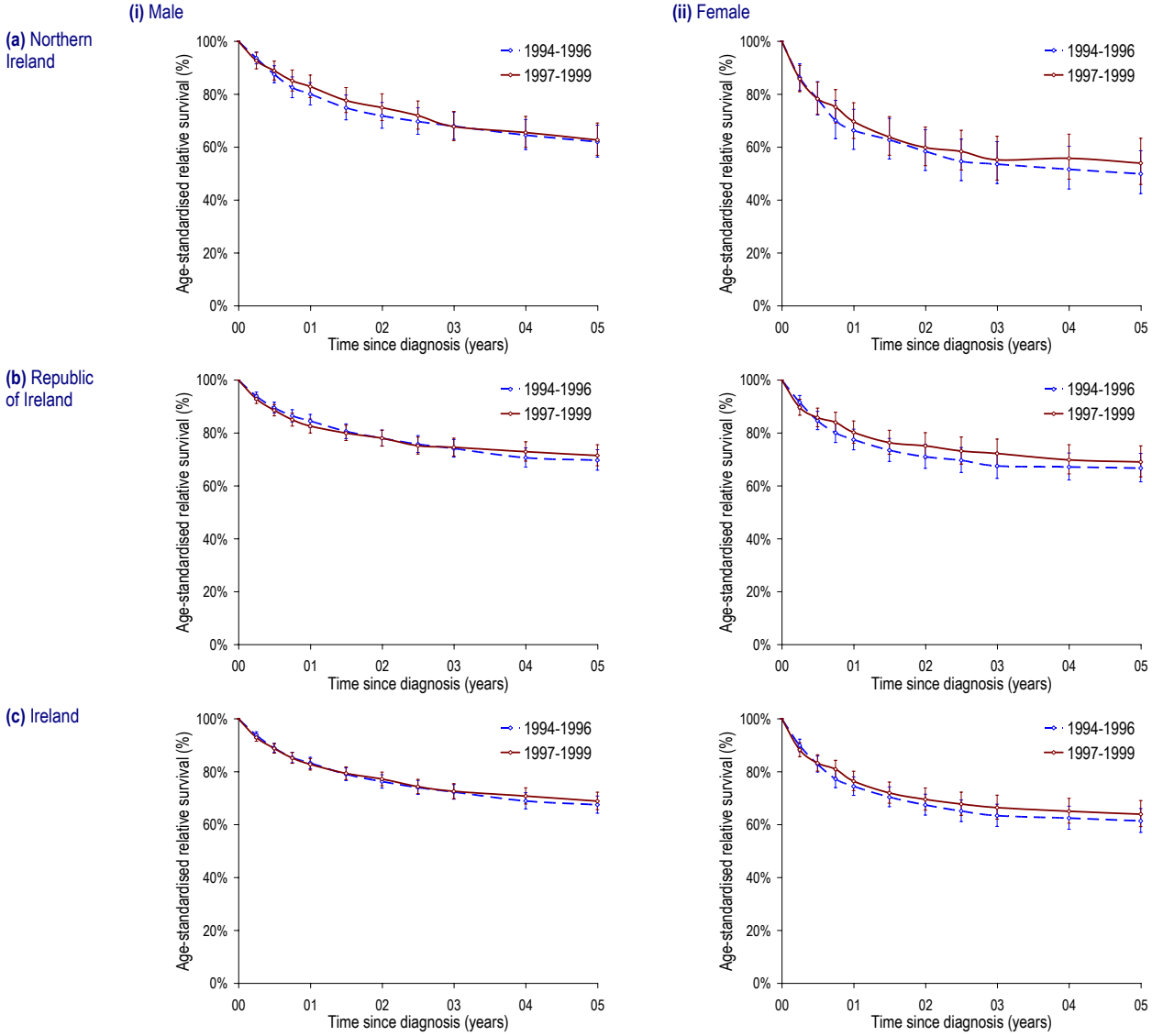
20.2.1: Changes in survival over time

There was no significant variation in one or five-year (age-standardised) relative survival from bladder cancer for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland or in Northern Ireland and Republic of Ireland considered separately. (Fig. 20.9, Tab. 20.4)

Table 20.4: Age-standardised relative survival for bladder cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	76.1% (72.5%, 79.8%)	78.9% (75.4%, 82.7%)	57.9% (53.2%, 63.0%)	60.5% (55.7%, 65.8%)
	Republic of Ireland	82.4% (80.3%, 84.5%)	81.9% (79.7%, 84.2%)	68.9% (65.8%, 72.1%)	70.7% (67.4%, 74.1%)
	Ireland	80.5% (78.7%, 82.4%)	81.0% (79.1%, 82.9%)	65.6% (63.0%, 68.3%)	67.5% (64.8%, 70.3%)
Male	Northern Ireland	80.1% (76.0%, 84.4%)	82.9% (78.8%, 87.2%)	62.0% (56.3%, 68.3%)	62.7% (56.9%, 69.1%)
	Republic of Ireland	84.5% (82.1%, 87.0%)	82.6% (80.0%, 85.3%)	69.7% (65.9%, 73.7%)	71.5% (67.6%, 75.6%)
	Ireland	83.3% (81.2%, 85.5%)	82.8% (80.6%, 85.0%)	67.5% (64.4%, 70.8%)	68.9% (65.7%, 72.3%)
Female	Northern Ireland	66.3% (59.2%, 74.3%)	69.7% (63.3%, 76.8%)	49.9% (42.5%, 58.7%)	54.0% (45.9%, 63.4%)
	Republic of Ireland	77.5% (73.7%, 81.5%)	80.3% (76.2%, 84.6%)	66.7% (61.6%, 72.3%)	69.1% (63.4%, 75.2%)
	Ireland	74.5% (71.0%, 78.1%)	76.5% (72.9%, 80.2%)	61.4% (57.1%, 66.1%)	64.0% (59.2%, 69.1%)

Figure 20.9: Age-standardised relative survival for bladder cancer patients by sex, country and period of diagnosis: 1994-1999



20.2.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by those diagnosed with cancer. Of those diagnosed in Ireland with bladder cancer during 1997-1999 50.3% survived a minimum of five-years. There was no significant variation in observed survival by sex, however five-year observed survival was 10.1% (p=0.004) higher in Republic of Ireland than Northern Ireland for all persons diagnosed in 1997-1999. There was also no change in either one or five-year observed survival for bladder cancer between 1994-1996 and 1997-1999 in either country. (Tab. 20.5)

Table 20.5: Observed survival for bladder cancer patients by sex, country and period of diagnosis: 1994-1999

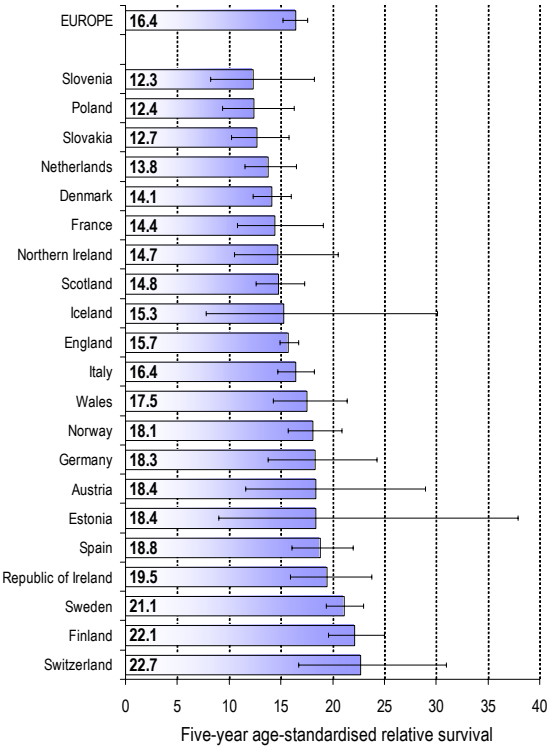
		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	69.8% (66.3%, 73.5%)	72.3% (68.7%, 76.1%)	41.9% (38.2%, 45.9%)	43.9% (40.0%, 48.1%)
	Republic of Ireland	76.2% (74.0%, 78.5%)	76.2% (73.8%, 78.6%)	51.1% (48.6%, 53.8%)	54.0% (51.3%, 56.9%)
	Ireland	74.2% (72.3%, 76.2%)	74.9% (73.0%, 77.0%)	48.2% (46.1%, 50.5%)	50.8% (48.6%, 53.2%)
Male	Northern Ireland	74.2% (70.2%, 78.4%)	77.6% (73.6%, 81.7%)	44.9% (40.4%, 49.8%)	46.3% (41.8%, 51.4%)
	Republic of Ireland	78.5% (75.9%, 81.1%)	76.5% (73.8%, 79.3%)	50.8% (47.7%, 54.0%)	53.2% (50.0%, 56.5%)
	Ireland	77.2% (75.0%, 79.4%)	76.8% (74.6%, 79.1%)	49.0% (46.4%, 51.6%)	51.0% (48.4%, 53.8%)
Female	Northern Ireland	60.2% (53.7%, 67.5%)	58.8% (51.6%, 66.9%)	35.2% (29.1%, 42.6%)	37.5% (30.7%, 45.8%)
	Republic of Ireland	70.7% (66.5%, 75.3%)	75.4% (70.9%, 80.0%)	52.0% (47.3%, 57.0%)	56.2% (51.2%, 61.7%)
	Ireland	67.3% (63.7%, 71.2%)	70.1% (66.2%, 74.2%)	46.5% (42.7%, 50.7%)	50.3% (46.1%, 54.9%)

20.2.3: European comparisons

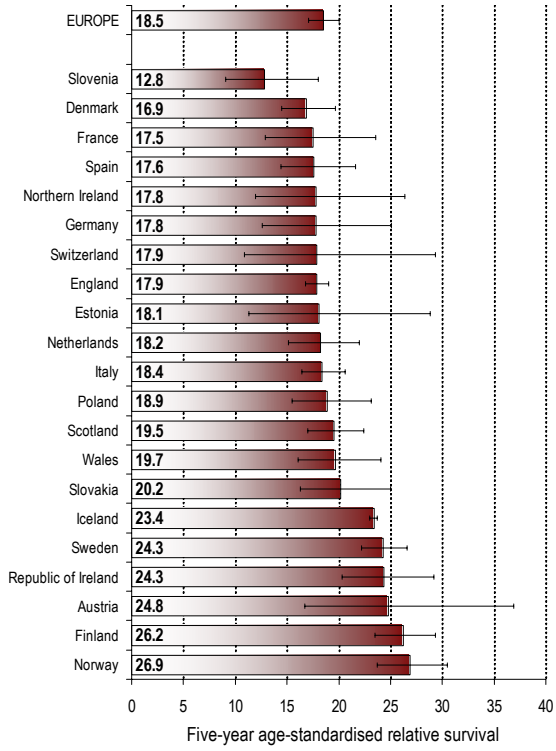
Five-year (age-standardised) relative survival for males and females diagnosed in 1994-1996 with bladder cancer in Republic of Ireland was similar to the European average for patients diagnosed in 1990-1994. In Northern Ireland however five-year (age-standardised) relative survival was significantly lower for both sexes than in Europe. The difference was particularly large for females, with Northern Ireland having one of the worst female survival rates among the European countries included in the EUROCARE-III study. (Fig. 20.10)

Figure 20.10: European comparisons of five-year age-standardised relative survival for bladder cancer patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)

(a) Male



(b) Female



Source: EUROCARE-III[158]

20.3: Mortality

During 2000-2004 there were on average 163 male and 81 female deaths from bladder cancer in Ireland. Deaths from this disease contributed 2.8% of all male and 1.5% of all female cancer deaths (excluding NMSC) during the five-year period. It was the twelfth most common cancer site responsible for deaths due to cancer among males and the sixteenth among females. The odds of dying from the disease before the age of 75, assuming the absence of other causes of death, were 1 in 286 for males and 1 in 747 for females. (Tab. 20.6)

Table 20.6: Summary statistics for deaths from bladder cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	55	30	85	108	51	160	163	81	244
% of all cancer deaths (ex. NMSC)	2.9%	1.7%	2.3%	2.7%	1.4%	2.1%	2.8%	1.5%	2.2%
Rank (ex. NMSC)	8	14	12	12	17	15	12	16	14
Median age at death	77	79	77	77	78	78	77	78	77
Cumulative risk (Aged 0 to 74)	0.4%	0.2%	0.3%	0.3%	0.1%	0.2%	0.3%	0.1%	0.2%
Crude rate per 100,000 persons	6.7	3.4	5.0	5.6	2.6	4.1	5.9	2.9	4.4
EASMR ± 95% CI	6.7 ±0.8	2.3 ±0.4	3.9 ±0.4	6.3 ±0.5	2.1 ±0.3	3.8 ±0.3	6.5 ±0.5	2.2 ±0.2	3.9 ±0.2
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							5.2% ±15.6	7.7% ±23.1	3.0% ±12.5

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

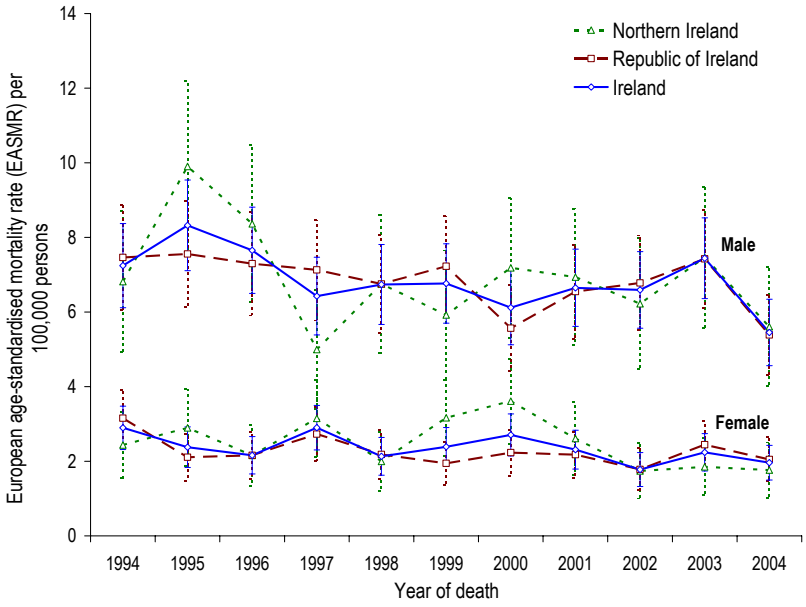
The number of deaths per year among males was double that among females with European age-standardised mortality rates (EASMR) almost three times higher among males than females. There was however no significant difference in EASMRs between Northern Ireland and Republic of Ireland during 2000-2004. (Tab. 20.6)

20.3.1: Trends

For males and females there were annual percentage changes in European age-standardised mortality rates (EASMR) for bladder cancer of -2.0% and -2.7% respectively. However neither of these values were statistically significant (p=0.051, p=0.054), thus no definite conclusions regarding trends in mortality rates can be made. Trends in EASMRs in Northern Ireland and Republic of Ireland were also not significant. (Fig. 20.11)

As a result of demographic change however there was a decrease of 1.1 males and 1.5 female deaths from bladder cancer each year in Ireland between 1994 and 2004, with this decrease evenly split between Northern Ireland and Republic of Ireland. (Fig. 20.11)

Figure 20.11: Trends in European age-standardised mortality rates (EASMR) for bladder cancer by sex and country: 1994-2004



20.4: Prevalence

At the end of 2004 there were 3,744 people resident in Ireland who were still alive after being diagnosed with bladder cancer during 1994-2004, 50.9% of all people diagnosed during this period. 2,127 of these people had been diagnosed during 2000-2004. (Tab. 20.7)

Table 20.7: Prevalence of bladder cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	766	48.3%	453	64.3%
	Female	264	40.0%	150	53.4%
	All persons	1,030	45.9%	603	61.2%
Republic of Ireland	Male	1,919	52.7%	1,082	66.6%
	Female	795	54.1%	442	64.5%
	All persons	2,714	53.1%	1,524	66.0%
Ireland	Male	2,685	51.4%	1,535	65.9%
	Female	1,059	49.7%	592	61.3%
	All persons	3,744	50.9%	2,127	64.6%

The number of people per 100,000 of the population alive at the end of 2004 having been diagnosed within the previous five-years (i.e. 2000-2004) was 6.5% lower in Northern Ireland than Republic of Ireland. (Tab. 20.7)

20.5: Discussion

The bladder is part of the urinary system which stores urine before it is passed out of the body. The majority of people with bladder cancer present with blood in the urine. Other symptoms include urgent or frequent urination or pain when passing urine.[159]

Tobacco use is the major established risk factor for this cancer. The risk has been assessed as being four times higher in smokers versus non-smokers with the level of risk being linked to the length of time a person has smoked.[160] A diet high in fruit and

vegetables has been linked to diminishing cancer risk,[161] while consumption of large quantities of coffee (10 or more cups per day) slightly increases the risk of developing this disease.[162] Other environmental factors such as exposure to polyaromatic hydrocarbons[163] and contaminants such as chlorine in drinking water[164] may also increase incidence of bladder cancer. There is no conclusive evidence to suggest that a high intake of fluids decreases risk.[165] Having had bladder infections or bladder stones in the past is associated with increased risk of developing particular types of bladder cancer.[166] The risk of developing a second bladder cancer is also higher than normal in cases where there is a past history of the disease.[165] There is no evidence however that this cancer is genetically related and a family history of bladder cancer does not increase the risk of it developing.[165]

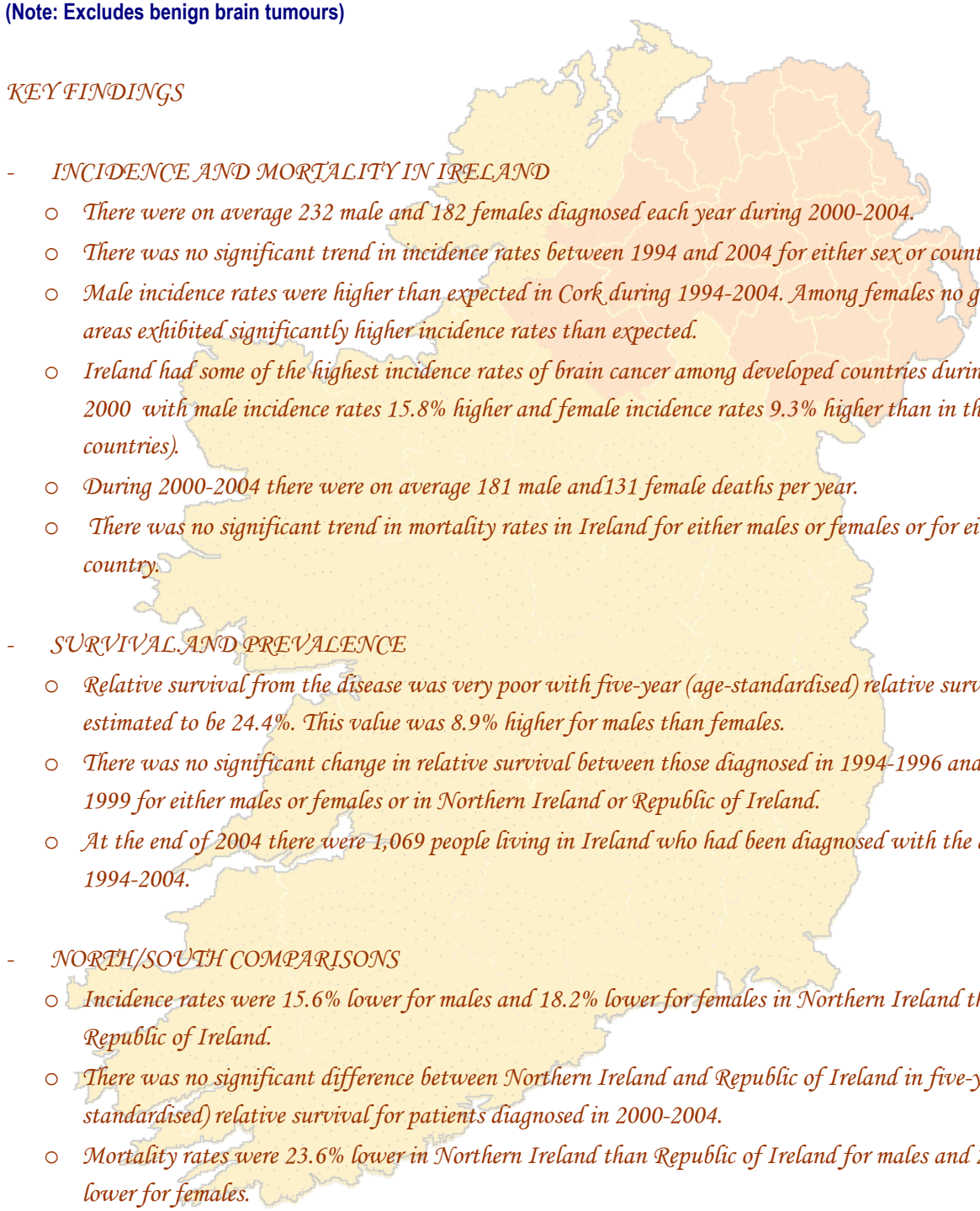
Bladder cancer is the ninth most common cancer worldwide with 330,000 cases diagnosed annually, two thirds of which are in developed countries. Almost 65% of all male cases and 30% of female cases diagnosed in developed countries are a direct result of cigarette smoking. Considerable reductions in levels of bladder cancer in Ireland are thus possible through reductions in smoking levels in the general population.

However even in the unlikely event of eradication of smoking as a source of bladder cancer further risk factors remain. While some, such as having a healthy diet, can also be targeted with the aim of prevention of bladder cancer development, some members of the general population will still be unfortunate enough to develop the disease. In this event surgery remains the best treatment option with removal of the bladder likely to improve survival probability except in advanced cases. Radiotherapy for bladder tumours of a certain size, stage and cell type is possible while chemotherapy also has some positive results. As with other cancers the crucial determinant of treatment type and survival is the stage at which the disease is diagnosed. Investigation of any symptoms by a doctor is the most likely manner in which the disease is caught at an early stage as no effective screening processes exist, although some based upon urine examination are under investigation.

Chapter 21:

Brain cancer (including central nervous system; C70-C72)

(Note: Excludes benign brain tumours)



KEY FINDINGS

- *INCIDENCE AND MORTALITY IN IRELAND*
  - *There were on average 232 male and 182 females diagnosed each year during 2000-2004.*
  - *There was no significant trend in incidence rates between 1994 and 2004 for either sex or country.*
  - *Male incidence rates were higher than expected in Cork during 1994-2004. Among females no geographic areas exhibited significantly higher incidence rates than expected.*
  - *Ireland had some of the highest incidence rates of brain cancer among developed countries during 1998-2000 with male incidence rates 15.8% higher and female incidence rates 9.3% higher than in the EU (15 countries).*
  - *During 2000-2004 there were on average 181 male and131 female deaths per year.*
  - *There was no significant trend in mortality rates in Ireland for either males or females or for either country.*

- *SURVIVAL AND PREVALENCE*
  - *Relative survival from the disease was very poor with five-year (age-standardised) relative survival estimated to be 24.4%. This value was 8.9% higher for males than females.*
  - *There was no significant change in relative survival between those diagnosed in 1994-1996 and 1997-1999 for either males or females or in Northern Ireland or Republic of Ireland.*
  - *At the end of 2004 there were 1,069 people living in Ireland who had been diagnosed with the disease in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were 15.6% lower for males and 18.2% lower for females in Northern Ireland than in Republic of Ireland.*
  - *There was no significant difference between Northern Ireland and Republic of Ireland in five-year (age-standardised) relative survival for patients diagnosed in 2000-2004.*
  - *Mortality rates were 23.6% lower in Northern Ireland than Republic of Ireland for males and 21.8% lower for females.*
  - *At the end of 2004 the number of people living with brain cancer per 100,000 persons, having been diagnosed with the disease in the previous five years, was 9.6% higher in Republic of Ireland than Northern Ireland.*

21.1: Incidence

During 2000-2004 there were 232 male and 182 females diagnosed with brain cancer, a male to female ratio of 1.3:1. It made up 2.1% of all male cancers (excluding NMSC) diagnosed during the five-year period placing it thirteenth in a descending list of the most common male cancers. Among females brain cancer was the fifteenth most common cancer (excluding NMSC) making up 1.7% of all cancers. The odds of developing the disease before the age of 75 were 1 in 139 for males and 1 in 198 for females. (Tab. 21.1)

European age standardised incidence rates (EASIR) were 43.8% higher among males that females ($p<0.001$) during 2000-2004. This proportion was slightly higher in Northern Ireland than Republic of Ireland (NI: 46.5%; ROI: 41.9%). Additionally EASIRs were 15.6% ($p=0.005$) lower for males and 18.2% ($p=0.004$) lower for females in Northern Ireland than in Republic of Ireland. (Tab. 21.1)

Table 21.1: Summary statistics for incidence of brain cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	65	50	114	167	133	300	232	182	414
% of all cancer cases (ex. NMSC)	2.0%	1.4%	1.7%	2.2%	1.9%	2.0%	2.1%	1.7%	1.9%
Rank (ex. NMSC)	13	16	16	13	13	15	13	15	16
Median age at diagnosis	58	61	59	58	62.5	60	58	62	60
Cumulative risk (Aged 0 to 74)	0.6%	0.4%	0.5%	0.8%	0.5%	0.6%	0.7%	0.5%	0.6%
Crude rate per 100,000 persons	7.8	5.7	6.7	8.6	6.7	7.7	8.4	6.4	7.4
EASIR ± 95% CI	7.9 ±0.9	5.4 ±0.7	6.6 ±0.5	9.4 ±0.6	6.6 ±0.5	8.0 ±0.4	8.9 ±0.5	6.2 ±0.4	7.5 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-15.6% ±10.9	-18.2% ±12.3	-17.4% ±8.1

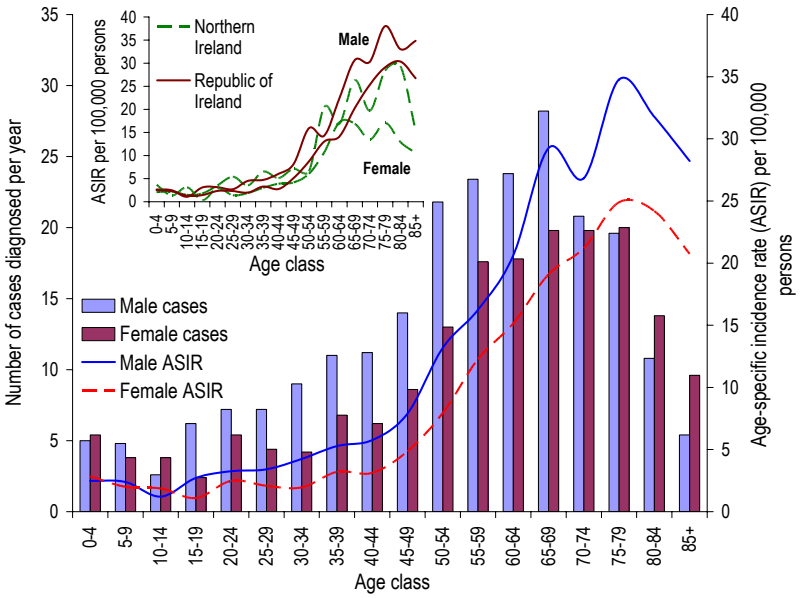
EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

21.1.1: Age distribution

Brain cancer had a median age at diagnosis of 58 years for males and 62 years for females, both considerably younger than most cancer sites. The age distribution was also more spread out than for most cancer sites although cases still peaked in the older age classes (65-69 for males and 75-79 for females). (Fig. 21.1)

In Ireland age-specific incidence rates (ASIR) were highest among the 75-79 age class for males and females. This varied by country particularly for females with ASIRs in Northern Ireland highest among females aged 60-64 compared to 80-84 in Republic of Ireland. (Fig. 21.1)

Figure 21.1: Number of cases of brain cancer diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



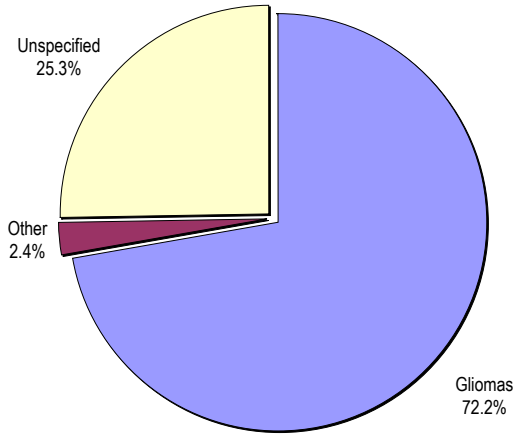
During 2000-2004 there were on average 12 boys and 13 girls (aged 0-14) diagnosed with brain cancer each year. This made up 5.3% of male and 7.1% of female brain cancers diagnosed during the period. (Fig. 21.1)

21.1.2: Cell type

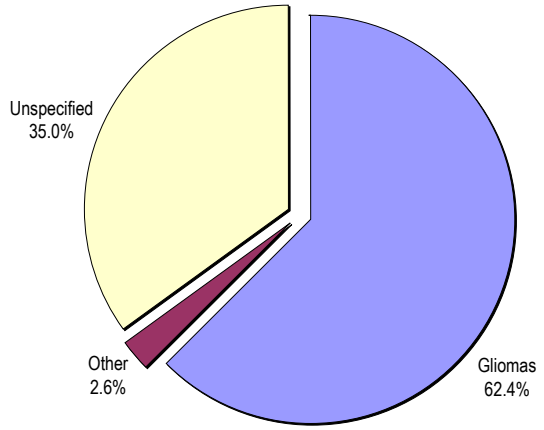
Gliomas were the most common type of brain cancer diagnosed during 2000-2004 making up 72.2% of male and 62.4% of female cases. The remainder were mostly of an unspecified cell type although a small proportion were of another type (male: 2.4%, female: 2.6%) which mostly included blood vessel tumours, miscellaneous tumours and neuroepitheliomatous neoplasms. The proportion of cases diagnosed with an unspecified cell type was higher in Northern Ireland (43.1%) than Republic of Ireland (24.5%). (Fig. 21.2)

Figure 21.2: Types of brain cancer diagnosed in Ireland: 2000-2004

(a) Male



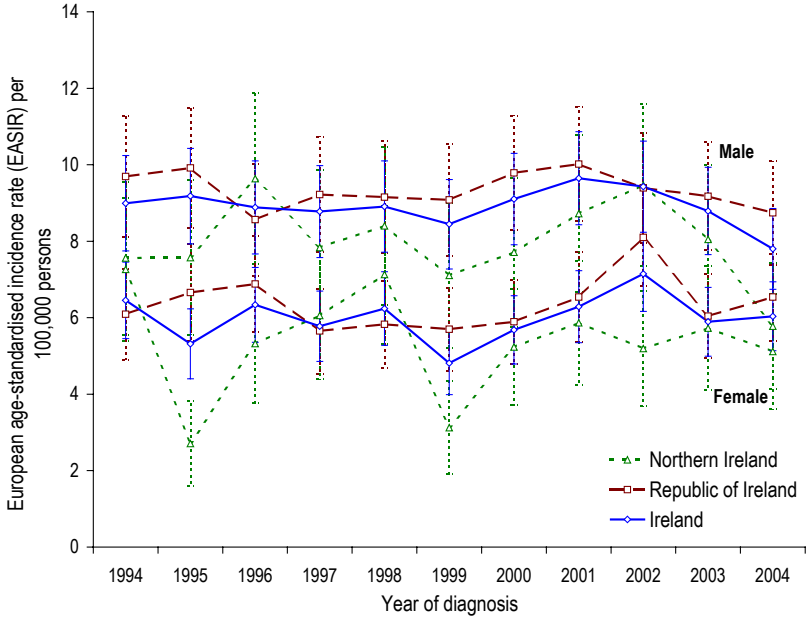
(b) Female



21.1.3: Trends

There was no significant trend in European age-standardised incidence rates (EASIR) for brain cancer between 1994 and 2004 for either sex or country. However, as a result of population growth and ageing the number of cases diagnosed increased by 2.6 male and 3.4 female cases each year. The majority of this increase (90%) came from Republic of Ireland. (Fig. 21.3, Tab. 21.2)

Figure 21.3: Trends in European age-standardised incidence rates (EASIR) for brain cancer by sex and country: 1994-2004



21.1.4: Geographic variations

As a result of the low number of cases there was little conclusive variation in incidence of brain cancer among counties and councils in Ireland during 1994-2004. However male incidence rates were higher than expected in Cork and were lower than expected in Ards and Lisburn. Among females no geographic areas exhibited significantly higher rates however Banbridge, Belfast, Carrickfergus, Dungannon and Monaghan had significantly lower rates. (Fig. 21.4)

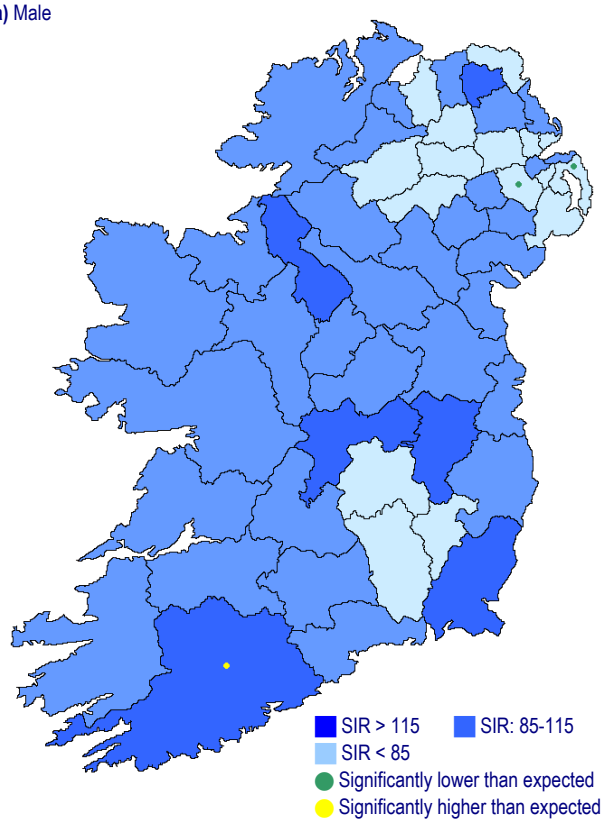
Table 21.2: Number of cases and European age-standardised incidence rates (EASIR) for brain cancer by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	56	7.6 ±2.0	150	9.7 ±1.6	206	9.0 ±1.2	60	7.3 ±1.9	108	6.1 ±1.2	168	6.5 ±1.0
1995	55	7.6 ±2.0	159	9.9 ±1.6	214	9.2 ±1.2	25	2.7 ±1.1	113	6.7 ±1.3	138	5.3 ±0.9
1996	73	9.6 ±2.2	136	8.6 ±1.5	209	8.9 ±1.2	47	5.3 ±1.6	123	6.9 ±1.2	170	6.3 ±1.0
1997	59	7.8 ±2.0	150	9.2 ±1.5	209	8.8 ±1.2	53	6.1 ±1.7	107	5.7 ±1.1	160	5.8 ±0.9
1998	64	8.4 ±2.1	153	9.2 ±1.5	217	8.9 ±1.2	64	7.1 ±1.8	107	5.8 ±1.1	171	6.2 ±1.0
1999	55	7.1 ±1.9	149	9.1 ±1.5	204	8.4 ±1.2	27	3.1 ±1.2	111	5.7 ±1.1	138	4.8 ±0.8
2000	61	7.7 ±1.9	166	9.8 ±1.5	227	9.1 ±1.2	49	5.2 ±1.5	116	5.9 ±1.1	165	5.7 ±0.9
2001	70	8.7 ±2.1	176	10.0 ±1.5	246	9.6 ±1.2	53	5.9 ±1.6	126	6.5 ±1.2	179	6.3 ±0.9
2002	78	9.5 ±2.1	166	9.4 ±1.4	244	9.4 ±1.2	49	5.2 ±1.5	165	8.1 ±1.3	214	7.1 ±1.0
2003	66	8.1 ±2.0	165	9.2 ±1.4	231	8.8 ±1.1	50	5.7 ±1.6	123	6.0 ±1.1	173	5.9 ±0.9
2004	48	5.8 ±1.6	164	8.7 ±1.3	212	7.8 ±1.1	47	5.1 ±1.5	134	6.5 ±1.1	181	6.0 ±0.9

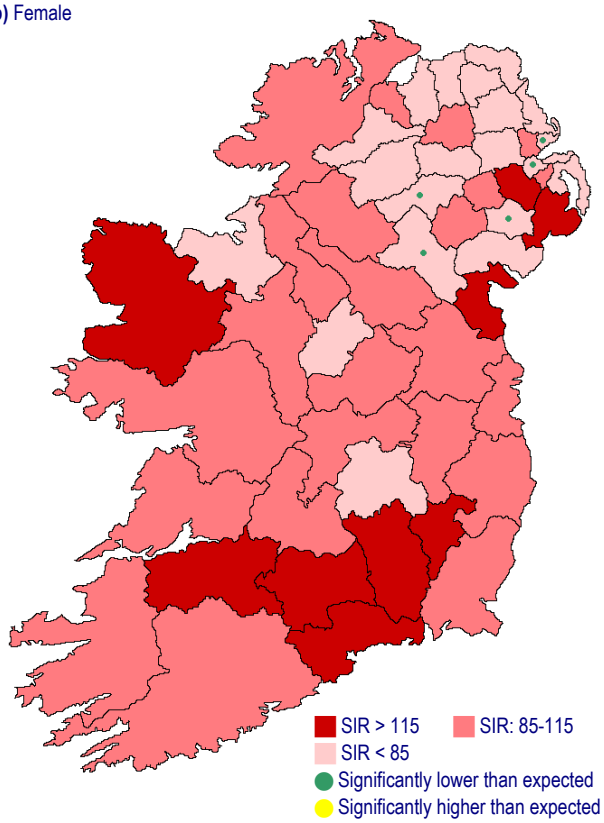
EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 21.4: Significant differences in county/council standardised incidence ratios for brain cancer compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female

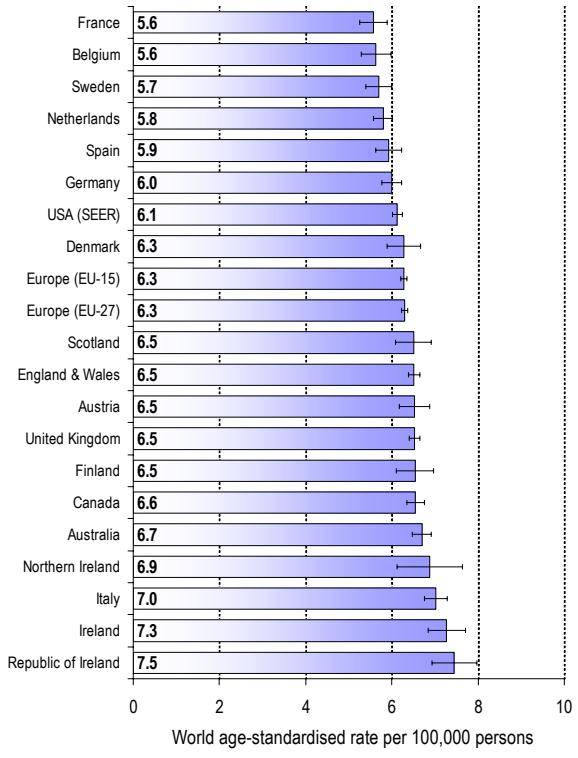


21.1.5: International comparisons

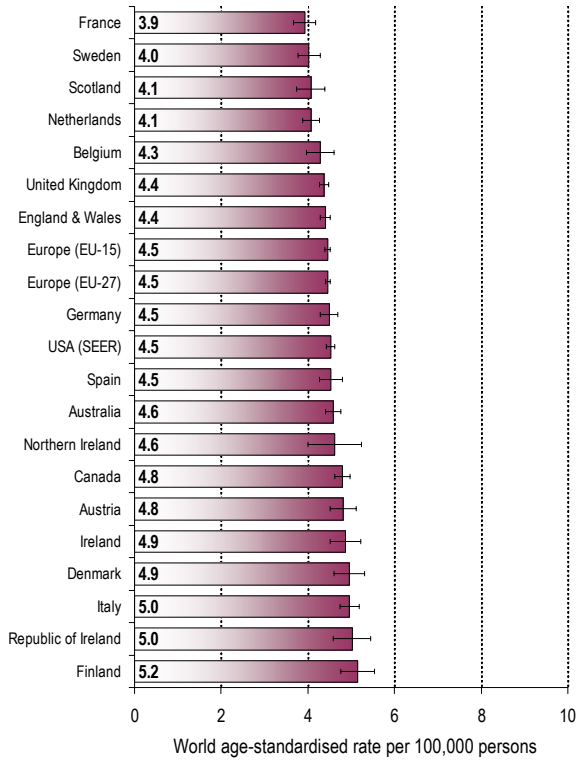
Ireland had one of the highest incidences of brain cancer among developed countries during 1998-2000 with male incidence rates 15.8% and female incidence rates 8.2% higher than in the European Union (15 countries). This was driven primarily by higher rates in Republic of Ireland although Northern Ireland still had high incidence rates compared to most other European countries. (Fig. 21.5)

Figure 21.5: International comparisons of world age-standardised incidence rates for brain cancer: 1998-2000

(a) Male



(b) Female



Source: IARC[167]

21.2: Survival

Survival from brain cancer was poor during 2000-2004 with estimates of one-year (age-standardised) relative survival 42.1% and five-year (age-standardised) relative survival 24.4% for all patients diagnosed during this five-year period. (Fig. 21.6, Tab. 21.3)

Table 21.3: Age-standardised relative survival for brain cancer patients by country and sex: 2000-2004 period analysis estimates

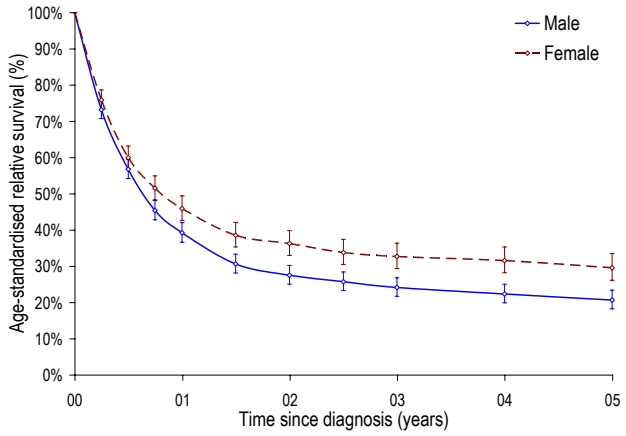
		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	37.9% (33.0%, 43.5%)	42.4% (36.5%, 49.3%)	39.7% (35.9%, 44.0%)
	Republic of Ireland	39.7% (36.7%, 43.0%)	47.2% (43.4%, 51.4%)	42.8% (40.4%, 45.4%)
	Ireland	39.3% (36.7%, 42.1%)	46.0% (42.7%, 49.5%)	42.1% (40.1%, 44.3%)
5-year	Northern Ireland	20.6% (16.4%, 25.9%)	24.7% (18.8%, 32.5%)	22.1% (18.5%, 26.5%)
	Republic of Ireland	20.7% (17.9%, 24.1%)	31.6% (27.5%, 36.2%)	24.9% (22.5%, 27.6%)
	Ireland	20.7% (18.3%, 23.5%)	29.6% (26.2%, 33.6%)	24.4% (22.3%, 26.6%)

Survival experience varied by sex with male five-year (age-standardised) relative survival 20.7% compared to 29.6% for females, a significant difference of 8.9% (p=0.005). (Fig. 21.6, Tab. 21.3)

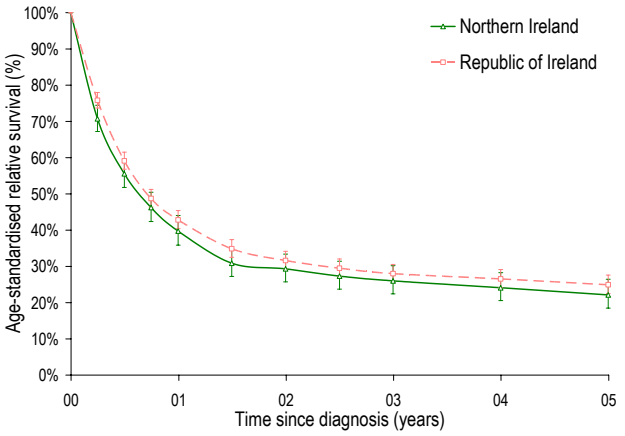
There was however no significant difference in (age-standardised) relative survival between Northern Ireland and Republic of Ireland for either sex despite five-year (age-standardised) relative survival 24.7% for females in Northern Ireland compared to 31.6% in Republic of Ireland. (Fig. 21.6, Tab.21.3)

Figure 21.6: Age-standardised relative survival for brain cancer patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



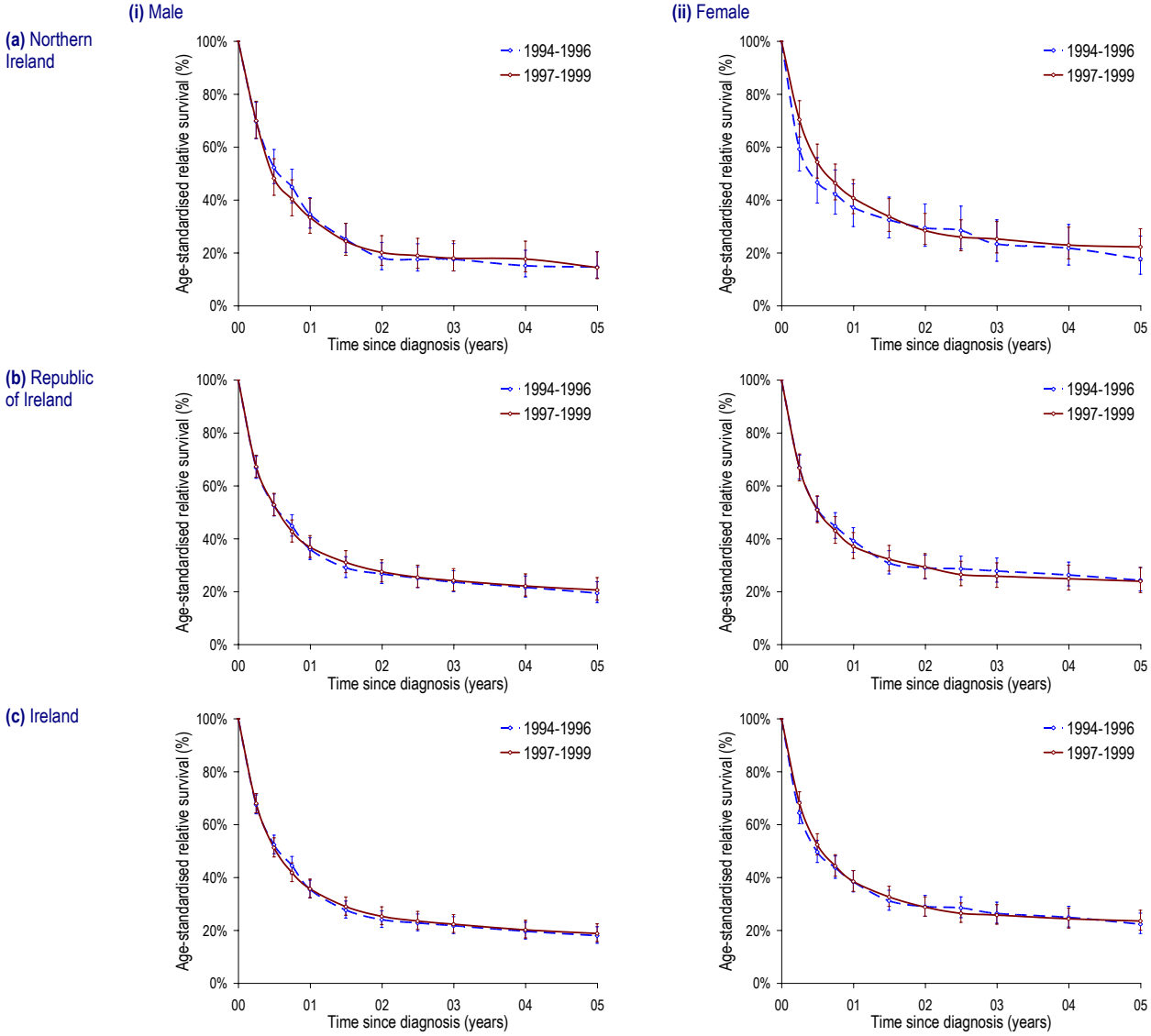
21.2.1: Changes in survival over time

There was no significant change in (age-standardised) relative survival for males or females diagnosed with brain cancer in Ireland between 1994-1996 and 1997-1999. This was apparent in both Northern Ireland and Republic of Ireland with only female survival in Northern Ireland showing any possible sign of variation. (Fig. 21.7, Tab. 21.4)

Table 21.4: Age-standardised relative survival for brain cancer patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	35.6% (31.1%, 40.6%)	36.8% (32.4%, 41.8%)	16.1% (12.4%, 20.8%)	18.1% (14.5%, 22.5%)
	Republic of Ireland	37.3% (34.3%, 40.5%)	37.0% (34.0%, 40.3%)	21.4% (18.6%, 24.5%)	21.8% (18.9%, 25.1%)
	Ireland	36.8% (34.3%, 39.4%)	37.0% (34.5%, 39.7%)	19.7% (17.4%, 22.3%)	20.7% (18.4%, 23.4%)
Male	Northern Ireland	34.6% (29.4%, 40.8%)	33.4% (27.5%, 40.6%)	14.7% (10.5%, 20.6%)	14.5% (10.3%, 20.4%)
	Republic of Ireland	36.1% (32.2%, 40.4%)	36.9% (33.0%, 41.2%)	19.5% (16.0%, 23.8%)	20.7% (16.8%, 25.4%)
	Ireland	35.5% (32.3%, 39.0%)	35.7% (32.4%, 39.4%)	18.0% (15.2%, 21.4%)	18.9% (15.8%, 22.5%)
Female	Northern Ireland	37.2% (30.0%, 46.1%)	40.8% (34.9%, 47.7%)	17.8% (12.0%, 26.4%)	22.3% (17.0%, 29.2%)
	Republic of Ireland	39.3% (34.9%, 44.2%)	37.2% (32.6%, 42.4%)	24.3% (20.3%, 29.2%)	24.0% (19.7%, 29.2%)
	Ireland	38.4% (34.6%, 42.6%)	38.5% (34.8%, 42.7%)	22.4% (18.9%, 26.6%)	23.6% (20.1%, 27.6%)

Figure 21.7: Age-standardised relative survival for brain cancer patients by sex, country and period of diagnosis: 1994-1999



21.2.2: Observed survival

Including other causes of deaths 16.8% of males and 21.2% of females diagnosed in 1997-1999 in Ireland were still alive five years from their diagnosis date. The difference in this observed survival figure between males and females was not statistically significant. There was no variation in this value by country despite a 4.2% difference for males. Compared to patients diagnosed in 1994-1996 there was very little change in either one-year or five-year observed survival for either sex or country. (Tab. 21.5)

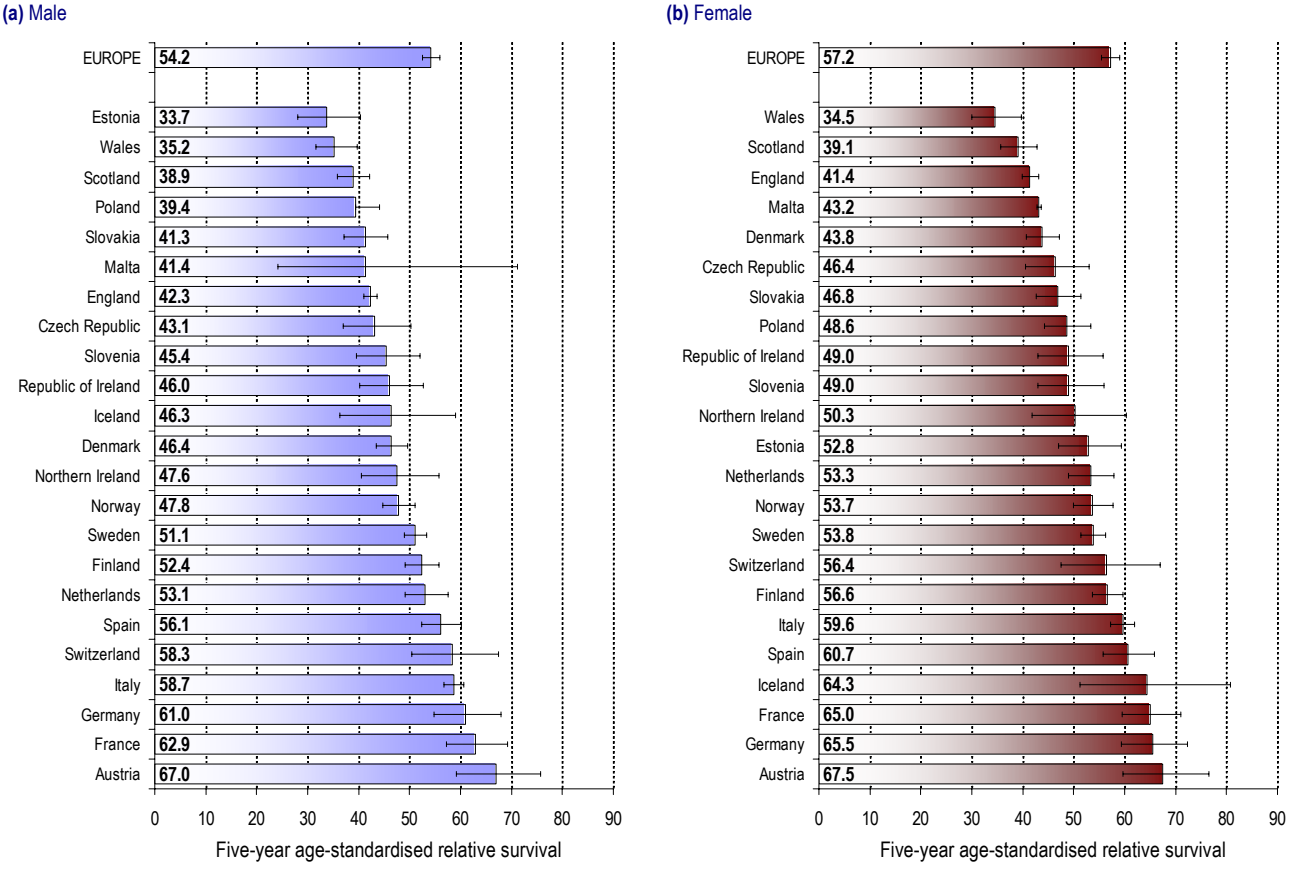
Table 21.5: Observed survival for brain cancer patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	34.8% (29.6%, 40.9%)	36.0% (31.0%, 41.9%)	15.4% (11.6%, 20.3%)	17.2% (13.4%, 22.0%)
	Republic of Ireland	34.0% (30.6%, 37.8%)	34.5% (31.1%, 38.2%)	18.6% (15.9%, 21.8%)	19.3% (16.5%, 22.5%)
	Ireland	34.3% (31.4%, 37.4%)	34.9% (32.1%, 38.1%)	17.7% (15.4%, 20.3%)	18.6% (16.4%, 21.3%)
Male	Northern Ireland	35.2% (28.5%, 43.4%)	32.9% (26.5%, 40.9%)	14.8% (10.2%, 21.4%)	13.8% (9.4%, 20.1%)
	Republic of Ireland	34.9% (30.4%, 40.0%)	35.0% (30.6%, 40.1%)	18.0% (14.5%, 22.2%)	18.0% (14.6%, 22.2%)
	Ireland	35.0% (31.2%, 39.2%)	34.4% (30.7%, 38.6%)	17.0% (14.2%, 20.5%)	16.8% (13.9%, 20.2%)
Female	Northern Ireland	34.2% (26.5%, 44.3%)	40.0% (32.4%, 49.4%)	16.2% (10.6%, 24.8%)	21.5% (15.5%, 29.9%)
	Republic of Ireland	32.9% (27.8%, 38.8%)	33.7% (28.6%, 39.6%)	19.4% (15.3%, 24.6%)	21.1% (16.8%, 26.4%)
	Ireland	33.2% (28.9%, 38.2%)	35.7% (31.3%, 40.6%)	18.5% (15.1%, 22.8%)	21.2% (17.6%, 25.5%)

21.2.3: European comparisons

Five-year (age-standardised) relative survival for brain cancer patients diagnosed in Europe during 1990-1994 was 16.4% for males and 18.5% for females. Male patients diagnosed in 1994-1996 in Northern Ireland and Republic of Ireland had a similar survival experience with no significant difference from the European average in five-year (age-standardised) relative survival, however female patients experienced better survival in Republic of Ireland than in Europe as a whole, while female survival in Northern Ireland was similar to that of Europe. (Fig. 21.8)

Figure 21.8: European comparisons of five-year age-standardised relative survival for brain cancer patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[168]

21.3: Mortality

Deaths from brain cancer contributed 3.1% of all male and 2.4% of all female cancer deaths (excluding NMSC) during 2000-2004 with 181 male and 131 female deaths per year. For both sexes it was the tenth most common cause of cancer death with a 0.6% risk of males dying from the disease before the age of 75 and a 0.4% risk for females. European age-standardised mortality rates (EASMR) were higher among males than females by 57.3% (p<0.001). They were also considerably higher in Republic of Ireland

Table 21.6: Summary statistics for deaths from brain cancer: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	47	36	82	134	95	229	181	131	311
% of all cancer deaths (ex. NMSC)	2.5%	2.0%	2.2%	3.3%	2.7%	3.0%	3.1%	2.4%	2.8%
Rank (ex. NMSC)	12	11	13	10	10	11	10	10	11
Median age at death	60	64	62	61	64	62	60	64	62
Cumulative risk (Aged 0 to 74)	0.5%	0.3%	0.4%	0.6%	0.4%	0.5%	0.6%	0.4%	0.5%
Crude rate per 100,000 persons	5.6	4.1	4.9	6.9	4.8	5.8	6.5	4.6	5.5
EASMR ± 95% CI	5.8 ±0.7	3.8 ±0.6	4.7 ±0.5	7.6 ±0.6	4.8 ±0.4	6.2 ±0.4	7.0 ±0.5	4.5 ±0.4	5.7 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-23.6% ±11.5	-21.8% ±13.9	-23.2% ±8.8

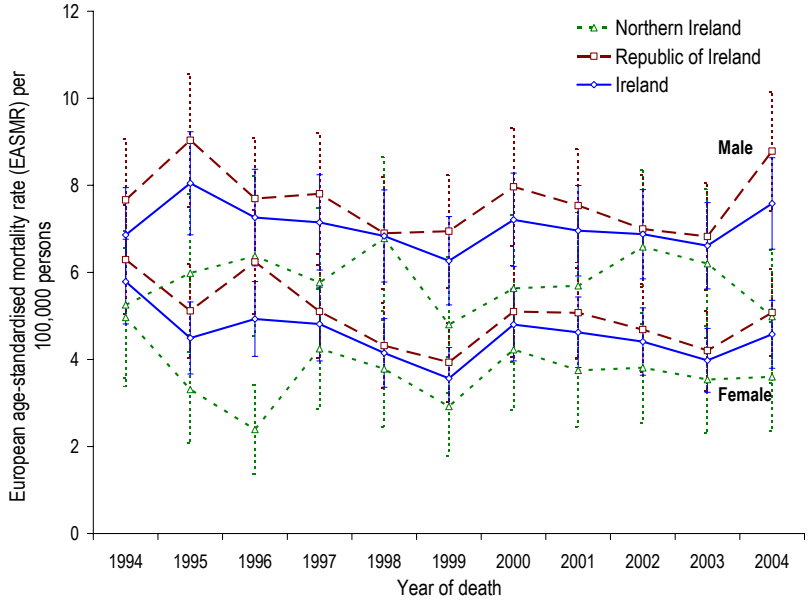
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

than Northern Ireland with a 23.6% difference for males and a 21.8% difference for females (p<0.001). (Tab. 21.6)

21.3.1: Trends

Between 1994 and 2004 there was no significant trend in European age-standardised mortality rates (EASMR) for brain cancer in Ireland for either males or females. Both Northern Ireland and Republic of Ireland considered separately also exhibited static incidence rates although Republic of Ireland exhibited some evidence of a decrease in female mortality with an annual percentage change of -2.4% (p=0.077) although this did not reach statistical significance. (Fig. 21.9)

Figure 21.9: Trends in European age-standardised mortality rates (EASMR) for brain cancer by sex and country: 1994-2004



Despite the static rates the number of male deaths from brain cancer rose by 2.3 per year as a result of increases in the population and in the proportion aged over 60. The number of female deaths per year however remained fairly static over time. (Fig. 21.9)

21.4: Prevalence

At the end of 2004 there were 1,069 people living in Ireland who had been diagnosed with brain cancer during 1994-2004, which was 25.0% of all brain cancers diagnosed during this period. The majority of these (676 people) were diagnosed in the 2000-2004 period, which was 32.6% of all those diagnosed within the five year period. (Tab. 21.7)

Table 21.7: Prevalence of brain cancer in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	142	20.7%	96	29.7%
	Female	149	28.4%	91	36.7%
	All persons	291	24.1%	187	32.7%
Republic of Ireland	Male	410	23.6%	256	30.6%
	Female	368	27.6%	233	35.1%
	All persons	778	25.4%	489	32.6%
Ireland	Male	552	22.8%	352	30.3%
	Female	517	27.8%	324	35.5%
	All persons	1,069	25.0%	676	32.6%

The majority of those alive at the end of 2004 having been diagnosed within the previous five years were male (352 males compared to 324 females) while 187 survivors were resident in Northern Ireland compared to 489 in Republic of Ireland. At the end of 2004 the number of people living with brain cancer per 100,000 persons, having been diagnosed with the disease in the previous five years, was 9.6% higher in Republic of Ireland than Northern Ireland. (Tab. 21.7)

21.5: Discussion

The brain is part of the body that controls all other bodily functions. The most common symptoms associated with cancer of this organ are headaches and fits, although these are common symptoms of many other ailments. Further symptoms depend upon the location of the tumour in the brain but range from changes in personality, irritability, difficulty concentrating, memory loss and loss of coordination or sensory problems such as loss of sense of smell.[169]

The only environmental factor associated with an increased risk of brain tumours is ionising radiation.[170] There are however some genetic (e.g. neurofibromatosis, tuberous sclerosis) and medical conditions (e.g. cerebral palsy in children) that increase risk by a small amount, as does a weakened immune system.[171] A small increased risk has been associated with some occupations such as those in the petrochemical, electrical and health professions, however the evidence is inconclusive and no causal agent has been identified.[172] Despite public concern none of the following have a proven association: industrial and agricultural chemicals, viruses, bacterial infection, head injury, diet, non-ionising radiation (power lines, mobile phones) or tobacco.[173]

The lack of understanding of the causes of brain cancer is a major hindrance to the development of prevention strategies for this disease although the link with ionising radiation warrants precautions being taken with regard to the presence of ionising radiation in the environment. These are already in place in Ireland and studies have been undertaken with regard to the possible link between cancers linked with ionising radiation and possible radioactivity from the Irish Sea. None have demonstrated a definite link and the high incidence of brain cancer in Ireland thus remains unexplained.

Survival from the disease remains poor as brain cancer is resistant to treatment using chemotherapy and radiotherapy. Additionally symptoms from the disease present at a late stage which reduces survival probability among patients. However understanding of the genetic processes in the development of the disease has improved over recent years and it is hoped that this will result in new therapeutic approaches that will improve survival prospects.[174]

Chapter 22:

Lymphoma (C81-C85, C96)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were 470 male and 437 female cases diagnosed in Ireland each year between 2000 and 2004.*
  - *Non-Hodgkin's lymphoma made up 84.9% of male and 86.3% of female cases of lymphoma diagnosed during 2000-2004.*
  - *Incidence rates increased in Ireland between 1994-2004 by 1.0% per year among males and by 1.6% per year among females.*
  - *Male incidence rates were higher during 1994-2004 than the average rate throughout Ireland in Belfast and Craigavon. Among females incidence rates were higher than expected in Castlereagh, Dublin, Carrickfergus, Armagh and Newry & Mourne.*
  - *During 2000-2004 there was no variation in incidence rates by socio-economic factors in either country.*
  - *Incidence rates during 1998-2000 were lower than USA, Canada and Australia but similar to UK for males and females. For males they were also similar to those in EU, while for females they were higher than in EU.*
  - *There were 203 male and 190 females deaths from the disease each year between 2000 and 2004.*
  - *Among males there was no significant change in mortality rates during 1994-2004. Among females mortality rates increased by 5.6% per year between 1994 and 2000.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival for patients diagnosed in 2000-2004 was estimated to be 51.7% for males and 53.8% for females.*
  - *There was no significant change in (age-standardised) relative survival for males or females diagnosed in Ireland between 1994-1996 and 1997-1999.*
  - *For patients diagnosed in 1997-1999 five-year (age-standardised) relative survival from Hodgkin's lymphoma was 73.5% for males and 74.5% for females , while for non-Hodgkin's lymphoma it was 48.4% for males and 49.3% for females.*
  - *At the end of 2004 there were 4,875 people living in Ireland who had been diagnosed with lymphoma during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *There was no significant difference in incidence rates for either males or females between Northern Ireland and Republic of Ireland during 2000-2004. Nor were there any differences for Hodgkin's lymphoma or non-Hodgkin's lymphoma.*
  - *Incidence rates in Republic of Ireland increased by 1.7% per year among males and 1.9% per year among females. However there was no significant change in incidence rates in Northern Ireland during 1994-2004.*
  - *There was no significant difference in five-year (age-standardised) relative survival for either males or females between Northern Ireland and Republic of Ireland.*
  - *There was also no significant difference between the two countries in five-year (age-standardised) relative survival for either Hodgkin's lymphoma or non-Hodgkin's lymphoma.*
  - *There was no significant difference in mortality rates between Northern Ireland and Republic of Ireland during 1994-2004.*
  - *At the end of 2004 the number of people living with lymphoma per 100,000 persons, having been diagnosed with the disease in the previous five years, was 13.5% higher in Northern Ireland than Republic of Ireland.*

22.1: Incidence

Lymphoma (including Hodgkin's and non-Hodgkin's lymphoma) contributed 4.3% of all male and 4.2% of all female cancers (excluding NMSC) during 2000-2004. The number of cases diagnosed annually was slightly higher among males than females with 470 male cases each year compared to 437 female cases. It was the fourth most common male and seventh most common female cancer during the period with a 1 in 69 chance of a male developing the disease before age 75 compared to a 1 in 84 chance for females. (Tab. 22.1)

Male European age-standardised incidence rates (EASIR) were 25.0% ($p<0.001$) higher than those for females. The difference between sexes was similar in Northern Ireland and Republic of Ireland, while there was no significant difference in EASIRs for either males or females between the two countries. (Tab. 22.1)

Table 22.1: Summary statistics for incidence of lymphoma: 2000-2004

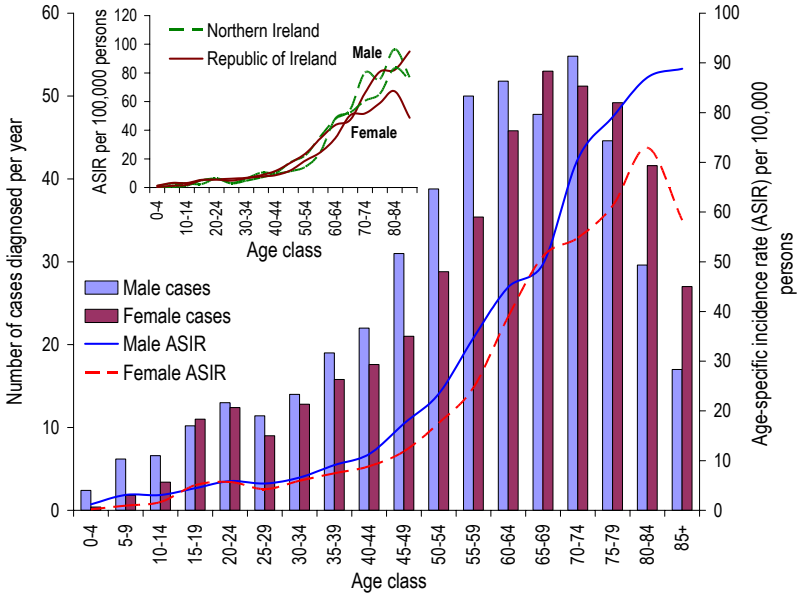
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	150	153	303	320	284	605	470	437	907
% of all cancer cases (ex. NMSC)	4.5%	4.4%	4.5%	4.2%	4.0%	4.1%	4.3%	4.2%	4.2%
Rank (ex. NMSC)	4	6	5	5	7	5	4	7	5
Median age at diagnosis	63	67	65	59	63	61	60	65	62
Cumulative risk (Aged 0 to 74)	1.5%	1.2%	1.4%	1.4%	1.2%	1.3%	1.4%	1.2%	1.3%
Crude rate per 100,000 persons	18.1	17.6	17.8	16.5	14.4	15.4	16.9	15.4	16.2
EASIR ± 95% CI	18.4 ±1.3	15.1 ±1.1	16.7 ±0.9	18.0 ±0.9	14.2 ±0.8	16.0 ±0.6	18.2 ±0.7	14.5 ±0.6	16.2 ±0.5
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							2.2% ±9.0	6.3% ±9.7	4.4% ±6.6

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

22.1.1: Age distribution

While still a disease more common among the elderly lymphoma had a significant presence among all age groups in Ireland during 2000-2004. It had a median age of diagnosis of 60 years for males and 65 years for females, while the number of cases diagnosed annually was highest for males among those aged 70-74 and for females among those aged 65-69, with 55 male and 53 female cases per year. There were on average 15 boys and 6 girls (aged 0-14) diagnosed each year with the disease between 2000 and 2004. (Fig. 22.1)

Figure 22.1: Number of cases of lymphoma diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



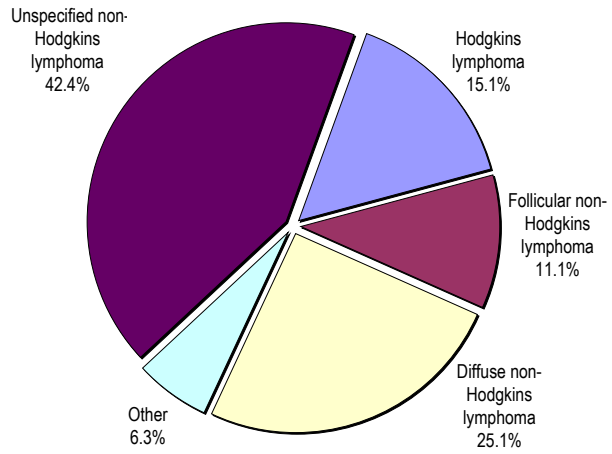
Age-specific incidence rates (ASIR) climbed steadily to a maximum among those aged 85 and over for males and 80-84 for females. While both Northern Ireland and Republic of Ireland exhibited this general increase the magnitude of fluctuations in ASIRs between consecutive age groups differed in each country. (Fig. 22.1)

22.1.2: Cancer site

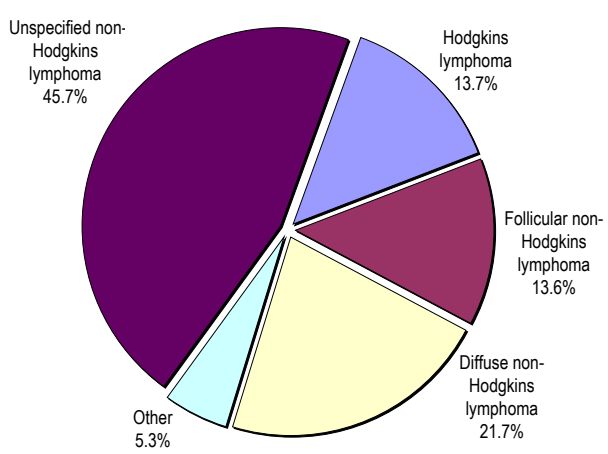
Lymphoma can be subdivided into two main categories: Hodgkin's lymphoma and non-Hodgkin's lymphoma (NHL). The later of these was the more common making up 84.9% of male and 86.3% of female cases of lymphoma diagnosed during 2000-2004. NHL can be further subdivided with 51.8% of all lymphomas in Northern Ireland being unspecified NHL compared to 40.0% of all lymphomas in Republic of Ireland. (Fig. 22.2)

Figure 22.2: Types of lymphoma diagnosed in Ireland: 2000-2004

(a) Male



(b) Female



During 2000-2004 there were on average 131 cases of Hodgkin's lymphoma diagnosed each year making up 0.6% of all cancers (excluding NMSC) with the number of males cases 18.7% higher than the number of female cases. The median age at diagnosis for Hodgkin's disease was fairly young at 35 years of age although this varied by country with a median age at diagnosis of 39 in Northern Ireland compared to 33 in Republic of Ireland. There was however no significant variation between Northern Ireland and Republic of Ireland in European age-standardised incidence rates (EASIR). (Tab. 22.2)

Table 22.2: Summary statistics for incidence of Hodgkin's lymphoma: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	20	17	37	51	43	94	71	60	131
% of all cancer cases (ex. NMSC)	0.6%	0.5%	0.6%	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%
Median age at diagnosis	39.5	37.5	39	33	32.5	33	36	33	35
Crude rate per 100,000 persons	2.4	2.0	2.2	2.6	2.2	2.4	2.6	2.1	2.3
EASIR ± 95% CI	2.4 ±0.5	2.0 ±0.4	2.2 ±0.3	2.6 ±0.3	2.1 ±0.3	2.3 ±0.2	2.5 ±0.3	2.0 ±0.2	2.3 ±0.2
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-6.6% ±21.9	-3.1% ±24.7	-5.8% ±16.2

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

During 2000-2004 there were on average 399 male and 377 female cases of non-Hodgkin's lymphoma diagnosed each year with 34.2% occurring in Northern Ireland. In Ireland as a whole 3.6% of all male and female cancers (excluding NMSC) were non-Hodgkin's lymphomas. The number of cases diagnosed annually was 5.8% higher among males than females although female cases slightly exceeded male cases in Northern Ireland. However male European age-standardised incidence rates (EASIRs) were significantly higher than those for females in both countries. There was no significant difference in male or female EASIRs for this disease between Northern Ireland and Republic of Ireland. (Tab. 22.3)

Table 22.3: Summary statistics for incidence of non-Hodgkin's lymphoma: 2000-2004

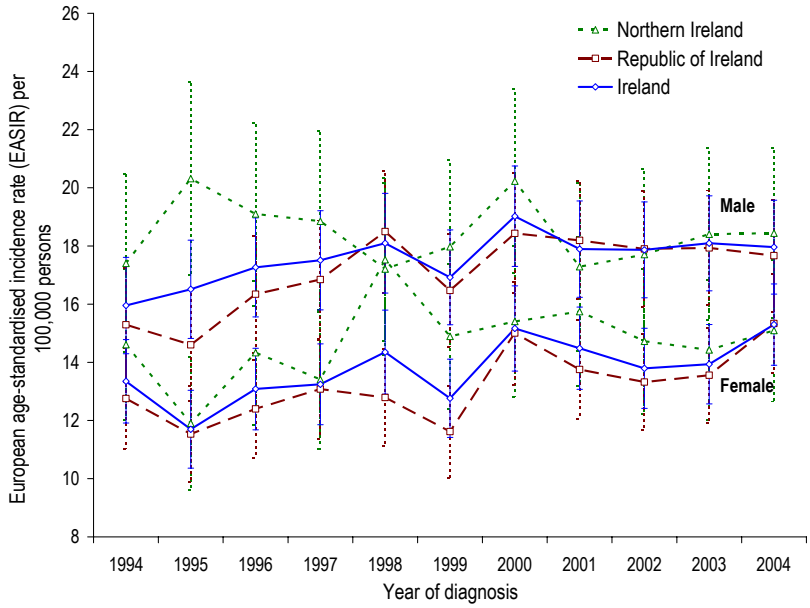
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	130	136	266	269	242	511	399	377	776
% of all cancer cases (ex. NMSC)	3.9%	3.9%	3.9%	3.5%	3.4%	3.5%	3.6%	3.6%	3.6%
Median age at diagnosis	64	69	67	62	66	64	63	67	65
Crude rate per 100,000 persons	15.7	15.6	15.7	13.8	12.3	13.0	14.4	13.3	13.8
EASIR ± 95% CI	16.0 ±1.2	13.1 ±1.0	14.5 ±0.8	15.5 ±0.8	12.1 ±0.7	13.6 ±0.5	15.6 ±0.7	12.5 ±0.6	13.9 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							3.7% ±9.8	7.9% ±10.6	6.1% ±7.2

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

22.1.3: Trends

European age-standardised incidence rates (EASIR) of lymphoma increased in Ireland between 1994 and 2004 by 1.0% (p=0.020) per year among males and by 1.6% (p=0.021) per year among females. Increases in rates were also apparent in Republic of Ireland with EASIRs increasing by 1.7% (p=0.012) among males and 1.9% (p=0.018) among females. However there was no significant change in EASIRs in Northern Ireland during 1994-2004. (Fig. 22.3, Tab. 22.4)

Figure 22.3: Trends in European age-standardised incidence rates (EASIR) for lymphoma by sex and country: 1994-2004



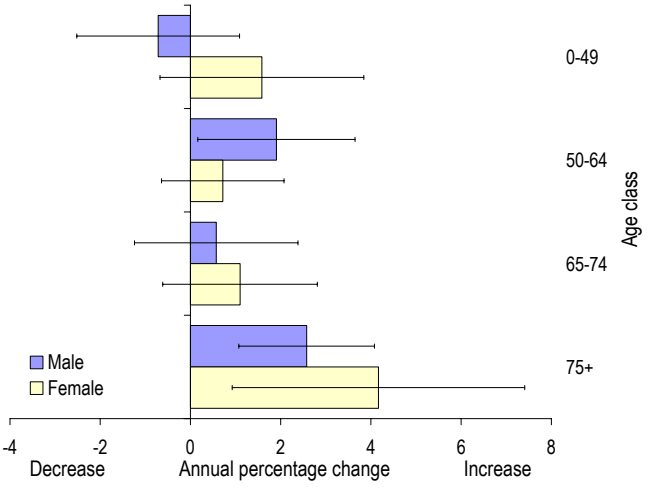
The changes in incidence rates in Republic of Ireland combined with population changes resulted in an annual increase of 9.8 male and 9.4 female cases of lymphoma during 1994-2004. In Northern Ireland, despite no significant change in incidence rates, cases of lymphoma increased annually by 1.6 male and 3.2 female cases during the eleven-year period. (Fig. 22.3, Tab. 22.4)

Table 22.4: Number of cases and European age-standardised incidence rates (EASIR) for lymphoma by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	127	17.4 ±3.1	243	15.3 ±2.0	370	16.0 ±1.7	133	14.6 ±2.6	224	12.8 ±1.7	357	13.3 ±1.4
1995	148	20.3 ±3.3	229	14.6 ±1.9	377	16.5 ±1.7	113	11.9 ±2.3	203	11.5 ±1.6	316	11.7 ±1.3
1996	145	19.1 ±3.1	261	16.3 ±2.0	406	17.3 ±1.7	140	14.3 ±2.5	221	12.4 ±1.7	361	13.1 ±1.4
1997	144	18.9 ±3.1	272	16.8 ±2.0	416	17.5 ±1.7	130	13.4 ±2.4	243	13.1 ±1.7	373	13.2 ±1.4
1998	131	17.2 ±3.0	306	18.5 ±2.1	437	18.1 ±1.7	163	17.5 ±2.8	243	12.8 ±1.7	406	14.3 ±1.4
1999	142	18.0 ±3.0	279	16.5 ±2.0	421	16.9 ±1.6	149	14.9 ±2.5	220	11.6 ±1.6	369	12.8 ±1.3
2000	160	20.2 ±3.2	315	18.4 ±2.1	475	19.0 ±1.7	147	15.4 ±2.6	289	15.0 ±1.8	436	15.2 ±1.5
2001	140	17.3 ±2.9	316	18.2 ±2.0	456	17.9 ±1.7	158	15.7 ±2.6	268	13.8 ±1.7	426	14.5 ±1.4
2002	142	17.7 ±2.9	316	17.9 ±2.0	458	17.9 ±1.6	147	14.7 ±2.5	260	13.3 ±1.7	407	13.8 ±1.4
2003	152	18.4 ±3.0	327	17.9 ±2.0	479	18.1 ±1.6	150	14.4 ±2.4	276	13.6 ±1.6	426	13.9 ±1.4
2004	156	18.4 ±2.9	327	17.7 ±1.9	483	18.0 ±1.6	162	15.1 ±2.4	329	15.3 ±1.7	491	15.3 ±1.4

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 22.4: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for lymphoma by sex and age: 1994-2004



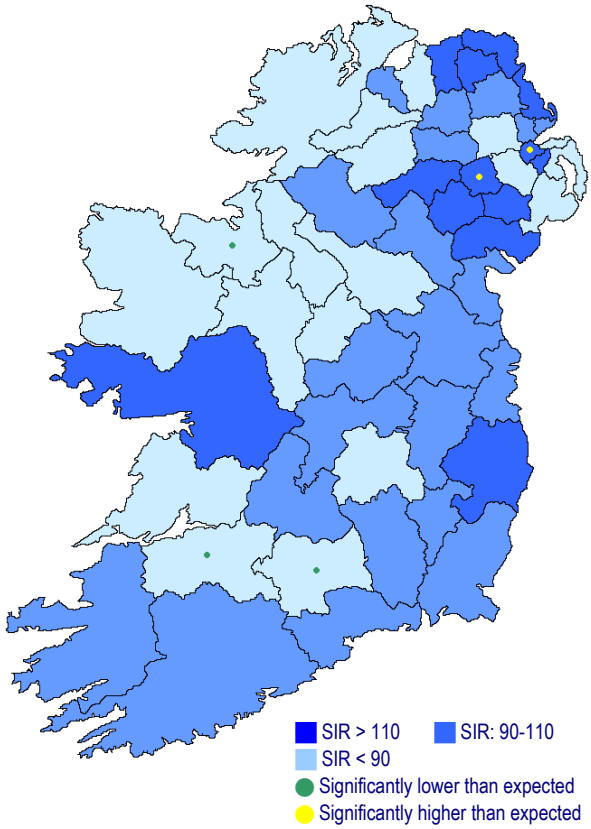
The increase in EASIRs among males and females in Ireland during 1994-2004 was driven primarily by increases among the 75 and over age group, with EASIRs for this cohort increasing among males by 2.6% (p=0.004) each year and among females by 4.2% (p=0.017) each year. EASIRs also increased significantly among males aged 50-64 with an annual percentage change of 1.9% (p=0.035). Changes in EASIRs among the other age groups (0-49, female 50-64, 65-74) were not significant. (Fig. 22.4)

22.1.4: Geographic variations

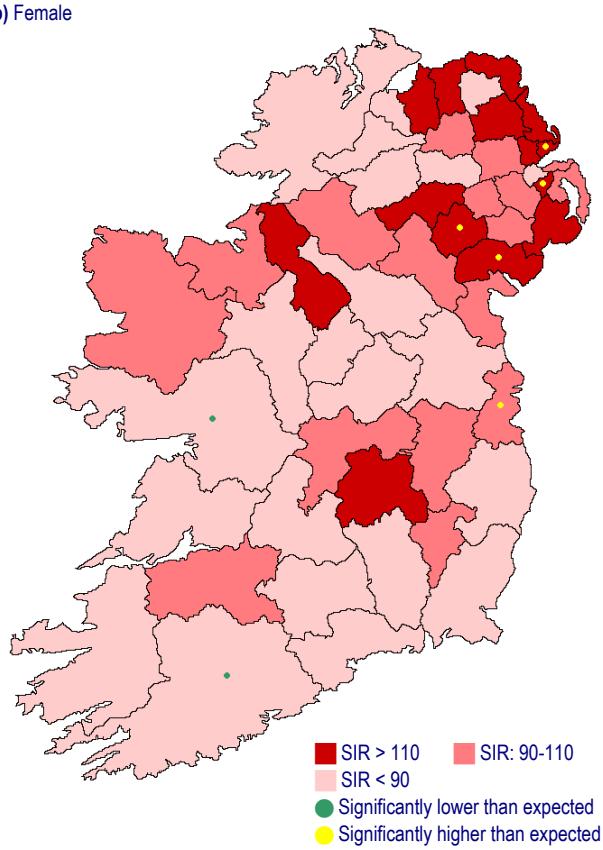
Incidence rates of lymphoma among males were significantly higher in Belfast and Craigavon during 1994-2004 than the average rate throughout Ireland. Among females incidence rates were higher than expected in Carrickfergus, Armagh, Newry & Mourne, Castlereagh and Dublin. Limerick, South Tipperary and Sligo had lower than expected male incidence rates while Cork and Galway had lower than expected female incidence rates of the disease. (Fig. 22.5)

Figure 22.5: Significant differences in county/council standardised incidence ratios for lymphoma compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female

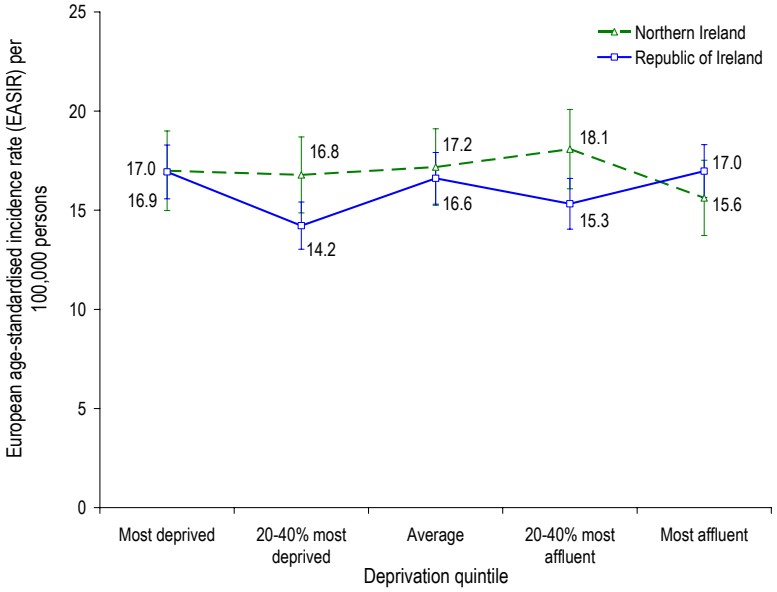


22.1.5: Socio-economic factors

During 2000-2004 there was no significant variation in European age-standardised incidence rates (EASIR) of lymphoma by deprivation among the populations of either Northern Ireland or Republic of Ireland. (Fig. 22.6)

EASIRs in the second and fourth deprivation quintile (representing the 20-40% most deprived population and the 20-40% most affluent population respectively, with deprivation status derived from the socio-economic characteristics of area of residence) were significantly higher in Northern Ireland than the equivalent population in Republic of Ireland by 18.0% (p=0.035) and 18.1% (p=0.032) respectively. (Fig. 22.6)

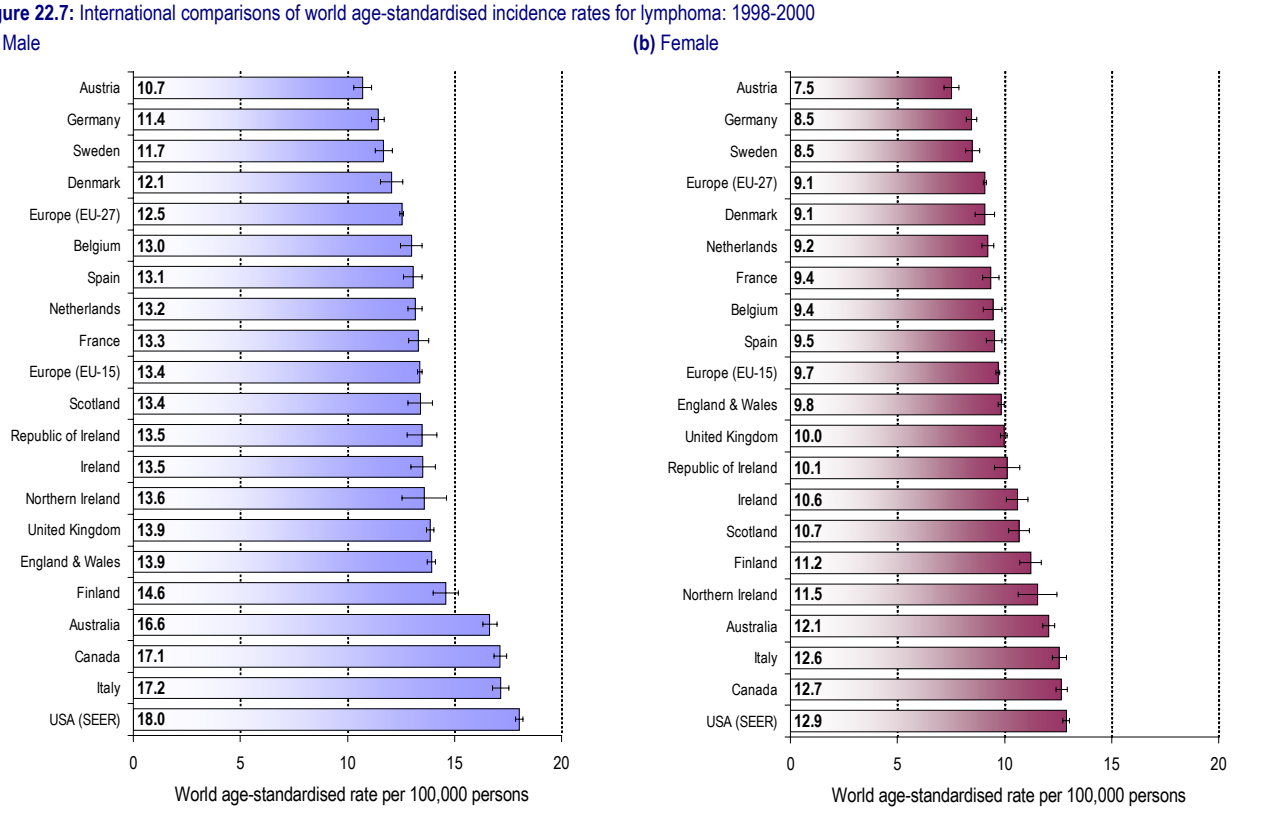
Figure 22.6: European age-standardised incidence rates (EASIR) for lymphoma by country specific deprivation quintile: 2000-2004



22.1.6: International comparisons

Among males incidence rates of lymphoma during 1998-2000 were similar in Ireland to those in European Union (15 countries) and UK, although they were higher than those in European Union (27 countries) and lower than those in USA, Canada and Australia. Among females incidence rates of lymphoma were also similar to those in UK and lower than those in USA, Canada and Australia, but were higher than those in European Union (15 and 27 countries). (Fig. 22.7)

Figure 22.7: International comparisons of world age-standardised incidence rates for lymphoma: 1998-2000



Source: IARC[175]

22.2: Survival

Survival from lymphoma was moderate during 2000-2004 with estimates of one-year (age-standardised) relative survival 70.0% and five-year (age-standardised) relative survival 52.4% for all patients diagnosed during this five-year period. (Fig. 22.8, Tab. 22.5)

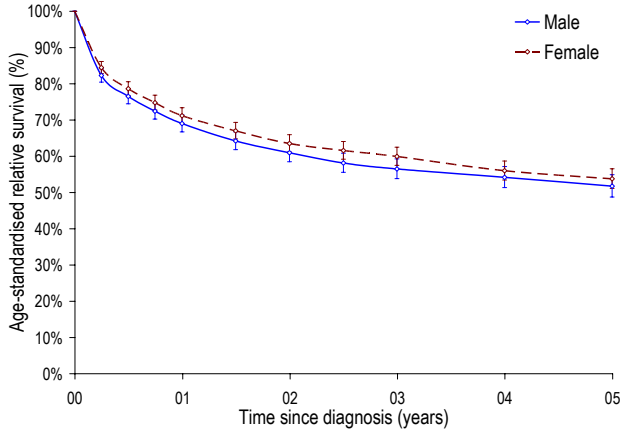
Table 22.5: Age-standardised relative survival for lymphoma patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	69.2% (65.3%, 73.4%)	72.3% (68.8%, 75.9%)	70.4% (67.8%, 73.1%)
	Republic of Ireland	68.9% (66.1%, 71.9%)	70.7% (67.9%, 73.5%)	69.7% (67.7%, 71.7%)
	Ireland	69.0% (66.7%, 71.4%)	71.2% (69.0%, 73.4%)	70.0% (68.4%, 71.6%)
5-year	Northern Ireland	52.4% (47.3%, 58.0%)	55.6% (51.4%, 60.2%)	53.1% (49.9%, 56.6%)
	Republic of Ireland	51.5% (47.9%, 55.4%)	52.9% (49.5%, 56.5%)	51.9% (49.5%, 54.5%)
	Ireland	51.7% (48.8%, 54.9%)	53.8% (51.1%, 56.6%)	52.4% (50.4%, 54.4%)

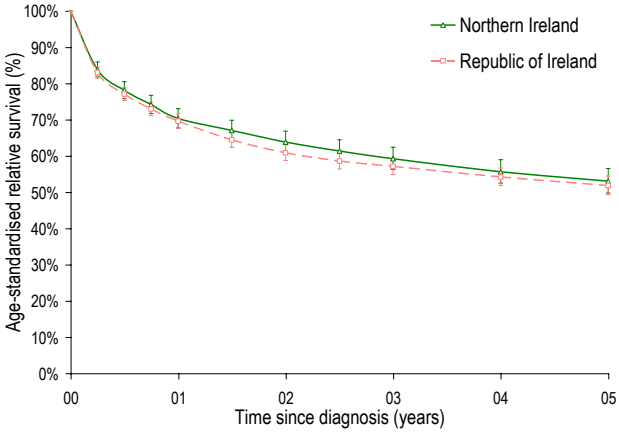
There was no significant difference in survival between males and females diagnosed with lymphoma during 2000-2004, with estimates of five-year (age-standardised) relative survival 51.7% for males and 53.8% for females. This was also the situation in Northern Ireland and Republic of Ireland separately, while there was no significant difference in five-year (age-standardised) relative survival apparent between the two countries for either males or females. (Fig. 22.8; Tab. 22.5)

Figure 22.8: Age-standardised relative survival for lymphoma patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



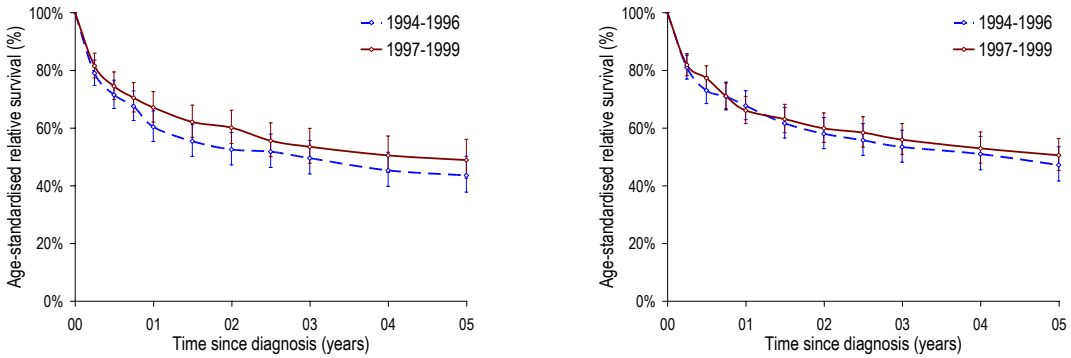
21.2.1: Changes in survival over time

There was no significant change in (age-standardised) relative survival for males or females diagnosed with lymphoma in Ireland between 1994-1996 and 1997-1999. While this was also apparent in Northern Ireland and Republic of Ireland separately, the later country exhibited some weak evidence of an improvement for males with an increase in five-year (age-standardised) relative survival of 7.7% (p=0.132). (Fig. 22.9, Tab. 22.6)

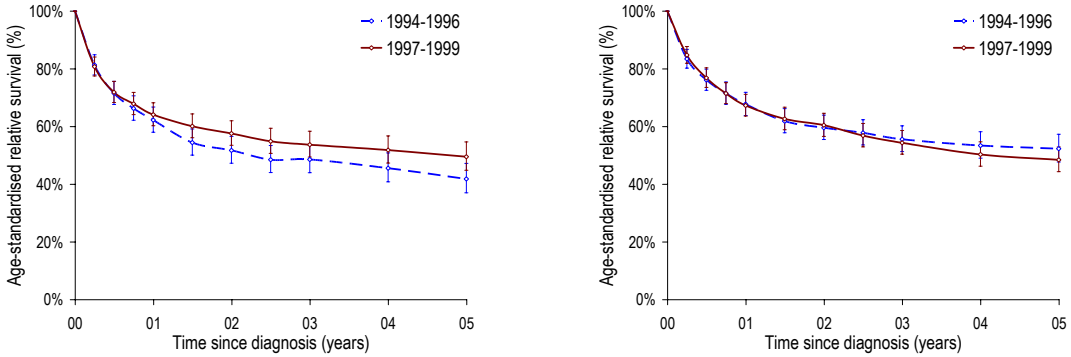
Figure 22.9: Age-standardised relative survival for lymphoma patients by sex, country and period of diagnosis: 1994-1999

(i) Male **(ii)** Female

(a) Northern Ireland



(b) Republic of Ireland



(c) Ireland

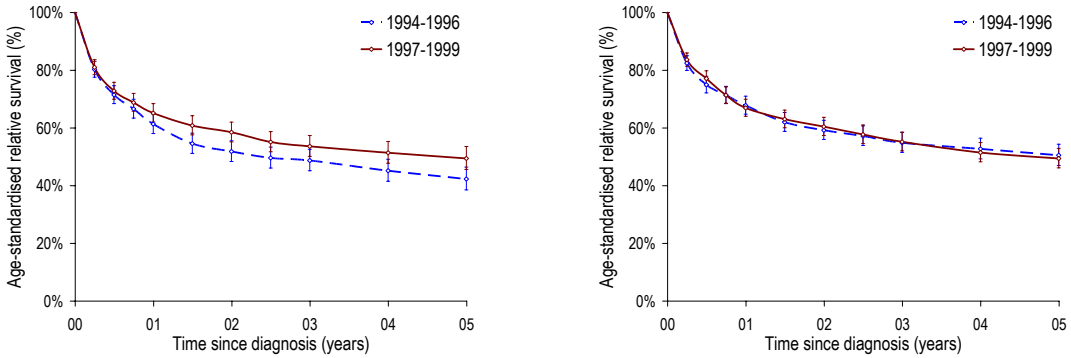


Table 22.6: Age-standardised relative survival for lymphoma patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	64.0% (60.5%, 67.8%)	66.5% (63.1%, 70.1%)	45.4% (41.4%, 49.9%)	49.2% (45.1%, 53.6%)
	Republic of Ireland	64.7% (61.8%, 67.7%)	65.5% (62.8%, 68.3%)	46.8% (43.4%, 50.4%)	48.4% (45.3%, 51.7%)
	Ireland	64.4% (62.1%, 66.7%)	65.9% (63.8%, 68.1%)	46.2% (43.6%, 49.0%)	48.8% (46.3%, 51.4%)
Male	Northern Ireland	60.4% (55.4%, 66.0%)	67.2% (62.1%, 72.7%)	43.6% (37.8%, 50.3%)	48.9% (42.6%, 56.1%)
	Republic of Ireland	62.3% (58.1%, 66.8%)	64.1% (60.3%, 68.2%)	41.9% (37.1%, 47.3%)	49.5% (44.9%, 54.7%)
	Ireland	61.4% (58.1%, 64.8%)	65.2% (62.1%, 68.4%)	42.3% (38.6%, 46.4%)	49.4% (45.6%, 53.6%)
Female	Northern Ireland	67.8% (62.9%, 73.0%)	66.1% (61.6%, 71.0%)	47.2% (41.7%, 53.5%)	50.6% (45.4%, 56.4%)
	Republic of Ireland	67.8% (63.9%, 71.9%)	67.3% (63.6%, 71.2%)	52.3% (47.7%, 57.4%)	48.5% (44.4%, 52.9%)
	Ireland	67.8% (64.8%, 71.0%)	66.9% (64.1%, 70.0%)	50.6% (47.0%, 54.4%)	49.4% (46.2%, 52.9%)

22.2.2: Observed survival

Observed survival includes causes of death in addition to lymphoma and is unadjusted for age, thereby representing the survival actually experienced by patients. Five-year observed survival was 49.1% for patients diagnosed in 1997-1999, with no significant difference between males and females or between Northern Ireland and Republic of Ireland during this three-year period. Observed survival for lymphoma did not change significantly between 1994-1996 and 1997-1999. (Tab. 22.7)

Table 22.7: Observed survival for lymphoma patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	65.6% (62.3%, 69.0%)	68.0% (64.8%, 71.3%)	44.1% (40.7%, 47.8%)	46.7% (43.3%, 50.3%)
	Republic of Ireland	68.7% (66.3%, 71.3%)	70.0% (67.7%, 72.4%)	48.8% (46.2%, 51.6%)	50.5% (48.0%, 53.1%)
	Ireland	67.6% (65.6%, 69.6%)	69.3% (67.4%, 71.2%)	47.1% (45.0%, 49.3%)	49.1% (47.1%, 51.2%)
Male	Northern Ireland	64.1% (59.5%, 69.0%)	69.7% (65.3%, 74.5%)	43.8% (39.2%, 49.0%)	45.6% (41.0%, 50.9%)
	Republic of Ireland	66.4% (63.0%, 70.0%)	69.5% (66.4%, 72.8%)	44.4% (40.8%, 48.2%)	50.3% (47.0%, 53.9%)
	Ireland	65.6% (62.8%, 68.4%)	69.6% (67.0%, 72.3%)	44.2% (41.3%, 47.2%)	48.8% (46.0%, 51.7%)
Female	Northern Ireland	67.2% (62.5%, 72.3%)	66.3% (61.8%, 71.0%)	44.4% (39.6%, 49.9%)	47.7% (43.1%, 52.8%)
	Republic of Ireland	71.3% (67.8%, 75.0%)	70.6% (67.2%, 74.1%)	53.8% (50.0%, 57.9%)	50.7% (47.0%, 54.6%)
	Ireland	69.8% (67.0%, 72.7%)	68.9% (66.2%, 71.7%)	50.4% (47.3%, 53.6%)	49.5% (46.6%, 52.6%)

22.2.3: Cancer site

Hodgkin's lymphoma

For patients diagnosed in 1997-1999 five-year (age-standardised) relative survival from Hodgkin's lymphoma was 73.8%. This value did not vary by sex or country and did not vary significantly from survival for those diagnosed in 1994-1996. (Tab. 22.8)

Table 22.8: Age-standardised relative survival for Hodgkin's lymphoma patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	84.8% (78.8%, 91.3%)	86.5% (80.9%, 92.6%)	73.3% (64.3%, 83.5%)	79.3% (71.5%, 88.1%)
	Republic of Ireland	87.4% (82.7%, 92.4%)	83.1% (79.1%, 87.3%)	73.2% (67.1%, 79.8%)	71.4% (66.2%, 77.0%)
	Ireland	86.3% (82.5%, 90.2%)	84.0% (80.7%, 87.4%)	74.0% (68.6%, 79.7%)	73.8% (69.3%, 78.5%)
Male	Northern Ireland	82.5% (74.3%, 91.6%)	87.6% (79.6%, 96.4%)	70.2% (58.4%, 84.3%)	73.1% (62.5%, 85.6%)
	Republic of Ireland	83.5% (77.5%, 89.9%)	82.3% (77.2%, 87.8%)	67.2% (58.6%, 77.0%)	72.9% (65.3%, 81.3%)
	Ireland	83.0% (77.9%, 88.4%)	84.1% (79.7%, 88.8%)	68.0% (61.0%, 75.8%)	73.5% (66.8%, 80.8%)
Female	Northern Ireland	88.0% (79.1%, 98.0%)	84.1% (75.5%, 93.6%)	73.5% (63.8%, 84.7%)	82.5% (72.9%, 93.4%)
	Republic of Ireland	88.6% (80.1%, 98.1%)	84.0% (78.4%, 90.0%)	82.6% (71.0%, 96.1%)	70.7% (64.0%, 78.0%)
	Ireland	89.9% (84.0%, 96.2%)	83.9% (79.1%, 89.0%)	80.2% (71.8%, 89.5%)	74.5% (68.8%, 80.7%)

Non-Hodgkin's lymphoma

Survival from non-Hodgkin's lymphoma was considerably lower than for Hodgkin's lymphoma during 1997-1999 with five-year (age-standardised) relative survival 48.4% for males and 49.3% for females (compared to 73.5% and 74.5% respectively for Hodgkin's lymphoma). The difference in survival from non-Hodgkin's lymphoma between males and females was not statistically significant, nor where there any significant differences between survival in Northern Ireland and Republic of Ireland for this disease. There were also no significant variations in relative survival between those diagnosed in 1994-1996 and 1997-1999. (Tab. 22.9)

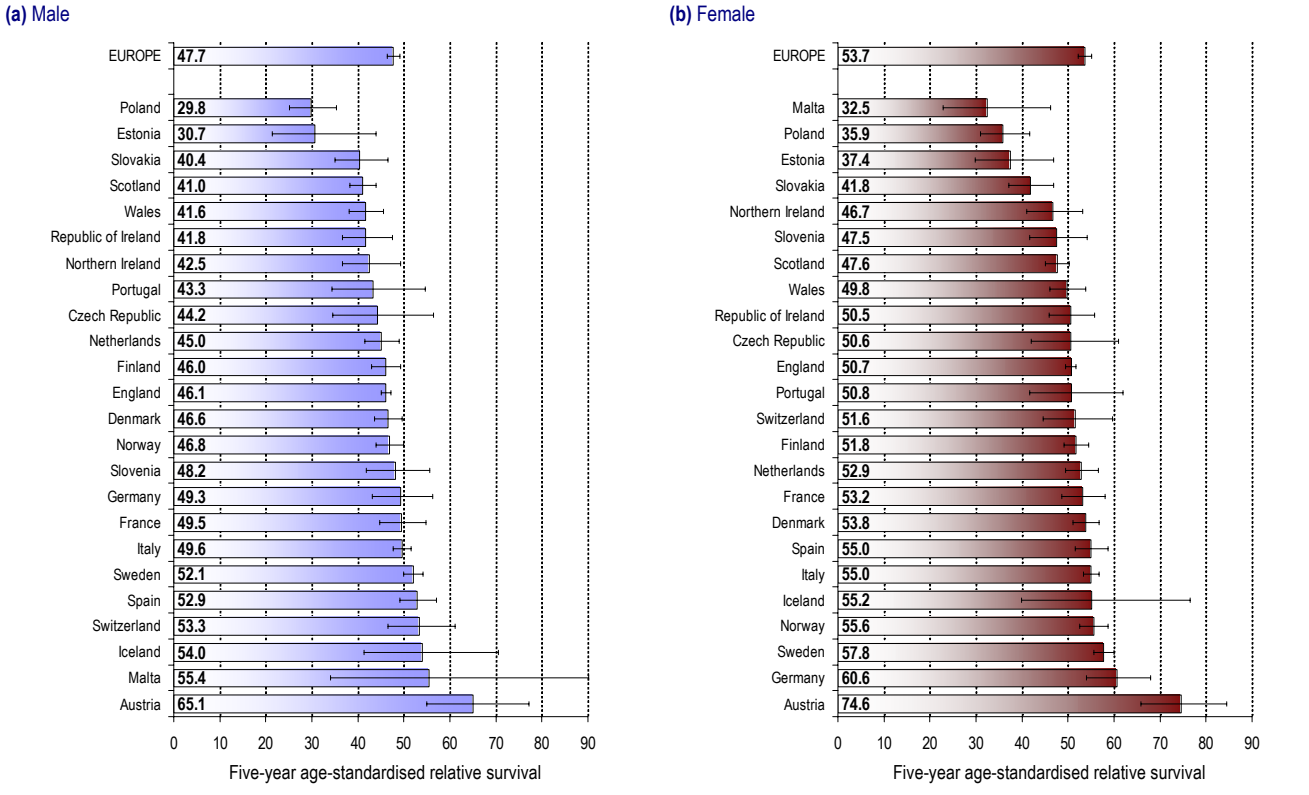
Table 22.9: Age-standardised relative survival for non-Hodgkin's lymphoma patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	63.7% (60.0%, 67.6%)	66.1% (62.6%, 69.9%)	44.8% (40.6%, 49.4%)	47.9% (43.7%, 52.4%)
	Republic of Ireland	63.8% (60.8%, 67.0%)	65.7% (62.9%, 68.6%)	45.8% (42.3%, 49.6%)	48.1% (44.9%, 51.6%)
	Ireland	63.7% (61.3%, 66.1%)	65.9% (63.7%, 68.2%)	45.3% (42.6%, 48.1%)	48.2% (45.6%, 50.9%)
Male	Northern Ireland	59.8% (54.5%, 65.7%)	66.5% (61.2%, 72.2%)	42.5% (36.6%, 49.3%)	47.4% (41.0%, 54.9%)
	Republic of Ireland	61.8% (57.5%, 66.5%)	64.3% (60.3%, 68.6%)	41.8% (36.7%, 47.5%)	48.7% (43.8%, 54.1%)
	Ireland	60.8% (57.4%, 64.5%)	65.1% (61.8%, 68.5%)	41.7% (37.8%, 46.0%)	48.4% (44.4%, 52.7%)
Female	Northern Ireland	67.4% (62.5%, 72.8%)	66.1% (61.4%, 71.1%)	46.7% (41.0%, 53.2%)	49.6% (44.2%, 55.6%)
	Republic of Ireland	66.5% (62.4%, 70.8%)	67.9% (64.1%, 71.9%)	50.5% (45.8%, 55.7%)	49.0% (44.7%, 53.7%)
	Ireland	66.9% (63.7%, 70.2%)	67.2% (64.3%, 70.4%)	49.3% (45.6%, 53.2%)	49.3% (45.9%, 53.0%)

22.2.4: European comparisons

Considering non-Hodgkin's lymphoma only, five-year (age-standardised) relative survival for patients diagnosed in Northern Ireland and Republic of Ireland in 1994-1996 was similar to that in Europe as a whole for patients diagnosed in 1990-1994. Survival in Ireland was also similar to that in the UK; however Austria had considerably better survival than in both countries for males and females. (Fig. 22.10)

Figure 22.10: European comparisons of five-year age-standardised relative survival for non-Hodgkin's lymphoma patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[176]

22.3: Mortality

Deaths from lymphoma (including non-Hodgkin's and Hodgkin's lymphoma) made up 3.5% of all cancer deaths (excluding NMSC) in Ireland during 2000-2004 with 203 male and 190 female deaths from the disease each year. It was the eighth most common male cancer death in Ireland with a cumulative risk of death from the disease before the age of 75 of 0.6%. Among females it was the seventh commonest form of cancer death with a cumulative risk of death from the disease before the age of 75 of 0.4%. (Tab. 22.10)

European age-standardised mortality rates (EASMR) for lymphoma were 38.3% (p<0.001) higher among males than females during 2000-2004. The difference between males and females was slightly higher in Northern Ireland than Republic of Ireland (44.9% vs 35.1%) however there was no significant difference in EASMRs between Northern Ireland and Republic of Ireland during the five-year period. (Tab. 22.10)

Table 22.10: Summary statistics for deaths from lymphoma: 2000-2004

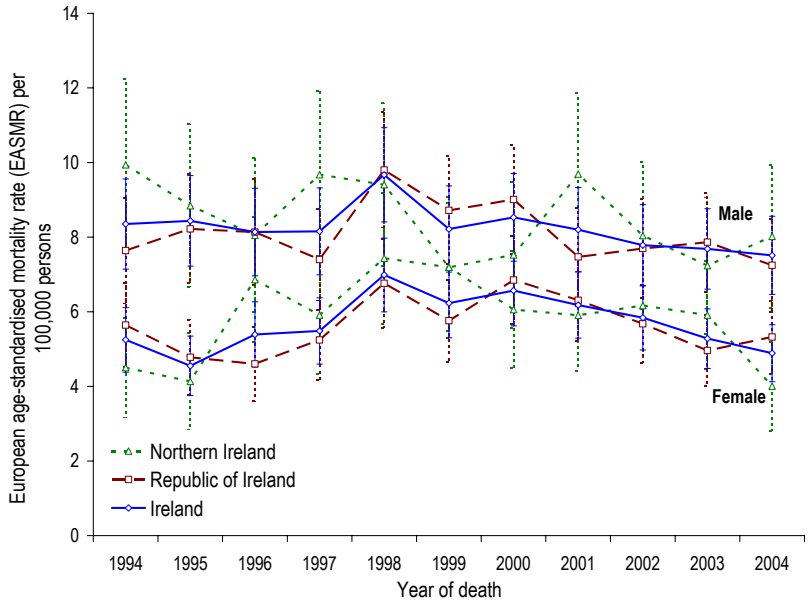
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	67	64	131	136	126	262	203	190	392
% of all cancer deaths (ex. NMSC)	3.6%	3.6%	3.6%	3.4%	3.5%	3.4%	3.4%	3.6%	3.5%
Rank (ex. NMSC)	7	7	8	9	7	9	8	7	8
Median age at death	70	73	72	68	73	70	68	73	71
Cumulative risk (Aged 0 to 74)	0.6%	0.4%	0.5%	0.6%	0.4%	0.5%	0.6%	0.4%	0.5%
Crude rate per 100,000 persons	8.1	7.4	7.7	7.0	6.4	6.7	7.3	6.7	7.0
EASMR ± 95% CI	8.1 ±0.9	5.6 ±0.6	6.7 ±0.5	7.8 ±0.6	5.8 ±0.5	6.7 ±0.4	7.9 ±0.5	5.7 ±0.4	6.7 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							3.3% ±13.7	-3.7% ±13.7	-0.2% ±9.6

EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

22.3.1: Trends

Among males there was no significant change in European age-standardised mortality rates (EASMR) during 1994-2004. This was also the situation in Northern Ireland and Republic of Ireland. As a result of population ageing and growth the actual number of deaths remained virtually static in Northern Ireland, while in Republic of Ireland there was an increase of 1.3 deaths per year over the eleven-year period. (Fig. 22.11)

Figure 22.11: Trends in European age-standardised mortality rates (EASMR) for lymphoma by sex and country: 1994-2004



Among females EASMRs increased by 5.6% per year (p=0.037) between 1994 and 2000. However between 2000 and 2004 they decreased by 7.9% each year, although this decrease was not statistically significant (p=0.065). Over the full eleven years (1994-2004) this translated to an average increase of 4.1 female deaths from lymphoma each year. In both Northern Ireland and Republic of Ireland there was no significant change in EASMRs throughout 1994-2004. As a result of the changing demographics however there was an annual increase of 1.1 deaths in Northern Ireland and 3.0 deaths in Republic of Ireland as a result of the disease. (Fig. 22.11)

22.4: Prevalence

At the end of 2004 there were 4,875 people living in Ireland who had been diagnosed with lymphoma during 1994-2004, which was 53.3% of all lymphoma patients diagnosed during this period. The majority of these (2,956 people) were diagnosed in the 2000-2004 period, which was 65.2% of all those diagnosed within these five years. (Tab. 22.11)

Table 22.11: Prevalence of lymphoma in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	791	49.8%	470	62.7%
	Female	800	50.3%	489	64.0%
	All persons	1,591	50.0%	959	63.3%
Republic of Ireland	Male	1,715	53.7%	1,045	65.3%
	Female	1,569	56.5%	952	66.9%
	All persons	3,284	55.0%	1,997	66.1%
Ireland	Male	2,506	52.4%	1,515	64.4%
	Female	2,369	54.2%	1,441	65.9%
	All persons	4,875	53.3%	2,956	65.2%

The majority of those alive at the end of 2004 having been diagnosed within the previous five years were male (1,515 males compared to 1,441 females) while 959 survivors were resident in Northern Ireland compared to 1,997 in Republic of Ireland. At the end of 2004 the number of people living with lymphoma per 100,000 persons, having been diagnosed with the disease in the previous five years, was 13.5% higher in Northern Ireland than Republic of Ireland. (Tab. 22.11)

22.5: Discussion

Lymphoma is a cancer of the lymphatic system with 4 out of 5 cases of the disease being non-Hodgkin's lymphoma, with the remainder being Hodgkin's lymphoma. It can occur in any part of the body with the neck being the most usual place for it to first appear. Symptoms of the disease include swelling of the neck, armpit or groin, extreme weight loss or spells of high temperature including heavy sweating at night.[177,178]

Not much is known about the causes of Hodgkin's lymphoma although two possible factors have been suggested; infection with Epson-Barr virus and/or a faulty gene. Further research however is required before a definite link is established.[179,180]

The risk of non-Hodgkin's lymphoma is increased by the use of immunosuppression, for example in transplant patients,[181] or among those with HIV infection, although only about 3% of HIV positive patients will develop non-Hodgkin's lymphoma.[181] Both increase risk by a weakening of the immune system. Various other infections also increase the risk of developing this cancer. Epstein-Barr virus is associated with Burkitt's lymphoma,[182] helicobacter pylori is linked with primary gastric lymphoma,[183] coliac disease is linked with both enteropathy type T cell lymphoma and B cell non-Hodgkin's lymphoma while human T cell lymphoma increases the risk of developing any type of non-Hodgkin's lymphoma.[182] There are many other possible factors that increase the risk of developing this cancer; however these have yet to be substantiated. They include family history, diet and use of recreational drugs, exposure to agricultural chemicals or chemicals in drinking water, use of hair dye for more than 10 years or exposure to Hepatitis C.[184] It has been shown that there is no increased risk from cigarette smoking or alcohol consumption.[185]

Globally there are approximately 350,000 cases of lymphoma diagnosed each year, with 290,000 of these non-Hodgkin's lymphoma. Incidence of the disease is increasing, as observed in Ireland, however while this increase can be partially explained by improvements in diagnostic methods and the relationship between the disease and AIDS, the reasons for the increase are not fully understood. Non-Hodgkin's lymphoma is more commonly found in developed countries but also in some areas of South America, Africa and the Middle East. Hodgkin's disease however is rare among Eastern Asian populations but is highest in parts of Africa, Western Europe and Middle East, with developed countries having average incidence rates of the disease. It is also a disease more common in younger people compared to non-Hodgkin's lymphoma which is more common among older adults.

Diagnosis of the disease is made primarily through tissue biopsy prompted by presentation of symptoms. Treatment of non-Hodgkin's lymphoma depends upon type, stage, behaviour, age and general health of the patients. However chemotherapy is the most effective form of treatment, with the type of drugs used varying according to these criteria. Radiotherapy is useful for some

types of non-Hodgkin's lymphoma at an early stage. Treatment for Hodgkin's lymphoma however depends upon stage at diagnosis, with radiotherapy used at an early stage and chemotherapy for the remaining stages. Treatment continues to improve with improvements in survival from lymphoma apparent worldwide. While not conclusively seen in Ireland during the period of this report there are suggestions within the analysis conducted that survival may be slowly improving.

Chapter 23:

Multiple myeloma (C90)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were on average 181 male and 136 female cases diagnosed per year in Ireland between 2000 and 2004.*
  - *There was no significant trend in incidence rates during 1994 and 2004 for either sex or country.*
  - *County Cork exhibited higher than expected incidence rates for females diagnosed between 1994 and 2004. No other counties/councils in Ireland had higher than expected incidence rates.*
  - *Among males incidence rates were significantly higher than those found in the EU, Canada and UK. Female incidence rates were similar to those in EU, USA, Canada, Australia and UK.*
  - *There was an average of 112 male and 95 female deaths each year between 2000 and 2004.*
  - *Mortality rates in Ireland decreased among males during 1994-2004 by 1.7% per year. Female mortality rates exhibited no significant change.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year relative survival was estimated to 34.9% for patients diagnosed in 2000-2004. Differences between males and females were not significant at 32.9% for males and 38.5% for females.*
  - *There was no significant change in relative survival between those diagnosed in 1994-1996 and 1997-1999 for either males or females in Ireland.*
  - *At the end of 2004 there were 975 people living in Ireland who had been diagnosed with the disease in 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Northern Ireland and Republic of Ireland had similar levels of the disease with no significant difference in incidence rates.*
  - *For the 2000-2004 period there was no difference in survival between Northern Ireland and Republic of Ireland however for the 1997-1999 period female survival was 16.7% higher in Northern Ireland.*
  - *Mortality rates during 2000-2004 were 22.0% lower in Northern Ireland than Republic of Ireland for males and 18.6% lower for females.*
  - *At the end of 2004 the number of people per 100,000 members of the population who had been diagnosed with the disease in the previous five years was 29.7% higher in Northern Ireland than Republic of Ireland.*

23.1: Incidence

Multiple myeloma was one of the less common cancers diagnosed during 2000-2004 being the fifteenth most common male and seventeenth most common female cancer (excluding NMSC). During this period there were 181 male and 136 female cases diagnosed each year, which made up 1.6% and 1.3% of all cancers (excluding NMSC) respectively. The risk of developing the disease before the age of 75 was 0.5% for males and 0.3% for females. (Tab. 23.1)

As with most cancers European age-standardised incidence rates (EASIR) were higher among males than females, with a 71.1% ($p<0.001$) difference between the two sexes. Both Northern Ireland and Republic of Ireland had similar levels of the disease with no significant difference between incidence rates. (Tab. 23.1)

Table 23.1: Summary statistics for incidence of multiple myeloma: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	60	47	107	121	89	211	181	136	317
% of all cancer cases (ex. NMSC)	1.8%	1.4%	1.6%	1.6%	1.3%	1.4%	1.6%	1.3%	1.5%
Rank (ex. NMSC)	15	17	17	15	17	17	15	17	17
Median age at diagnosis	70	74	72	70	73	71	70	73	71
Cumulative risk (Aged 0 to 74)	0.5%	0.3%	0.4%	0.5%	0.3%	0.4%	0.5%	0.3%	0.4%
Crude rate per 100,000 persons	7.2	5.4	6.3	6.2	4.5	5.4	6.5	4.8	5.7
EASIR ± 95% CI	7.2 ±0.8	4.1 ±0.6	5.4 ±0.5	7.0 ±0.6	4.2 ±0.4	5.5 ±0.3	7.1 ±0.5	4.1 ±0.3	5.5 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							2.7% ±14.4	-2.1% ±16.4	-0.5% ±10.7

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

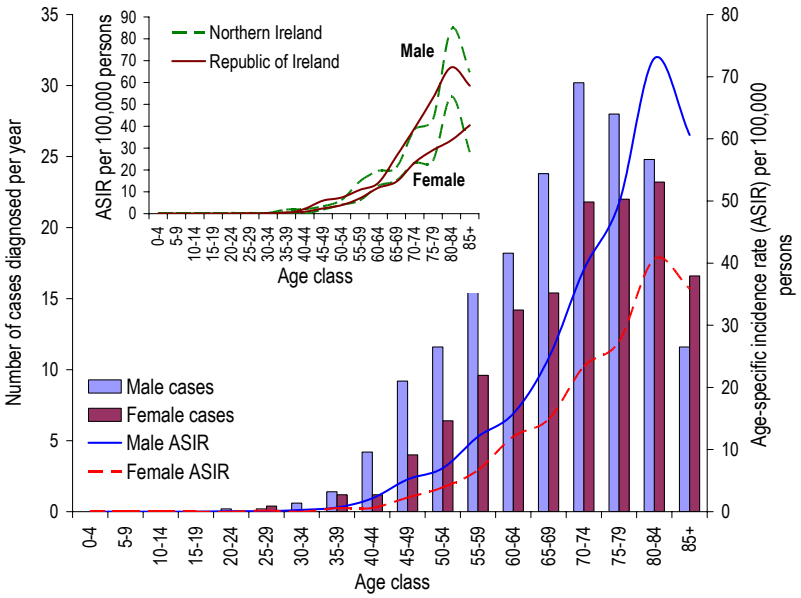
23.1.1: Age distribution

Multiple myeloma had a median age at diagnosis of 71 for patients diagnosed during 2000-2004. Cases peaked in the 70-74 age class for males and the 80-84 age class for females with an average of 30 (16.6%) and 23 (17.1%) cases diagnosed respectively each year. (Fig. 23.1)

Age-specific incidence rates (ASIR) were highest for both sexes in the 80-84 age class with males having higher ASIRs, particularly among the elderly. This was also the case in Northern Ireland however female ASIRs in Republic of Ireland peaked in the 85+ age class. (Fig. 23.1)

There were no children (aged 0-14) diagnosed with multiple myeloma during 2000-2004. (Fig. 23.1)

Figure 23.1: Number of cases of multiple myeloma diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004

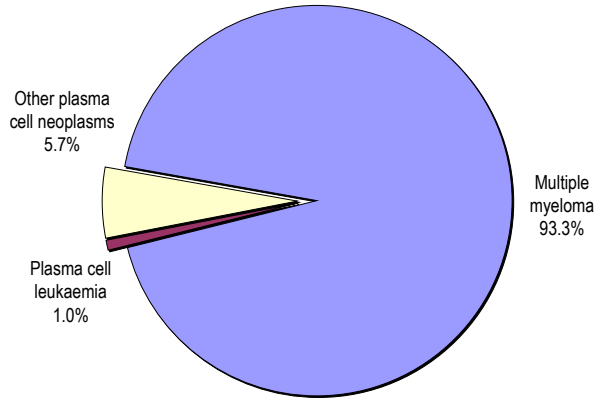


23.1.2: Cancer site

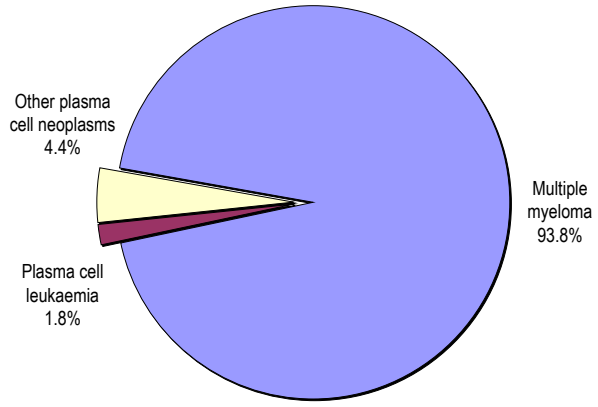
The cancer site classified as multiple myeloma (C90) includes two other rare forms of cancer, plasma cell leukaemia (C90.1) and other plasma cell neoplasms (C90.2), in addition to multiple myeloma itself (C90.0). In Ireland 5.2% of cases classified as multiple myeloma were other plasma cell neoplasms while 1.3% were plasma cell leukaemias. These proportions varied slightly by sex while other plasma cell neoplasms made up 1.3% of cases in Northern Ireland compared to 7.1% of cases in Republic of Ireland. (Fig. 23.2)

Figure 23.2: Types of multiple myeloma diagnosed in Ireland: 2000-2004

(a) Male



(b) Female

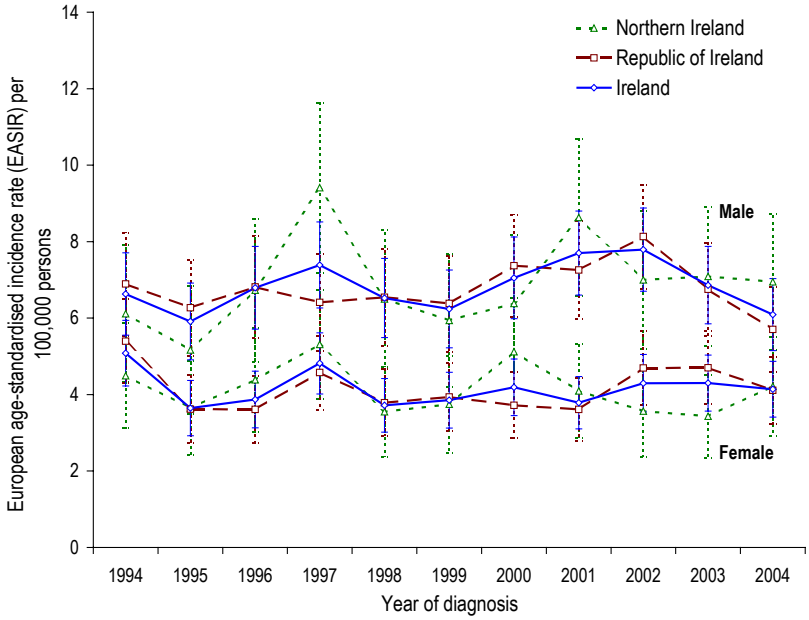


23.1.3: Trends

There was no significant trend in European age-standardised incidence rates (EASIR) for multiple myeloma between 1994 and 2004 for either sex or country. (Fig. 23.3)

Despite the static rates the number of cases diagnosed increased by 3.9 male and 0.9 female cases each year as a result of population growth and ageing. (Tab. 23.2)

Figure 23.3: Trends in European age-standardised incidence rates (EASIR) for multiple myeloma by sex and country: 1994-2004



23.1.4: Geographic variations

County Cork exhibited higher than expected female incidence rates for multiple myeloma between 1994 and 2004 compared to Ireland as a whole. No other counties/councils in Ireland had higher than expected rates of the disease.

However Ards, South Tipperary and Wexford had lower than average incidence rates for males while Strabane and Wicklow had lower than expected levels for females. Belfast and Dublin had 17 and 48 cases diagnosed respectively each year, both within the expected range. (Fig.23.4)

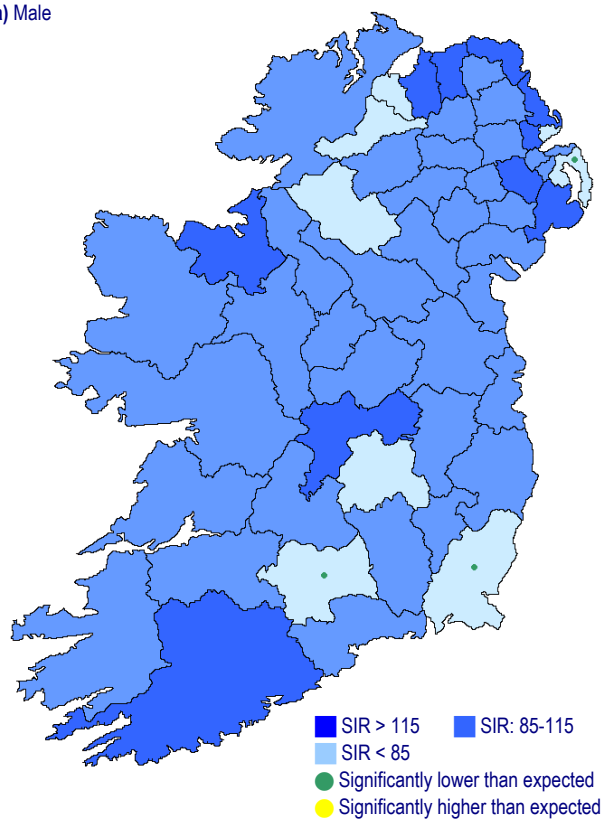
Table 23.2: Number of cases and European age-standardised incidence rates (EASIR) for multiple myeloma by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	46	6.1 ±1.8	105	6.9 ±1.3	151	6.6 ±1.1	46	4.5 ±1.4	102	5.4 ±1.1	148	5.1 ±0.9
1995	38	5.2 ±1.7	99	6.3 ±1.3	137	5.9 ±1.0	38	3.7 ±1.2	70	3.6 ±0.9	108	3.6 ±0.7
1996	51	6.7 ±1.9	104	6.8 ±1.3	155	6.8 ±1.1	45	4.4 ±1.4	71	3.6 ±0.9	116	3.9 ±0.7
1997	70	9.4 ±2.2	100	6.4 ±1.3	170	7.4 ±1.1	60	5.3 ±1.4	95	4.6 ±1.0	155	4.8 ±0.8
1998	51	6.5 ±1.8	105	6.5 ±1.3	156	6.5 ±1.0	39	3.5 ±1.2	78	3.8 ±0.9	117	3.7 ±0.7
1999	46	5.9 ±1.7	102	6.4 ±1.3	148	6.2 ±1.0	37	3.7 ±1.3	80	3.9 ±0.9	117	3.9 ±0.7
2000	50	6.4 ±1.8	121	7.4 ±1.3	171	7.1 ±1.1	58	5.1 ±1.4	78	3.7 ±0.9	136	4.2 ±0.7
2001	69	8.6 ±2.1	123	7.3 ±1.3	192	7.7 ±1.1	49	4.1 ±1.2	81	3.6 ±0.8	130	3.8 ±0.7
2002	60	7.0 ±1.8	140	8.1 ±1.4	200	7.8 ±1.1	39	3.6 ±1.2	98	4.7 ±1.0	137	4.3 ±0.7
2003	61	7.1 ±1.8	120	6.8 ±1.2	181	6.9 ±1.0	44	3.4 ±1.1	100	4.7 ±1.0	144	4.3 ±0.7
2004	60	6.9 ±1.8	103	5.7 ±1.1	163	6.1 ±0.9	44	4.2 ±1.3	89	4.1 ±0.9	133	4.1 ±0.7

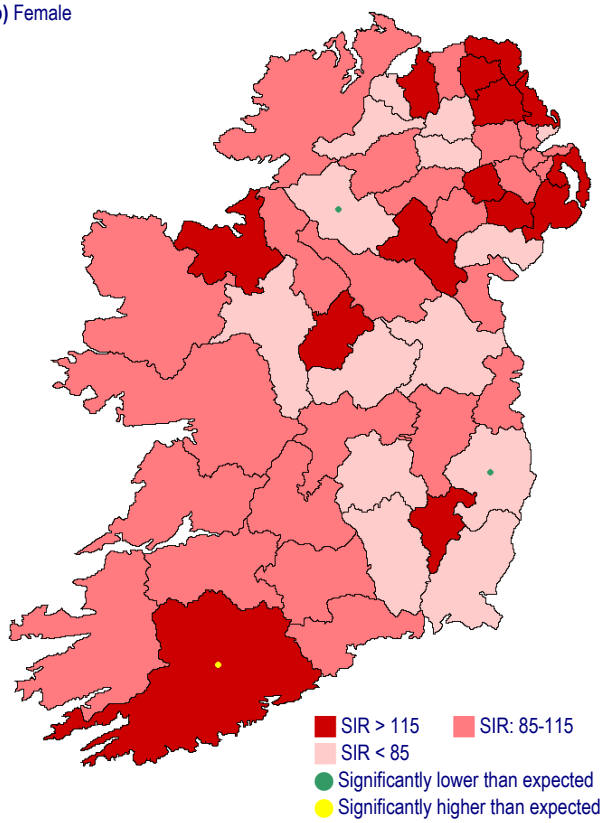
EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

Figure 23.4: Significant differences in county/council standardised incidence ratios for multiple myeloma compared to Ireland as a whole: 1994-2004

(a) Male



(b) Female

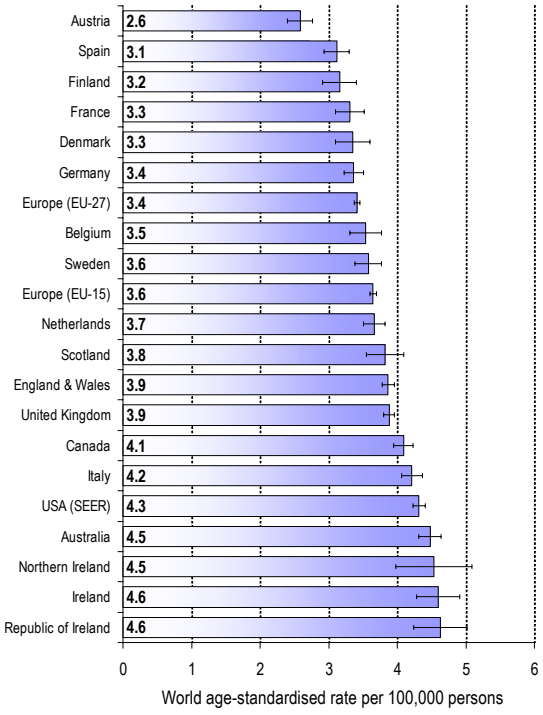


23.1.5: International comparisons

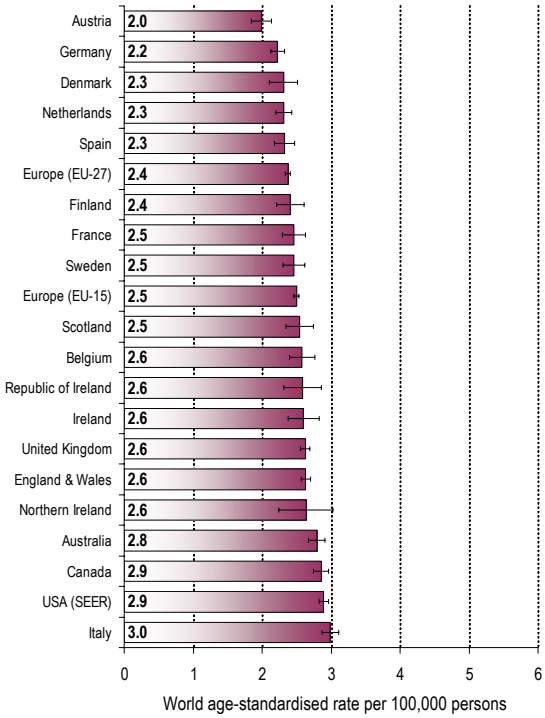
Among males incidence rates for multiple myeloma were high relative to other developed countries with rates significantly higher than those found in the European Union, Canada and UK although incidence rates were similar to those in USA and Australia. There was no significant difference in levels of multiple myeloma among females compared to the European Union, USA, Canada, Australia or UK. (Fig. 23.5)

Figure 23.5: International comparisons of world age-standardised incidence rates for multiple myeloma: 1998-2000

(a) Male



(b) Female



Source: IARC[187]

23.2: Survival

Survival from multiple myeloma was average with five-year (age-standardised) relative survival estimated to be 34.9%. Differences in five-year (age-standardised) relative survival between males and females were not significant at 32.9% for males and 38.5% for females. (Fig. 23.6, Tab. 23.3)

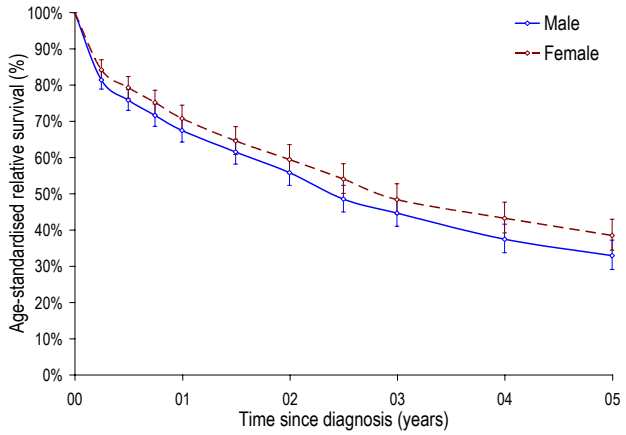
Table 23.3: Age-standardised relative survival for multiple myeloma patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	69.9% (64.5%, 75.6%)	72.4% (66.7%, 78.6%)	70.8% (66.8%, 75.0%)
	Republic of Ireland	66.4% (62.5%, 70.5%)	70.1% (65.7%, 74.7%)	67.8% (64.9%, 70.9%)
	Ireland	67.5% (64.3%, 70.8%)	70.8% (67.3%, 74.5%)	68.8% (66.4%, 71.3%)
5-year	Northern Ireland	36.7% (30.0%, 45.0%)	45.1% (38.8%, 52.5%)	39.8% (34.9%, 45.4%)
	Republic of Ireland	31.5% (27.1%, 36.6%)	34.9% (29.9%, 40.7%)	32.6% (29.2%, 36.4%)
	Ireland	32.9% (29.1%, 37.2%)	38.5% (34.5%, 43.0%)	34.9% (32.1%, 38.1%)

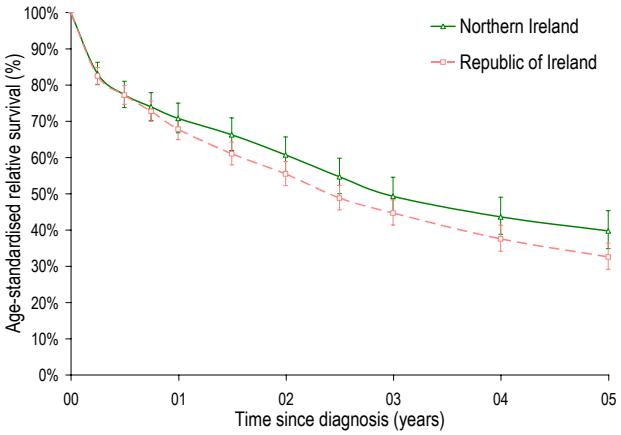
Differences in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland were also inconclusive at 39.8% and 32.6% respectively for all persons. (Fig. 23.6, Tab. 23.3)

Figure 23.6: Age-standardised relative survival for multiple myeloma patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



23.2.1: Changes in survival over time

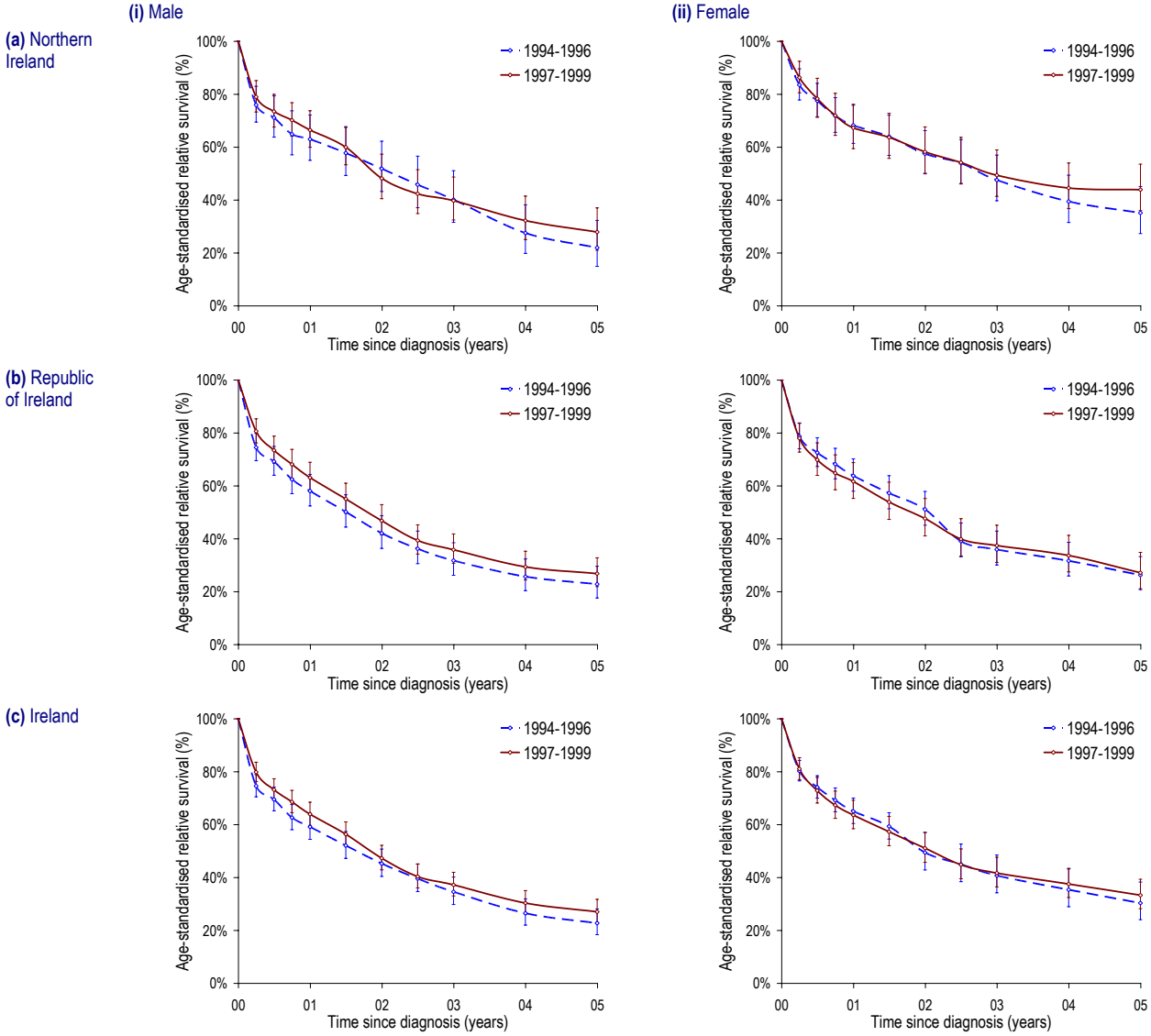
There was no significant change in (age-standardised) relative survival for males or females diagnosed with multiple myeloma between 1994-1996 and 1997-1999. This was apparent in Northern Ireland and Republic of Ireland as well as Ireland as a whole. (Fig. 23.7, Tab. 23.4)

While there was no significant difference between Northern Ireland and Republic of Ireland in estimates of (age-standardised) relative survival for the 2000-2004 period, actual survival five-year (age-standardised) relative survival in Northern Ireland was 16.7% (p=0.029) higher than in Republic of Ireland for females diagnosed in 1997-1999. There was however no conclusive difference in five-year (age-standardised) relative survival between the two countries during the 1994-1996 period. (Fig. 23.7, Tab. 23.4)

Table 23.4: Age-standardised relative survival for multiple myeloma patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	64.9% (59.2%, 71.2%)	67.6% (62.6%, 73.1%)	27.2% (21.3%, 34.9%)	35.5% (30.0%, 42.1%)
	Republic of Ireland	59.7% (55.4%, 64.4%)	63.2% (59.1%, 67.6%)	25.6% (21.4%, 30.5%)	27.5% (23.6%, 32.1%)
	Ireland	61.1% (57.6%, 64.9%)	64.5% (61.2%, 67.9%)	26.1% (22.6%, 30.1%)	30.2% (26.9%, 33.8%)
Male	Northern Ireland	63.0% (55.0%, 72.2%)	66.5% (60.0%, 73.8%)	22.0% (15.0%, 32.3%)	27.9% (21.1%, 37.1%)
	Republic of Ireland	58.1% (52.4%, 64.4%)	63.2% (57.9%, 69.0%)	22.9% (17.6%, 29.6%)	26.8% (21.9%, 32.8%)
	Ireland	59.2% (54.4%, 64.3%)	64.0% (59.7%, 68.5%)	22.8% (18.4%, 28.1%)	27.1% (23.0%, 31.8%)
Female	Northern Ireland	68.3% (61.5%, 75.8%)	67.3% (59.5%, 76.2%)	35.1% (27.4%, 45.1%)	43.9% (36.0%, 53.6%)
	Republic of Ireland	63.8% (58.0%, 70.2%)	61.7% (55.3%, 68.8%)	26.3% (20.8%, 33.3%)	27.2% (21.2%, 34.9%)
	Ireland	65.1% (60.4%, 70.0%)	63.6% (58.5%, 69.2%)	30.4% (24.1%, 38.3%)	33.3% (28.2%, 39.4%)

Figure 23.7: Age-standardised relative survival for multiple myeloma patients by sex, country and period of diagnosis: 1994-1999



23.2.2: Observed survival

One-year observed survival (which takes account of causes of death other than cancer and is thus lower than relative survival) was average at 59.6% for males and 58.5% for females diagnosed in 1997-1999. Five-year observed survival was poor for those diagnosed in this time period at 21.7% for males and 24.2% for females. The variations by sex were not statistically significant, nor were any variations in observed survival between Northern Ireland and Republic of Ireland despite a 12.4% difference for female five-year observed survival (p=0.066). Analysis of differences in observed survival over time did not reveal any significant change between 1994-1996 and 1997-1999. (Tab. 23.5)

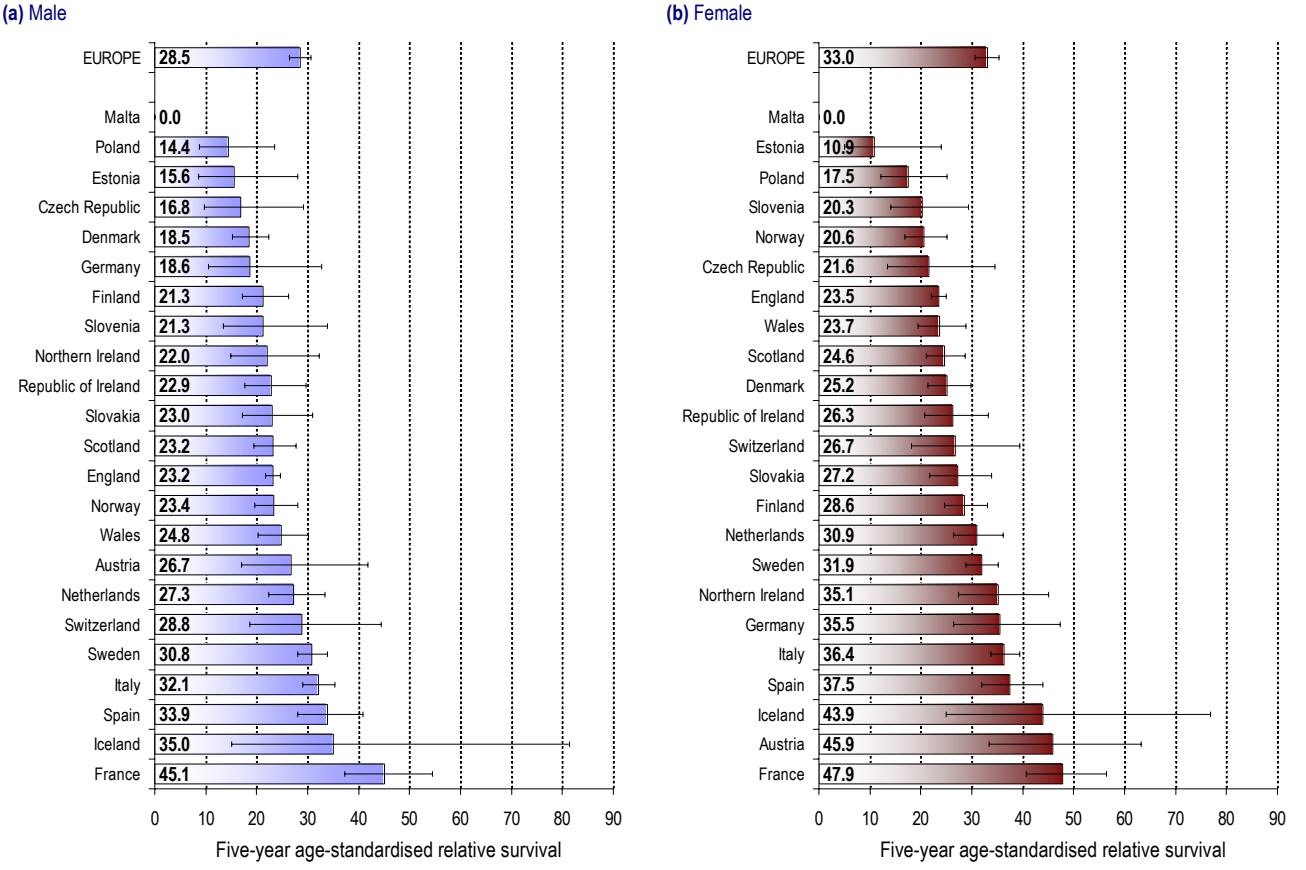
Table 23.5: Observed survival for multiple myeloma patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	57.7% (51.9%, 64.1%)	60.9% (55.5%, 66.8%)	20.2% (15.8%, 25.8%)	26.0% (21.4%, 31.5%)
	Republic of Ireland	55.3% (51.2%, 59.7%)	58.1% (54.0%, 62.5%)	18.9% (15.9%, 22.6%)	21.1% (17.8%, 24.9%)
	Ireland	56.1% (52.7%, 59.7%)	59.1% (55.8%, 62.6%)	19.3% (16.7%, 22.3%)	22.8% (20.1%, 25.9%)
Male	Northern Ireland	57.1% (49.1%, 66.5%)	60.1% (53.0%, 68.3%)	16.7% (11.3%, 24.6%)	20.9% (15.4%, 28.3%)
	Republic of Ireland	53.3% (47.8%, 59.3%)	59.3% (53.9%, 65.3%)	16.2% (12.4%, 21.0%)	22.1% (17.8%, 27.5%)
	Ireland	54.4% (49.9%, 59.4%)	59.6% (55.2%, 64.3%)	16.3% (13.1%, 20.3%)	21.7% (18.2%, 25.9%)
Female	Northern Ireland	58.3% (50.3%, 67.5%)	61.8% (54.0%, 70.7%)	23.6% (17.3%, 32.3%)	32.1% (25.0%, 41.1%)
	Republic of Ireland	57.8% (51.7%, 64.5%)	56.6% (50.5%, 63.4%)	22.4% (17.6%, 28.5%)	19.7% (15.2%, 25.6%)
	Ireland	57.9% (53.1%, 63.3%)	58.5% (53.6%, 63.8%)	22.8% (18.9%, 27.6%)	24.2% (20.2%, 29.1%)

23.2.3: European comparisons

Five-year (age-standardised) relative survival for males diagnosed in Northern Ireland and Republic of Ireland with multiple myeloma in 1994-1996 was 22.0% and 22.9% respectively, while for females it was 35.1% and 26.3% respectively. These values did not differ significantly from the European average for multiple myeloma patients diagnosed in 1990-1994. However France, which had the best survival from the disease, had significantly better male survival than in Northern Ireland and Republic of Ireland and female survival which was significantly better than that in Republic of Ireland. (Fig. 23.8)

Figure 23.8: European comparisons of five-year age-standardised relative survival for multiple myeloma patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)



Source: EUROCARE-III[188]

23.3: Mortality

An average of 112 male and 95 female deaths from multiple myeloma occurred each year between 2000 and 2004. This made up 1.9% of all male cancer deaths (excluding NMSC) and 1.8% of all female cancer deaths. It was the fourteenth most common male cancer death with a cumulative risk of dying from the disease before the age of 75 of 0.3%. Among females it was also the fourteenth commonest cancer death but with a lower risk of dying from the disease of 0.2%. (Tab. 23.6)

Table 23.6: Summary statistics for deaths from multiple myeloma: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	31	29	60	81	66	147	112	95	207
% of all cancer deaths (ex. NMSC)	1.7%	1.6%	1.6%	2.0%	1.9%	1.9%	1.9%	1.8%	1.8%
Rank (ex. NMSC)	14	16	16	14	13	16	14	14	16
Median age at death	75	78	76	74	77	75	74	77	75
Cumulative risk (Aged 0 to 74)	0.2%	0.2%	0.2%	0.3%	0.2%	0.2%	0.3%	0.2%	0.2%
Crude rate per 100,000 persons	3.8	3.3	3.5	4.1	3.4	3.7	4.0	3.4	3.7
EASMR ± 95% CI	3.7 ±0.6	2.3 ±0.4	2.9 ±0.3	4.8 ±0.5	2.8 ±0.3	3.7 ±0.3	4.4 ±0.4	2.6 ±0.2	3.4 ±0.2
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-22.0% ±14.7	-18.6% ±16.9	-21.7% ±10.8

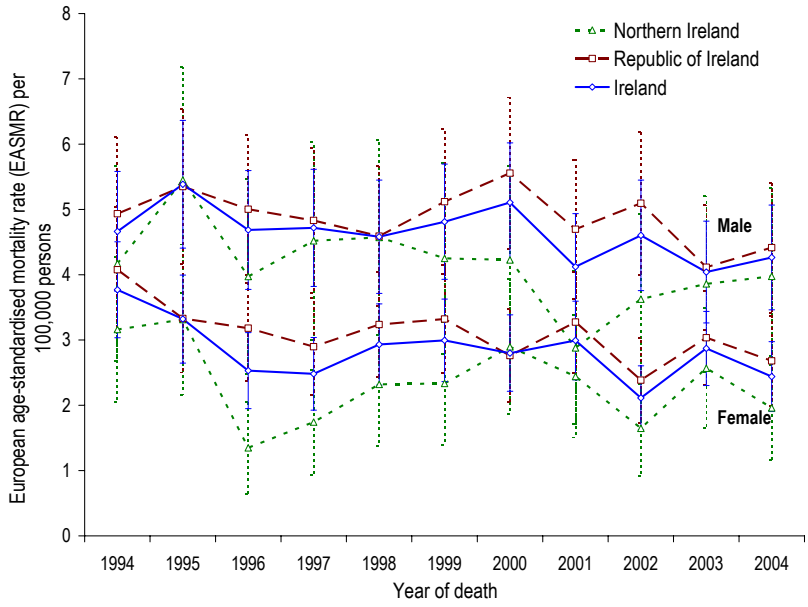
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

The number of male deaths from multiple myeloma exceeded the number of female deaths by a small margin however European age-standardised mortality rates (EASMR) were 67.7% higher among males than females. Comparing Northern Ireland and Republic of Ireland EASMRs were 22.0% (p=0.003) lower in Northern Ireland for males and 18.6% (p=0.031) lower for females. (Tab. 23.6)

23.3.1: Trends

European age standardised mortality rates (EASMR) in Ireland for multiple myeloma decreased among males during 1994-2004 by 1.7% (p=0.036) per year. Some evidence also existed for decreases in female EASMRs, however the annual percentage change in mortality rates for females (-2.7%, p=0.057) did not reach statistical significance. The reduction in mortality rates translated to a small annual decrease of 0.5 deaths per year. (Tab. 23.9)

Figure 23.9: Trends in European age-standardised mortality rates (EASMR) for multiple myeloma by sex and country: 1994-2004



Considering each country separately, there was no significant trend is EASMRs in Northern Ireland during 1994-2004. In Republic of Ireland however while no significant trend existed for males there was an annual decrease of 2.9% per year (p=0.018) in female EASMRs. For both countries there were small decreases in the absolute number of deaths from multiple myeloma each year. (Fig. 23.9)

23.4: Prevalence

Between 1994 and 2004 there were 3,265 people diagnosed with multiple myeloma. Of these 29.9% (975 people) were still alive at the end of 2004. The majority of these (751 people) were diagnosed in the 2000-2004 period, which was 47.3% of all those diagnosed during the five year period. (Tab. 23.7)

Table 23.7: Prevalence of multiple myeloma in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	193	32.1%	152	50.7%
	Female	160	32.1%	114	48.7%
	All persons	353	32.1%	266	49.8%
Republic of Ireland	Male	348	28.5%	276	45.5%
	Female	274	29.1%	209	46.9%
	All persons	622	28.7%	485	46.1%
Ireland	Male	541	29.7%	428	47.2%
	Female	434	30.1%	323	47.5%
	All persons	975	29.9%	751	47.3%

The majority of those alive at the end of 2004 having been diagnosed within the previous five years were male (428 males compared to 323 females) while 266 survivors were resident in Northern Ireland compared to 485 in Republic of Ireland. At the end of 2004 the number of people per 100,000 members of the population who had been diagnosed with the disease in the previous five years was 29.7% higher in Northern Ireland than Republic of Ireland. (Tab. 23.7)

23.5: Discussion

Multiple myeloma is a cancer that develops in plasma cells which are part of the immune system and are present in the bone marrow. There are several symptoms of the disease such as bone pain, thirst, tiredness, sickness, frequent urination, easy bruising or bleeding, susceptibility to infection or swollen ankles.[189]

Few risk factors for this cancer have been established although an increased risk has been associated with radiation exposure and the medical condition known as Monoclonal Gammopathy of Unknown Significance, with 20-30% of sufferers from this condition eventually developing multiple myeloma.[190] This cancer is also more common in black populations.[190]

Chemotherapy is the most effective form of treatment used for patients diagnosed with multiple myeloma, with response from this treatment fairly good. Receipt of treatment however depends upon several factors including stage at diagnosis, symptoms and general fitness levels. Survival overall therefore remains poor as these criteria are infrequently met as the disease occurs primarily in the elderly who are not always fit for chemotherapy. Radiotherapy can also be used but is less effective.

Prevention strategies for the disease do not exist due to the lack of understanding as to the causes of myeloma although people diagnosed with Monoclonal Gammopathy of Unknown Significance are regularly followed up for signs of the disease. Screening programmes for multiple myeloma could be developed using blood or urine tests however due to the small number of people diagnosed with the disease too many people would unnecessarily be called for tests potentially resulting in stress for those undergoing screening.

Chapter 24:

Leukaemia (C91-C95)

KEY FINDINGS

- *INCIDENCE AND MORTALITY*
  - *There were 359 male and 241 female cases diagnosed each year between 2000 and 2004.*
  - *Chronic lymphoblastic leukaemia, the commonest type of leukaemia, made up 39.7% of male and 37.3% of female cases.*
  - *Male incidence rates of leukaemia increased in Ireland by 1.5% each year between 1994 and 2004. Among females there was no significant change.*
  - *North Tipperary, Limerick and Cork all had higher than expected male incidence rates of leukaemia during 1994-2004, while Limerick and Louth had higher than expected incidence rates for females.*
  - *During 2000-2004 there was no relationship between incidence and deprivation.*
  - *Incidence rates during 1998-2000 were average in Northern Ireland compared to the EU for males and were low for females, while in Republic of Ireland incidence rates were higher than in EU for males and females.*
  - *During 2000-2004 there were 206 male and 146 female deaths in Ireland.*
  - *There was no significant change in mortality rates during 1994-2004.*

- *SURVIVAL AND PREVALENCE*
  - *Five-year (age-standardised) relative survival from leukaemia in Ireland was estimated to be 45.6% for males and 49.4% for females diagnosed in 2000-2004.*
  - *There was no significant change in one or five-year (age-standardised) relative survival from leukaemia for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland.*
  - *Survival from leukaemia depended upon cancer site for patients diagnosed during 1997-1999 with five-year (age-standardised) relative survival for chronic lymphoblastic leukaemia 70.2% compared to 9.5% for patients diagnosed with acute lymphoblastic leukaemia.*
  - *At the end of 2004 there were 2,651 people living in Ireland who had been diagnosed with leukaemia during 1994-2004.*

- *NORTH/SOUTH COMPARISONS*
  - *Incidence rates were 29.6% lower in Northern Ireland than Republic of Ireland for males and 24.7% lower for females.*
  - *Incidence rates for acute lymphoblastic, acute myeloid and chronic myeloid leukaemias were similar in Northern Ireland and Republic of Ireland. Incidence rates for chronic lymphoblastic leukaemia were 53.5% lower for males and 53.1% lower for females in Northern Ireland.*
  - *Males incidence rates increased in Republic of Ireland by 2.8% per year during 1994-2004, however in Northern Ireland rates were static. Female incidence rates remained static in both countries.*
  - *Five-year (age-standardised) relative survival was estimated to be 11.8% higher in Republic of Ireland than Northern Ireland for persons diagnosed in 2000-2004.*
  - *There was no significant difference between the two countries in five-year (age-standardised) relative survival for any of the four main types of leukaemia.*
  - *During 2000-2004 mortality rates were 29.4% lower in Northern Ireland than Republic of Ireland for males and 30.4% lower for females.*
  - *At the end of 2004 the number of people living with leukaemia per 100,000 persons, having been diagnosed with the disease in the previous five years, was 27.8% lower in Northern Ireland than Republic of Ireland.*

24.1: Incidence

Leukaemia made up 3.3% of all male and 2.3% of all female cancers (excluding NMSC) in Ireland during 2000-2004 with 359 male and 241 female cases diagnosed annually. Overall it was the eighth most common male cancer and eleventh most common female cancer. Once adjusted for age European age-standardised incidence rates (EASIRs) were 83.3% higher for males compared to those for females (p<0.001). The cumulative risk of developing the disease before the age of 75 was 1.1% for males and 0.6% for females. (Tab. 24.1)

There was a considerable difference in levels of this cancer between Northern Ireland and Republic of Ireland with European age-standardised incidence rates (EASIR) 29.6% lower in Northern Ireland than Republic of Ireland for males (p<0.001) and 24.7% lower for females (p<0.001). (Tab. 24.1)

Table 24.1: Summary statistics for incidence of leukaemia: 2000-2004

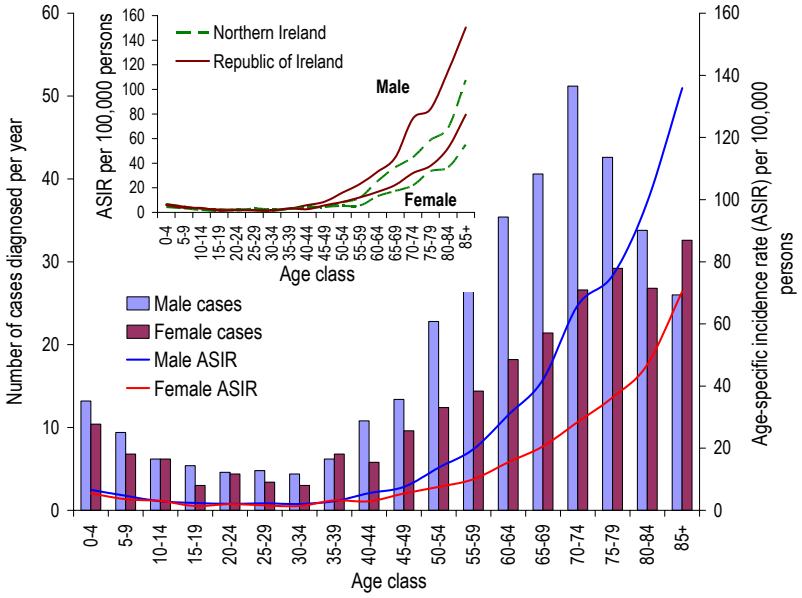
	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of cases per year	89	66	155	270	175	445	359	241	600
% of all cancer cases (ex. NMSC)	2.7%	1.9%	2.3%	3.5%	2.5%	3.0%	3.3%	2.3%	2.8%
Rank (ex. NMSC)	11	12	14	8	11	9	8	11	10
Median age at diagnosis	67	70	68	66	68	67	66.5	68	67
Cumulative risk (Aged 0 to 74)	0.8%	0.5%	0.6%	1.2%	0.6%	0.9%	1.1%	0.6%	0.8%
Crude rate per 100,000 persons	10.8	7.6	9.2	13.9	8.9	11.4	12.9	8.5	10.7
EASIR ± 95% CI	10.9 ±1.0	6.3 ±0.7	8.3 ±0.6	15.5 ±0.8	8.3 ±0.6	11.6 ±0.5	14.0 ±0.7	7.6 ±0.4	10.5 ±0.4
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-29.6% ±7.6	-24.7% ±10.0	-28.3% ±6.0

EASIR: European age-standardised incidence rate per 100,000 persons; CI: Confidence interval

24.1.1: Age distribution

Leukaemia had a median age of diagnosis of 67 years during 2000-2004. Cases were highest among males aged 70-74 and females aged 85 and over with an average of 51 male and 33 female cases each year. Leukaemia was the most common form of childhood cancer with 29 boys and 23 girls diagnosed each year during 2000-2004 which represented 8.0% of male and 9.7% of female leukaemias diagnosed. (Fig. 24.1)

Figure 24.1: Number of cases of leukaemia diagnosed per year by sex and age with age-specific incidence rate (ASIR) per 100,000 persons: 2000-2004



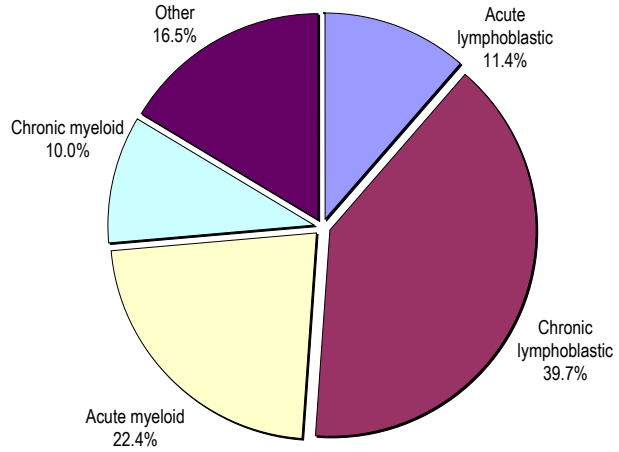
Age-specific incidence rates (ASIR) for children (aged 0-14) were higher than for those aged 20-39. However from the age of 40 onwards ASIRs rose steadily to a maximum among those aged 85 and over. This pattern was seen in both Northern Ireland and Republic of Ireland; however ASIRs were considerably higher in Republic of Ireland than Northern Ireland for both males and females during 2000-2004. (Fig. 24.1)

24.1.2: Cancer site

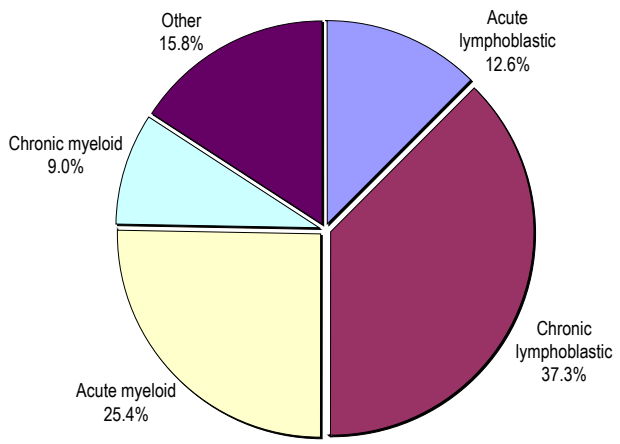
There were four main types of leukaemia diagnosed in Ireland during 2000-2004 with a further percentage of cases being less common forms of the disease. The most common type of leukaemia was chronic lymphoblastic leukaemia, which made up 39.7% of male and 37.3% of female leukaemias, while acute myeloid leukaemia made up approximately one quarter of all leukaemias for both males and females. (Fig. 24.2)

Figure 24.2: Types of leukaemia diagnosed in Ireland: 2000-2004

(a) Male

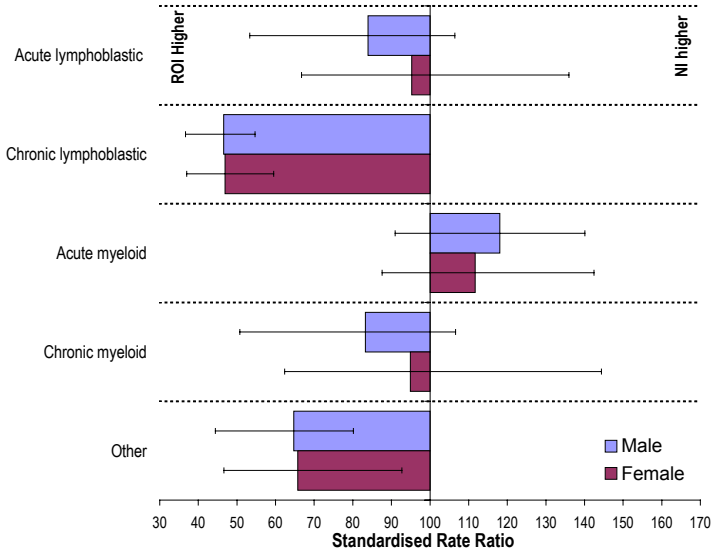


(b) Female



European age-standardised incidence rates (EASIR) of acute lymphoblastic leukaemia, acute myeloid leukaemia and chronic myeloid leukaemia were similar in Northern Ireland and Republic of Ireland. EASIRs for chronic lymphoblastic leukaemia however were 53.5% lower in Northern Ireland than those in Republic of Ireland for males and 53.1% lower for females. Additionally the rarer forms of leukaemia (collected under the "other" category") were also more common in Republic of Ireland with EASIRs 35.3% lower in Northern Ireland than those in Republic of Ireland for males and 34.3% lower for females. (Fig. 24.3)

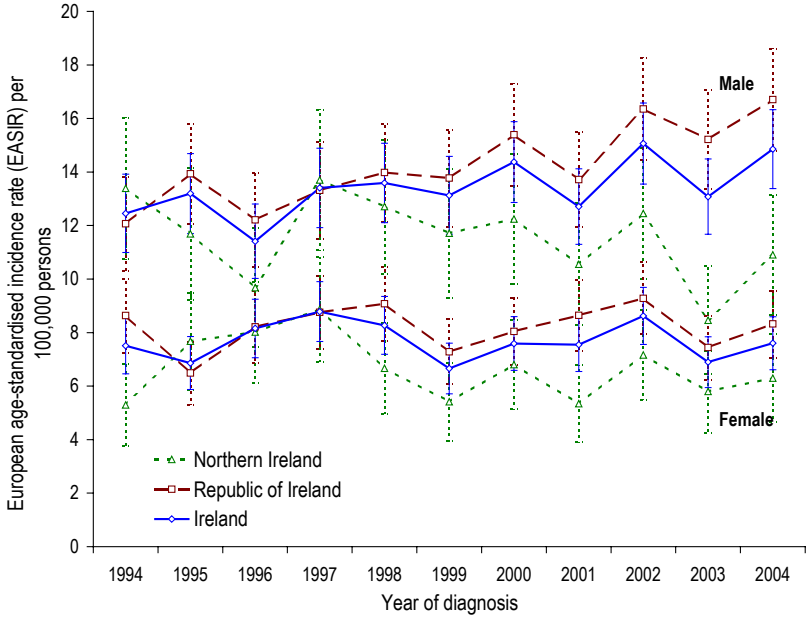
Figure 24.3: Standardised rate ratios comparing European age-standardised rates in Northern Ireland to those in Republic of Ireland for specific types of leukaemia: 2000-2004



24.1.3: Trends

European age-standardised incidence rates (EASIR) of leukaemia increased in Ireland by 1.5% (p=0.040) each year between 1994 and 2004. Among females however there was no significant change in EASIRs. This corresponded to an annual increase of 9.1 male and 2.8 female cases each year as a result of the increasing and ageing population in Ireland. (Fig. 24.4)

Figure 24.4: Trends in European age-standardised incidence rates (EASIR) for leukaemia by sex and country: 1994-2004



The increasing male incidence rates were apparent in Republic of Ireland with an increase in EASIRs of 2.8% (p<0.001), however in Northern Ireland male EASIRs did not change significantly. Female EASIRs remained static in both countries. In terms of the annual change in the number of cases diagnosed, Northern Ireland experienced an annual decrease of 1.3 cases while Republic of Ireland saw an annual increase of 13.2 cases. (Fig. 24.4; Tab. 24.2)

On examination of specific age and sex

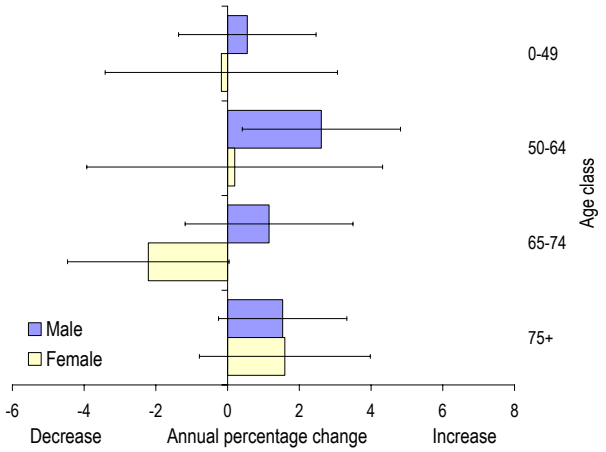
Table 24.2: Number of cases and European age-standardised incidence rates (EASIR) for leukaemia by year of diagnosis, sex and country: 1994-2004

Year	Male						Female					
	Northern Ireland		Republic of Ireland		Ireland		Northern Ireland		Republic of Ireland		Ireland	
	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR	Cases	EASIR
1994	102	13.4 ±2.6	190	12.1 ±1.8	292	12.5 ±1.5	52	5.3 ±1.5	161	8.6 ±1.4	213	7.5 ±1.1
1995	90	11.7 ±2.4	220	13.9 ±1.9	310	13.2 ±1.5	75	7.7 ±1.8	125	6.5 ±1.2	200	6.9 ±1.0
1996	75	9.7 ±2.2	194	12.2 ±1.8	269	11.4 ±1.4	75	8.0 ±1.9	154	8.2 ±1.3	229	8.2 ±1.1
1997	107	13.7 ±2.6	217	13.3 ±1.8	324	13.4 ±1.5	88	8.9 ±1.9	168	8.8 ±1.4	256	8.8 ±1.1
1998	102	12.7 ±2.5	230	14.0 ±1.8	332	13.6 ±1.5	65	6.7 ±1.7	177	9.1 ±1.4	242	8.3 ±1.1
1999	92	11.7 ±2.4	228	13.8 ±1.8	320	13.1 ±1.5	58	5.4 ±1.5	148	7.3 ±1.2	206	6.7 ±0.9
2000	99	12.2 ±2.4	256	15.4 ±1.9	355	14.4 ±1.5	70	6.8 ±1.7	166	8.0 ±1.3	236	7.6 ±1.0
2001	84	10.6 ±2.3	234	13.7 ±1.8	318	12.7 ±1.4	59	5.3 ±1.4	176	8.6 ±1.3	235	7.5 ±1.0
2002	101	12.5 ±2.5	287	16.4 ±1.9	388	15.1 ±1.5	79	7.2 ±1.7	194	9.3 ±1.3	273	8.6 ±1.1
2003	69	8.5 ±2.0	270	15.2 ±1.8	339	13.1 ±1.4	59	5.8 ±1.5	158	7.4 ±1.2	217	6.9 ±0.9
2004	93	10.9 ±2.2	303	16.7 ±1.9	396	14.9 ±1.5	64	6.3 ±1.6	180	8.3 ±1.3	244	7.6 ±1.0

EASIR: European age-standardised incidence rate per 100,000 persons with 95% confidence interval

groups, significant changes in EASIRs were observed only for the male 50-64 age class, with an annual increase of 2.6% (p=0.025) during 1994-2004. However while not statistically significant there was also some weak evidence for a decrease in EASIRs for females aged 65-74 (p=0.058) and of an increase in EASIRs among males aged 75 and over (p=0.084). (Fig. 24.5)

Figure 24.5: Annual percentage change (APC) in European age-standardised incidence rates (EASIR) for leukaemia by sex and age: 1994-2004

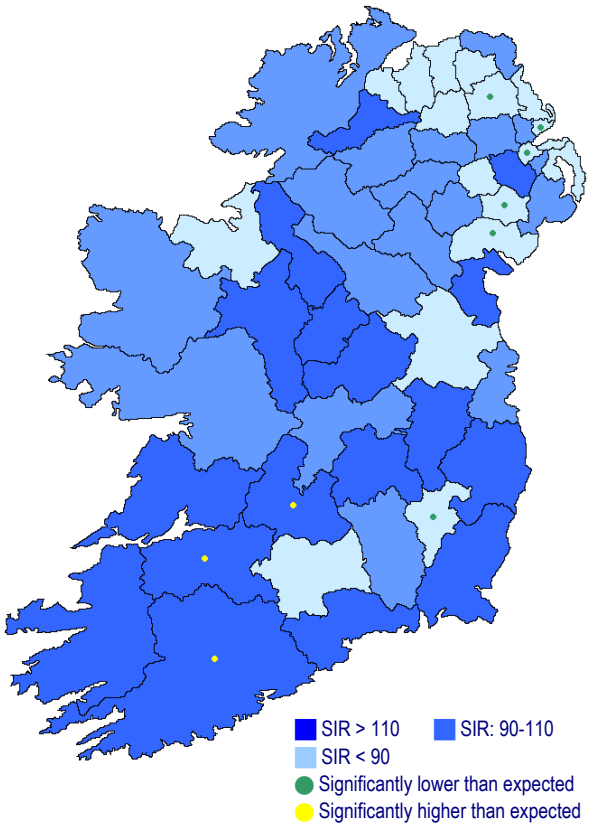


24.1.4: Geographic variations

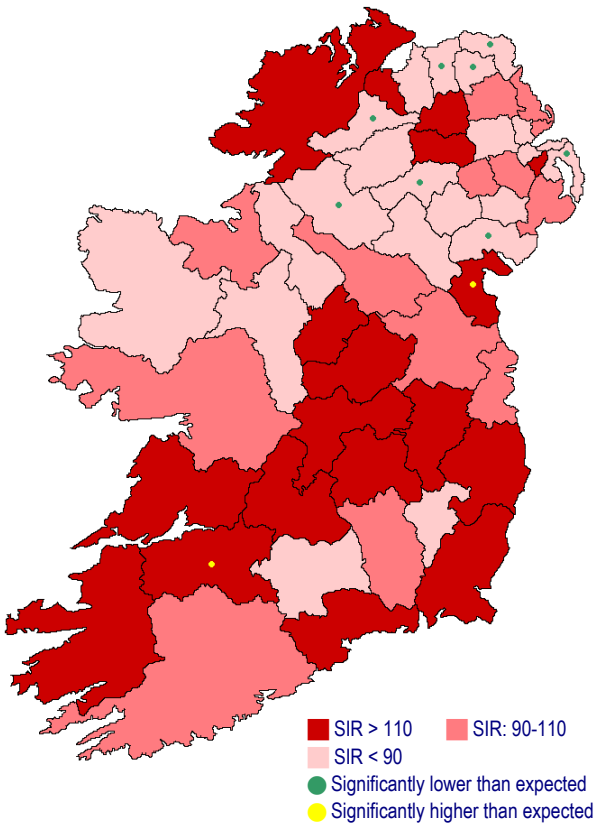
North Tipperary, Limerick and Cork all had higher than expected male incidence rates of leukaemia (compared to Ireland as a whole) during 1994-2004, while Limerick and Louth had higher than expected incidence rates for females.

Figure 24.6: Significant differences in county/council standardised incidence ratios for leukaemia compared to Ireland as a whole: 1994-2004

(a) Male

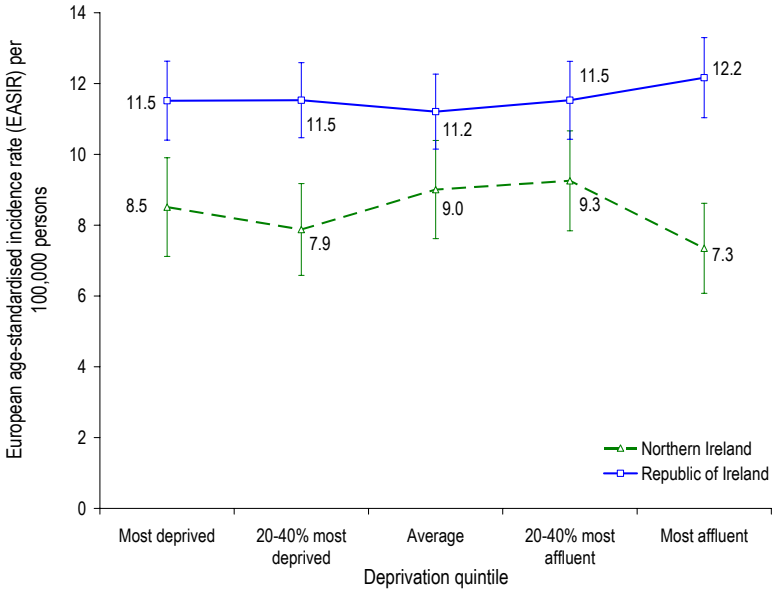


(b) Female



There were six councils/counties with lower than expected rates of the disease among males compared to eight for females. With the exception of Carlow for males these were all located in Northern Ireland. There were on average 15 male and 13 female cases of the disease diagnosed each year in Belfast and 53 male and 44 female cases diagnosed each year in Dublin. (Fig. 24.6)

Figure 24.7: European age-standardised incidence rates (EASIR) for leukaemia by country specific deprivation quintile: 2000-2004



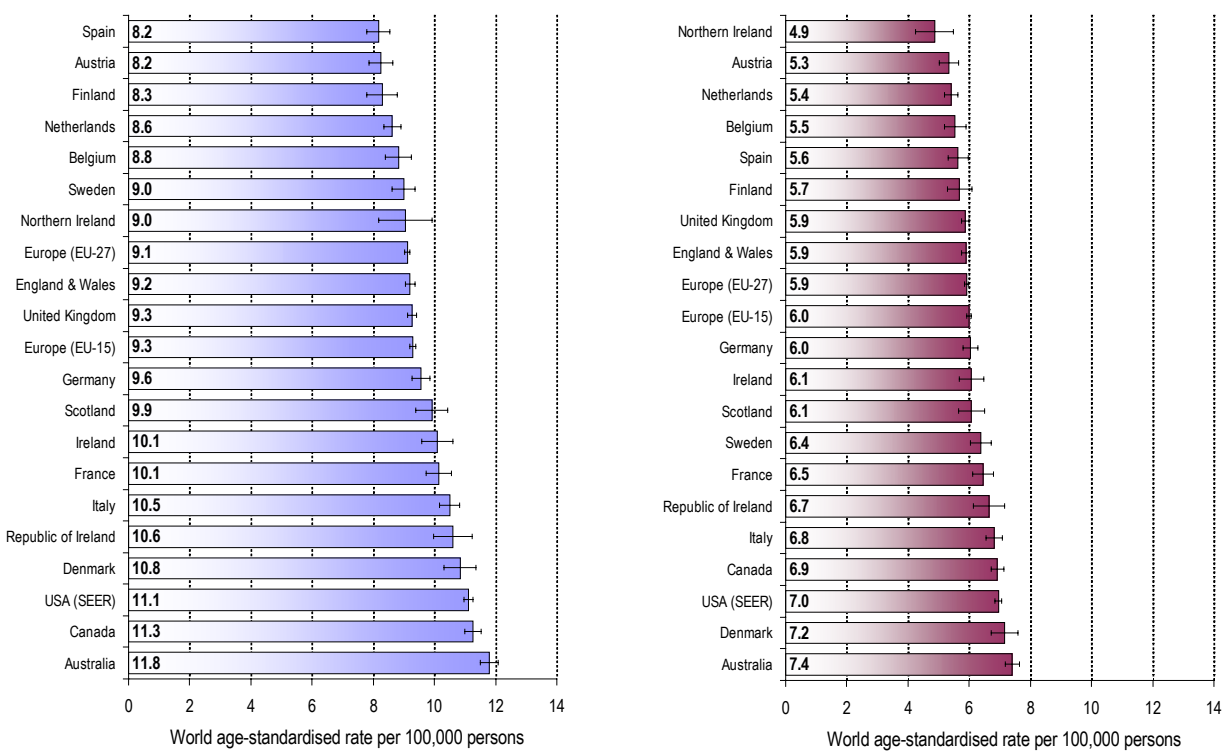
24.1.5: Socio-economic factors

During 2000-2004 there was no apparent relationship between incidence of leukaemia and deprivation in either Northern Ireland or Republic of Ireland. Due to the higher rates of leukaemia in Republic of Ireland compared to Northern Ireland European age-standardised incidence rates (EASIR) in all deprivation quintiles were significantly higher in Republic of Ireland than the equivalent population in Northern Ireland (measured using standardised rate ratios) with the difference highest among the 20% most affluent (40.0%; p<0.001). (Fig. 24.7)

24.1.6: International comparisons

World age-standardised incidence rates (WASIR) of leukaemia in Northern Ireland were similar to those in the European Union for males and were some of the lowest among developed countries for females. Republic of Ireland however had high rates of the disease compared to other developed countries with WASIRs significantly higher than those in European Union and UK, but similar to those in USA for both males and females. (Fig. 24.8)

Figure 24.8: International comparisons of world age-standardised incidence rates for leukaemia: 1998-2000



Source: IARC[191]

24.2: Survival

Five-year (age-standardised) relative survival from leukaemia in Ireland was estimated to be 45.6% for males and 49.4% for females diagnosed in 2000-2004. The variation by sex was not statistically significant in Ireland as a whole or in Northern Ireland or Republic of Ireland separately. (Fig. 24.9, Tab. 24.3)

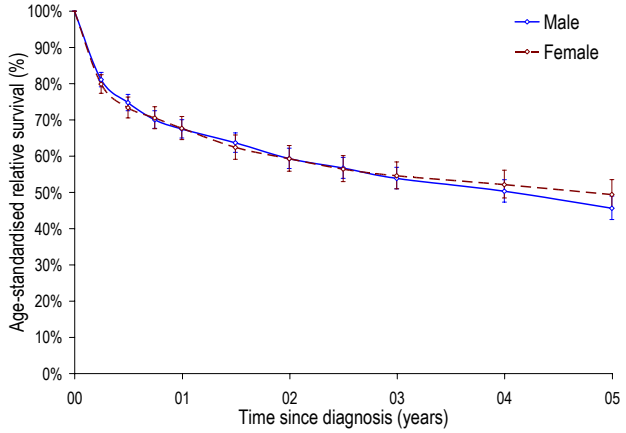
Table 24.3: Age-standardised relative survival for leukaemia patients by country and sex: 2000-2004 period analysis estimates

		Age-standardised relative survival (95% CI)		
		Male	Female	All
1-year	Northern Ireland	60.9% (56.0%, 66.2%)	59.2% (52.9%, 66.2%)	60.2% (56.3%, 64.4%)
	Republic of Ireland	69.8% (66.9%, 72.7%)	70.7% (67.2%, 74.5%)	70.2% (68.0%, 72.5%)
	Ireland	67.5% (65.0%, 70.1%)	67.7% (64.6%, 70.9%)	67.6% (65.7%, 69.6%)
5-year	Northern Ireland	38.8% (33.3%, 45.1%)	39.5% (33.0%, 47.3%)	38.7% (34.4%, 43.4%)
	Republic of Ireland	47.9% (44.2%, 51.9%)	53.6% (49.1%, 58.6%)	50.5% (47.6%, 53.5%)
	Ireland	45.6% (42.5%, 49.0%)	49.4% (45.6%, 53.5%)	47.3% (44.8%, 49.8%)

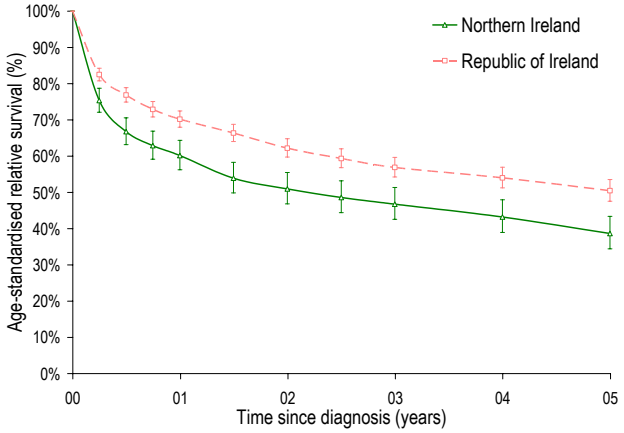
Five-year (age-standardised) relative survival was significantly higher in Republic of Ireland than Northern Ireland for all persons (11.8%, p=0.002) and for females (14.1%, p=0.020) with a 9.1% (p=0.066) difference for males that did not reach statistical significance. These differences are however likely to be linked to the higher proportion of chronic lymphoblastic leukaemia cases diagnosed in Republic of Ireland. (Fig. 24.9, Tab. 24.3)

Figure 24.9: Age-standardised relative survival for leukaemia patients by country and sex: 2000-2004 period analysis estimates

(a) All Ireland



(b) Northern Ireland and Republic of Ireland



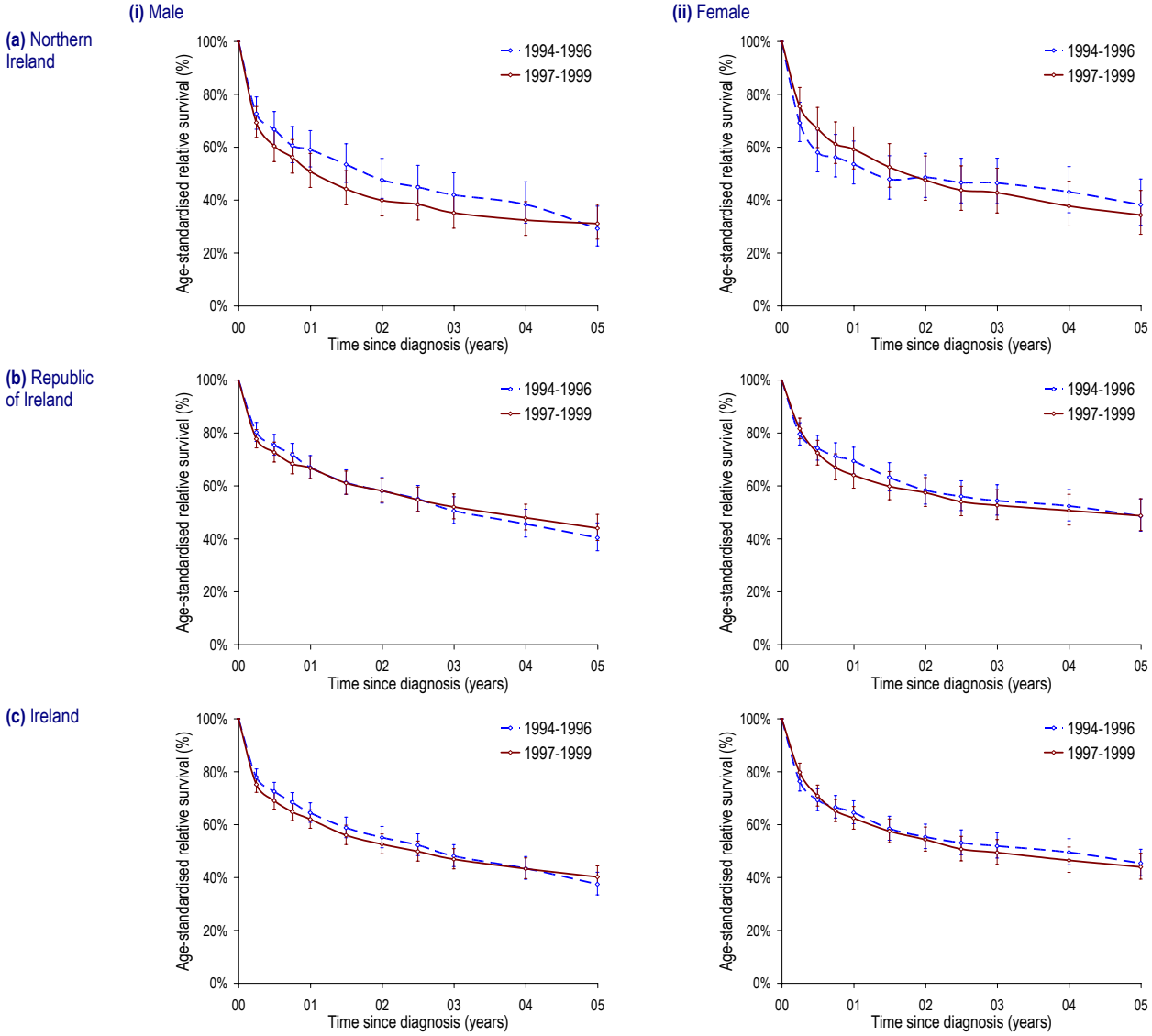
24.2.1: Changes in survival over time

There was no significant variation in one- or five-year (age-standardised) relative survival from leukaemia for males or females between those diagnosed in 1994-1996 and 1997-1999 in Ireland or in Northern Ireland and Republic of Ireland considered separately. (Fig. 24.10, Tab. 24.4)

Table 24.4: Age-standardised relative survival for leukaemia patients by sex, country and period of diagnosis: 1994-1999

		Age-standardised relative survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	56.3% (51.2%, 61.9%)	54.2% (49.5%, 59.5%)	33.4% (28.2%, 39.6%)	32.5% (27.8%, 37.9%)
	Republic of Ireland	68.3% (65.1%, 71.6%)	65.7% (62.6%, 69.0%)	44.4% (40.6%, 48.5%)	46.1% (42.4%, 50.1%)
	Ireland	64.8% (62.1%, 67.7%)	62.2% (59.6%, 65.0%)	41.3% (38.2%, 44.7%)	41.8% (38.9%, 45.0%)
Male	Northern Ireland	59.0% (52.5%, 66.3%)	50.8% (44.8%, 57.7%)	29.2% (22.7%, 37.7%)	31.1% (25.2%, 38.4%)
	Republic of Ireland	66.9% (62.7%, 71.5%)	66.8% (62.8%, 71.0%)	40.4% (35.5%, 46.0%)	44.0% (39.4%, 49.2%)
	Ireland	64.5% (60.9%, 68.2%)	62.0% (58.6%, 65.6%)	37.5% (33.4%, 42.0%)	40.2% (36.4%, 44.4%)
Female	Northern Ireland	53.6% (46.1%, 62.3%)	59.2% (51.8%, 67.7%)	38.2% (30.5%, 48.0%)	34.4% (27.0%, 43.7%)
	Republic of Ireland	69.4% (64.5%, 74.6%)	64.1% (59.1%, 69.4%)	48.6% (42.9%, 55.1%)	48.7% (43.1%, 55.2%)
	Ireland	64.5% (60.3%, 69.0%)	62.4% (58.3%, 66.9%)	45.4% (40.7%, 50.7%)	44.0% (39.4%, 49.2%)

Figure 24.10: Age-standardised relative survival for leukaemia patients by sex, country and period of diagnosis: 1994-1999



24.2.2: Observed survival

Observed survival includes causes of death other than cancer and represents survival actually experienced by those diagnosed with cancer. Of those diagnosed in Ireland with leukaemia during 1997-1999 35.2% survived a minimum of five-years. There was no significant variation in observed survival by sex or by period of diagnosis. As with relative survival however five-year observed survival was 13.0% (p=0.006) higher for males and 14.6% (p=0.010) higher for females in Republic of Ireland than in Northern Ireland. (Tab. 24.5)

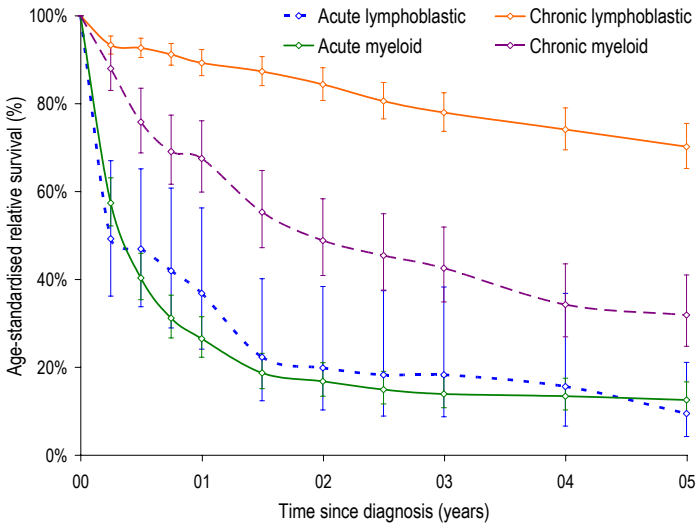
Table 24.5: Observed survival for leukaemia patients by sex, country and period of diagnosis: 1994-1999

		Observed survival (95% CI)			
		1-year		5-year	
		1994-1996	1997-1999	1994-1996	1997-1999
All persons	Northern Ireland	54.0% (49.3%, 59.2%)	52.3% (47.8%, 57.2%)	27.9% (23.8%, 32.8%)	25.7% (21.9%, 30.1%)
	Republic of Ireland	65.3% (62.3%, 68.5%)	63.7% (60.7%, 66.7%)	36.1% (33.1%, 39.3%)	39.4% (36.4%, 42.5%)
	Ireland	62.0% (59.4%, 64.7%)	60.2% (57.7%, 62.8%)	33.6% (31.2%, 36.3%)	35.2% (32.8%, 37.7%)
Male	Northern Ireland	54.6% (48.4%, 61.6%)	49.4% (43.7%, 55.9%)	24.3% (19.2%, 30.7%)	24.9% (20.1%, 30.8%)
	Republic of Ireland	63.7% (59.8%, 67.9%)	64.8% (61.1%, 68.8%)	32.1% (28.4%, 36.4%)	37.9% (34.2%, 42.1%)
	Ireland	61.1% (57.7%, 64.7%)	60.1% (56.9%, 63.5%)	29.9% (26.8%, 33.3%)	33.9% (30.9%, 37.3%)
Female	Northern Ireland	53.3% (46.2%, 61.3%)	56.3% (49.5%, 64.0%)	32.5% (26.2%, 40.4%)	26.8% (21.1%, 34.0%)
	Republic of Ireland	67.6% (63.1%, 72.5%)	62.0% (57.5%, 66.9%)	41.6% (37.0%, 46.9%)	41.4% (36.9%, 46.5%)
	Ireland	63.2% (59.3%, 67.4%)	60.2% (56.4%, 64.3%)	38.8% (34.9%, 43.1%)	36.9% (33.2%, 41.0%)

24.2.3: Cancer site

Survival from leukaemia depended upon cancer site for patients diagnosed during 1997-1999 with five-year (age-standardised) relative survival for chronic lymphoblastic leukaemia 70.2% compared to 9.5% for patients diagnosed with acute lymphoblastic leukaemia. (Fig. 24.11)

Figure 24.11: Age-standardised relative survival for leukaemia patients by cancer site: 1997-1999



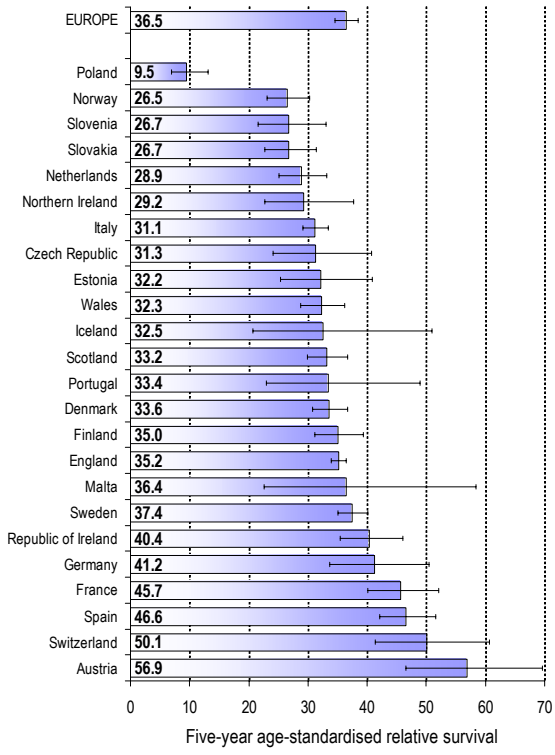
There was no change in five-year (age-standardised) relative survival for any type of leukaemia between 1994-1996 and 1997-1999. There was no significant difference in five-year (age-standardised) relative survival between Northern Ireland and Republic of Ireland for each of the different types of leukaemia, despite some apparently large differences. Thus the higher survival for patients with leukaemia in Republic of Ireland compared to Northern Ireland was a factor of the higher proportion of chronic lymphoblastic leukaemia, which had the highest survival among the different types of leukaemia. (Tab. 24.6)

Table 24.6: Five-year age-standardised relative survival for leukaemia patients by cancer site and period of diagnosis: 1994-1999

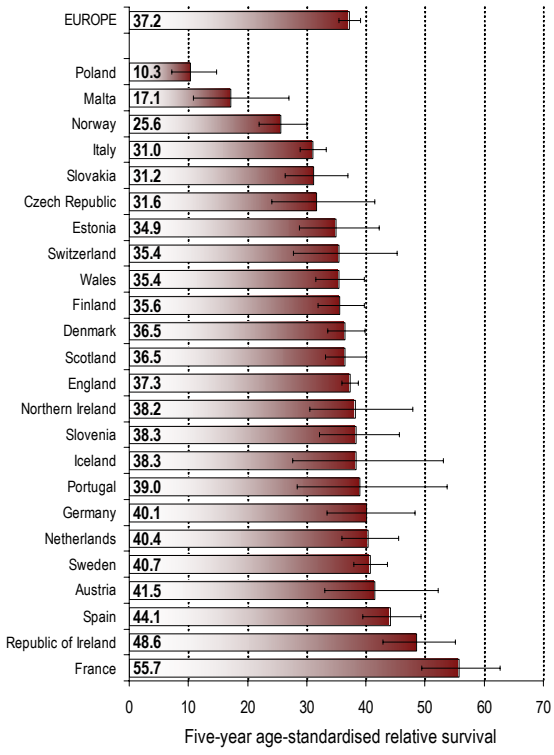
	Five-year age-standardised relative survival (95% CI)					
	Northern Ireland		Republic of Ireland		Ireland	
	1994-1996	1997-1999	1994-1996	1997-1999	1994-1996	1997-1999
Acute lymphoblastic	14.2% (6.8%, 29.5%)	3.5% (1.2%, 9.8%)	13.9% (6.0%, 31.8%)	12.1% (4.7%, 31.3%)	14.1% (7.6%, 26.1%)	9.5% (4.3%, 21.1%)
Chronic lymphoblastic	69.5% (59.7%,80.9%)	68.6% (59.9%,78.7%)	64.9% (58.7%,71.8%)	71.4% (65.7%,77.6%)	66.5% (61.2%,72.2%)	70.2% (65.3%,75.5%)
Acute myeloid	7.8% (3.7%, 16.1%)	8.2% (4.4%,15.3%)	13.0% (8.3%,20.2%)	14.6% (10.3%,20.7%)	10.2% (7.0%, 14.8%)	12.6% (9.5%, 16.7%)
Chronic myeloid	19.3% (10.3%,36.1%)	40.3% (31.0%,52.5%)	37.3% (26.4%,52.6%)	28.7% (20.3%,40.7%)	27.0% (19.6%,37.2%)	31.9% (24.8%,41.0%)
Other leukaemia	22.5% (13.2%,38.3%)	20.5% (13.5%,31.1%)	39.7% (32.6%,48.3%)	33.8% (27.5%,41.7%)	36.4% (30.3%,43.7%)	30.3% (25.1%,36.6%)

Figure 24.12: European comparisons of five-year age-standardised relative survival for leukaemia patients: 1990-1994 (EUROCARE III), 1994-1996 (NI & ROI)

(a) Male



(b) Female



Source: EUROCARE-III[192]

24.2.4: European comparisons

There was considerable variation in five-year (age-standardised) relative survival from leukaemia between the countries included in the EUROCARE-III study which reported on patients diagnosed in 1990-1994. This was likely due to a different mix of types of leukaemia diagnosed in each country, which can have a significant impact on patient survival. The European average for males was 36.5%, while for females it was 37.2%. For patients diagnosed in Northern Ireland and Republic of Ireland in 1994-1996 with leukaemia, there was no significant difference from the European average, except for females in Republic of Ireland, whose survival was significantly above the European average. (Fig. 24.12)

24.3: Mortality

During 2000-2004 there were 206 male and 146 female deaths from leukaemia in Ireland. It was the seventh most common cause of death due to cancer among males contributing 3.5% of all male deaths from cancer (excluding NMSC), with a risk of dying from the disease before age 75 of 1 in 192. Among females it was the ninth most common cause of death from cancer contributing 2.7% of all female deaths from cancer (excluding NMSC), with a risk of dying from the disease before age 75 of 1 in 367. (Tab. 24.7)

European age-standardised mortality rates (EASMR) were 92.9% higher among males than females, a difference found in both Northern Ireland and Republic of Ireland. During 2000-2004 EASMRs were 29.4% lower in Northern Ireland than Republic of Ireland for males and 30.4% lower for females. (Tab. 24.7)

Table 24.7: Summary statistics for deaths from leukaemia: 2000-2004

	Northern Ireland			Republic of Ireland			Ireland		
	Male	Female	All persons	Male	Female	All persons	Male	Female	All persons
Number of deaths per year	52	39	90	155	107	262	206	146	352
% of all cancer deaths (ex. NMSC)	2.7%	2.2%	2.5%	3.8%	3.0%	3.4%	3.5%	2.7%	3.1%
Rank (ex. NMSC)	10	10	10	7	9	8	7	9	10
Median age at death	71	76	74	74	76	74	73	76	74
Cumulative risk (Aged 0 to 74)	0.4%	0.2%	0.3%	0.6%	0.3%	0.4%	0.5%	0.3%	0.4%
Crude rate per 100,000 persons	6.2	4.5	5.3	7.9	5.4	6.7	7.4	5.1	6.3
EASMR ± 95% CI	6.3 ±0.8	3.2 ±0.5	4.5 ±0.4	8.9 ±0.6	4.7 ±0.4	6.5 ±0.4	8.0 ±0.5	4.2 ±0.3	5.8 ±0.3
% difference (NI vs ROI) ± 95% CI (+ NI higher, - NI lower)							-29.4% ±10.1	-30.4% ±12.1	-30.3% ±7.6

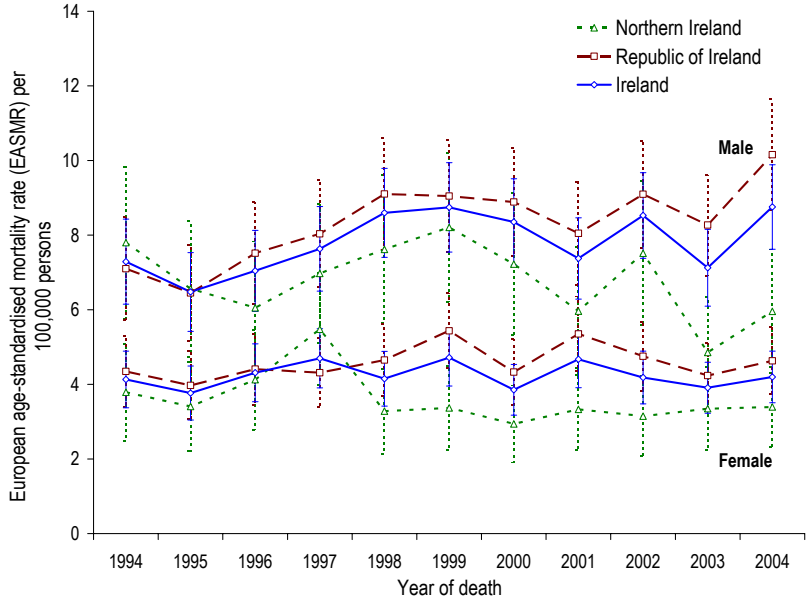
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

24.3.1: Trends

In Ireland there was no significant trend for males or females during 1994-2004 in European age-standardised mortality rates (EASMR) for leukaemia. However the absolute number of deaths increased by 6.0 male and 2.9 female deaths per year as a result of the changing size and age structure of the population. (Fig. 24.13)

In Northern Ireland there was no significant change in EASMRs for either males or females, nor were there any conclusive changes for females in Republic of Ireland. However male EASMRs for leukaemia increased by 3.0% (p=0.007) per year in Republic of Ireland during 1994-2004. (Fig. 24.13)

Figure 24.13: Trends in European age-standardised mortality rates (EASMR) for leukaemia by sex and country: 1994-2004



24.4: Prevalence

At the end of 2004 there were 2,651 people living in Ireland who had been diagnosed with leukaemia during 1994-2004, 42.8% of leukaemia patients diagnosed during this period. The majority of these (1,675 people) were diagnosed in 2000-2004, 55.8% of all those diagnosed within these five years. (Tab. 24.8)

Table 24.8: Prevalence of leukaemia in Ireland at the end of 2004 by country, sex and period of diagnosis

		Diagnosed 1994-2004		Diagnosed 2000-2004	
		Prevalence	% of cases diagnosed during period	Prevalence	% of cases diagnosed during period
Northern Ireland	Male	366	36.1%	225	50.4%
	Female	279	37.5%	167	50.5%
	All persons	645	36.7%	392	50.5%
Republic of Ireland	Male	1,177	44.8%	791	58.6%
	Female	829	45.9%	492	56.3%
	All persons	2,006	45.2%	1,283	57.7%
Ireland	Male	1,543	42.4%	1,016	56.6%
	Female	1,108	43.4%	659	54.7%
	All persons	2,651	42.8%	1,675	55.8%

The majority of those alive at the end of 2004 and diagnosed within the previous five years were male (1,016 males compared to 659 females) while 392 survivors were resident in Northern Ireland compared to 1,283 in Republic of Ireland. At the end of 2004 the number of people living with leukaemia per 100,000 persons, who were diagnosed during 2000-2004, was 27.8% lower in Northern Ireland than Republic of Ireland. (Tab. 24.8)

24.5: Discussion

Leukaemia refers to a group of diseases where white blood cells or their precursor cells multiply out of control preventing the bone marrow producing other essential cells such as red blood cells, platelets and normal white blood cells. There are several types of leukaemia with the most common being acute lymphoblastic, chronic lymphocytic, acute myeloid and chronic myeloid leukaemias. There are a wide range of symptoms, most of which are common between the different types. Examples include fatigue, weight loss, fever, breathlessness, frequent or persistent infections, bruising, bleeding from gums, bone pain, headaches and visual disturbances, abdominal discomfort or blood in the urine or stool.[193-195]

Exposure to high level of radiation[196] or benzene[197] increases the risk of developing acute leukaemia and chronic myeloid leukaemia. Smokers also have a higher risk of developing various forms of leukaemia with the association strongest for chronic myeloid leukaemia.[198] Other factors which increase risk include previous chemotherapy, blood disorders such as aplastic anaemia and myelodysplastic syndrome, inherited conditions such as Downs syndrome and infections such as human T-cell leukaemia virus.[199-201] Little else is known about the causes of leukaemia although a possible risk factor is family history which may increase the risk of developing leukaemia by a small amount.[202]

Globally there are approximately 250,000 cases of leukaemia diagnosed each year, 3% of all cancer cases, while there are 195,000 deaths from the disease annually. Incidence of the disease is higher in developed countries with incidence rates in African and Asian countries particularly low. Incidence rates are however stable or increasing very slowly. Despite this mortality rates have fallen since the 1960s as a result of treatment advances and survival improvements, although these are difficult to detect in Ireland due to data only being available since 1994.

The lack of understanding of the causes of leukaemia is a major hindrance to the development of prevention strategies for this disease although the link with ionising radiation warrants precautions being taken with regard to the presence of ionising radiation in the environment. These are already in place in Ireland and studies have been undertaken with regard to the possible link between cancers linked with ionising radiation and possible radioactivity from the Irish Sea. None have demonstrated a definite link and high incidence of leukaemia in Ireland thus remains unexplained.

Chemotherapy is the main treatment approach and has proven very effective for certain types of leukaemia such as chronic lymphocytic leukaemia. Other forms of leukaemia have very poor survival, however new types of treatment are continuously being developed. Some newer drugs for the treatment of chronic myeloid leukaemia have the potential to improve survival over the next decade.

SUPPLEMENTARY TABLES

- *S01: Population of Ireland by sex, country, five-year age group and year: 1994-2004*
- *S02: Incidence of cancer per year by sex, cancer site, country and age: 2000-2004*
- *S03: Cases and European age-standardised incidence rates by sex country and cancer site: 2000-2004*
- *S04: Incidence of cancer by county/district council, cancer site and sex: 1994-2004*
- *S05: Stage at diagnosis for cancer patients by sex, country and cancer site: 2000-2004 or 2001 only*
- *S06: Proportion of patients receiving the four main treatment types or any form of tumour directed treatment by cancer site, country and year of diagnosis: 1996 & 2001*
- *S07: Five-year (age-standardised) relative survival by sex, country, cancer site and period of diagnosis: 1994-2004*
- *S08: Deaths and European age-standardised mortality rates by sex country and cancer site: 2000-2004*

S01: Population of Ireland by sex, country, five-year age group and year: 1994-2004

MALE		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Northern Ireland	0-4	64,859	63,748	62,938	62,259	61,693	61,253	60,375	59,075	57,840	56,808	56,113
	5-9	68,614	68,406	68,136	67,446	66,306	65,061	64,039	63,019	62,530	62,318	61,856
	10-14	67,182	67,165	67,684	68,625	68,927	68,987	68,494	67,891	67,350	66,256	65,201
	15-19	62,468	62,311	62,454	63,256	64,044	64,272	64,779	66,037	67,734	68,408	68,419
	20-24	65,380	63,058	61,192	59,355	57,092	54,963	54,799	55,557	55,957	57,578	59,429
	25-29	64,524	63,899	64,514	64,196	63,286	61,041	58,999	56,958	55,131	53,512	52,847
	30-34	61,306	62,336	63,694	64,395	64,742	64,016	63,301	62,965	62,229	61,393	59,838
	35-39	54,588	56,119	57,658	59,173	60,404	61,790	63,092	63,911	64,516	64,511	63,902
	40-44	49,600	50,211	51,390	52,708	53,979	54,995	56,272	57,642	58,785	59,883	61,386
	45-49	47,683	48,281	48,820	48,657	49,215	49,896	50,656	51,843	52,958	54,046	54,792
	50-54	41,731	43,185	44,822	46,380	46,940	47,362	47,995	48,423	48,373	48,854	49,448
	55-59	36,390	36,823	37,135	37,819	39,319	40,821	42,293	43,862	45,469	46,072	46,546
	60-64	32,513	32,549	33,023	33,610	34,217	34,891	35,264	35,474	36,316	37,776	39,360
	65-69	29,291	29,291	29,263	29,291	29,543	29,667	29,964	30,487	31,092	31,734	32,407
	70-74	24,749	24,594	24,660	24,742	24,718	24,742	24,844	25,090	25,341	25,743	26,067
	75-79	15,796	16,430	17,192	17,711	18,276	18,545	18,498	18,650	19,072	19,297	19,552
	80-84	9,940	10,106	10,028	9,994	9,823	9,999	10,544	11,181	11,685	12,108	12,465
	85+	5,332	5,502	5,744	5,902	6,145	6,197	6,270	6,364	6,478	6,525	6,863
	Total	801,946	804,014	810,347	815,519	818,669	818,498	820,478	824,429	828,856	832,822	836,491
Republic of Ireland	0-4	134,001	131,501	128,740	128,699	130,801	133,997	137,199	140,402	142,040	145,601	148,799
	5-9	150,500	147,302	145,335	142,198	140,300	138,701	136,600	135,503	135,890	137,698	141,199
	10-14	177,798	172,501	167,377	163,499	158,299	154,098	151,299	148,998	146,114	144,199	142,400
	15-19	169,201	171,401	173,950	176,201	175,699	173,801	168,902	164,302	160,413	157,000	154,103
	20-24	148,901	148,000	149,143	151,301	152,302	153,600	157,399	160,501	165,292	168,501	170,298
	25-29	123,099	125,996	129,363	132,000	136,600	140,501	146,000	151,202	156,100	159,601	165,003
	30-34	125,803	127,101	127,735	129,901	131,803	133,903	137,502	144,198	152,377	157,201	160,301
	35-39	122,601	123,202	126,140	128,703	131,800	135,201	138,201	141,199	144,530	146,300	150,500
	40-44	117,500	119,100	120,064	123,297	124,996	127,498	129,698	132,999	135,301	138,202	140,800
	45-49	109,501	112,299	113,816	114,797	116,699	117,600	119,799	122,400	124,981	126,499	128,801
	50-54	86,898	89,801	94,818	100,801	105,798	110,400	114,099	115,500	116,585	118,199	119,603
	55-59	74,400	76,198	77,809	79,201	82,202	85,198	88,199	94,000	99,827	104,900	108,700
	60-64	67,901	67,902	68,690	70,199	70,904	72,499	74,800	75,899	77,559	80,599	83,598
	65-69	59,500	59,701	60,256	60,900	62,200	62,998	63,302	63,999	65,290	66,098	67,398
	70-74	51,000	50,402	50,124	50,199	49,799	49,697	50,300	51,100	51,719	53,100	54,399
	75-79	34,300	34,701	35,228	35,599	36,800	36,998	36,899	37,099	37,377	37,398	38,001
	80-84	21,100	21,302	21,074	20,899	20,500	20,400	21,001	21,701	22,283	23,303	23,701
	85+	9,301	9,999	10,570	11,002	11,400	11,500	11,800	12,200	12,486	12,998	13,701
	Total	1,783,305	1,788,409	1,800,232	1,819,396	1,838,902	1,858,590	1,882,999	1,913,202	1,946,164	1,977,397	2,011,305
Ireland	0-4	198,860	195,249	191,678	190,958	192,494	195,250	197,574	199,477	199,880	202,409	204,912
	5-9	219,114	215,708	213,471	209,644	206,606	203,762	200,639	198,522	198,420	200,016	203,055
	10-14	244,980	239,666	235,061	232,124	227,226	223,085	219,793	216,889	213,464	210,455	207,601
	15-19	231,669	233,712	236,404	239,457	239,743	238,073	233,681	230,339	228,147	225,408	222,522
	20-24	214,281	211,058	210,335	210,656	209,394	208,563	212,198	216,058	221,249	226,079	229,727
	25-29	187,623	189,895	193,877	196,196	199,886	201,542	204,999	208,160	211,231	213,113	217,850
	30-34	187,109	189,437	191,429	194,296	196,545	197,919	200,803	207,163	214,606	218,594	220,139
	35-39	177,189	179,321	183,798	187,876	192,204	196,991	201,293	205,110	209,046	210,811	214,402
	40-44	167,100	169,311	171,454	176,005	178,975	182,493	185,970	190,641	194,086	198,085	202,186
	45-49	157,184	160,580	162,636	163,454	165,914	167,496	170,455	174,243	177,939	180,545	183,593
	50-54	128,629	132,986	139,640	147,181	152,738	157,762	162,094	163,923	164,958	167,053	169,051
	55-59	110,790	113,021	114,944	117,020	121,521	126,019	130,492	137,862	145,296	150,972	155,246
	60-64	100,414	100,451	101,713	103,809	105,121	107,390	110,064	111,373	113,875	118,375	122,958
	65-69	88,791	88,992	89,519	90,191	91,743	92,665	93,266	94,486	96,382	97,832	99,805
	70-74	75,749	74,996	74,784	74,941	74,517	74,439	75,144	76,190	77,060	78,843	80,466
	75-79	50,096	51,131	52,420	53,310	55,076	55,543	55,397	55,749	56,449	56,695	57,553
	80-84	31,040	31,408	31,102	30,893	30,323	30,399	31,545	32,882	33,968	35,411	36,166
	85+	14,633	15,501	16,314	16,904	17,545	17,697	18,070	18,564	18,964	19,523	20,564
	Total	2,585,251	2,592,423	2,610,579	2,634,915	2,657,571	2,677,088	2,703,477	2,737,631	2,775,020	2,810,219	2,847,796

Table S01 continued…

FEMALE		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Northern Ireland	0-4	61,892	60,900	59,934	59,354	58,749	57,939	56,955	55,674	54,671	53,824	52,977
	5-9	64,995	64,788	64,717	64,088	63,149	62,217	61,146	59,834	59,456	58,844	58,328
	10-14	64,796	64,747	65,115	65,535	65,749	65,557	65,094	64,551	64,032	63,118	62,478
	15-19	60,793	60,937	61,650	62,203	62,443	62,579	63,130	63,833	64,597	64,928	64,565
	20-24	61,232	59,825	58,714	57,120	55,874	54,851	54,574	54,835	54,803	55,226	57,168
	25-29	64,132	63,567	63,715	63,267	62,625	61,164	59,720	57,906	56,149	54,487	54,070
	30-34	62,960	64,209	65,311	65,713	66,130	65,864	65,217	64,984	64,215	63,311	62,023
	35-39	55,600	57,750	59,642	61,608	62,667	64,190	65,590	66,319	66,482	66,547	66,204
	40-44	49,448	49,684	50,838	52,581	54,321	56,155	58,308	60,159	61,659	62,660	64,166
	45-49	48,992	49,469	50,010	49,406	49,428	49,593	49,855	51,051	52,533	54,286	56,003
	50-54	43,058	44,619	46,054	47,831	48,529	48,980	49,526	49,814	49,279	49,262	49,360
	55-59	38,621	39,032	39,185	39,752	41,323	42,586	44,022	45,491	47,389	48,128	48,596
	60-64	37,044	36,536	36,599	36,975	37,210	37,845	38,201	38,245	38,839	40,445	41,834
	65-69	35,706	35,893	35,778	35,500	35,520	35,310	34,980	35,016	35,561	35,735	36,331
	70-74	33,348	33,020	32,860	32,727	32,565	32,510	32,738	32,762	32,641	32,675	32,657
	75-79	24,247	24,758	25,723	26,655	27,507	28,026	27,805	28,000	28,154	28,224	28,376
	80-84	19,081	19,198	18,996	18,582	18,218	18,101	18,559	19,356	20,219	21,071	21,560
	85+	15,816	16,185	16,563	16,845	17,093	17,041	17,046	17,060	17,106	17,035	17,135
	Total	841,761	845,117	851,404	855,742	859,100	860,508	862,466	864,890	867,785	869,806	873,831
Republic of Ireland	0-4	126,199	123,902	121,654	121,302	122,901	125,800	128,899	132,797	135,590	139,199	142,300
	5-9	142,999	139,901	137,608	135,697	133,602	131,898	130,102	128,200	128,200	130,300	133,402
	10-14	167,200	162,700	158,710	154,500	150,099	146,200	143,800	141,598	139,594	136,799	135,002
	15-19	161,798	163,799	165,586	167,599	168,001	164,697	160,501	156,198	152,775	149,802	146,698
	20-24	141,200	142,502	144,211	145,899	146,702	150,298	154,501	157,102	163,042	167,500	168,500
	25-29	124,201	126,503	129,682	132,499	135,800	139,300	143,301	149,601	156,593	159,298	164,301
	30-34	131,799	132,698	133,194	135,201	136,099	138,000	140,000	144,400	152,299	156,199	160,501
	35-39	124,700	126,400	129,536	131,998	135,300	138,300	141,999	143,901	146,376	147,799	149,402
	40-44	116,503	118,603	120,377	124,000	126,300	128,204	130,801	134,600	136,683	139,900	142,900
	45-49	106,300	110,000	111,584	113,399	116,102	117,100	119,299	121,502	124,623	126,701	129,501
	50-54	83,699	86,600	91,829	97,600	102,099	107,099	110,800	112,701	114,258	116,598	117,902
	55-59	73,598	75,401	75,998	76,901	80,298	83,000	86,100	91,801	97,467	101,800	105,800
	60-64	68,898	68,598	69,256	70,799	71,499	72,997	74,899	75,799	76,693	79,801	82,502
	65-69	67,401	66,899	66,553	65,800	66,000	65,895	65,999	66,802	68,184	69,202	70,499
	70-74	62,901	62,901	62,418	62,602	62,000	61,401	61,000	60,802	60,410	60,500	60,899
	75-79	47,502	47,803	48,869	49,399	51,598	52,096	52,001	52,105	52,438	52,300	52,201
	80-84	33,499	34,599	34,697	34,898	34,202	34,199	34,799	35,901	36,574	38,200	39,000
	85+	22,202	23,101	24,093	24,902	25,998	26,800	27,600	28,202	29,240	29,802	31,099
	Total	1,802,599	1,812,910	1,825,855	1,844,995	1,864,600	1,883,284	1,906,401	1,934,012	1,971,039	2,001,700	2,032,409
Ireland	0-4	188,091	184,802	181,588	180,656	181,650	183,739	185,854	188,471	190,261	193,023	195,277
	5-9	207,994	204,689	202,325	199,785	196,751	194,115	191,248	188,034	187,656	189,144	191,730
	10-14	231,996	227,447	223,825	220,035	215,848	211,757	208,894	206,149	203,626	199,917	197,480
	15-19	222,591	224,736	227,236	229,802	230,444	227,276	223,631	220,031	217,372	214,730	211,263
	20-24	202,432	202,327	202,925	203,019	202,576	205,149	209,075	211,937	217,845	222,726	225,668
	25-29	188,333	190,070	193,397	195,766	198,425	200,464	203,021	207,507	212,742	213,785	218,371
	30-34	194,759	196,907	198,505	200,914	202,229	203,864	205,217	209,384	216,514	219,510	222,524
	35-39	180,300	184,150	189,178	193,606	197,967	202,490	207,589	210,220	212,858	214,346	215,606
	40-44	165,951	168,287	171,215	176,581	180,621	184,359	189,109	194,759	198,342	202,560	207,066
	45-49	155,292	159,469	161,594	162,805	165,530	166,693	169,154	172,553	177,156	180,987	185,504
	50-54	126,757	131,219	137,883	145,431	150,628	156,079	160,326	162,515	163,537	165,860	167,262
	55-59	112,219	114,433	115,183	116,653	121,621	125,586	130,122	137,292	144,856	149,928	154,396
	60-64	105,942	105,134	105,855	107,774	108,709	110,842	113,100	114,044	115,532	120,246	124,336
	65-69	103,107	102,792	102,331	101,300	101,520	101,205	100,979	101,818	103,745	104,937	106,830
	70-74	96,249	95,921	95,278	95,329	94,565	93,911	93,738	93,564	93,051	93,175	93,556
	75-79	71,749	72,561	74,592	76,054	79,105	80,122	79,806	80,105	80,592	80,524	80,577
	80-84	52,580	53,797	53,693	53,480	52,420	52,300	53,358	55,257	56,793	59,271	60,560
	85+	38,018	39,286	40,656	41,747	43,091	43,841	44,646	45,262	46,346	46,837	48,234
	Total	2,644,360	2,658,027	2,677,259	2,700,737	2,723,700	2,743,792	2,768,867	2,798,902	2,838,824	2,871,506	2,906,240

S02: Incidence of cancer per year by sex, cancer site, country and age: 2000-2004

NORTHERN IRELAND		0 to 14	15 to 44	45 to 54	55 to 64	65 to 74	75 to 84	85+	Total
MALE	Head and Neck (C00-C14, C30-C32)	0	9	24	42	38	26	5	145
	Oesophagus (C15)	0	3	12	21	26	23	7	92
	Stomach (C16)	0	6	11	30	48	45	7	147
	Colorectal (C18-C21)	0	12	40	115	170	134	30	501
	Liver (C22)	0	1	4	7	11	10	3	36
	Pancreas (C25)	0	1	7	16	22	23	5	75
	Lung (C33,C34)	0	6	37	114	201	157	28	542
	Malignant melanoma (C43)	0	22	14	17	21	13	5	91
	Breast (C50)	0	0	0	1	3	2	1	7
	Prostate (C61)	0	0	23	133	259	196	55	666
	Testis (C62)	0	51	7	2	0	0	0	60
	Kidney (C64-C66,C68)	2	5	11	28	33	23	5	107
	Bladder (C67)	0	3	7	26	44	48	14	141
	Brain and other central nervous system (C70-C72)	4	16	7	15	13	9	1	65
	Lymphoma (C81-C85,C96)	4	24	20	34	37	26	5	150
	Multiple myeloma (C90)	0	3	5	14	16	18	4	60
	Leukaemia (C91-C95)	9	10	6	15	23	19	7	89
	Non-melanoma skin cancer (C44)	0	58	101	237	358	346	103	1,204
	Other	3	22	32	58	100	87	26	327
	All (excluding NMSC) (C00-C96, ex. C44)	22	192	269	687	1,067	858	209	3,303
	All cancers (C00-C96)	22	250	370	924	1,425	1,204	312	4,507
FEMALE	Head and Neck (C00-C14, C30-C32)	0	4	9	17	14	11	7	61
	Oesophagus (C15)	0	1	2	8	17	20	10	59
	Stomach (C16)	0	4	2	13	25	35	15	95
	Colorectal (C18-C21)	0	13	37	78	121	134	54	437
	Liver (C22)	1	1	2	3	8	7	3	24
	Pancreas (C25)	0	3	5	11	24	30	12	84
	Lung (C33,C34)	0	7	26	74	116	103	26	352
	Malignant melanoma (C43)	0	38	17	23	25	18	10	132
	Breast (C50)	0	130	221	253	178	147	65	994
	Cervix (C53)	0	40	11	12	9	6	1	80
	Uterus (C54-C55)	0	6	24	49	44	27	10	161
	Ovary (C56)	0	28	28	40	44	34	12	187
	Kidney (C64-C66,C68)	2	4	8	15	18	16	7	70
	Bladder (C67)	0	2	3	6	17	22	7	56
	Brain and other central nervous system (C70-C72)	5	8	5	12	10	7	2	50
	Lymphoma (C81-C85,C96)	1	22	13	31	38	35	13	153
	Multiple myeloma (C90)	0	1	3	8	13	18	5	47
	Leukaemia (C91-C95)	6	8	5	8	13	17	9	66
	Non-melanoma skin cancer (C44)	0	53	86	158	252	341	172	1,062
	Other	4	26	25	47	83	108	52	346
	All (excluding NMSC) (C00-C96, ex. C44)	19	343	447	708	819	796	320	3,452
	All cancers (C00-C96)	19	396	533	866	1,071	1,137	492	4,514

Table S02 continued…

REPUBLIC OF IRELAND		0 to 14	15 to 44	45 to 54	55 to 64	65 to 74	75 to 84	85+	Total
MALE	Head and Neck (C00-C14, C30-C32)	1	18	54	88	81	46	11	299
	Oesophagus (C15)	0	6	24	42	67	56	9	204
	Stomach (C16)	0	14	24	56	89	77	21	282
	Colorectal (C18-C21)	0	32	103	233	383	305	60	1,117
	Liver (C22)	2	2	8	18	22	21	3	76
	Pancreas (C25)	0	6	13	37	62	56	15	190
	Lung (C33,C34)	0	17	73	232	375	300	59	1,057
	Malignant melanoma (C43)	0	49	31	40	39	32	10	201
	Breast (C50)	0	1	1	2	5	3	1	13
	Prostate (C61)	0	5	97	487	813	548	135	2,084
	Testis (C62)	2	110	11	4	1	0	0	128
	Kidney (C64-C66,C68)	4	17	32	57	69	49	13	241
	Bladder (C67)	0	10	22	57	106	100	31	325
	Brain and other central nervous system (C70-C72)	9	36	29	32	36	22	4	167
	Lymphoma (C81-C85,C96)	11	66	49	68	65	49	12	320
	Multiple myeloma (C90)	0	4	16	22	38	35	7	121
	Leukaemia (C91-C95)	20	26	30	49	69	57	19	270
	Non-melanoma skin cancer (C44)	0	160	285	593	944	794	217	2,993
	Other	15	48	55	106	171	155	50	600
	All (excluding NMSC) (C00-C96, ex. C44)	64	468	673	1,630	2,490	1,912	459	7,696
	All cancers (C00-C96)	64	628	958	2,223	3,434	2,706	677	10,689
FEMALE	Head and Neck (C00-C14, C30-C32)	1	8	16	25	26	23	12	110
	Oesophagus (C15)	0	3	9	17	33	40	22	124
	Stomach (C16)	0	9	10	28	47	61	27	181
	Colorectal (C18-C21)	0	36	89	148	230	263	94	860
	Liver (C22)	0	2	3	8	13	13	4	44
	Pancreas (C25)	0	4	11	26	53	65	29	188
	Lung (C33,C34)	1	16	46	122	225	203	52	664
	Malignant melanoma (C43)	1	88	48	56	53	45	22	312
	Breast (C50)	0	288	511	558	366	279	99	2,101
	Cervix (C53)	0	89	48	27	19	12	4	199
	Uterus (C54-C55)	0	17	53	83	73	45	15	285
	Ovary (C56)	1	48	69	92	83	63	19	374
	Kidney (C64-C66,C68)	5	9	17	27	37	30	8	131
	Bladder (C67)	0	4	11	20	42	39	20	137
	Brain and other central nervous system (C70-C72)	8	21	16	24	29	26	8	133
	Lymphoma (C81-C85,C96)	5	57	37	51	66	56	14	284
	Multiple myeloma (C90)	0	2	7	16	24	28	12	89
	Leukaemia (C91-C95)	18	18	17	25	35	39	23	175
	Non-melanoma skin cancer (C44)	0	182	269	454	667	745	337	2,655
	Other	12	72	54	97	136	201	95	667
	All (excluding NMSC) (C00-C96, ex. C44)	51	793	1,071	1,447	1,589	1,530	577	7,058
	All cancers (C00-C96)	52	975	1,340	1,901	2,256	2,275	914	9,713

Table S02 continued…

IRELAND		0 to 14	15 to 44	45 to 54	55 to 64	65 to 74	75 to 84	85+	Total
MALE	Head and Neck (C00-C14, C30-C32)	1	27	78	130	119	72	16	444
	Oesophagus (C15)	0	9	36	62	94	80	16	296
	Stomach (C16)	0	19	35	86	138	122	28	429
	Colorectal (C18-C21)	0	44	143	349	553	439	90	1,618
	Liver (C22)	2	4	12	25	33	31	5	111
	Pancreas (C25)	0	7	21	53	84	79	21	265
	Lung (C33,C34)	0	23	110	346	575	457	87	1,599
	Malignant melanoma (C43)	0	71	46	57	60	45	14	292
	Breast (C50)	0	1	1	3	8	5	2	20
	Prostate (C61)	0	5	119	620	1,072	744	190	2,750
	Testis (C62)	2	161	18	5	2	0	0	189
	Kidney (C64-C66,C68)	5	22	43	86	102	72	18	349
	Bladder (C67)	0	12	29	83	150	147	45	466
	Brain and other central nervous system (C70-C72)	12	52	36	47	49	30	5	232
	Lymphoma (C81-C85,C96)	15	90	70	102	103	74	17	470
	Multiple myeloma (C90)	0	7	21	36	54	53	12	181
	Leukaemia (C91-C95)	29	36	36	64	92	76	26	359
	Non-melanoma skin cancer (C44)	0	218	386	830	1,303	1,140	321	4,197
	Other	18	70	87	163	270	242	76	928
	All (excluding NMSC) (C00-C96, ex. C44)	86	660	942	2,317	3,557	2,770	668	10,999
	All cancers (C00-C96)	86	878	1,328	3,147	4,859	3,910	989	15,196
FEMALE	Head and Neck (C00-C14, C30-C32)	1	12	25	42	40	34	18	171
	Oesophagus (C15)	0	4	11	26	50	60	32	183
	Stomach (C16)	0	13	12	41	72	96	42	276
	Colorectal (C18-C21)	0	49	126	226	351	396	148	1,297
	Liver (C22)	1	3	5	11	21	20	7	68
	Pancreas (C25)	0	7	15	36	77	95	41	272
	Lung (C33,C34)	1	22	72	196	341	306	78	1,016
	Malignant melanoma (C43)	1	126	66	79	78	62	32	444
	Breast (C50)	0	418	732	811	544	426	164	3,095
	Cervix (C53)	0	128	59	40	28	18	5	278
	Uterus (C54-C55)	0	23	77	132	118	71	25	446
	Ovary with borderline (C56)	2	75	97	132	127	97	31	561
	Kidney (C64-C66,C68)	7	13	24	41	55	46	14	201
	Bladder (C67)	0	6	14	27	58	61	27	193
	Brain and other central nervous system (C70-C72)	13	29	22	35	40	34	10	182
	Lymphoma (C81-C85,C96)	6	79	50	81	104	91	27	437
	Multiple myeloma (C90)	0	3	10	24	37	45	17	136
	Leukaemia (C91-C95)	23	26	22	33	48	56	33	241
	Non-melanoma skin cancer (C44)	1	235	355	612	919	1,086	509	3,717
	Other	16	98	79	144	220	310	146	1,013
	All (excluding NMSC) (C00-C96, ex. C44)	70	1,136	1,518	2,155	2,408	2,325	897	10,510
	All cancers (C00-C96)	71	1,370	1,873	2,767	3,328	3,412	1,406	14,227

S03: Cases and European age-standardised incidence rates by sex, country and cancer site: 2000-2004

MALE	Ireland		Northern Ireland		Republic of Ireland	
	Average per year	EASIR	Average per year	EASIR	Average per year	EASIR
Head and Neck (C00-C14, C30-C32)	444	17.7 (17.0, 18.5)	145	18.2 (16.9, 19.5)	299	17.5 (16.7, 18.4)
Oral (C00-C14)	267	10.7 (10.1, 11.2)	87	10.9 (9.9, 12.0)	180	10.5 (9.8, 11.2)
Lip (C00)	30	1.2 (1.0, 1.4)	14	1.7 (1.3, 2.1)	16	0.9 (0.7, 1.1)
Base of tongue (C01)	18	0.7 (0.6, 0.9)	4	0.5 (0.3, 0.7)	14	0.8 (0.7, 1.0)
Other tongue (C02)	44	1.7 (1.5, 2.0)	17	2.1 (1.7, 2.6)	27	1.6 (1.3, 1.8)
Gum (C03)	10	0.4 (0.3, 0.5)	4	0.5 (0.3, 0.7)	6	0.3 (0.2, 0.5)
Floor of mouth (C04)	20	0.8 (0.7, 1.0)	6	0.8 (0.5, 1.0)	14	0.8 (0.7, 1.0)
Palate (C05)	11	0.4 (0.3, 0.6)	5	0.6 (0.4, 0.9)	6	0.4 (0.2, 0.5)
Other mouth (C06)	16	0.7 (0.5, 0.8)	5	0.6 (0.4, 0.9)	11	0.7 (0.5, 0.8)
Parotid gland (C07)	20	0.8 (0.6, 0.9)	5	0.6 (0.4, 0.8)	15	0.9 (0.7, 1.1)
Other salivary glands (C08)	5	0.2 (0.1, 0.3)	2	0.2 (0.1, 0.3)	4	0.2 (0.1, 0.3)
Tonsil (C09)	21	0.9 (0.7, 1.0)	4	0.6 (0.3, 0.8)	17	1.0 (0.8, 1.2)
Oropharynx (C10)	12	0.5 (0.4, 0.6)	4	0.5 (0.3, 0.7)	8	0.5 (0.3, 0.6)
Nasopharynx (C11)	14	0.5 (0.4, 0.7)	4	0.5 (0.3, 0.7)	10	0.5 (0.4, 0.7)
Pyriform sinus (C12)	21	0.9 (0.7, 1.0)	5	0.6 (0.4, 0.8)	16	1.0 (0.8, 1.2)
Hypopharynx (C13)	9	0.4 (0.3, 0.5)	4	0.4 (0.2, 0.6)	5	0.3 (0.2, 0.4)
Other mouth/pharynx (C14)	15	0.6 (0.5, 0.8)	6	0.8 (0.5, 1.0)	10	0.6 (0.4, 0.7)
Nose and sinuses (C30-C31)	20	0.8 (0.6, 0.9)	9	1.1 (0.8, 1.4)	11	0.6 (0.4, 0.8)
Nasal cavity & middle ear (C30)	10	0.4 (0.3, 0.5)	7	0.8 (0.5, 1.1)	4	0.2 (0.1, 0.3)
Accessory sinuses (C31)	10	0.4 (0.3, 0.5)	3	0.3 (0.1, 0.5)	7	0.4 (0.3, 0.5)
Larynx (C32)	158	6.3 (5.9, 6.8)	49	6.2 (5.4, 6.9)	109	6.4 (5.9, 6.9)
Oesophagus (C15)	296	11.7 (11.1, 12.3)	92	11.4 (10.4, 12.5)	204	11.8 (11.1, 12.5)
Stomach (C16)	429	16.8 (16.1, 17.5)	147	17.7 (16.4, 19.0)	282	16.4 (15.5, 17.3)
Small intestine (C17)	44	1.7 (1.5, 1.9)	15	1.9 (1.5, 2.3)	28	1.6 (1.4, 1.9)
Colorectal (C18-C21)	1,618	63.6 (62.2, 65.0)	501	61.1 (58.7, 63.5)	1,117	64.9 (63.2, 66.6)
Colon (C18)	937	36.7 (35.7, 37.8)	299	36.2 (34.3, 38.0)	639	37.0 (35.7, 38.3)
Rectum (C19-C21)	681	26.9 (26.0, 27.8)	202	24.9 (23.3, 26.4)	478	27.8 (26.7, 28.9)
Rectosigmoid junction (C19)	128	5.1 (4.7, 5.5)	40	4.9 (4.3, 5.6)	88	5.1 (4.6, 5.6)
Rectum (C20)	528	20.8 (20.0, 21.6)	153	18.8 (17.4, 20.1)	375	21.8 (20.8, 22.8)
Anus (C21)	25	1.0 (0.8, 1.2)	9	1.2 (0.8, 1.5)	15	0.9 (0.7, 1.1)
Liver & intrahepatic bile ducts (C22)	111	4.4 (4.0, 4.7)	36	4.4 (3.7, 5.0)	76	4.4 (3.9, 4.8)
Gallbladder (C23-C24)	63	2.5 (2.2, 2.7)	18	2.2 (1.7, 2.6)	45	2.6 (2.3, 3.0)
Gallbladder (C23)	11	0.4 (0.3, 0.5)	1	0.1 (0.0, 0.3)	10	0.6 (0.4, 0.7)
Other biliary (C24)	52	2.0 (1.8, 2.3)	16	2.0 (1.6, 2.5)	35	2.1 (1.8, 2.4)
Pancreas (C25)	265	10.4 (9.9, 11.0)	75	9.1 (8.2, 10.1)	190	11.1 (10.4, 11.8)
Other digestive (C26)	25	1.0 (0.8, 1.2)	7	0.9 (0.6, 1.1)	18	1.1 (0.9, 1.4)
Lung (C33-C34)	1,599	62.8 (61.4, 64.2)	542	65.5 (63.0, 67.9)	1,057	61.6 (59.9, 63.2)
Trachea (C33)	2	0.1 (0.0, 0.1)	1	0.2 (0.0, 0.3)	1	0.0 (0.0, 0.1)
Bronchus & lung (C34)	1,597	62.7 (61.3, 64.1)	541	65.3 (62.8, 67.8)	1,056	61.5 (59.9, 63.2)
Thymus (C37)	4	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	3	0.2 (0.1, 0.3)
Heart, mediastinum & pleura (C38)	11	0.4 (0.3, 0.5)	2	0.2 (0.1, 0.4)	9	0.5 (0.4, 0.7)
Other respiratory/intrathoracic (C39)	1	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	1	0.0 (0.0, 0.1)
Bone (C40-C41)	28	1.0 (0.9, 1.2)	6	0.7 (0.4, 1.0)	23	1.2 (1.0, 1.4)
Bones, joints of limbs (C40)	14	0.5 (0.4, 0.6)	2	0.2 (0.1, 0.4)	12	0.6 (0.5, 0.8)
Bones, joints head and trunk (C41)	14	0.5 (0.4, 0.7)	4	0.5 (0.2, 0.7)	11	0.6 (0.4, 0.7)
Malignant melanoma (C43)	292	11.3 (10.7, 11.9)	91	11.4 (10.3, 12.4)	201	11.3 (10.6, 12.0)
Non-melanoma skin cancer (C44)	4,197	165.2 (163.0, 167.5)	1,204	146.3 (142.6, 150.0)	2,993	174.3 (171.5, 177.1)
Mesothelioma (C45)	68	2.7 (2.4, 3.0)	45	5.5 (4.8, 6.2)	22	1.3 (1.1, 1.6)
Kaposis sarcoma (C46)	4	0.2 (0.1, 0.2)	1	0.1 (0.0, 0.2)	3	0.2 (0.1, 0.3)
Peritoneum (C48)	7	0.3 (0.2, 0.4)	1	0.2 (0.0, 0.3)	6	0.3 (0.2, 0.5)
Connective and soft tissues (C47, C49)	76	2.9 (2.6, 3.2)	21	2.5 (2.1, 3.0)	55	3.1 (2.8, 3.5)
Peripheral nerves / nervous system (C47)	4	0.1 (0.1, 0.2)	0	0.0 (0.0, 0.1)	3	0.2 (0.1, 0.3)
Connective tissues (C49)	73	2.8 (2.5, 3.1)	21	2.5 (2.0, 3.0)	52	3.0 (2.6, 3.3)
Breast (C50)	20	0.8 (0.6, 0.9)	7	0.8 (0.5, 1.1)	13	0.8 (0.6, 1.0)
Penis (C60)	37	1.5 (1.3, 1.7)	15	1.9 (1.4, 2.3)	22	1.3 (1.1, 1.6)
Prostate (C61)	2,750	109.1 (107.3, 110.9)	666	80.6 (77.9, 83.4)	2,084	122.7 (120.4, 125.1)
Testes (C62)	189	6.5 (6.1, 6.9)	60	7.2 (6.4, 8.0)	128	6.2 (5.7, 6.6)

Table S03 continued…

MALE	Ireland		Northern Ireland		Republic of Ireland	
	Average per year	EASIR	Average per year	EASIR	Average per year	EASIR
Other male genital (C63)	5	0.2 (0.1, 0.3)	3	0.3 (0.2, 0.5)	2	0.1 (0.1, 0.2)
Kidney (C64-C66, C68)	349	13.8 (13.2, 14.5)	107	13.3 (12.1, 14.4)	241	14.1 (13.3, 14.9)
Kidney except renal pelvis (C64)	315	12.5 (11.9, 13.1)	91	11.3 (10.2, 12.3)	224	13.1 (12.3, 13.8)
Renal pelvis (C65)	11	0.4 (0.3, 0.5)	4	0.5 (0.3, 0.7)	7	0.4 (0.2, 0.5)
Ureter (C66)	14	0.6 (0.4, 0.7)	6	0.7 (0.4, 1.0)	9	0.5 (0.4, 0.7)
Other urinary (C68)	9	0.3 (0.2, 0.4)	6	0.8 (0.5, 1.1)	2	0.1 (0.1, 0.2)
Bladder (C67)	466	18.3 (17.6, 19.1)	141	16.9 (15.6, 18.2)	325	19.0 (18.1, 19.9)
Eye & adnexa (C69)	27	1.1 (0.9, 1.2)	5	0.7 (0.4, 0.9)	21	1.2 (1.0, 1.5)
Brain and other central nervous system (C70-C72)	232	8.9 (8.4, 9.5)	65	7.9 (7.1, 8.8)	167	9.4 (8.8, 10.0)
Meninges (C70)	160	6.2 (5.8, 6.6)	1	0.1 (0.0, 0.2)	159	9.0 (8.3, 9.6)
Brain (C71)	65	2.5 (2.2, 2.8)	62	7.7 (6.8, 8.5)	3	0.2 (0.1, 0.2)
Spinal cord (C72)	7	0.3 (0.2, 0.3)	2	0.2 (0.1, 0.3)	5	0.3 (0.2, 0.4)
Thyroid gland (C73)	35	1.3 (1.1, 1.5)	10	1.3 (0.9, 1.6)	25	1.4 (1.1, 1.6)
Adrenal gland (C74)	9	0.4 (0.3, 0.5)	4	0.5 (0.3, 0.7)	6	0.3 (0.2, 0.4)
Other endocrine glands (C75)	6	0.2 (0.1, 0.3)	1	0.1 (0.0, 0.2)	5	0.3 (0.2, 0.4)
Lymphoma (C81-C85, C96)	470	18.2 (17.4, 18.9)	150	18.4 (17.1, 19.7)	320	18.0 (17.1, 18.9)
Hodgkins lymphoma (C81)	71	2.5 (2.3, 2.8)	20	2.4 (1.9, 2.9)	51	2.6 (2.2, 2.9)
Non-Hodgkin's lymphoma (C82-C85, C96)	399	15.6 (15.0, 16.3)	130	16.0 (14.8, 17.3)	269	15.5 (14.6, 16.3)
Follicular non-Hodgkins lymphoma (C82)	52	2.1 (1.8, 2.3)	18	2.3 (1.9, 2.8)	34	1.9 (1.6, 2.2)
Diffuse non-Hodgkins lymphoma (C83)	118	4.6 (4.2, 5.0)	28	3.4 (2.8, 3.9)	90	5.1 (4.7, 5.6)
Peripheral/cutaneous T cell lymphoma (C84)	29	1.2 (1.0, 1.4)	10	1.3 (0.9, 1.6)	19	1.1 (0.9, 1.3)
Other/unspecified NHL (C85)	198	7.8 (7.3, 8.3)	73	9.0 (8.0, 9.9)	125	7.2 (6.6, 7.8)
Other lymphoid and haematopoietic (C96)	1	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Malignant immunoproliferative disease (C88)	9	0.4 (0.2, 0.5)	2	0.3 (0.1, 0.4)	7	0.4 (0.3, 0.5)
Multiple myeloma (C90)	181	7.1 (6.6, 7.6)	60	7.2 (6.4, 8.0)	121	7.0 (6.5, 7.6)
Leukaemia (C91-C95)	359	14.0 (13.4, 14.7)	89	10.9 (9.9, 11.9)	270	15.5 (14.7, 16.3)
Lymphoid leukaemia (C91)	199	7.8 (7.3, 8.3)	42	5.1 (4.4, 5.8)	157	9.1 (8.5, 9.7)
Myeloid leukaemia (C92)	129	5.0 (4.6, 5.4)	43	5.2 (4.5, 6.0)	87	4.9 (4.4, 5.3)
Monocyctic leukaemia (C93)	3	0.1 (0.0, 0.2)	0	0.0 (0.0, 0.1)	2	0.1 (0.1, 0.2)
Other specified leukaemia (C94)	7	0.3 (0.2, 0.4)	1	0.1 (0.0, 0.2)	7	0.4 (0.2, 0.5)
Unspecified leukaemia (C95)	21	0.8 (0.7, 1.0)	3	0.4 (0.2, 0.6)	18	1.0 (0.8, 1.2)
Other (C76, C80)	468	18.4 (17.6, 19.1)	169	20.5 (19.1, 21.8)	299	17.4 (16.5, 18.3)
Ill-defined site (C76)	17	0.7 (0.5, 0.8)	2	0.3 (0.1, 0.5)	15	0.9 (0.7, 1.1)
Unknown primary site (C80)	450	17.7 (17.0, 18.5)	167	20.2 (18.8, 21.6)	284	16.6 (15.7, 17.4)
All (excluding NMSC) (C00-C96, ex. C44)	10,999	431.8 (428.2, 435.4)	3,303	401.9 (395.8, 408.1)	7,696	446.4 (441.9, 450.8)
All cancers (C00-C96)	15,196	597.1 (592.8, 601.3)	4,507	548.2 (541.1, 555.4)	10,689	620.7 (615.4, 625.9)

Table S03 continued…

FEMALE	Ireland		Northern Ireland		Republic of Ireland	
	Average per year	EASIR	Average per year	EASIR	Average per year	EASIR
Head and Neck (C00-C14, C30-C32)	171	5.7 (5.3, 6.1)	61	6.3 (5.6, 7.1)	110	5.5 (5.0, 5.9)
Oral (C00-C14)	122	4.1 (3.8, 4.4)	43	4.4 (3.8, 5.0)	78	4.0 (3.6, 4.4)
Lip (C00)	5	0.1 (0.1, 0.2)	3	0.2 (0.1, 0.4)	2	0.1 (0.0, 0.1)
Base of tongue (C01)	7	0.3 (0.2, 0.3)	2	0.2 (0.1, 0.3)	5	0.3 (0.2, 0.4)
Other tongue (C02)	22	0.7 (0.6, 0.9)	8	0.8 (0.5, 1.0)	14	0.7 (0.6, 0.9)
Gum (C03)	7	0.2 (0.1, 0.3)	3	0.3 (0.1, 0.4)	4	0.2 (0.1, 0.3)
Floor of mouth (C04)	10	0.4 (0.3, 0.5)	4	0.5 (0.3, 0.7)	6	0.3 (0.2, 0.4)
Palate (C05)	7	0.3 (0.2, 0.3)	2	0.3 (0.1, 0.4)	5	0.3 (0.2, 0.4)
Other mouth (C06)	14	0.4 (0.3, 0.5)	6	0.6 (0.4, 0.8)	7	0.3 (0.2, 0.4)
Parotid gland (C07)	12	0.4 (0.3, 0.5)	4	0.4 (0.2, 0.6)	8	0.4 (0.3, 0.5)
Other salivary glands (C08)	5	0.2 (0.1, 0.2)	2	0.3 (0.1, 0.4)	3	0.1 (0.1, 0.2)
Tonsil (C09)	9	0.4 (0.2, 0.5)	2	0.2 (0.1, 0.4)	7	0.4 (0.3, 0.5)
Oropharynx (C10)	3	0.1 (0.1, 0.2)	2	0.2 (0.0, 0.3)	2	0.1 (0.0, 0.2)
Nasopharynx (C11)	4	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	3	0.1 (0.1, 0.2)
Pyriform sinus (C12)	4	0.1 (0.1, 0.2)	0	0.0 (0.0, 0.1)	4	0.2 (0.1, 0.3)
Hypopharynx (C13)	6	0.2 (0.1, 0.3)	2	0.2 (0.0, 0.3)	4	0.2 (0.1, 0.3)
Other mouth/pharynx (C14)	5	0.2 (0.1, 0.2)	2	0.2 (0.1, 0.3)	3	0.2 (0.1, 0.2)
Nose and sinuses (C30-C31)	17	0.5 (0.4, 0.6)	5	0.5 (0.3, 0.7)	11	0.5 (0.4, 0.7)
Nasal cavity & middle ear (C30)	7	0.2 (0.1, 0.3)	4	0.4 (0.2, 0.5)	3	0.2 (0.1, 0.2)
Accessory sinuses (C31)	9	0.3 (0.2, 0.4)	1	0.1 (0.0, 0.3)	8	0.4 (0.3, 0.5)
Larynx (C32)	33	1.1 (0.9, 1.3)	12	1.4 (1.1, 1.8)	20	1.0 (0.8, 1.2)
Oesophagus (C15)	183	5.4 (5.0, 5.7)	59	5.0 (4.4, 5.6)	124	5.6 (5.1, 6.0)
Stomach (C16)	276	8.2 (7.7, 8.6)	95	7.9 (7.2, 8.7)	181	8.2 (7.7, 8.8)
Small intestine (C17)	31	1.0 (0.8, 1.2)	12	1.1 (0.8, 1.4)	19	0.9 (0.7, 1.1)
Colorectal (C18-C21)	1,297	40.5 (39.4, 41.5)	437	40.1 (38.4, 41.9)	860	40.6 (39.4, 41.9)
Colon (C18)	875	26.9 (26.1, 27.7)	291	26.3 (24.9, 27.7)	584	27.2 (26.2, 28.2)
Rectum (C19-C21)	422	13.6 (13.0, 14.2)	146	13.8 (12.8, 14.9)	276	13.5 (12.7, 14.2)
Rectosigmoid junction (C19)	88	2.8 (2.6, 3.1)	28	2.8 (2.3, 3.2)	60	2.9 (2.6, 3.2)
Rectum (C20)	307	9.8 (9.3, 10.3)	109	10.1 (9.2, 11.0)	198	9.7 (9.0, 10.3)
Anus (C21)	26	0.9 (0.7, 1.1)	9	1.0 (0.7, 1.2)	18	0.9 (0.7, 1.1)
Liver & intrahepatic bile ducts (C22)	68	2.2 (1.9, 2.4)	24	2.2 (1.8, 2.6)	44	2.1 (1.8, 2.4)
Gallbladder (C23-C24)	102	3.0 (2.7, 3.3)	28	2.4 (2.0, 2.8)	74	3.3 (3.0, 3.7)
Gallbladder (C23)	45	1.4 (1.2, 1.6)	12	1.1 (0.8, 1.4)	33	1.5 (1.3, 1.8)
Other biliary (C24)	57	1.6 (1.4, 1.8)	16	1.3 (1.0, 1.6)	41	1.8 (1.5, 2.0)
Pancreas (C25)	272	8.0 (7.6, 8.5)	84	7.3 (6.6, 8.0)	188	8.4 (7.9, 9.0)
Other digestive (C26)	37	0.9 (0.8, 1.1)	15	1.1 (0.8, 1.4)	23	0.9 (0.7, 1.0)
Lung (C33-C34)	1,016	32.4 (31.5, 33.3)	352	33.6 (32.0, 35.3)	664	31.9 (30.7, 33.0)
Trachea (C33)	2	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	2	0.1 (0.0, 0.1)
Bronchus & lung (C34)	1,014	32.3 (31.4, 33.2)	351	33.5 (31.9, 35.2)	662	31.8 (30.7, 32.9)
Thymus (C37)	3	0.1 (0.0, 0.1)	0	0.0 (0.0, 0.1)	3	0.1 (0.1, 0.2)
Heart, mediastinum & pleura (C38)	6	0.2 (0.1, 0.3)	1	0.1 (0.0, 0.2)	5	0.2 (0.1, 0.3)
Other respiratory/intrathoracic (C39)	1	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)	1	0.0 (0.0, 0.1)
Bone (C40-C41)	22	0.7 (0.6, 0.9)	5	0.5 (0.3, 0.7)	17	0.8 (0.6, 1.0)
Bones, joints of limbs (C40)	9	0.3 (0.2, 0.4)	2	0.3 (0.1, 0.4)	7	0.3 (0.2, 0.5)
Bones, joints head and trunk (C41)	13	0.4 (0.3, 0.5)	3	0.3 (0.1, 0.4)	10	0.5 (0.3, 0.6)
Malignant melanoma (C43)	444	15.1 (14.4, 15.7)	132	14.0 (12.9, 15.1)	312	15.6 (14.8, 16.4)
Non-melanoma skin cancer (C44)	3,717	114.8 (113.1, 116.6)	1,062	93.9 (91.2, 96.6)	2,655	125.3 (123.1, 127.5)
Mesothelioma (C45)	9	0.3 (0.2, 0.4)	5	0.5 (0.3, 0.7)	4	0.2 (0.1, 0.3)
Kaposis sarcoma (C46)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Peritoneum (C48)	12	0.5 (0.3, 0.6)	3	0.3 (0.2, 0.5)	9	0.5 (0.4, 0.7)
Connective and soft tissues (C47, C49)	54	1.8 (1.6, 2.0)	17	1.7 (1.3, 2.1)	37	1.8 (1.6, 2.1)
Peripheral nerves / nervous system (C47)	4	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	4	0.2 (0.1, 0.3)
Connective tissues (C49)	50	1.6 (1.4, 1.8)	16	1.6 (1.2, 2.0)	33	1.6 (1.4, 1.9)
Breast (C50)	3,095	110.8 (109.1, 112.6)	994	108.2 (105.1, 111.3)	2,101	112.2 (110.0, 114.4)
Vulva (C51)	61	1.9 (1.7, 2.1)	25	2.3 (1.9, 2.7)	36	1.7 (1.4, 1.9)
Vagina (C52)	14	0.4 (0.3, 0.5)	5	0.5 (0.3, 0.7)	8	0.4 (0.3, 0.5)

Table S03 continued…

FEMALE	Ireland		Northern Ireland		Republic of Ireland	
	Average per year	EASIR	Average per year	EASIR	Average per year	EASIR
Cervix uteri (C53)	278	9.9 (9.4, 10.4)	80	8.9 (8.0, 9.8)	199	10.4 (9.7, 11.0)
Uterus (C54-C55)	446	15.9 (15.2, 16.5)	161	17.2 (15.9, 18.4)	285	15.2 (14.4, 16.0)
Corpus uteri (C54)	423	15.1 (14.5, 15.8)	158	17.0 (15.7, 18.2)	266	14.2 (13.4, 15.0)
Uterus, unspecified (C55)	22	0.7 (0.6, 0.9)	3	0.2 (0.1, 0.3)	19	1.0 (0.8, 1.2)
Ovary including borderline (C56)	561	19.5 (18.7, 20.2)	187	19.6 (18.3, 20.9)	374	19.5 (18.6, 20.4)
Ovary (C56)	494	17.1 (16.4, 17.8)	165	17.1 (15.8, 18.3)	330	17.1 (16.3, 18.0)
Ovary - borderline (C56)	67	2.4 (2.1, 2.7)	22	2.6 (2.1, 3.1)	45	2.4 (2.0, 2.7)
Other female genital (C57)	10	0.4 (0.3, 0.5)	4	0.4 (0.2, 0.6)	6	0.3 (0.2, 0.4)
Placenta (C58)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Kidney (C64-C66, C68)	201	6.7 (6.3, 7.2)	70	6.9 (6.2, 7.7)	131	6.6 (6.1, 7.2)
Kidney except renal pelvis (C64)	186	6.3 (5.9, 6.7)	62	6.3 (5.5, 7.0)	124	6.3 (5.8, 6.8)
Renal pelvis (C65)	5	0.1 (0.1, 0.2)	2	0.2 (0.1, 0.3)	3	0.1 (0.1, 0.2)
Ureter (C66)	7	0.2 (0.1, 0.3)	4	0.3 (0.2, 0.5)	3	0.2 (0.1, 0.2)
Other urinary (C68)	3	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	2	0.1 (0.0, 0.1)
Bladder (C67)	193	5.9 (5.5, 6.3)	56	4.9 (4.3, 5.5)	137	6.4 (5.9, 6.9)
Eye & adnexa (C69)	23	0.8 (0.6, 0.9)	4	0.4 (0.2, 0.6)	19	1.0 (0.8, 1.2)
Brain and other central nervous system (C70-C72)	182	6.2 (5.8, 6.6)	50	5.4 (4.7, 6.1)	133	6.6 (6.1, 7.1)
Meninges (C70)	8	0.2 (0.2, 0.3)	1	0.1 (0.0, 0.1)	7	0.3 (0.2, 0.4)
Brain (C71)	167	5.7 (5.3, 6.1)	47	5.1 (4.4, 5.8)	120	6.0 (5.5, 6.5)
Spinal cord (C72)	8	0.3 (0.2, 0.4)	2	0.2 (0.1, 0.4)	6	0.3 (0.2, 0.4)
Thyroid gland (C73)	92	3.2 (2.9, 3.5)	30	3.4 (2.8, 3.9)	62	3.1 (2.7, 3.4)
Adrenal gland (C74)	11	0.4 (0.3, 0.5)	3	0.4 (0.2, 0.6)	9	0.5 (0.3, 0.6)
Other endocrine glands (C75)	6	0.2 (0.1, 0.3)	1	0.2 (0.0, 0.3)	4	0.2 (0.1, 0.3)
Lymphoma (C81-C85, C96)	437	14.5 (13.9, 15.2)	153	15.1 (14.0, 16.2)	284	14.2 (13.4, 14.9)
Hodgkins lymphoma (C81)	60	2.0 (1.8, 2.3)	17	2.0 (1.6, 2.4)	43	2.1 (1.8, 2.3)
Non-Hodgkin's lymphoma (C82-C85, C96)	377	12.5 (11.9, 13.1)	136	13.1 (12.0, 14.1)	242	12.1 (11.4, 12.8)
Follicular non-Hodgkins lymphoma (C82)	59	2.1 (1.9, 2.4)	21	2.3 (1.8, 2.7)	38	2.0 (1.7, 2.3)
Diffuse non-Hodgkins lymphoma (C83)	95	3.1 (2.8, 3.4)	24	2.3 (1.9, 2.8)	71	3.5 (3.1, 3.9)
Peripheral / cutaneous T cell lymphoma (C84)	23	0.8 (0.6, 0.9)	7	0.7 (0.5, 1.0)	16	0.8 (0.6, 1.0)
Other / unspecified NHL (C85)	198	6.4 (6.0, 6.8)	83	7.6 (6.9, 8.4)	116	5.7 (5.2, 6.2)
Other lymphoid and haematopoietic (C96)	1	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	1	0.0 (0.0, 0.1)
Malignant immunoproliferative disease (C88)	5	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	4	0.2 (0.1, 0.3)
Multiple myeloma (C90)	136	4.1 (3.8, 4.5)	47	4.1 (3.5, 4.6)	89	4.2 (3.8, 4.6)
Leukaemia (C91-C95)	241	7.6 (7.2, 8.1)	66	6.3 (5.6, 7.0)	175	8.3 (7.8, 8.9)
Lymphoid leukaemia (C91)	125	4.0 (3.7, 4.3)	29	2.8 (2.3, 3.2)	96	4.6 (4.2, 5.0)
Myeloid leukaemia (C92)	91	3.0 (2.7, 3.2)	32	3.1 (2.6, 3.6)	60	2.9 (2.6, 3.2)
Monocyctic leukaemia (C93)	1	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Other specified leukaemia (C94)	4	0.1 (0.1, 0.2)	0	0.0 (0.0, 0.1)	4	0.2 (0.1, 0.3)
Unspecified leukaemia (C95)	19	0.5 (0.4, 0.6)	4	0.3 (0.2, 0.5)	15	0.6 (0.5, 0.8)
Other (C76, C80)	513	14.7 (14.1, 15.3)	187	15.6 (14.5, 16.6)	326	14.3 (13.5, 15.0)
Ill-defined site (C76)	27	0.8 (0.6, 0.9)	5	0.3 (0.2, 0.5)	22	1.0 (0.8, 1.1)
Unknown primary site (C80)	486	14.0 (13.4, 14.5)	182	15.2 (14.2, 16.3)	304	13.3 (12.6, 14.0)
All (excluding NMSC) (C00-C96, ex. C44)	10,510	349.3 (346.2, 352.4)	3,452	344.1 (338.8, 349.5)	7,058	352.0 (348.3, 355.8)
All cancers (C00-C96)	14,227	464.2 (460.7, 467.7)	4,514	438.1 (432.1, 444.0)	9,713	477.4 (473.0, 481.7)

EASIR: European age-standardised incidence rates per 100,000 persons with 95% confidence interval

S04: Incidence of cancer by county/district council, cancer site and sex: 1994-2004

		Head and Neck (C00-C14, C30-C32)		Oesophagus (C15)		Stomach (C16)		Colorectal (C18-C21)		Liver (C22)	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Northern Ireland	Antrim	25	8	25	17	43	19	129	129	11	7
	Ards	58	29	48	34	73	37	219	201	6	13
	Armagh	53	22	34	19	52	18	145	141	8	<5
	Ballymena	56	17	38	25	63	31	191	187	12	7
	Ballymoney	19	6	20	7	16	18	93	85	5	<5
	Banbridge	23	13	29	20	28	25	108	101	7	<5
	Belfast	382	164	204	143	368	271	1,005	927	93	60
	Carrickfergus	32	10	33	23	40	24	94	103	5	7
	Castlereagh	59	29	45	32	82	46	228	205	18	12
	Coleraine	48	35	33	17	54	30	191	179	14	10
	Cookstown	45	10	16	9	23	23	84	78	5	<5
	Craigavon	68	30	50	24	74	34	244	206	16	13
	Derry	102	49	57	28	96	59	298	249	18	11
	Down	52	28	43	18	53	36	212	187	10	13
	Dungannon	44	16	11	15	37	23	125	146	<5	7
	Fermanagh	71	29	25	21	60	39	192	159	13	7
	Larne	35	10	17	16	29	21	129	105	10	8
	Limavady	25	9	17	13	39	10	80	61	7	5
	Lisburn	82	40	73	37	91	54	296	307	17	12
	Magherafelt	34	9	14	15	31	23	112	105	8	9
	Moyle	20	9	<5	5	11	7	59	51	<5	<5
	Newry & Mourne	95	27	40	26	120	72	293	247	7	18
	Newtownabbey	79	36	46	24	85	47	281	257	22	15
	North Down	71	31	54	32	63	54	281	290	16	15
	Omagh	39	13	25	13	31	27	145	122	7	5
	Strabane	39	14	19	18	39	24	121	93	8	7
Republic of Ireland	Carlow	31	11	22	23	34	23	112	97	7	<5
	Cavan	46	15	36	18	70	49	230	157	13	7
	Clare	94	28	41	24	72	43	300	166	8	14
	Cork	378	122	258	187	322	199	1,496	1,179	99	55
	Donegal	132	44	63	36	150	84	465	399	19	6
	Dublin	986	380	560	394	939	690	3,033	2,616	221	101
	Galway	239	58	91	53	166	102	649	452	38	19
	Kerry	125	45	79	55	110	58	428	309	15	16
	Kildare	92	41	72	50	109	42	357	249	18	14
	Kilkenny	45	16	56	29	76	36	217	150	11	<5
	Laois	45	17	33	21	37	22	157	125	5	<5
	Leitrim	36	17	22	10	34	16	127	92	5	<5
	Limerick	149	41	79	53	110	72	499	347	18	13
	Longford	55	17	23	12	33	16	100	80	5	4
	Louth	72	36	63	28	94	67	306	203	10	7
	Mayo	153	29	83	32	105	58	482	286	16	8
	Meath	82	30	60	33	91	52	307	252	11	8
	Monaghan	37	15	32	16	61	45	182	116	8	<5
	Offaly	46	20	36	28	62	29	179	162	7	7
	Roscommon	66	14	44	22	43	25	201	166	8	7
	Sligo	71	19	22	20	61	32	210	165	16	<5
	Tipperary-North	59	10	45	23	52	44	173	117	5	5
	Tipperary-South	64	24	54	26	64	33	267	184	12	7
	Waterford	71	23	65	38	85	42	325	243	33	7
	Westmeath	61	18	40	21	77	30	212	164	14	7
	Wexford	92	28	59	36	72	48	361	260	19	15
	Wicklow	74	28	62	45	89	57	280	258	14	12

Table S04 continued...

		Pancreas (C25)		Lung (C33, C34)		Malignant melanoma (C43)		Breast (C50)	Cervix (C53)	Uterus (C54-C55)	Ovary (C56)
		Male	Female	Male	Female	Male	Female	Female	Female	Female	Female
Northern Ireland	Antrim	14	22	161	95	18	32	252	24	53	52
	Ards	45	47	272	143	32	71	487	39	61	88
	Armagh	21	31	156	73	33	55	319	17	41	49
	Ballymena	23	26	169	80	19	46	342	30	44	85
	Ballymoney	18	9	73	35	7	17	146	7	27	36
	Banbridge	13	20	107	64	21	38	248	19	45	41
	Belfast	152	177	1,583	1,058	133	213	1,822	197	274	337
	Carrickfergus	16	15	151	92	27	22	220	33	32	39
	Castlereagh	29	28	274	178	50	70	484	34	72	79
	Coleraine	26	24	176	110	40	60	368	31	67	72
	Cookstown	11	21	90	37	15	18	148	15	20	24
	Craigavon	40	38	237	144	41	72	464	47	71	95
	Derry	48	51	342	241	32	55	556	48	69	86
	Down	17	24	217	126	26	41	387	19	57	83
	Dungannon	15	24	144	74	31	36	276	15	45	68
	Fermanagh	39	32	201	91	34	39	342	24	62	58
	Larne	19	15	117	65	26	37	212	22	36	47
	Limavady	12	12	64	42	8	11	180	15	28	28
	Lisburn	54	44	306	218	59	82	579	63	94	120
	Magherafelt	22	16	113	44	16	20	218	16	26	46
	Moyle	11	8	71	36	8	17	94	6	13	17
	Newry & Mourne	33	43	267	169	43	65	510	40	73	102
	Newtownabbey	39	36	288	193	45	60	539	43	67	105
	North Down	49	52	251	176	70	78	603	47	78	104
	Omagh	17	13	107	67	15	23	249	21	31	40
	Strabane	18	13	118	68	15	17	186	16	24	36
Republic of Ireland	Carlow	20	29	156	75	12	31	206	23	26	40
	Cavan	47	29	198	86	29	43	291	22	43	56
	Clare	56	53	248	113	38	51	456	55	68	100
	Cork	252	271	1,255	700	262	418	2,365	216	328	492
	Donegal	74	78	440	226	66	85	594	53	91	122
	Dublin	440	525	3,621	2,543	562	930	6,444	677	749	1,054
	Galway	129	101	532	249	90	144	976	77	161	200
	Kerry	78	92	366	184	75	83	728	68	128	131
	Kildare	52	42	381	204	67	90	714	88	109	127
	Kilkenny	36	35	218	90	38	57	395	31	44	87
	Laois	29	30	139	66	30	32	287	32	29	58
	Leitrim	35	15	101	39	6	22	144	25	32	29
	Limerick	90	84	493	257	80	122	872	85	150	147
	Longford	16	14	132	58	13	19	173	20	28	43
	Louth	41	48	313	197	32	80	519	49	63	74
	Mayo	87	92	316	182	41	94	632	39	119	123
	Meath	59	48	259	159	60	75	558	54	54	104
	Monaghan	28	17	144	60	20	42	262	19	38	58
	Offaly	35	34	138	77	30	40	330	36	51	65
	Roscommon	28	41	180	79	31	46	313	31	37	62
	Sligo	36	31	210	109	39	39	351	31	54	75
	Tipperary-North	41	32	170	102	30	35	348	26	55	74
	Tipperary-South	45	42	231	104	31	80	391	50	70	92
	Waterford	63	41	289	139	58	104	537	53	85	123
	Westmeath	38	38	221	103	25	60	374	40	47	70
	Wexford	63	58	334	219	54	86	565	68	91	121
	Wicklow	53	56	290	201	60	85	601	80	71	99

Table S04 continued…

		Prostate (C61)	Testes (C62)	Kidney (C64-C66, C68)		Bladder (C67)		Brain and other CNS (C70-C72)		Lymphoma (C81-C85, C96)	
		Male	Male	Male	Female	Male	Female	Male	Female	Male	Female
Northern Ireland	Antrim	144	20	37	16	34	18	17	13	31	37
	Ards	252	20	44	36	94	26	23	20	58	67
	Armagh	207	22	46	16	41	20	24	17	59	65
	Ballymena	245	18	35	28	51	23	30	19	59	61
	Ballymoney	87	11	13	16	16	9	19	8	29	20
	Banbridge	184	17	27	13	37	12	17	8	43	34
	Belfast	930	76	195	129	345	166	122	88	303	269
	Carrickfergus	129	18	32	18	36	14	13	7	35	48
	Castlereagh	280	28	53	33	80	34	25	28	74	85
	Coleraine	246	18	53	31	56	19	24	14	64	57
	Cookstown	114	8	17	14	24	7	11	8	26	24
	Craigavon	304	35	50	43	57	31	34	31	92	71
	Derry	367	49	54	43	76	34	40	34	83	72
	Down	267	18	36	29	56	17	20	28	50	64
	Dungannon	167	19	37	15	42	18	17	10	48	49
	Fermanagh	293	23	39	30	49	17	30	18	51	48
	Larne	109	10	23	19	37	17	15	9	36	41
	Limavady	114	10	13	13	33	9	11	8	23	26
	Lisburn	364	40	56	38	79	26	32	44	81	96
	Magherafelt	124	16	25	17	28	8	11	14	34	27
	Moyle	88	7	12	9	22	6	<5	<5	21	22
	Newry & Mourne	277	35	62	27	65	26	42	22	81	86
	Newtownabbey	266	28	64	28	69	37	30	27	73	81
	North Down	319	23	48	36	94	39	38	25	65	79
	Omagh	227	13	26	11	36	13	17	13	36	36
	Strabane	163	7	23	18	25	13	18	8	29	22
Republic of Ireland	Carlow	229	18	28	21	37	16	15	21	39	34
	Cavan	294	15	36	23	70	20	24	19	43	43
	Clare	452	27	41	31	74	30	42	29	76	62
	Cork	2,370	177	246	142	443	186	237	165	378	297
	Donegal	808	26	79	40	178	56	62	39	108	92
	Dublin	4,345	364	615	377	1,047	472	470	388	888	895
	Galway	1,129	52	136	65	194	59	88	73	204	129
	Kerry	770	42	79	39	159	63	67	40	141	96
	Kildare	471	60	64	47	82	39	67	41	107	89
	Kilkenny	396	20	63	33	67	29	27	32	67	59
	Laois	266	9	37	18	54	24	20	15	45	47
	Leitrim	167	<5	21	10	30	15	17	10	22	27
	Limerick	637	48	85	52	149	69	68	66	121	131
	Longford	179	10	21	7	19	11	13	7	24	19
	Louth	402	36	59	39	78	32	44	40	77	67
	Mayo	685	33	68	34	136	40	52	49	103	103
	Meath	465	31	75	36	93	36	51	38	93	69
	Monaghan	273	14	35	17	44	12	25	8	45	41
	Offaly	337	22	56	19	55	20	38	19	51	42
	Roscommon	381	18	45	16	70	14	29	17	51	39
	Sligo	367	18	54	29	58	23	27	17	40	44
	Tipperary-North	325	17	44	17	62	26	28	22	54	41
	Tipperary-South	340	23	34	29	70	36	34	35	55	58
	Waterford	548	32	55	37	91	34	47	43	96	68
	Westmeath	321	23	59	20	52	29	26	25	63	47
	Wexford	497	32	68	38	103	41	64	37	99	72
	Wicklow	520	29	71	41	128	38	52	38	101	65

Table S04 continued…

		Multiple myeloma (C90)		Leukaemia (C91-C95)		All cancers (ex. NMSC)	
		Male	Female	Male	Female	Male	Female
Northern Ireland	Antrim	15	10	32	17	1,169	1,162
	Ards	19	27	46	27	2,052	2,104
	Armagh	17	15	36	20	1,540	1,480
	Ballymena	21	24	25	32	1,616	1,591
	Ballymoney	10	15	14	7	688	713
	Banbridge	12	15	18	15	1,121	1,143
	Belfast	103	89	167	147	8,923	9,469
	Carrickfergus	11	9	16	18	1,040	1,132
	Castlereagh	27	23	48	43	2,067	2,169
	Coleraine	24	18	33	15	1,639	1,650
	Cookstown	10	6	21	18	830	734
	Craigavon	28	29	46	38	2,283	2,282
	Derry	22	16	52	56	2,442	2,488
	Down	29	28	40	30	1,799	1,853
	Dungannon	17	13	31	13	1,269	1,322
	Fermanagh	17	13	45	19	1,700	1,469
	Larne	14	12	17	16	975	996
	Limavady	14	9	15	11	693	709
	Lisburn	43	30	77	50	2,670	2,870
	Magherafelt	12	7	18	23	980	946
	Moyle	10	6	12	<5	555	456
	Newry & Mourne	30	16	41	29	2,551	2,532
	Newtownabbey	37	22	55	31	2,289	2,382
	North Down	31	29	48	38	2,397	2,746
	Omagh	16	11	30	17	1,136	1,044
	Strabane	9	5	28	10	997	897
Republic of Ireland	Carlow	14	14	16	15	1,176	1,018
	Cavan	26	16	45	25	1,863	1,473
	Clare	34	22	87	52	2,744	2,208
	Cork	167	161	329	214	13,465	11,904
	Donegal	52	33	99	72	4,191	3,212
	Dublin	281	243	584	479	29,784	31,491
	Galway	68	46	153	96	6,100	4,735
	Kerry	49	41	116	71	4,657	3,841
	Kildare	39	25	91	59	3,163	2,983
	Kilkenny	30	13	50	37	2,099	1,760
	Laois	17	10	46	30	1,510	1,291
	Leitrim	14	9	27	12	962	758
	Limerick	55	41	141	99	4,355	4,024
	Longford	12	12	29	24	1,040	838
	Louth	26	21	76	58	2,673	2,611
	Mayo	53	41	89	52	3,898	3,138
	Meath	31	21	59	45	2,905	2,519
	Monaghan	21	16	36	18	1,519	1,206
	Offaly	27	13	42	38	1,735	1,521
	Roscommon	22	12	54	25	1,982	1,510
	Sligo	33	21	37	26	1,981	1,625
	Tipperary-North	22	16	60	32	1,816	1,501
	Tipperary-South	18	18	50	30	2,184	1,993
	Waterford	31	25	82	52	3,047	2,663
	Westmeath	18	14	60	35	2,005	1,754
	Wexford	25	21	93	56	2,981	2,673
	Wicklow	37	17	78	55	2,991	2,795

S05: Stage at diagnosis for cancer patients by sex, country and cancer site: 2000-2004 or 2001 only

		Male			Female			All		
		Northern Ireland	Republic of Ireland	Ireland	Northern Ireland	Republic of Ireland	Ireland	Northern Ireland	Republic of Ireland	Ireland
2000-2004										
Colorectal	**Stage I**	8.5%	11.6%	10.7%	8.8%	11.6%	10.6%	8.6%	11.6%	10.6%
	Stage II	23.2%	23.5%	23.4%	24.0%	25.5%	25.0%	23.6%	24.4%	24.2%
	Stage III	27.4%	26.6%	26.9%	25.8%	24.5%	25.0%	26.7%	25.7%	26.0%
	Stage IV	15.9%	24.2%	21.6%	14.2%	21.1%	18.8%	15.1%	22.8%	20.3%
	Unknown	25.0%	14.0%	17.4%	27.2%	17.2%	20.6%	26.1%	15.4%	18.9%
Breast	**Stage I**	-	-	-	30.2%	25.3%	26.8%	-	-	-
	Stage II	-	-	-	36.5%	45.8%	42.8%	-	-	-
	Stage III	-	-	-	13.5%	12.4%	12.8%	-	-	-
	Stage IV	-	-	-	2.3%	7.0%	5.5%	-	-	-
	Unknown	-	-	-	17.5%	9.5%	12.1%	-	-	-
Cervix	**Stage I**	-	-	-	45.4%	34.2%	37.3%	-	-	-
	Stage II	-	-	-	18.9%	7.0%	10.4%	-	-	-
	Stage III	-	-	-	17.3%	21.7%	20.4%	-	-	-
	Stage IV	-	-	-	8.9%	8.3%	8.4%	-	-	-
	Unknown	-	-	-	9.4%	28.9%	23.4%	-	-	-
Ovary	**Stage I**	-	-	-	32.6%	12.7%	19.4%	-	-	-
	Stage II	-	-	-	4.6%	2.2%	3.0%	-	-	-
	Stage III	-	-	-	29.9%	27.4%	28.3%	-	-	-
	Stage IV	-	-	-	11.8%	26.9%	21.8%	-	-	-
	Unknown	-	-	-	21.1%	30.7%	27.5%	-	-	-
Melanoma	**<=1.0mm**	46.6%	20.9%	28.9%	51.3%	28.5%	35.3%	49.4%	25.5%	32.8%
	1 to 2mm	14.9%	22.2%	19.9%	13.4%	23.3%	20.3%	14.0%	22.9%	20.2%
	2 to 4mm	14.7%	29.0%	24.5%	10.6%	25.1%	20.8%	12.3%	26.6%	22.3%
	4+ mm	10.1%	12.9%	12.0%	6.1%	8.4%	7.7%	7.7%	10.2%	9.4%
	Unknown	13.8%	15.0%	14.6%	18.7%	14.6%	15.8%	16.7%	14.8%	15.4%
2001 only										
Oesophageal	**Stage I**	7.1%	4.8%	5.6%	6.8%	0.0%	2.3%	7.0%	3.1%	4.4%
	Stage II	9.2%	8.2%	8.5%	10.2%	9.6%	9.8%	9.6%	8.7%	9.0%
	Stage III	15.3%	15.5%	15.4%	6.8%	11.4%	9.8%	12.1%	14.0%	13.4%
	Stage IV	15.3%	18.8%	17.7%	15.3%	18.4%	17.3%	15.3%	18.7%	17.6%
	Unknown	53.1%	52.7%	52.8%	61.0%	60.5%	60.7%	56.1%	55.5%	55.6%
Stomach	**Stage I**	10.4%	9.6%	9.9%	12.5%	12.0%	12.2%	11.3%	10.5%	10.8%
	Stage II	4.2%	5.6%	5.1%	5.8%	7.8%	7.0%	4.8%	6.4%	5.8%
	Stage III	17.4%	16.3%	16.7%	6.7%	12.6%	10.3%	12.9%	14.9%	14.2%
	Stage IV	31.9%	35.2%	34.1%	28.8%	35.3%	32.8%	30.6%	35.2%	33.6%
	Unknown	36.1%	33.3%	34.3%	46.2%	32.3%	37.6%	40.3%	33.0%	35.6%
Lung	**Stage I**	11.2%	9.0%	9.8%	12.3%	8.8%	10.1%	11.6%	8.9%	9.9%
	Stage II	4.0%	5.4%	4.9%	5.7%	5.8%	5.8%	4.6%	5.6%	5.2%
	Stage III	9.9%	20.3%	16.5%	10.3%	17.3%	14.9%	10.0%	19.2%	15.9%
	Stage IV	33.2%	33.5%	33.4%	24.7%	31.2%	28.9%	30.1%	32.6%	31.7%
	Unknown	41.7%	31.9%	35.4%	47.0%	36.8%	40.3%	43.7%	33.7%	37.3%
Prostate	**Stage I**	2.0%	0.3%	0.7%	-	-	-	-	-	-
	Stage II	19.1%	6.7%	9.6%	-	-	-	-	-	-
	Stage III	13.0%	3.2%	5.5%	-	-	-	-	-	-
	Stage IV	12.8%	13.5%	13.3%	-	-	-	-	-	-
	Unknown	53.1%	76.2%	70.9%	-	-	-	-	-	-

S06: Proportion of patients receiving the four main treatment types or any form of tumour directed treatment by cancer site, country and year of diagnosis: 1996 & 2001

	1996					2001				
	Surgery	Chemo-therapy	Radio-therapy	Hormone therapy	Any** Treatment	Surgery	Chemo-therapy	Radio-therapy	Hormone therapy	Any** Treatment
OESOPHAGUS										
Northern Ireland	38.0%	9.3%	13.2%	-	51.2%	35.7%	22.3%	12.1%	-	51.6%
Republic of Ireland	32.2%	19.0%	34.3%	-	52.6%	20.9%	34.9%	48.6%	-	63.9%
Ireland	34.0%	16.0%	27.8%	-	52.2%	25.7%	30.8%	36.6%	-	59.8%
STOMACH										
Northern Ireland	54.6%	13.3%	4.1%	-	60.1%	47.2%	20.2%	3.6%	-	56.0%
Republic of Ireland	45.7%	8.0%	4.3%	-	51.5%	42.6%	23.6%	13.0%	-	57.2%
Ireland	49.0%	9.9%	4.2%	-	54.7%	44.2%	22.3%	9.6%	-	56.8%
COLORECTAL										
Northern Ireland	81.9%	18.8%	6.6%	-	84.3%	83.5%	31.7%	13.6%	-	87.9%
Republic of Ireland	78.7%	25.4%	11.0%	-	82.2%	75.9%	38.7%	18.7%	-	84.7%
Ireland	79.9%	23.0%	9.4%	-	82.9%	78.4%	36.4%	17.1%	-	85.8%
COLON										
Northern Ireland	84.1%	19.0%	6.9%	-	86.4%	86.1%	29.6%	3.3%	-	88.5%
Republic of Ireland	79.6%	24.4%	4.1%	-	81.3%	77.2%	34.5%	5.0%	-	83.3%
Ireland	81.3%	22.4%	5.1%	-	83.2%	80.2%	32.9%	4.5%	-	85.1%
RECTUM*										
Northern Ireland	77.8%	18.5%	5.8%	-	80.3%	79.5%	34.9%	29.7%	-	87.0%
Republic of Ireland	77.2%	27.2%	22.8%	-	83.7%	73.9%	44.9%	39.3%	-	86.8%
Ireland	77.4%	24.1%	16.9%	-	82.5%	75.7%	41.7%	36.2%	-	86.9%
LUNG										
Northern Ireland	13.7%	11.4%	33.2%	-	48.1%	11.4%	17.8%	36.4%	-	52.7%
Republic of Ireland	16.0%	13.9%	31.9%	-	49.5%	13.1%	18.4%	36.7%	-	54.2%
Ireland	15.2%	13.0%	32.4%	-	49.0%	12.5%	18.2%	36.6%	-	53.7%
BREAST										
Northern Ireland	81.2%	23.8%	57.1%	82.0%	94.7%	86.6%	38.7%	69.3%	76.4%	96.1%
Republic of Ireland	83.4%	33.9%	47.2%	60.6%	95.8%	85.9%	49.9%	63.6%	47.6%	96.0%
Ireland	82.7%	30.4%	50.6%	68.0%	95.4%	86.1%	46.4%	65.4%	56.6%	96.0%
CERVIX										
Northern Ireland	54.3%	9.8%	43.5%	-	82.6%	62.9%	32.9%	44.3%	-	87.1%
Republic of Ireland	66.8%	4.5%	50.0%	-	92.1%	60.1%	42.1%	57.4%	-	96.7%
Ireland	62.9%	6.1%	48.0%	-	89.1%	60.9%	39.5%	53.8%	-	94.1%
OVARY										
Northern Ireland	75.9%	47.4%	2.9%	-	81.0%	75.3%	47.6%	3.0%	-	80.1%
Republic of Ireland	43.8%	50.0%	2.6%	-	68.8%	69.4%	47.5%	2.2%	-	80.6%
Ireland	53.7%	49.2%	2.7%	-	72.6%	71.4%	47.6%	2.4%	-	80.4%
PROSTATE										
Northern Ireland	53.0%	0.0%	6.7%	55.5%	79.0%	29.7%	0.2%	19.7%	54.2%	73.3%
Republic of Ireland	58.2%	2.0%	9.4%	34.5%	81.9%	41.2%	1.7%	25.8%	40.6%	81.8%
Ireland	56.8%	1.5%	8.6%	40.2%	81.1%	38.5%	1.4%	24.4%	43.8%	79.9%

* Includes rectosigmoid junction and anus; ** Tumour directed treatment

S07: Five-year (age-standardised) relative survival by sex, country, cancer site and period of diagnosis: 1994-2004

	IRELAND		NORTHERN IRELAND		REPUBLIC OF IRELAND	
	Male	Female	Male	Female	Male	Female
ALL CANCERS (EXCLUDING NMSC)						
2000-2004*	46.8% (46.2%, 47.3%)	51.6% (51.1%, 52.2%)	43.2% (42.2%, 44.2%)	51.5% (50.6%, 52.4%)	48.4% (47.7%, 49.1%)	51.7% (51.1%, 52.4%)
1997-1999	41.4% (40.7%, 42.1%)	49.0% (48.3%, 49.7%)	38.8% (37.6%, 40.0%)	49.9% (48.8%, 51.1%)	42.6% (41.7%, 43.4%)	48.5% (47.6%, 49.3%)
1994-1996	37.5% (36.8%, 38.2%)	47.1% (46.4%, 47.8%)	36.5% (35.4%, 37.8%)	47.2% (46.0%, 48.4%)	37.9% (37.1%, 38.8%)	47.1% (46.3%, 48.0%)
HEAD & NECK						
2000-2004*	53.3% (50.4%, 56.5%)	49.8% (45.6%, 54.3%)	58.9% (53.6%, 64.7%)	55.8% (48.6%, 64.0%)	50.4% (46.9%, 54.2%)	46.8% (41.9%, 52.4%)
1997-1999	52.2% (48.8%, 56.0%)	48.4% (43.5%, 53.9%)	53.4% (47.5%, 60.0%)	47.9% (40.2%, 57.1%)	51.7% (47.5%, 56.3%)	48.9% (42.7%, 55.9%)
1994-1996	51.3% (47.7%, 55.1%)	51.7% (46.7%, 57.2%)	53.6% (47.4%, 60.6%)	54.8% (46.9%, 64.0%)	49.9% (45.7%, 54.6%)	49.1% (42.9%, 56.2%)
OESOPHAGUS						
2000-2004*	12.8% (10.7%, 15.2%)	17.0% (13.9%, 20.7%)	11.3% (8.4%, 15.2%)	16.7% (12.2%, 22.8%)	13.4% (10.8%, 16.7%)	16.7% (13.2%, 21.1%)
1997-1999	10.3% (8.2%, 13.0%)	15.2% (11.6%, 19.9%)	12.8% (9.1%, 18.2%)	10.5% (6.5%, 16.9%)	8.9% (6.5%, 12.1%)	16.8% (12.3%, 22.9%)
1994-1996	9.0% (6.9%, 11.7%)	17.8% (13.9%, 22.8%)	6.4% (3.8%, 10.7%)	17.0% (10.8%, 26.9%)	10.9% (8.1%, 14.7%)	17.9% (13.4%, 23.9%)
STOMACH						
2000-2004*	17.8% (15.9%, 20.0%)	22.1% (19.3%, 25.3%)	18.5% (15.2%, 22.4%)	19.9% (15.5%, 25.6%)	17.2% (14.9%, 19.9%)	22.7% (19.4%, 26.7%)
1997-1999	16.7% (14.4%, 19.3%)	21.0% (17.8%, 24.7%)	17.6% (13.8%, 22.5%)	17.5% (12.9%, 23.7%)	16.1% (13.4%, 19.3%)	22.3% (18.3%, 27.0%)
1994-1996	16.0% (13.9%, 18.5%)	18.7% (15.7%, 22.3%)	16.9% (13.2%, 21.7%)	17.7% (13.1%, 23.8%)	15.6% (13.0%, 18.6%)	19.8% (16.0%, 24.6%)
COLORECTAL						
2000-2004*	51.9% (50.4%, 53.5%)	54.6% (53.0%, 56.2%)	52.6% (49.9%, 55.4%)	54.9% (52.3%, 57.7%)	51.7% (49.9%, 53.6%)	54.4% (52.5%, 56.4%)
1997-1999	51.6% (49.7%, 53.5%)	53.5% (51.6%, 55.5%)	53.2% (49.9%, 56.7%)	54.8% (51.6%, 58.1%)	50.9% (48.7%, 53.2%)	52.7% (50.4%, 55.2%)
1994-1996	46.3% (44.3%, 48.3%)	49.3% (47.3%, 51.3%)	48.7% (45.5%, 52.2%)	47.9% (44.8%, 51.2%)	45.1% (42.7%, 47.6%)	50.3% (47.8%, 52.9%)
LIVER						
2000-2004*	10.9% (7.7%, 15.3%)	12.8% (8.6%, 19.2%)	6.3% (2.9%, 13.5%)	4.3% (1.4%, 13.3%)	11.7% (8.0%, 17.1%)	15.7% (10.1%, 24.5%)
1997-1999	5.5% (2.9%, 10.5%)	5.2% (2.4%, 11.3%)	1.4% (0.2%, 8.1%)	5.5% (2.1%, 14.1%)	7.5% (3.8%, 14.7%)	3.0% (0.8%, 11.4%)
1994-1996	4.6% (2.2%, 9.8%)	9.4% (5.0%, 17.9%)	7.9% (3.4%, 18.6%)	11.0% (5.8%, 21.0%)	1.4% (0.4%, 5.3%)	8.9% (4.6%, 17.6%)
PANCREAS						
2000-2004*	5.4% (3.9%, 7.5%)	6.8% (5.0%, 9.2%)	6.3% (3.7%, 10.8%)	1.2% (0.3%, 4.4%)	6.0% (4.3%, 8.5%)	9.2% (6.8%, 12.4%)
1997-1999	5.6% (3.8%, 8.4%)	6.6% (4.4%, 9.7%)	1.9% (0.6%, 5.8%)	2.3% (0.7%, 7.2%)	7.4% (4.9%, 11.3%)	8.2% (5.6%, 12.2%)
1994-1996	4.0% (2.6%, 6.3%)	6.9% (4.4%, 11.0%)	3.3% (1.3%, 8.4%)	9.6% (7.3%, 12.5%)	4.6% (2.8%, 7.5%)	6.9% (4.2%, 11.3%)
LUNG						
2000-2004*	9.2% (8.3%, 10.2%)	12.1% (10.9%, 13.4%)	9.1% (7.5%, 11.0%)	11.2% (9.3%, 13.4%)	9.4% (8.3%, 10.6%)	12.9% (11.4%, 14.6%)
1997-1999	8.9% (7.8%, 10.0%)	11.3% (9.9%, 12.9%)	9.0% (7.4%, 11.0%)	11.5% (9.3%, 14.3%)	8.8% (7.5%, 10.3%)	11.2% (9.5%, 13.3%)
1994-1996	8.7% (7.7%, 9.9%)	9.9% (8.6%, 11.5%)	8.0% (6.5%, 10.0%)	9.1% (7.2%, 11.7%)	9.1% (7.9%, 10.7%)	10.3% (8.5%, 12.3%)
MELANOMA						
2000-2004*	77.8% (74.6%, 81.2%)	91.6% (89.7%, 93.7%)	80.9% (75.4%, 86.9%)	96.0% (92.6%, 99.5%)	76.3% (72.4%, 80.4%)	89.7% (87.3%, 92.2%)
1997-1999	77.8% (73.7%, 82.1%)	91.3% (88.8%, 94.0%)	85.1% (78.1%, 92.8%)	94.4% (89.9%, 99.1%)	74.6% (69.7%, 79.8%)	89.8% (86.7%, 93.0%)
1994-1996	77.2% (72.8%, 81.8%)	88.9% (86.2%, 91.8%)	84.9% (77.8%, 92.7%)	90.4% (85.3%, 95.8%)	72.7% (67.2%, 78.6%)	88.0% (84.7%, 91.5%)
BREAST						
2000-2004*	-	77.6% (76.4%, 78.8%)	-	78.6% (76.7%, 80.6%)	-	77.1% (75.6%, 78.6%)
1997-1999	-	75.7% (74.2%, 77.2%)	-	77.5% (75.1%, 80.0%)	-	74.7% (72.8%, 76.6%)
1994-1996	-	72.0% (70.4%, 73.6%)	-	75.0% (72.4%, 77.6%)	-	70.3% (68.3%, 72.4%)
CERVIX						
2000-2004*	-	60.8% (57.5%, 64.2%)	-	59.4% (53.9%, 65.4%)	-	61.4% (57.5%, 65.6%)
1997-1999	-	62.0% (57.8%, 66.5%)	-	63.7% (57.0%, 71.2%)	-	61.6% (56.3%, 67.4%)
1994-1996	-	53.4% (49.3%, 57.9%)	-	55.0% (48.7%, 62.2%)	-	54.2% (48.9%, 60.1%)
UTERUS						
2000-2004*	-	71.6% (68.8%, 74.5%)	-	69.0% (64.6%, 73.6%)	-	73.4% (69.9%, 77.0%)
1997-1999	-	71.4% (67.8%, 75.1%)	-	69.7% (64.0%, 76.0%)	-	72.2% (67.7%, 77.0%)
1994-1996	-	67.6% (63.9%, 71.6%)	-	64.9% (58.9%, 71.6%)	-	69.4% (64.6%, 74.4%)

Table S07 continued…

	IRELAND		NORTHERN IRELAND		REPUBLIC OF IRELAND	
	Male	Female	Male	Female	Male	Female
OVARY						
2000-2004*	-	35.8% (33.8%, 38.0%)	-	39.2% (35.7%, 43.2%)	-	34.1% (31.6%, 36.8%)
1997-1999	-	34.9% (32.3%, 37.7%)	-	39.4% (34.8%, 44.7%)	-	32.5% (29.5%, 35.9%)
1994-1996	-	36.4% (33.5%, 39.5%)	-	36.7% (32.0%, 42.1%)	-	36.2% (32.6%, 40.1%)
PROSTATE						
2000-2004*	77.7% (76.3%, 79.3%)	-	73.1% (69.9%, 76.5%)	-	79.2% (77.5%, 80.9%)	-
1997-1999	70.5% (68.5%, 72.7%)	-	62.7% (58.4%, 67.5%)	-	73.0% (70.7%, 75.4%)	-
1994-1996	61.7% (59.2%, 64.3%)	-	57.8% (53.1%, 62.9%)	-	63.3% (60.4%, 66.3%)	-
TESTES						
2000-2004*	96.9% (93.7%,100.2%)	-	93.7% (88.9%, 98.7%)	-	97.2% (93.6%,100.9%)	-
1997-1999	96.2% (84.3%,109.8%)	-	97.3% (80.4%,117.7%)	-	90.7% (75.1%,109.6%)	-
1994-1996	82.3% (76.2%, 88.9%)	-	84.4% (75.6%, 94.4%)	-	82.7% (78.3%, 87.4%)	-
KIDNEY						
2000-2004*	44.5% (41.4%, 47.9%)	53.5% (49.7%, 57.7%)	47.4% (42.0%, 53.4%)	52.5% (46.4%, 59.5%)	42.8% (39.1%, 46.9%)	54.4% (49.6%, 59.7%)
1997-1999	45.7% (41.8%, 49.9%)	49.7% (45.0%, 54.9%)	51.3% (44.6%, 59.1%)	48.1% (41.1%, 56.4%)	42.6% (38.1%, 47.6%)	51.1% (44.9%, 58.2%)
1994-1996	46.7% (42.1%, 51.8%)	49.3% (44.4%, 54.8%)	47.6% (40.6%, 55.8%)	50.3% (41.9%, 60.3%)	46.0% (40.2%, 52.8%)	49.0% (43.0%, 55.8%)
BLADDER						
2000-2004*	69.9% (67.2%, 72.7%)	64.2% (60.3%, 68.4%)	64.1% (59.4%, 69.1%)	52.7% (44.9%, 62.0%)	72.6% (69.4%, 76.0%)	68.2% (63.6%, 73.0%)
1997-1999	68.9% (65.7%, 72.3%)	64.0% (59.2%, 69.1%)	62.7% (56.9%, 69.1%)	54.0% (45.9%, 63.4%)	71.5% (67.6%, 75.6%)	69.1% (63.4%, 75.2%)
1994-1996	67.5% (64.4%, 70.8%)	61.4% (57.1%, 66.1%)	62.0% (56.3%, 68.3%)	49.9% (42.5%, 58.7%)	69.7% (65.9%, 73.7%)	66.7% (61.6%, 72.3%)
BRAIN						
2000-2004*	20.7% (18.3%, 23.5%)	29.6% (26.2%, 33.6%)	20.6% (16.4%, 25.9%)	24.7% (18.8%, 32.5%)	20.7% (17.9%, 24.1%)	31.6% (27.5%, 36.2%)
1997-1999	18.9% (15.8%, 22.5%)	23.6% (20.1%, 27.6%)	14.5% (10.3%, 20.4%)	22.3% (17.0%, 29.2%)	20.7% (16.8%, 25.4%)	24.0% (19.7%, 29.2%)
1994-1996	18.0% (15.2%, 21.4%)	22.4% (18.9%, 26.6%)	14.7% (10.5%, 20.6%)	17.8% (12.0%, 26.4%)	19.5% (16.0%, 23.8%)	24.3% (20.3%, 29.2%)
LYMPHOMA						
2000-2004*	51.7% (48.8%, 54.9%)	53.8% (51.1%, 56.6%)	52.4% (47.3%, 58.0%)	55.6% (51.4%, 60.2%)	51.5% (47.9%, 55.4%)	52.9% (49.5%, 56.5%)
1997-1999	49.4% (45.6%, 53.6%)	49.4% (46.2%, 52.9%)	48.9% (42.6%, 56.1%)	50.6% (45.4%, 56.4%)	49.5% (44.9%, 54.7%)	48.5% (44.4%, 52.9%)
1994-1996	42.3% (38.6%, 46.4%)	50.6% (47.0%, 54.4%)	43.6% (37.8%, 50.3%)	47.2% (41.7%, 53.5%)	41.9% (37.1%, 47.3%)	52.3% (47.7%, 57.4%)
MULTIPLE MYELOMA						
2000-2004*	32.9% (29.1%, 37.2%)	38.5% (34.5%, 43.0%)	36.7% (30.0%, 45.0%)	45.1% (38.8%, 52.5%)	31.5% (27.1%, 36.6%)	34.9% (29.9%, 40.7%)
1997-1999	27.1% (23.0%, 31.8%)	33.3% (28.2%, 39.4%)	27.9% (21.1%, 37.1%)	43.9% (36.0%, 53.6%)	26.8% (21.9%, 32.8%)	27.2% (21.2%, 34.9%)
1994-1996	22.8% (18.4%, 28.1%)	30.4% (24.1%, 38.3%)	22.0% (15.0%, 32.3%)	35.1% (27.4%, 45.1%)	22.9% (17.6%, 29.6%)	26.3% (20.8%, 33.3%)
LEUKAEMIA						
2000-2004*	45.6% (42.5%, 49.0%)	49.4% (45.6%, 53.5%)	38.8% (33.3%, 45.1%)	39.5% (33.0%, 47.3%)	47.9% (44.2%, 51.9%)	53.6% (49.1%, 58.6%)
1997-1999	40.2% (36.4%, 44.4%)	44.0% (39.4%, 49.2%)	31.1% (25.2%, 38.4%)	34.4% (27.0%, 43.7%)	44.0% (39.4%, 49.2%)	48.7% (43.1%, 55.2%)
1994-1996	37.5% (33.4%, 42.0%)	45.4% (40.7%, 50.7%)	29.2% (22.7%, 37.7%)	38.2% (30.5%, 48.0%)	40.4% (35.5%, 46.0%)	48.6% (42.9%, 55.1%)

* Derived using period analysis

S08: Deaths and European age-standardised mortality rates by sex, country and cancer site: 2000-2004

MALE	Ireland		Northern Ireland		Republic of Ireland	
	Deaths per year	EASMR	Deaths per year	EASMR	Deaths per year	EASMR
Head and Neck (C00-C14, C30-C32)	191	7.6 (7.1, 8.1)	51	6.3 (5.5, 7.0)	140	8.3 (7.6, 8.9)
Oral (C00-C14)	119	4.8 (4.4, 5.2)	33	4.0 (3.4, 4.6)	86	5.2 (4.7, 5.6)
Lip (C00)	6	0.3 (0.2, 0.3)	1	0.1 (0.0, 0.2)	5	0.3 (0.2, 0.5)
Base of tongue (C01)	3	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	2	0.1 (0.0, 0.2)
Other tongue (C02)	25	1.0 (0.8, 1.2)	6	0.8 (0.5, 1.0)	19	1.1 (0.9, 1.3)
Gum (C03)	1	0.1 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Floor of mouth (C04)	7	0.3 (0.2, 0.4)	0	0.1 (0.0, 0.1)	6	0.4 (0.2, 0.5)
Palate (C05)	3	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	2	0.1 (0.1, 0.2)
Other mouth (C06)	10	0.4 (0.3, 0.5)	3	0.4 (0.2, 0.6)	6	0.4 (0.3, 0.5)
Parotid gland (C07)	7	0.3 (0.2, 0.4)	2	0.3 (0.1, 0.4)	5	0.3 (0.2, 0.5)
Other salivary glands (C08)	3	0.1 (0.1, 0.2)	0	0.0 (0.0, 0.1)	3	0.2 (0.1, 0.3)
Tonsil (C09)	9	0.4 (0.2, 0.5)	4	0.5 (0.3, 0.7)	5	0.3 (0.2, 0.4)
Oropharynx (C10)	8	0.3 (0.2, 0.4)	3	0.4 (0.2, 0.6)	5	0.3 (0.2, 0.4)
Nasopharynx (C11)	8	0.3 (0.2, 0.4)	3	0.3 (0.2, 0.5)	5	0.3 (0.2, 0.4)
Pyriform sinus (C12)	8	0.3 (0.2, 0.4)	2	0.3 (0.1, 0.4)	5	0.3 (0.2, 0.5)
Hypopharynx (C13)	6	0.2 (0.2, 0.3)	1	0.1 (0.0, 0.2)	5	0.3 (0.2, 0.4)
Other mouth/pharynx (C14)	15	0.6 (0.5, 0.8)	4	0.5 (0.3, 0.8)	11	0.7 (0.5, 0.8)
Nose and sinuses (C30-C31)	7	0.3 (0.2, 0.4)	2	0.2 (0.1, 0.4)	5	0.3 (0.2, 0.4)
Nasal cavity & middle ear (C30)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Accessory sinuses (C31)	6	0.2 (0.2, 0.3)	1	0.2 (0.0, 0.3)	5	0.3 (0.2, 0.4)
Larynx (C32)	64	2.6 (2.3, 2.8)	16	2.0 (1.6, 2.5)	48	2.8 (2.4, 3.2)
Oesophagus (C15)	296	11.6 (11.0, 12.2)	97	11.8 (10.7, 12.8)	199	11.6 (10.9, 12.3)
Stomach (C16)	300	11.7 (11.1, 12.3)	101	12.0 (10.9, 13.1)	199	11.6 (10.9, 12.4)
Small intestine (C17)	13	0.5 (0.4, 0.6)	4	0.6 (0.3, 0.8)	8	0.5 (0.3, 0.6)
Colorectal (C18-C21)	744	29.3 (28.4, 30.3)	221	26.9 (25.3, 28.5)	523	30.6 (29.4, 31.7)
Colon (C18)	488	19.3 (18.5, 20.0)	150	18.3 (17.0, 19.7)	338	19.7 (18.8, 20.7)
Rectum (C19-C21)	256	10.1 (9.5, 10.6)	71	8.5 (7.6, 9.4)	185	10.8 (10.1, 11.5)
Rectosigmoid junction (C19)	76	3.0 (2.7, 3.3)	18	2.2 (1.7, 2.6)	58	3.4 (3.0, 3.8)
Rectum (C20)	173	6.8 (6.3, 7.2)	51	6.1 (5.4, 6.9)	122	7.1 (6.6, 7.7)
Anus (C21)	7	0.3 (0.2, 0.4)	2	0.2 (0.1, 0.4)	5	0.3 (0.2, 0.5)
Liver & intrahepatic bile ducts (C22)	132	5.2 (4.8, 5.6)	39	4.7 (4.0, 5.3)	93	5.4 (4.9, 5.9)
Gallbladder (C23-C24)	22	0.9 (0.7, 1.0)	6	0.7 (0.5, 1.0)	16	1.0 (0.7, 1.2)
Gallbladder (C23)	7	0.3 (0.2, 0.4)	1	0.1 (0.0, 0.1)	6	0.4 (0.3, 0.5)
Other biliary (C24)	15	0.6 (0.5, 0.7)	5	0.7 (0.4, 0.9)	10	0.6 (0.4, 0.7)
Pancreas (C25)	270	10.7 (10.1, 11.2)	82	9.9 (9.0, 10.9)	188	11.0 (10.3, 11.7)
Other digestive (C26)	127	5.0 (4.6, 5.4)	42	5.0 (4.3, 5.7)	85	5.0 (4.5, 5.5)
Lung (C33-C34)	1,447	56.8 (55.5, 58.1)	488	58.6 (56.3, 61.0)	959	55.9 (54.3, 57.5)
Trachea (C33)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Bronchus & lung (C34)	1,446	56.8 (55.4, 58.1)	488	58.6 (56.2, 60.9)	959	55.9 (54.3, 57.5)
Thymus (C37)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Heart, mediastinum & pleura (C38)	55	2.2 (1.9, 2.4)	41	5.0 (4.3, 5.6)	14	0.8 (0.6, 1.0)
Other respiratory/intrathoracic (C39)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Bone (C40-C41)	19	0.7 (0.6, 0.9)	4	0.5 (0.3, 0.7)	15	0.8 (0.6, 1.0)
Bones, joints of limbs (C40)	3	0.1 (0.1, 0.2)	0	0.0 (0.0, 0.1)	3	0.1 (0.1, 0.2)
Bones, joints head and trunk (C41)	16	0.6 (0.5, 0.8)	4	0.5 (0.3, 0.7)	12	0.7 (0.5, 0.9)
Malignant melanoma (C43)	59	2.3 (2.1, 2.6)	20	2.5 (2.0, 3.0)	40	2.3 (1.9, 2.6)
Non-melanoma skin cancer (C44)	35	1.4 (1.2, 1.6)	7	0.9 (0.6, 1.2)	27	1.6 (1.3, 1.9)
Peritoneum (C48)	8	0.3 (0.2, 0.4)	2	0.2 (0.1, 0.3)	7	0.4 (0.3, 0.5)
Connective and soft tissues (C47, C49)	33	1.2 (1.0, 1.4)	7	0.8 (0.5, 1.0)	26	1.5 (1.2, 1.7)
Peripheral nerves / nervous system (C47)	0	0.0 (0.0, 0.0)	0	0.1 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Connective tissues (C49)	32	1.2 (1.0, 1.4)	6	0.7 (0.5, 1.0)	26	1.5 (1.2, 1.7)
Breast (C50)	4	0.2 (0.1, 0.2)	1	0.2 (0.0, 0.3)	3	0.2 (0.1, 0.3)
Penis (C60)	9	0.3 (0.2, 0.4)	3	0.3 (0.1, 0.5)	6	0.4 (0.2, 0.5)
Prostate (C61)	745	29.4 (28.4, 30.4)	215	25.5 (24.0, 27.1)	530	31.4 (30.1, 32.6)
Testes (C62)	9	0.3 (0.2, 0.4)	3	0.4 (0.2, 0.6)	6	0.3 (0.2, 0.4)
Other male genital (C63)	1	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	1	0.0 (0.0, 0.1)

Table S08 continued…

MALE	Ireland		Northern Ireland		Republic of Ireland	
	Deaths per year	EASMR	Deaths per year	EASMR	Deaths per year	EASMR
Kidney (C64-C66, C68)	170	6.8 (6.4, 7.3)	55	6.7 (5.9, 7.6)	115	6.8 (6.3, 7.4)
Kidney except renal pelvis (C64)	163	6.5 (6.1, 7.0)	51	6.4 (5.6, 7.1)	112	6.6 (6.1, 7.2)
Renal pelvis (C65)	1	0.0 (0.0, 0.1)	0	0.1 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Ureter (C66)	4	0.2 (0.1, 0.2)	2	0.2 (0.1, 0.3)	2	0.1 (0.1, 0.2)
Other urinary (C68)	2	0.1 (0.0, 0.1)	1	0.2 (0.0, 0.3)	1	0.0 (0.0, 0.1)
Bladder (C67)	163	6.5 (6.0, 6.9)	55	6.7 (5.9, 7.5)	108	6.3 (5.8, 6.9)
Eye & adnexa (C69)	5	0.2 (0.1, 0.3)	1	0.1 (0.0, 0.1)	5	0.3 (0.2, 0.4)
Brain and other central nervous system (C70-C72)	181	7.0 (6.6, 7.5)	47	5.8 (5.1, 6.6)	134	7.6 (7.0, 8.2)
Meninges (C70)	132	5.1 (4.7, 5.5)	0	0.0 (0.0, 0.0)	132	7.5 (6.9, 8.1)
Brain (C71)	48	1.9 (1.6, 2.1)	47	5.8 (5.0, 6.5)	1	0.1 (0.0, 0.1)
Spinal cord (C72)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Thyroid gland (C73)	12	0.5 (0.3, 0.6)	3	0.4 (0.2, 0.6)	8	0.5 (0.3, 0.6)
Adrenal gland (C74)	7	0.3 (0.2, 0.3)	2	0.3 (0.1, 0.4)	5	0.3 (0.2, 0.4)
Other endocrine glands (C75)	3	0.1 (0.0, 0.2)	1	0.1 (0.0, 0.2)	2	0.1 (0.0, 0.2)
Lymphoma (C81-C85, C96)	203	7.9 (7.4, 8.4)	67	8.1 (7.2, 9.0)	136	7.8 (7.2, 8.4)
Hodgkins lymphoma (C81)	16	0.6 (0.5, 0.8)	5	0.6 (0.4, 0.8)	11	0.6 (0.5, 0.8)
Non-Hodgkin's lymphoma (C82-C85, C96)	186	7.3 (6.8, 7.8)	62	7.5 (6.7, 8.3)	124	7.2 (6.6, 7.8)
Follicular non-Hodgkins lymphoma (C82)	2	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	1	0.1 (0.0, 0.1)
Diffuse non-Hodgkins lymphoma (C83)	6	0.2 (0.1, 0.3)	4	0.5 (0.3, 0.7)	2	0.1 (0.0, 0.2)
Peripheral/cutaneous T cell lymphoma (C84)	4	0.1 (0.1, 0.2)	2	0.3 (0.1, 0.5)	1	0.1 (0.0, 0.1)
Other/unspecified NHL (C85)	174	6.9 (6.4, 7.3)	54	6.6 (5.8, 7.4)	120	7.0 (6.4, 7.5)
Other lymphoid and haematopoietic (C96)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Malignant immunoproliferative disease (C88)	1	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.2)	0	0.0 (0.0, 0.0)
Multiple myeloma (C90)	112	4.4 (4.0, 4.8)	31	3.7 (3.1, 4.3)	81	4.8 (4.3, 5.2)
Leukaemia (C91-C95)	206	8.0 (7.5, 8.5)	52	6.3 (5.5, 7.1)	155	8.9 (8.3, 9.5)
Lymphoid leukaemia (C91)	65	2.5 (2.2, 2.8)	15	1.8 (1.4, 2.2)	50	2.9 (2.5, 3.2)
Myeloid leukaemia (C92)	95	3.7 (3.3, 4.0)	33	4.0 (3.4, 4.7)	62	3.5 (3.1, 3.9)
Monocyctic leukaemia (C93)	1	0.1 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Other specified leukaemia (C94)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)
Unspecified leukaemia (C95)	44	1.7 (1.5, 2.0)	3	0.4 (0.2, 0.6)	41	2.4 (2.1, 2.7)
Other (C76, C80)	371	14.5 (13.8, 15.1)	137	16.4 (15.2, 17.7)	233	13.5 (12.7, 14.3)
Ill-defined site (C76)	41	1.6 (1.4, 1.8)	5	0.6 (0.3, 0.8)	36	2.1 (1.7, 2.4)
Unknown primary site (C80)	330	12.9 (12.3, 13.5)	133	15.8 (14.6, 17.1)	197	11.5 (10.7, 12.2)
All (excluding NMSC) (C00-C96, ex. C44)	5,921	232.6 (230.0, 235.3)	1,879	226.5 (221.9, 231.1)	4,042	235.8 (232.5, 239.0)
All cancers (C00-C96)	5,955	234.0 (231.4, 236.7)	1,886	227.4 (222.8, 232.1)	4,069	237.4 (234.1, 240.7)

Table S08 continued…

FEMALE	Ireland		Northern Ireland		Republic of Ireland	
	Deaths per year	EASMR	Deaths per year	EASMR	Deaths per year	EASMR
Head and Neck (C00-C14, C30-C32)	77	2.4 (2.1, 2.6)	25	2.3 (1.9, 2.7)	52	2.4 (2.1, 2.7)
Oral (C00-C14)	56	1.7 (1.5, 2.0)	18	1.7 (1.4, 2.1)	37	1.7 (1.5, 2.0)
Lip (C00)	1	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)	1	0.0 (0.0, 0.1)
Base of tongue (C01)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)
Other tongue (C02)	11	0.4 (0.3, 0.5)	4	0.4 (0.2, 0.5)	7	0.4 (0.2, 0.5)
Gum (C03)	3	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	2	0.1 (0.0, 0.1)
Floor of mouth (C04)	2	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.1)	2	0.1 (0.0, 0.1)
Palate (C05)	4	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	3	0.1 (0.1, 0.2)
Other mouth (C06)	6	0.2 (0.1, 0.2)	2	0.2 (0.1, 0.3)	3	0.1 (0.1, 0.2)
Parotid gland (C07)	6	0.2 (0.1, 0.2)	2	0.2 (0.1, 0.3)	4	0.2 (0.1, 0.3)
Other salivary glands (C08)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)	1	0.1 (0.0, 0.1)
Tonsil (C09)	3	0.1 (0.0, 0.1)	2	0.1 (0.0, 0.3)	1	0.1 (0.0, 0.1)
Oropharynx (C10)	3	0.1 (0.1, 0.2)	2	0.2 (0.0, 0.3)	2	0.1 (0.0, 0.1)
Nasopharynx (C11)	3	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	2	0.1 (0.0, 0.2)
Pyriform sinus (C12)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Hypopharynx (C13)	4	0.1 (0.1, 0.2)	1	0.1 (0.0, 0.2)	3	0.2 (0.1, 0.3)
Other mouth/pharynx (C14)	7	0.2 (0.1, 0.3)	2	0.2 (0.1, 0.3)	4	0.2 (0.1, 0.3)
Nose and sinuses (C30-C31)	7	0.2 (0.1, 0.3)	2	0.1 (0.0, 0.2)	6	0.3 (0.2, 0.4)
Nasal cavity & middle ear (C30)	2	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Accessory sinuses (C31)	6	0.2 (0.1, 0.2)	1	0.1 (0.0, 0.1)	5	0.2 (0.1, 0.3)
Larynx (C32)	14	0.4 (0.3, 0.5)	5	0.5 (0.3, 0.7)	9	0.4 (0.3, 0.5)
Oesophagus (C15)	174	4.9 (4.5, 5.2)	56	4.5 (4.0, 5.1)	118	5.1 (4.6, 5.5)
Stomach (C16)	202	5.8 (5.4, 6.1)	71	5.7 (5.1, 6.4)	131	5.8 (5.3, 6.2)
Small intestine (C17)	13	0.4 (0.3, 0.5)	5	0.5 (0.3, 0.7)	8	0.3 (0.2, 0.5)
Colorectal (C18-C21)	594	17.1 (16.4, 17.7)	197	16.5 (15.4, 17.6)	397	17.4 (16.6, 18.2)
Colon (C18)	429	12.2 (11.7, 12.8)	138	11.3 (10.4, 12.2)	291	12.7 (12.0, 13.4)
Rectum (C19-C21)	165	4.8 (4.5, 5.2)	59	5.2 (4.5, 5.8)	105	4.7 (4.3, 5.1)
Rectosigmoid junction (C19)	52	1.6 (1.4, 1.8)	18	1.6 (1.2, 1.9)	34	1.6 (1.3, 1.8)
Rectum (C20)	106	3.0 (2.8, 3.3)	41	3.5 (3.0, 4.0)	65	2.8 (2.5, 3.1)
Anus (C21)	7	0.2 (0.1, 0.3)	1	0.1 (0.0, 0.2)	6	0.3 (0.2, 0.4)
Liver & intrahepatic bile ducts (C22)	105	3.1 (2.8, 3.4)	34	3.0 (2.5, 3.5)	70	3.1 (2.8, 3.5)
Gallbladder (C23-C24)	49	1.4 (1.2, 1.6)	16	1.4 (1.1, 1.7)	33	1.5 (1.2, 1.7)
Gallbladder (C23)	33	1.0 (0.8, 1.2)	10	1.0 (0.7, 1.2)	23	1.0 (0.8, 1.2)
Other biliary (C24)	16	0.4 (0.3, 0.5)	5	0.4 (0.2, 0.6)	10	0.4 (0.3, 0.6)
Pancreas (C25)	277	8.0 (7.6, 8.4)	89	7.4 (6.7, 8.2)	188	8.3 (7.8, 8.9)
Other digestive (C26)	124	3.3 (3.1, 3.6)	47	3.7 (3.2, 4.1)	77	3.2 (2.8, 3.5)
Lung (C33-C34)	893	27.7 (26.8, 28.5)	314	29.0 (27.5, 30.5)	578	27.0 (26.0, 28.1)
Trachea (C33)	1	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Bronchus & lung (C34)	891	27.6 (26.8, 28.5)	314	28.9 (27.4, 30.4)	578	27.0 (26.0, 28.0)
Thymus (C37)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Heart, mediastinum & pleura (C38)	10	0.3 (0.2, 0.4)	6	0.6 (0.4, 0.8)	4	0.2 (0.1, 0.3)
Other respiratory/intrathoracic (C39)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)
Bone (C40-C41)	15	0.4 (0.3, 0.5)	4	0.3 (0.2, 0.4)	11	0.5 (0.4, 0.6)
Bones, joints of limbs (C40)	3	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.1)	2	0.1 (0.0, 0.2)
Bones, joints head and trunk (C41)	12	0.4 (0.3, 0.5)	3	0.2 (0.1, 0.4)	9	0.4 (0.3, 0.5)
Malignant melanoma (C43)	60	1.8 (1.6, 2.1)	16	1.5 (1.1, 1.8)	43	2.0 (1.7, 2.3)
Non-melanoma skin cancer (C44)	23	0.5 (0.4, 0.6)	8	0.5 (0.3, 0.7)	15	0.6 (0.4, 0.7)
Peritoneum (C48)	11	0.3 (0.2, 0.4)	2	0.1 (0.0, 0.3)	9	0.4 (0.3, 0.6)
Connective and soft tissues (C47, C49)	32	1.1 (0.9, 1.2)	9	0.9 (0.6, 1.1)	23	1.2 (0.9, 1.4)
Peripheral nerves / nervous system (C47)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Connective tissues (C49)	32	1.0 (0.9, 1.2)	8	0.8 (0.6, 1.1)	23	1.2 (0.9, 1.4)
Breast (C50)	947	31.2 (30.3, 32.1)	297	28.7 (27.2, 30.3)	650	32.5 (31.3, 33.6)
Vulva (C51)	22	0.6 (0.5, 0.7)	9	0.7 (0.5, 0.9)	13	0.5 (0.4, 0.7)
Vagina (C52)	6	0.2 (0.1, 0.3)	2	0.2 (0.1, 0.3)	4	0.2 (0.1, 0.3)
Cervix uteri (C53)	103	3.6 (3.3, 3.9)	30	3.1 (2.5, 3.6)	73	3.8 (3.4, 4.2)

Table S08 continued…

FEMALE	Ireland		Northern Ireland		Republic of Ireland	
	Deaths per year	EASMR	Deaths per year	EASMR	Deaths per year	EASMR
Uterus (C54-C55)	104	3.2 (2.9, 3.4)	40	3.6 (3.0, 4.1)	65	2.9 (2.6, 3.3)
Corpus uteri (C54)	73	2.2 (2.0, 2.4)	20	1.7 (1.4, 2.1)	54	2.4 (2.1, 2.7)
Uterus, unspecified (C55)	31	1.0 (0.8, 1.1)	20	1.8 (1.5, 2.2)	11	0.5 (0.4, 0.7)
Ovary (C56)	359	11.7 (11.1, 12.2)	116	11.1 (10.1, 12.0)	243	12.0 (11.3, 12.7)
Other female genital (C57)	2	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	1	0.0 (0.0, 0.1)
Placenta (C58)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)
Kidney (C64-C66, C68)	86	2.6 (2.4, 2.9)	32	2.7 (2.3, 3.2)	54	2.5 (2.2, 2.9)
Kidney except renal pelvis (C64)	83	2.5 (2.3, 2.8)	31	2.6 (2.2, 3.1)	52	2.4 (2.1, 2.7)
Renal pelvis (C65)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Ureter (C66)	1	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)
Other urinary (C68)	2	0.1 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Bladder (C67)	81	2.2 (2.0, 2.4)	30	2.3 (1.9, 2.7)	51	2.1 (1.9, 2.4)
Eye & adnexa (C69)	8	0.3 (0.2, 0.3)	2	0.2 (0.1, 0.3)	6	0.3 (0.2, 0.4)
Brain and other central nervous system (C70-C72)	131	4.5 (4.1, 4.8)	36	3.8 (3.2, 4.3)	95	4.8 (4.4, 5.3)
Meninges (C70)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.1)
Brain (C71)	128	4.4 (4.0, 4.7)	34	3.6 (3.1, 4.2)	93	4.7 (4.3, 5.2)
Spinal cord (C72)	2	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.2)	1	0.0 (0.0, 0.1)
Thyroid gland (C73)	19	0.6 (0.5, 0.7)	6	0.5 (0.3, 0.7)	13	0.6 (0.4, 0.7)
Adrenal gland (C74)	6	0.2 (0.1, 0.3)	1	0.1 (0.0, 0.2)	5	0.3 (0.2, 0.4)
Other endocrine glands (C75)	3	0.1 (0.0, 0.1)	1	0.1 (0.0, 0.1)	2	0.1 (0.0, 0.2)
Lymphoma (C81-C85, C96)	190	5.7 (5.4, 6.1)	64	5.6 (4.9, 6.2)	126	5.8 (5.3, 6.3)
Hodgkins lymphoma (C81)	11	0.4 (0.3, 0.5)	3	0.3 (0.2, 0.5)	8	0.4 (0.3, 0.5)
Non-Hodgkin's lymphoma (C82-C85, C96)	179	5.4 (5.0, 5.8)	61	5.3 (4.7, 5.9)	118	5.4 (5.0, 5.9)
Follicular non-Hodgkins lymphoma (C82)	1	0.0 (0.0, 0.1)	1	0.1 (0.0, 0.2)	0	0.0 (0.0, 0.0)
Diffuse non-Hodgkins lymphoma (C83)	3	0.1 (0.1, 0.2)	2	0.2 (0.1, 0.4)	1	0.1 (0.0, 0.1)
Peripheral / cutaneous T cell lymphoma (C84)	2	0.1 (0.0, 0.1)	2	0.2 (0.0, 0.3)	0	0.0 (0.0, 0.0)
Other / unspecified NHL (C85)	172	5.2 (4.8, 5.5)	56	4.7 (4.2, 5.3)	116	5.4 (4.9, 5.8)
Other lymphoid and haematopoietic (C96)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Malignant immunoproliferative disease (C88)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Multiple myeloma (C90)	95	2.6 (2.4, 2.9)	29	2.3 (1.9, 2.7)	66	2.8 (2.5, 3.1)
Leukaemia (C91-C95)	146	4.2 (3.8, 4.5)	39	3.2 (2.8, 3.7)	107	4.7 (4.2, 5.1)
Lymphoid leukaemia (C91)	48	1.3 (1.2, 1.5)	12	0.9 (0.7, 1.2)	37	1.5 (1.3, 1.8)
Myeloid leukaemia (C92)	65	2.0 (1.7, 2.2)	22	1.9 (1.6, 2.3)	43	2.0 (1.7, 2.3)
Monocyctic leukaemia (C93)	1	0.0 (0.0, 0.1)	1	0.0 (0.0, 0.1)	0	0.0 (0.0, 0.0)
Other specified leukaemia (C94)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)	0	0.0 (0.0, 0.0)
Unspecified leukaemia (C95)	32	0.8 (0.7, 1.0)	4	0.3 (0.2, 0.4)	28	1.1 (0.9, 1.3)
Other (C76, C80)	396	11.3 (10.8, 11.9)	160	13.3 (12.3, 14.3)	236	10.3 (9.7, 10.9)
Ill-defined site (C76)	48	1.3 (1.1, 1.5)	11	0.8 (0.6, 1.1)	38	1.6 (1.3, 1.8)
Unknown primary site (C80)	348	10.0 (9.5, 10.5)	149	12.4 (11.5, 13.4)	199	8.8 (8.2, 9.3)
All (excluding NMSC) (C00-C96, ex. C44)	5,340	162.8 (160.8, 164.8)	1,784	158.9 (155.4, 162.3)	3,556	164.8 (162.3, 167.3)
All cancers (C00-C96)	5,363	163.3 (161.3, 165.4)	1,792	159.4 (155.9, 162.8)	3,571	165.3 (162.8, 167.8)

EASMR: European age-standardised mortality rate per 100,000 persons with 95% confidence interval

APPENDICES

Appendix 1:

Data collection and quality

Cancer registration occurs in many countries throughout the world, however there is a range of methodologies in use, with even common classifications being applied differently in different registries, sometimes even within the same country. The approaches used by the cancer registries in Northern Ireland and the Republic of Ireland are similar, however any studies using data from both registries requires a degree of data recoding and quality assurance in order to maximize comparability between the two countries. This appendix details the process of how the data from both countries was collected, checked and modified in order to produce the All-Ireland cancer incidence and mortality datasets that were used in the production of this report.

A1.1: Registration techniques

The two cancer registries in Ireland rely upon similar information sources for their data however both use very different methods in the way the data is collated and verified, with a predominantly electronic approach used in the North and a manual approach, supplemented with some electronic data collection in the South.

Northern Ireland

The Northern Ireland Cancer Registry (NICR) was established in 1994 and uses an automated computer system with multiple information sources to collate information on new diagnoses of cancer, with information collected for incidence years 1993 onwards. The three main sources for registration are the Patient Administration System (PAS) used by all the Hospital Trusts, histopathology reports and death notifications, which are supplied by the General Registrar Office (GRO). From PAS the registry obtains demographic information on individual patients along with basic site and behaviour information for each tumour. This information is supplemented by electronic downloads from histopathology and cytopathology laboratories. A major focus of the registry's operation work is on the verification of the information from a single hospital admission, a single histopathology report or a single death certificate (death initiated cases). Trained Tumour Verification Officers (TVOs) examine general practitioners' (GPs) notes for patients who have died from cancer, hospital records for cases identified without histopathology or cytology confirmation and histopathology reports where there is conflicting information or other possible errors. In the event that no further information on death-initiated cases is obtainable the record is included in the registry but flagged as a death certificate only (DCO) case. Follow up of patients is conducted passively by linking cancer incidence data to death certificate information. Data on cancer mortality also comes from the information supplied by GRO.

Republic of Ireland

The National Cancer Registry (NCRI) was founded in 1991 and provides a population-based registry for the Republic of Ireland by collecting most of its information through active case finding and data abstraction. It has collected data for incidence years 1994 onwards with most notifications coming from pathology departments, with a smaller number from other hospital sources, death certificates and general practitioners. The data collected from these sources is gathered by Tumour Registration Officers (TROs) who are trained in cancer registration techniques and are responsible for a particular geographic catchment area. Mortality data is also supplied by the Central Statistics Office (CSO), which is based upon death certificates, with NCRI having full access to these records. As in Northern Ireland it uses these for case finding and follow-up of patient status. Cancer related death certificates with no supporting information from other sources are followed up with the hospital of death or certifying doctor, with DCO flags attached to the record if no further information is available.

A1.2: Classification and coding

Incidence

Cancer site in NICR incidence data, based on the electronic data collated from various sources, is received coded to the tenth revision of the International Classification of Diseases[203] (ICD10). In addition cancer morphology is received coded to the second

revision of the International Classification of Diseases for Oncology (ICD-O-2) [204]. Both of these are in wide use throughout the world in cancer registries; however in Northern Ireland cancer topography is received already coded using the Systematized Nomenclature of Medicine (SNOMED) due to its use in the UK National Health Service (NHS). The use of this classification is much less widespread.

Cancer site in NCRI incidence data is also coded to ICD10, however unlike in Northern Ireland where this is assigned at the source, in Republic of Ireland this code is derived from the cancer topography and morphology codes collected for each registration by TROs. Both of these are initially coded using ICD-O-2, with IARC tools[205] followed by some manual corrections used to convert between this classification and ICD10.

The data from both registries is considered to be of high quality and has been accepted for use in the "Cancer Incidence in Five Continents" series[206] and in the recent EUROCARE-IV survival collaboration[207].

Mortality

In Northern Ireland mortality data is coded by GRO using the International Classification of Diseases, with the ninth revision[208] (ICD9) used from 1994 to 2000 and the tenth revision (ICD10)[203] used from 2001 onwards. Data on all causes of death is received by NICR and used to update patient status and add DCOs to the cancer registration system. For purposes of reporting cancer mortality, NICR extract the information relating to malignant cancers (ICD9:140-208,238.6, ICD10:C00-C97) from the GRO dataset and recode any cause of death coded using ICD9 to ICD10 using a four digit ICD9 to three digit ICD10 lookup file developed by the National Cancer Institute (NCI) [209]. Conversely a four-digit ICD9 code is assigned to any record coded using ICD10 using the same lookup file, however this is rarely used for reporting purposes.

In the Republic of Ireland cause of death is coded using ICD9 for all years from 1994 to 2004. With the exception of this factor NCRI uses mortality data in the same manner as NICR with data on all deaths used to update patient status and provide DCOs, with further extraction of malignant cancer deaths (ICD9:140-208,238.6) completed for reporting purposes. Cause of cancer death is converted to ICD10 using a look-up table derived by NCRI with a single code selected using information from the NCRI cancer incidence database in the event that more than one ICD10 code is applicable.

Mortality data on non-malignant cancers is also retained by each registry but is not usually reported on.

Treatment

Surgical and chemotherapy data is coded using the Classification of Surgical Operations and Procedures (OPCS) in Northern Ireland and the International Classification of Diseases, ninth revision, Clinical Modification (ICD-9-CM) in Republic of Ireland. The treatment data collected electronically in Northern Ireland comes from the same PAS data as the majority of cancer registrations but does not include radiotherapy or hormone therapy data. NCRI also collects treatment data from medical records, however this data is manually coded by TROs to the ICD-9-CM classification and does include radiotherapy and hormone therapy data.

Given that detailed data on the process of care is thus not available from the electronic sources used to compile the registry in Northern Ireland, regional audits of breast, prostate, lung, colorectal, stomach, oesophageal, cervical and ovarian cancers for patients diagnosed in 1996 and 2001 have been undertaken to fill this knowledge gap[210-215]. The detailed audit data, focusing on cancer patient management, was collected with the agreement of relevant clinicians by NICR TVOs who visited hospitals in Northern Ireland and extracted data by examination of clinical notes. The databases used to record the information needed for the study were developed in

Table A1.1: Comparison of Northern Ireland surgery levels using data collected by hospital information systems (PAS) and independent audits involving examination of clinical notes (Audit)

	1996		2001	
	PAS	Audit	PAS	Audit
Oesophagus (C15)	35.7%	38.0%	37.6%	35.7%
Stomach (C16)	45.0%	54.6%	44.4%	47.2%
Colon (C18)	79.3%	84.1%	75.9%	86.1%
Rectum (C19-C21)	71.7%	77.8%	72.0%	79.5%
Lung (C33, C34)	13.7%	13.7%	11.1%	11.4%
Breast (C50)	74.4%	81.0%	77.2%	86.3%
Cervix (C53)	59.8%	54.3%	57.1%	62.9%
Ovary (C56)	62.8%	75.9%	62.7%	75.3%
Prostate (C61)	37.6%	53.0%	25.4%	29.7%

collaboration with relevant clinicians and captured details on patient management, treatment and outcome.

To determine the best source of treatment information in Northern Ireland, the two sources for surgery data in Northern Ireland were compared and an apparent undercount in surgery levels using the OPCS data was identified for several cancer sites, particularly colorectal and breast (Table A1.1). This report therefore uses NICR audit data only, thereby restricting analysis to the years and cancer sites for which audits were conducted. For any additional patients registered for these years and cancer sites since the time the audits were conducted, treatment information was gathered from the PAS data.

Audits for pancreatic and thyroid cancer patients have also been conducted but are not included in this report[216-217].

Stage

Staging is carried out using a number of laboratory and clinical tests at diagnosis. The staging classification used in both countries is the TNM stage[217] that includes information on the extent of the primary tumour (T), the absence or presence of lymph node metastasis (N) and the absence or presence of distant metastasis (M). The classification combines these three elements to produce an overall TNM stage for the tumour. However the manner in which the overall TNM stage is derived depends upon the cancer site.

In Republic of Ireland staging is carried out on most cancer sites, however in Northern Ireland collection is restricted to specific sites, namely colorectal, breast, ovary, cervix and malignant melanoma. Staging information is also available from cancer audit data in Northern Ireland for oesophagus, stomach and lung in 1996 and 2001. For analysis purposes the different stages for these cancers are combined into four groups, ranging from early tumours (Stage I) to advanced tumours that have distant metastasis (Stage IV) which occasionally map to alternative classifications that are in common use. Table A1.2 illustrates how the TNM for these sites is assigned.

Table A1.2: Staging of cancer sites (TNM 6th edition)

Cancer site	Stage	Alternative classification	T	N	M	Notes (TNM 6th edition)
OESOPHAGUS	Stage I	-	T1	N0	M0	T1: Tumour invades lamina propria or submucosa T2: Tumour invades muscularis propria T3: Tumour invades adventitia T4: Tumour invades adjacent structures N0: No regional lymph node metastasis N1: Regional lymph node metastasis M0: No distant metastasis M1: Distant metastasis
	Stage II	-	T2,T3	N0	M0	
			T1,T2	N1	M0	
	Stage III	-	T3	N1	M0	
			T4	Any N	M0	
	Stage IV	-	Any T	Any N	M1	
STOMACH	Stage I	-	T1,T2	N0	M0	T1: Tumour invades lamina propria or submucosa T2: Tumour invades muscularis propria or subserosa T3: Tumour penetrates serosa without invasion of adjacent structures T4: Tumour invades adjacent structures N0: No regional lymph node metastasis N1: Metastasis in 1-6 regional lymph nodes N2: Metastasis in 7-15 regional lymph nodes N3: Metastasis in more than 15 regional lymph nodes M0: No distant metastasis M1: Distant metastasis
			T1	N1	M0	
	Stage II	-	T1	N2	M0	
			T2	N1	M0	
			T3	N0	M0	
	Stage III	-	T2	N2	M0	
			T3	N1,N2	M0	
			T4	N0	M0	
	Stage IV	-	T4	N1-N3	M0	
			T1-T3	N3	M0	
			Any T	Any N	M1	
COLORECTAL	Stage I	Dukes A	T1,T2	N0	M0	T1: Tumour invades submucosa T2: Tumour invades muscularis propria T3: Tumour invades through the muscularis propria into the subserosa or into non-peritonealized pericolic or periretal tissues T4: Tumour directly invades other organs and/or perforates visceral peritoneum N0: No regional lymph node metastasis N1: Metastasis in 1-3 regional lymph nodes N2: Metastasis in 4 or more regional lymph nodes M0: No distant metastasis; M1: Distant metastasis
	Stage II	Dukes B	T3,T4	N0	M0	
	Stage III	Dukes C	Any T	N1,N2	M0	
	Stage IV	Dukes D	Any T	Any N	M1	
MALIGNANT MELANOMA	Stage I	Clarks II	T1, T2a	N0	M0	T1: Tumour 1mm or less in thickness (a) without (b) with ulceration T2: Tumour more than 1mm but not more than 2mm in thickness T3: Tumour more than 2mm but not more than 4mm in thickness T4: Tumour more than 4mm in thickness N0: No regional lymph nodes involved N1: Metastasis in one regional lymph node N2: Metastasis in 2-3 regional lymph nodes N3: Metastasis in 4 or more regional lymph nodes M0: No distant metastasis; M1: Distant metastasis
	Stage II	Clarks III	T2b-T4	N0	M0	
	Stage III	Clarks IV	Any T	N1-N3	M0	
	Stage IV	Clarks V	Any T	Any N	M1	

LUNG	Stage I	-	T1,T2	N0	M0	T1: Tumour 3cm or less surrounded by lung or pleura, without involvement of bronchus T2: Tumour with more than 3cm or involves main bronchus, 2cm or more distal to the carina or invades visceral pleura or Atelectasis or obstructive pneumonitis but not involving whole lung T3: Tumour that directly invades chest wall, diaphragm, pleura, pericardium, or tumour in main bronchus within 2cm of the carina or Atelectasis or obstructive pneumonitis involving entire lung T4: Tumour of any size that directly invades mediastinum, heart, great vessels, trachea, oesophagus, vertebral body, carina, or separate tumour nodules in same lobe or tumour with a malignant pleural effusion N0: No regional nodes involved N1: Metastasis in ipsilateral peribronchial or ipsilateral hilar nodes, or intrapulmonary nodes N2: Metastasis in ipsilateral mediastinal and/or subcarinal nodes N3: Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene or supraclavicular nodes M0: No distant metastasis; M1: Distant metastasis
	Stage II	-	T3	N0	M0	
			T1,T2	N1	M0	
	Stage III	-	T3	N1	M0	
			T1-T3	N2	M0	
			Any T	N3	M0	
			T4	Any N	M0	
	Stage IV	-	Any T	Any N	M1	
BREAST	Stage I	-	T1	N0	M0	T0: No evidence of primary tumour T1: Tumour 2cm or less in greatest dimension T2: Tumour more than 2cm but less than 5cm in greatest dimension T3: Tumour more than 5cm in greatest dimension T4: Tumour of any size with direct extension to chest wall or skin N0: No regional lymph node metastasis N1: Metastasis in 1-3 axiliary lymph nodes N2: Metastasis in 4-9 axiliary lymph nodes N3: More than 10 axiliary lymph nodes involved or metastases in infraclavicular nodes M0: No distant metastasis; M1: Distant metastasis
	Stage II	-	T2,T3	N0	M0	
			T0-T2	N1	M0	
	Stage III	-	T0-T2	N2	M0	
			T3	N1,N2	M0	
			T4	N0-N2	M0	
			Any T	N3	M0	
	Stage IV	-	Any T	Any N	M1	
CERVIX	Stage I	FIGO I	T1	N0	M0	T1: Tumour confined to uterus T2: Tumour invades beyond the uterus but not to the pelvic wall or lower third of the vagina T3: Tumour extends to pelvic wall and/or involves lower third of the vagina and/or causes hydronephrosis or defunctioning kidney T4: Tumour invades mucosa of bladder or rectum, and/or extends beyond the pelvis N0: No regional lymph node metastasis N1: Regional lymph node metastasis M0: No distant metastasis; M1: Distant metastasis
	Stage II	FIGO II	T2	N0	M0	
	Stage III	FIGO III	T1,T2	N1	M0	
			T3	Any N	M0	
	Stage IV	FIGO IV	T4	Any N	M0	
			Any T	Any N	M1	
OVARY	Stage I	FIGO I	T1	N0	M0	T1: Tumour limited to ovaries (one or both) T2: Tumour involves one or both ovaries with pelvic extension T3: Tumour involves one or both ovaries with microscopically confirmed peritoneal metastases outside the pelvis and/or regional lymph node metastasis N0: No regional lymph node metastasis; N1: Regional lymph node metastasis M0: No distant metastasis; M1: Distant metastasis
	Stage II	FIGO II	T2	N0	M0	
	Stage III	FIGO III	T3	N0	M0	
			Any T	N1	M0	
	Stage IV	FIGO IV	Any T	Any N	M1	
PROSTATE	Stage I	-	T1a	N0+G1	M0	T1a: Tumour found as incidental finding in less than 5% resected tissue T1b: Tumour found as incidental finding in more than 5% resected tissue T1c: Tumour identified by needle biopsy (e.g. because of elevated PSA) T2: Tumour confined to the prostate T3: Tumour extends through the prostatic capsule T4: Tumour fixed or invades adjacent structures such as bladder neck or rectum N0: No regional lymph node metastasis; N1: Regional lymph node metastasis M0: No distant metastasis; M1: Distant metastasis G1: Well differentiated; G2: Moderately differentiated G3-4: Poorly differentiated/undifferentiated
	Stage II	-	T1a	N0+G2-4	M0	
			T1b-T1c	N0	M0	
			T2	N0	M0	
	Stage III	-	T3	N0	M0	
	Stage IV	-	T4	N0	M0	
			Any T	N1	M0	
			Any T	Any N	M1	

FIGO: Federation International de Gynecologie et d'Obstetrique; Source: Sobin et al[218]

Caution needs to be exercised in analysis of staging information as the meaning of T and N codes and their groupings have changed between editions of TNM. NCRI started data collection in 1994 using the 4th edition but have since moved to the 5th edition while NICR used the 6th edition for audit purposes. The grouping of T, N and M codes into the four stages used in this report uses the 6th edition of TNM[218]; however no attempt has been made to change the original T, N or M codes assigned. However, it should be noted that the absence of a value for M has been taken to mean M0.

A1.3: Comparability and processing of data

A key objective in this report is to ensure accurate comparison of data from Northern Ireland and Republic of Ireland. Given the different processes and in some instances classifications used by both registries an extensive process of verifying coding, identifying impossible combinations of codes, converting data to a standard format and identifying duplicate registrations has been carried out for incidence, mortality and treatment data

A1.3.1: Incidence data

The definition of cancer site used in this report is based upon the original ICD10 code assigned by NICR and NCRI. However to maximize comparability an evaluation of the incidence data was undertaken using IARC tools developed by Ferlay et al[205] and used

by the International Agency for Research on Cancer (IARC) in the "Cancer Incidence in Five Continents" series[206]. This evaluation was conducted in three phases; firstly some recoding of data was completed to correct for some local practices, namely

- Recoding of any locally used morphology codes in Northern Ireland to the ICD-O-2 classification;
- Recoding of the ICD10 codes C77, C78 and C79 used by NICR but not NCRI, to site C80.

Secondly IARC data checks were applied to data from both registries with any errors checked by the appropriate registry and corrected where required. These included:

- Data consistency checks (e.g. date of diagnosis before date of death);
- Checks for invalid ICD10 and ICD-O-2 morphology codes and for invalid combinations of ICD10 and ICD-O-2;
- Identification of unlikely cancer site/morphology and sex combinations and cancer site/morphology and age combinations.

Finally using the IARC tools the methodology used by IARC in assigning an ICD10 code for the "Cancer Incidence in Five Continents" series[206] was applied to the data. This involved using the ICD10 and ICD-O-2 morphology codes to generate an ICD-O-2 topography and morphology code, which was then further translated to ICD-O-3 before being converted back into ICD10 for use in analysis of data. The ICD10 code generated in this manner was checked against the original ICD10 code assigned by each registry. In the event of a discrepancy between the two ICD10 codes, the IARC assignment was accepted in the majority of cases as this process ensured consistency in the manner in which certain cancer morphologies were treated. In particular, records coded as ICD10: C00-C80, but had leukaemia or lymphoma morphology codes had their ICD10 codes reset to the appropriate leukaemia or lymphoma code, ensuring a level of consistency between NICR and NCRI data that did not previously exist. However some cancer sites are particularly affected by differences in practices throughout different registries and acceptance of the ICD10 code assigned from the ICD-O-3 code was not always warranted. Each of these cancer sites was given special attention in this exercise in order to maximize comparability.

- Ovarian cancer: Worldwide there is considerable variation in registration practice with regard to borderline ovarian cancers. This is primarily due to the coding of the behaviour of these tumours changing from uncertain to malignant and back to uncertain between the different versions of ICD-O. Both NICR and NCRI consider borderline ovarian cancers as malignant. This assignment is retained in this report; however for comparability between registries and for ease of comparison with international cancer incidence compendiums like IARC's "Cancer Incidence in Five Continents", a flag for non-borderline ovarian cancers is retained thereby allowing omission of these cancers when appropriate.

- Bladder cancer: Both NICR and NRCI exercise caution when assigning a behaviour code to bladder cancers with clear distinctions made between malignant, uncertain, benign and in situ tumours. Coding rules in both NICR and NCRI were checked for consistency to ensure that similar types of cancer were considered malignant. No major differences were identified. In addition the distribution of morphology codes used in each country was examined and found to be similar at the three-digit level. The malignant behaviour code as assigned by each registry was thus accepted although caution is suggested in interpretation of results.

- Brain and central nervous system: Despite the potentially fatal nature of benign and uncertain tumours, NICR and NRCI make a clear distinction between these and malignant cancers. However some malignant brain tumours under ICD-O-2 are classified as uncertain under ICD-O-3, while some uncertain cancers are now classified as malignant. These were excluded or included from the set of malignant cancers analyzed in this report depending upon their behaviour under ICD-O-3.

- Myeloproliferative disorders and myelodysplastic syndromes: These diseases formerly considered as non-malignant are now considered as malignant under ICD-O-3. They are not usually included as malignant cancers in NICR or NCRI, have a low microscopically verified rate as basis for diagnosis and do not have a "C" code under ICD10. They are thus excluded from this report, although data is available for these diseases.

Examples of recoding ICD10

Some examples of this process are illustrated below. (Table A1.3)

Table A1.3: Examples of recoding of ICD10 to ensure consistency between cancer registries

	Original ICD10 & ICD-O-2(M) code		New ICD-O-2 (T+M) code		New ICD-O-3 (T+M) code		New ICD10 code
Example 1: Colorectal cancer – unchanged by processing	C18.0 M8140/3	→	C18.0 M8140/3	→	C18.0 M8140/3	→	C18.0
Example 2: Unknown – changed to leukaemia by processing	C80 M9800/3	→	C42.1 M9800/3	→	C42.1 M9800/3	→	C95.9
Example 3: Ovarian cancer – borderline indicator added	C56 M8442/3	→	C56.9 M8442/3	→	C56.9 M8442/1	→	C56+ borderline indicator
Example 4: Brain cancer - behaviour change to uncertain	C71.6 M9421/3	→	C71.6 M9421/3	→	C71.6 M9421/1	→	D41.3 - excluded

T: Topography; M: Morphology

Quantifying the level of recoding

Despite the lengthy process involved in the processing of data, the impact on the data was small, which is an indication that good coding and data verification practices are adhered to in each registry. The main beneficiaries of the process were brain cancers, liver cancers and haematological cancers, the first due to behaviour changes between versions of ICD-O and the later two through the use of IARC rules as to valid combinations of ICD10 and ICD-O morphology codes. (Table A1.4)

Table A1.4: Changes in number of malignant cancers in Northern Ireland and Republic of Ireland as a result of recoding data for consistency: 1994-2004

	Northern Ireland					Republic of Ireland				
	Initial total	Lost	Gained	New total	% change	Initial total	Lost	Gained	New total	% change
Head and Neck (C00-C14, C30-C32)	2,391	8	0	2,383	-0.3%	4,560	10	0	4,550	-0.2%
Oesophagus (C15)	1,677	0	0	1,677	0.0%	3,434	1	0	3,433	0.0%
Stomach (C16)	2,782	1	0	2,781	0.0%	5,233	1	0	5,232	0.0%
Colorectal (C18-C21)	10,348	2	0	10,346	0.0%	20,656	7	0	20,649	0.0%
Liver (C22)	580	0	49	629	8.4%	960	0	50	1,010	5.2%
Pancreas (C25)	1,646	3	0	1,643	-0.2%	3,950	3	0	3,947	-0.1%
Lung (C33,C34)	9,785	0	3	9,788	0.0%	17,995	0	1	17,996	0.0%
Malignant melanoma (C43)	2,146	0	22	2,168	1.0%	4,874	0	0	4,874	0.0%
Breast (C50)	10,330	2	4	10,332	0.0%	20,575	0	0	20,575	0.0%
Cervix (C53)	892	0	0	892	0.0%	2,049	1	0	2,048	0.0%
Uterus (C54-C55)	1,512	1	1	1,512	0.0%	2,821	0	0	2,821	0.0%
Ovary (C56)	1,935	0	3	1,938	0.2%	3,826	0	0	3,826	0.0%
Prostate (C61)	6,269	0	0	6,269	0.0%	17,974	0	0	17,974	0.0%
Testis (C62)	596	1	0	595	-0.2%	1,199	0	1	1,200	0.1%
Kidney (C64-C66,C68)	1,895	0	2	1,897	0.1%	3,558	0	0	3,558	0.0%
Bladder (C67)	2,281	1	1	2,281	0.0%	5,118	0	0	5,118	0.0%
Brain and other CNS (C70-C72)	1,244	34	0	1,210	-2.7%	3,199	135	3	3,067	-4.1%
Lymphoma (C81-C85,C96)	3,167	19	40	3,188	0.7%	5,912	0	63	5,975	1.1%
Multiple myeloma (C90)	1,105	3	3	1,105	0.0%	2,079	0	88	2,167	4.2%
Leukaemia (C91-C95)	1,747	6	22	1,763	0.9%	4,301	0	138	4,439	3.2%
Non-melanoma skin cancer (C44)	24,442	29	24	24,437	0.0%	59,180	0	11	59,191	0.0%
Other	7,539	125	28	7,442	-1.3%	14,657	395	3	14,265	-2.7%
All cancers (C00-C96)*	96,309	34	1	96,276	0.0%	208,110	198	3	207,915	-0.1%

CNS: Central Nervous System; * Changes to all cancers as a result of behaviour changes

A1.3.2: Mortality data

The approaches and lookup files used by each registry in translating mortality data from ICD9 to ICD10 are consistent at the three digit level with no attempt made in Northern Ireland to convert all records to a four digit ICD10 code due to insufficient information. However several ICD10 codes do not have an ICD9 equivalent (e.g. C45-mesothelioma). Thus mortality data is available in Northern Ireland for some cancers from 2001 onwards, for which no data exists in Republic of Ireland due to the exclusive use of ICD9. To cater for the different approaches in dealing with these cancers Northern Ireland mortality data was modified to adopt the NCRI approach. Thus in the NICR mortality dataset:

- C45 (Mesothelioma) was recoded to C38.4 (Cancer of the pleura);
- C46 (Kaposi's sarcoma) was recoded to C44.9 (Unspecified non-melanoma skin cancer);

- C97 (Independent (multiple) primary sites) was recoded to C80 (Unknown primary site).

As with incidence data the ICD10 codes C77, C78 and C79, signifying secondary cancers are unused by NCRI. Data from NICR using these codes were thus recoded to site C80 for consistency.

A1.3.3: Treatment data

Both NCRI and NICR consider cancer treatment, particularly surgery, to be treatment that is tumour directed. As such the list of procedures considered to refer to cancer treatment in both Northern Ireland and Republic of Ireland are very similar with only a small number of adjustments required, mainly in the exclusion of some types of biopsy in Northern Ireland (e.g. excision biopsies for breast cancer). This however affects only a small number of patients.

Follow up time in treatment analysis differs in both countries, with NCRI only reporting on treatment received within six months of diagnosis (although data beyond this point is available) with the cancer audits conducted by NICR considering all treatment received. For this report a compromise was applied with all treatments within one year of diagnosis considered in the analysis.

A1.3.4: Data exclusions

The dataset resulting from these manipulations contains a total of 304,191 registrations of malignant cancer. However not all of these records apply to the different types of analysis conducted. In the calculation of incidence figures multiple primary cancers were excluded based upon IARC rules[205]. In survival and treatment analysis these were also excluded, while patients aged 0-14 or 100+ at diagnosis or cancers whose basis of diagnosis was an autopsy or death certificate only were also omitted. In survival analysis EUROCARE methodology suggests that only the first cancer diagnosed in a patient is included with only the most severe retained if more than one cancer is diagnosed on the same date[219]. This approach was applied for both survival and treatment analysis in this report, with EUROCARE guidance used as to tumour severity[219]. The total number of exclusions is provided in Table A1.5.

Table A1.5: Exclusions from incidence, survival and treatment analysis (excluding NMSC): 1994-2004

	Number (%) of records excluded				
	Incidence	Survival & treatment			
	IARC multiple primary	Aged 0-14 or 100+	DCOs and autopsies	EUROCARE second cancer	Total exclusions
Northern Ireland	260 (0.3%)	527 (0.7%)	1,494 (2.0%)	2,425 (3.2%)	4,706 (6.1%)
Republic of Ireland	42 (0.0%)	1,226 (0.8%)	4,030 (2.5%)	4,733 (3.0%)	10,031 (6.3%)
All Ireland	302 (0.1%)	1,753 (0.7%)	5,524 (2.3%)	7,158 (3.0%)	14,737 (6.3%)

Note: Each column excludes the cancers which meet the criteria of the previous columns
(e.g. exclusions for those aged 0-14 or 100+ refers to records dropped after IARC multiple primaries have been omitted)

A1.4: Geographic and socio-economic data

Both cancer registries routinely collect address information allowing small geographic areas to be assigned to records of cancer incidence. This is accomplished differently in each country, while small geographic areas for cancer deaths are only available in Northern Ireland. Analysis at a small geographic level is however potentially disclosive and these areas are thus solely used as building blocks to identify larger areas for analysis, which in this report are district council in Northern Ireland and county in Republic of Ireland. The small geographic areas can also be used to assign socio-economic indicators to each cancer incidence record based upon the economic conditions of that area.

Census output areas and electoral districts

In Northern Ireland the smallest geographic area in common use is the census output area (COA). It is assigned to each cancer incidence and mortality record through an electronic process that uses the postcode that accompanies the majority of Northern Ireland addresses along with a postcode to COA lookup file known as the Central Postcode Directory (CPD)[220], which is maintained by the Northern Ireland Statistics and Research Agency (NISRA) and updated annually. Addresses with an unknown, incomplete or invalid postcode cannot be assigned a COA.

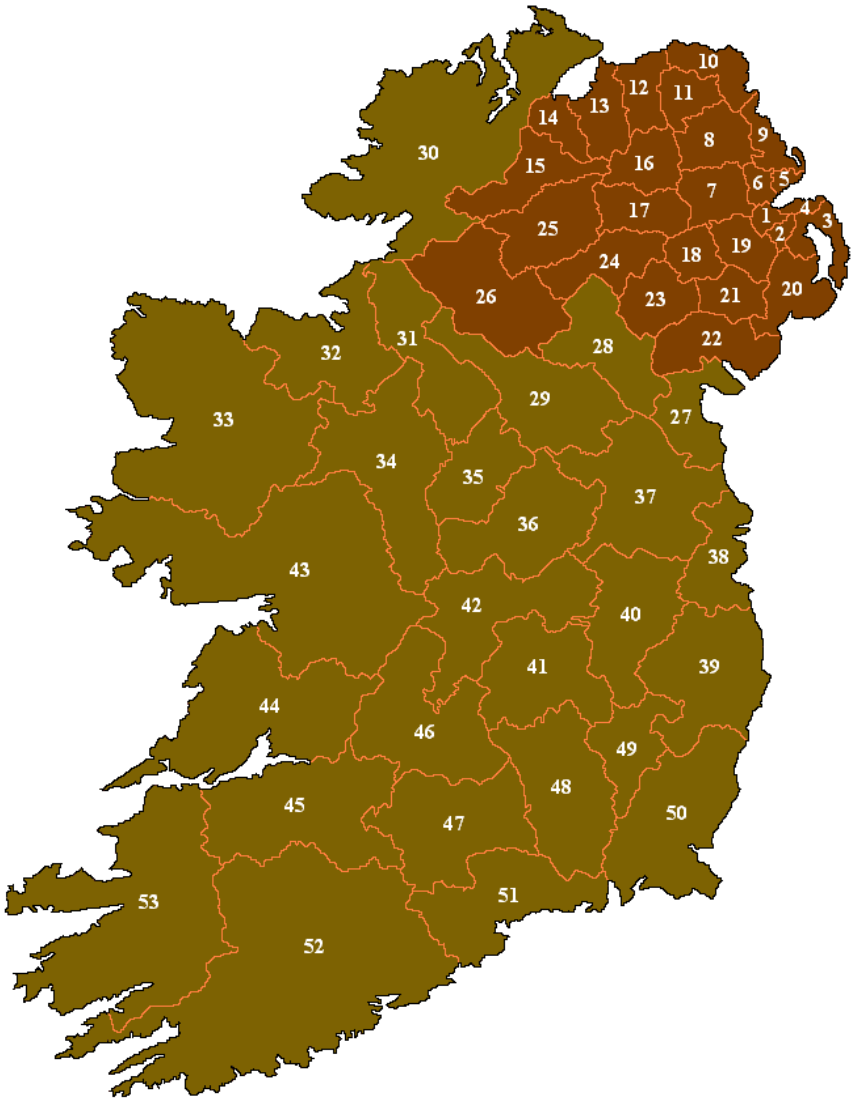
In the Republic of Ireland the smallest geographic area is the electoral district (ED). These are assigned by NCRI directly from the patient address on cancer incidence records using the GeoDirectory product available from An Post. However it is not always possible to assign a unique ED, particularly in rural areas, as address information is occasionally incomplete or the address may span two or more small areas. In addition EDs are not assigned to Republic of Ireland mortality records as information received by NCRI from CSO with regard to cancer deaths only contains information coded to county level with additional information on town, city or county of residence, which is insufficient to assign an ED.

Populations for both sets of areas are available from the Census for each country[221-222]. In Northern Ireland the size of a COA is dependent upon the population, thus there are no restrictions on the availability of population by sex and five-year age group. In Republic of Ireland however the size of an ED is not dictated by population size and there are consequently some EDs for which data is not available. In these cases two or more EDs have been grouped together for the purposes of releasing population information. For the purposes of this report we have thus recoded ED information to the groups used in the Republic of Ireland 2002 Census.

District councils and counties

Ireland is divided into 32 counties with 26 of these in the Republic of Ireland. These 26 are used in Republic of Ireland as administrative boundaries with Tipperary frequently divided into North and South. In Northern Ireland however county boundaries are rarely used, with 26 Local Government Districts (LGDs, also known as district councils) used for administrative purposes. The combined set of these 53 areas is used in this report as the basis for geographic analysis. (Fig. A1.1)

Figure A1.1: District councils (Northern Ireland) and Counties (ROI) in Ireland



Both COAs and EDs aggregate exactly to district councils and counties respectively, thus assigning these areas to cancer data is a straightforward process. However a further exercise is conducted to identify these areas for records where a COA or ED cannot be identified. In Northern Ireland this was done using partial postcode data, where a postcode sector (e.g. BT01 9) or district (e.g. BT01) is unique to a district council, or by using the original district council from the General Registry Office for mortality data. In Republic of Ireland NCRI are able to code the county directly from the patient address.

Measures of deprivation

Using the small geographic areas a deprivation quintile was assigned to Northern Ireland patients using the 2005 Noble economic deprivation measure[223] and to Republic of Ireland patients using the 2004 SAHRU deprivation index[224], both of which assigned a deprivation score to each COA or ED based upon the economic characteristics of all persons usually resident in that area. For the purposes of this study the deprivation quintile was determined by independently ranking COAs or EDs according to the appropriate countries deprivation score and divided into quintiles based upon the population of each small area. Thus quintile 5 contains the fifth of the population resident in the least deprived COAs in Northern Ireland or EDs in Republic of Ireland, while quintile 1 contains the fifth of the population resident in the most deprived COAs or EDs. This differs from some studies that divide the COAs or EDs into equal numbers of areas. Any deprivation analysis in this report considers both countries separately as the Northern Ireland and Republic of Ireland deprivation measures are not directly comparable.

Examples of assigning geographic and socio-economic details

Below are examples of four of the most common scenarios encountered during the assignation of geographic and socio-economic factors to records of cancer incidence and mortality in Ireland. Completeness levels are discussed in chapter A1.6.

Table A1.6: Examples of assigning geographic and socio-economic details to registered cancer patients

	Original address		Assign COA/ED		Assign county/ district council		Assign deprivation quintile
Example 1: Complete information in NI	1 Example Street, Belfast, BT01 1AA	→	95GG200003 - from CPD lookup file	→	Belfast - from COA code	→	20% most deprived in NI - from COA code
Example 2: Complete information in ROI	1 Illustration Road, Dublin	→	2019 - from GeoDirectory lookup	→	Dublin - from ED code	→	20% most affluent in ROI - from ED code
Example 3: Insufficient information in NI	1 Other Street, Belfast, BT01 1AE	→	Cannot be assigned - inactive postcode	→	Belfast - from postcode district BT01	→	Cannot be assigned - unknown COA
Example 4: Insufficient information in ROI	1 Any Street, Clare	→	Cannot be assigned - ED boundary splits property	→	Clare - from NCRI examination	→	Cannot be assigned - unknown unique ED

A1.5: Population data

The population data used throughout this report comes from two sources, the Northern Ireland Statistics and Research Agency (NISRA) and the Department of Health and Children (DOHC)[225-226]. Both sets of data are mid-year population estimates, which use census figures along with births, deaths and migration data to provide up to date estimates of the population of Northern Ireland and Republic of Ireland respectively. Both of these are combined to produce population figures for all of Ireland.

County/district council populations are also required to calculate cancer rates for these areas. These are available separately, as mid-year population estimates, for Northern Ireland and Republic of Ireland from NISRA[225] and CSO[226] respectively. They are available for each year covered by this report, however, due to the small numbers of cancer cases in some of these areas, all calculations at this geographic level use an eleven-year average from 1994-2004.

A1.6: Data quality

There are many measures of data quality used by cancer registries. Some of the most common are tabulated below.

Basis of diagnosis

Microscopic verification (including histology and cytology) is an indication of a high level of accuracy in a diagnosis of cancer, thus values of 80.7% and 85.9% in Northern Ireland and Republic of Ireland for the 2000-2004 period (excluding NMSC) suggest good

quality information with regard to cancer site. Values of between 80% and 90% also indicate that there is not an over reliance on pathology information in cancer registration with a healthy level of information inflow from non-pathological sources. Low DCO and Post-mortem rates also suggest excellent coverage (Table A1.7). These rates compare favourably to countries included in the recent EUROCARE-IV study, which collectively had a rate of 87% microscopically verified, 4% DCOs and 0.5% post mortems for the 1995-1999 period[207].

Table A1.7: Basis of diagnosis by cancer site: 2000-2004

	Microscopic verification		Clinical		Death certificate		Postmortem		Unknown/Other	
	NI	ROI	NI	ROI	NI	ROI	NI	ROI	NI	ROI
Head and neck (C00-C14, C30-C32)	92.2%	96.4%	7.6%	2.1%	0.2%	0.9%	0.0%	0.0%	0.0%	0.6%
Oesophagus (C15)	88.8%	91.1%	10.3%	6.2%	0.8%	1.9%	0.1%	0.2%	0.0%	0.5%
Stomach (C16)	90.3%	91.1%	7.2%	5.2%	1.7%	3.0%	0.2%	0.1%	0.7%	0.6%
Colorectal (C18-C21)	89.8%	91.3%	8.5%	6.1%	1.3%	1.9%	0.2%	0.1%	0.1%	0.5%
Liver (C22)	40.8%	54.1%	53.2%	39.0%	4.3%	3.9%	1.0%	0.3%	0.7%	2.7%
Pancreas (C25)	35.3%	45.1%	59.6%	47.4%	3.5%	4.9%	0.9%	0.6%	0.8%	2.0%
Lung (C33,C34)	61.9%	73.6%	34.9%	22.0%	2.3%	3.0%	0.6%	0.2%	0.3%	1.2%
Malignant melanoma (C43)	99.0%	99.6%	0.7%	0.1%	0.1%	0.0%	0.0%	0.0%	0.2%	0.3%
Breast (C50)	97.4%	97.1%	2.0%	1.4%	0.5%	1.2%	0.0%	0.0%	0.1%	0.3%
Cervix (C53)	98.2%	97.9%	1.3%	1.0%	0.0%	0.8%	0.5%	0.1%	0.0%	0.2%
Uterus (C54-C55)	95.8%	95.5%	3.6%	2.3%	0.5%	2.0%	0.0%	0.0%	0.1%	0.2%
Ovary (C56)	86.0%	88.4%	12.4%	8.6%	1.3%	1.9%	0.3%	0.1%	0.0%	1.1%
Prostate (C61)	82.8%	88.3%	15.5%	6.8%	0.5%	1.7%	0.0%	0.1%	1.2%	3.1%
Testis (C62)	98.7%	97.7%	1.3%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Kidney (C64-C66,C68)	73.4%	75.1%	24.7%	21.6%	1.6%	1.7%	0.2%	0.4%	0.1%	1.2%
Bladder (C67)	90.9%	91.7%	8.3%	6.0%	0.6%	1.6%	0.0%	0.0%	0.2%	0.7%
Brain and other CNS (C70-C72)	50.4%	67.8%	48.0%	27.6%	0.9%	3.0%	0.2%	0.4%	0.5%	1.2%
Lymphoma (C81-C85,C96)	88.6%	98.4%	10.0%	0.3%	0.8%	0.8%	0.5%	0.1%	0.1%	0.3%
Multiple myeloma (C90)	69.7%	87.8%	27.7%	7.5%	1.7%	3.5%	0.2%	0.2%	0.7%	0.9%
Leukaemia (C91-C95)	73.9%	92.7%	24.3%	2.9%	1.4%	3.2%	0.1%	0.0%	0.3%	1.1%
Non-melanoma skin cancer (C44)	98.5%	95.4%	1.5%	4.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
Other	61.0%	64.8%	33.7%	28.3%	4.1%	4.5%	0.4%	0.2%	0.8%	2.2%
All cancers ex. NMSC (C00-C96, ex.C44)	80.7%	85.9%	17.2%	10.7%	1.5%	2.2%	0.2%	0.1%	0.4%	1.2%

CNS: Central Nervous System

Completeness of data

Most data fields on the All-Ireland database had a high level of completion, although 16.9% of tumours (excluding NMSC) had an unspecified morphology code, while 5.0% were assigned to C80 (unknown primary site). 9.3% of Republic of Ireland records (excluding NMSC) had an unknown deprivation quintile due to an unknown or non-unique electoral district. County information was 100% complete in Republic of Ireland compared to 99.4% in Northern Ireland, however this is due to registration practice by NCRI who, for reporting purposes, exclude a small percentage of records with sex, age or county incomplete. (Tab. A1.8)

Table A1.8: Completeness of key data fields in All-Ireland cancer incidence database (excluding NMSC): 1994-2004

	Unknown primary site (Coded as C80)	Unknown morphology (Coded as M8000/3)	Unknown district council (NI) or county (ROI)	Unknown deprivation quintile
Northern Ireland	5.3%	20.3%	0.6%	0.7%
Republic of Ireland	4.9%	15.2%	0.0%	9.3%
All Ireland	5.0%	16.9%	0.2%	6.5%

Table A1.9: Percentage of cases with known stage: 1994-2004 & NICR audit years

	1994-2004 inclusive		NICR Audit years: 1996 & 2001	
	Northern Ireland	Republic of Ireland	Northern Ireland	Republic of Ireland
Oesophagus (C15)	7.5%	46.9%	37.6%	44.0%
Stomach (C16)	12.1%	63.6%	52.3%	62.8%
Colorectal (C18-C21)	67.7%	80.8%	82.3%	79.9%
Lung (C33, C34)	11.8%	60.2%	50.3%	56.8%
Malignant melanoma (C43)	85.5%	28.7%	85.8%	25.1%
Breast (C50)	74.1%	86.2%	87.9%	85.6%
Cervix (C53)	81.2%	66.7%	88.4%	66.6%
Ovary (C56)	69.4%	65.3%	79.0%	65.2%
Prostate (C61)	6.8%	27.6%	36.4%	26.5%

The completeness of staging information varies considerably by site with low levels of missing information for breast and ovarian cancer and high levels of incompleteness for prostate cancer. The use of audit data improves completeness in Northern Ireland for 1996 & 2001, particularly for lung and stomach cancer. (Table A1.9)

Mortality: Incidence ratio

The Mortality: Incidence: ratio (M:I) is another measure of completeness as it is a crude indicator of survival. M:I ratios that are inconsistent with survival data for a cancer site suggest either over or under registration in the number of cases or deaths. The M:I ratios for each cancer site are similar for Northern Ireland and Republic of Ireland. (Table A1.10)

In both countries however liver and pancreatic cancers have M:I ratios that are greater than 1 suggesting that more deaths than diagnosed cases of these cancers occurred between 1994 and 2004. This is probably a result of cancers spreading from a different part of the body to the liver or pancreas, i.e. liver or pancreatic cancer being a secondary cancer that is subsequently accredited as the cause of death. In addition checking is more rigorous for cancer incidence than deaths with errors in assignment of cause of death less likely to be corrected. (Table A1.10)

Table A1.10: Mortality: Incidence (M:I) ratio: 1994-2004

	Incidence		Mortality		M:I ratio	
	Northern Ireland	Republic of Ireland	Northern Ireland	Republic of Ireland	Northern Ireland	Republic of Ireland
Head and Neck (C00-C14, C30-C32)	2,353	4,547	869	2,179	0.4	0.5
Oesophagus (C15)	1,677	3,433	1,629	3,411	1.0	1.0
Stomach (C16)	2,781	5,232	2,003	3,965	0.7	0.8
Colorectal (C18-C21)	10,274	20,649	4,668	10,212	0.5	0.5
Liver (C22)	626	1,010	805	1,562	1.3	1.5
Pancreas (C25)	1,642	3,947	1,755	4,040	1.1	1.0
Lung (C33,C34)	9,782	17,996	8,683	16,637	0.9	0.9
Malignant melanoma (C43)	2,158	4,872	357	803	0.2	0.2
Breast (C50)	10,304	20,568	3,316	7,111	0.3	0.3
Cervix (C53)	892	2,048	344	821	0.4	0.4
Uterus (C54-C55)	1,512	2,821	384	674	0.3	0.2
Ovary (C56)	1,938	3,826	1,156	2,525	0.6	0.7
Prostate (C61)	6,267	17,974	2,337	5,720	0.4	0.3
Testis (C62)	593	1,200	32	76	0.1	0.1
Kidney (C64-C66,C68)	1,851	3,551	846	1,652	0.5	0.5
Bladder (C67)	2,245	5,113	953	1,797	0.4	0.4
Brain and other CNS(C70-C72)	1,209	3,067	863	2,430	0.7	0.8
Lymphoma (C81-C85,C96)	3,179	5,967	1,427	2,735	0.4	0.5
Multiple myeloma (C90)	1,101	2,164	662	1,607	0.6	0.7
Leukaemia (C91-C95)	1,758	4,436	1,028	2,620	0.6	0.6
Non-melanoma skin cancer (C44)	24,181	59,189	145	410	0.0	0.0
Other	7,437	14,261	5,574	10,014	0.7	0.7
All cancers excluding NMSC (C00-C96, ex. C44)	71,579	148,682	39,691	82,591	0.6	0.6

CNS: Central Nervous System

Appendix 02:

Statistical methodology

The statistical methods used in this report are those widely used by cancer registries throughout the world in describing the burden of cancer within their catchment area. Consequently a significant amount of literature is available on these techniques (see references 227 and 228 as introductory texts to general principles and survival analysis respectively). However while some of the methods, such as age-standardisation, have been used by epidemiologists for many years, some other techniques, such as relative survival period analysis, are relatively new. Additionally there are variations within the general methods such as the standard populations used or methodology behind deriving expected survival that can vary between studies. This appendix thus gives a very general overview of the techniques utilised in this report focusing on local variations and identifying which methods were selected. It should be noted however that this chapter is for reference only and to allow future reproduction of the results presented within the report and not meant to supplant the numerous (and better) texts on cancer registration techniques and medical statistics.

A2.1: Descriptive measures of incidence and mortality

The most common and useful measures of cancer levels in a population are the absolute number of cases (incidence) or deaths (mortality) in a given year. It is these very basic figures that allow planning by the health services of each country for each year and are the fundamental building blocks of any other analysis. However the number of diagnoses of cancer within a year compared to the size of the population of Ireland is relatively small. This can result in the number of events being studied fluctuating each year as a result of random factors, particularly for the less common cancers. This requires the population to be observed over a number of years in order to present a stable value for the number of cases diagnosed or number of deaths per year. Throughout this report a five-year annual average for the number of cases diagnosed or number of deaths from cancer has thus been used to represent the situation at a given point in time rather than using data for a particular year.

A2.1.1: Crude rates

While the absolute number of cases or deaths is useful for planning purposes these measures do not allow accurate comparison of populations of different size. A crude incidence/mortality rate compensates for this by presenting the number of cases/deaths per 100,000 members of the population and is based upon the ratio of events to members of the population. If we let R be the number of events in a given year and N be the population for that year then the crude incidence/mortality rate per 100,000 persons for that year, C, is given by:

$$C = \frac{R}{N} \times 100{,}000$$

In a situation where several years worth of data is required then R represents several years worth of events and the population used must reflect this by summing the populations of the years in question. In this event N is referred to as the number of person-years of observation.

A2.1.2: Age-specific rates

Crude rates are not always the best measure for comparative purposes as there is a very strong relationship between cancer and age, thus a younger population is more likely to have a lower number of cancers than an older population of the same size. The most useful and easiest to calculate measure that compensates for differences in the age-structures of two populations is a set of age-specific rates, which are calculated in a similar manner to crude rates.

If r_i is the number of events in age group i and n_i is the number of person-years of observation within which the events occur, then the age-specific rate for that age group, denoted by a_i is given by:

$$a_i = \frac{r_i}{n_i} \times 100{,}000$$

The draw back of the use of age-specific rates is off course the number of these that must be quoted in order to give a full picture of the cancer/population being studied, particularly since five-year age-groups are the most commonly used age breakdown. In addition the small numbers involved can cause very noticeable fluctuations over time, even when several years worth of data are used.

A2.1.3: Age-standardisation

A widely used technique, which provides a summary measure that allows for the changing or differing population age-structure, is age-standardisation. This does not completely overcome the difficulty in comparing rates between populations[229] and is thus not a replacement for age-specific rates but does provide statistics that are more manageable and lend themselves to further analysis, particularly comparisons of many sets of incidence/mortality rates such as is required in trend and geographic analysis.

There are two methods of age-standardisation, direct and indirect, used in this report. The former is the most commonly used as it provides an absolute measure while the indirect method provides a value relative to some other measure and is thus very restricted in its range of applications.

Direct standardisation

The result of direct standardisation is known as an age-standardised rate (ASR), which refers to the number of events per 100,000 persons occurring in the population if the population possessed the same age structure as a standard population. There are two standard populations used in this report, the European standard population, which is used throughout the EU, and the World standard population, which is used for global comparisons of cancer rates. The former is the preferred measure used by NICR and NCRI, with the World standard only used for international comparisons of incidence. (Table A2.1)

Table A2.1: Standard populations used in age-standardisation

Age class	European standard population	World standard population
0-4	8,000	12,000
5-9	7,000	10,000
10-14	7,000	9,000
15-19	7,000	9,000
20-24	7,000	8,000
25-29	7,000	8,000
30-34	7,000	6,000
35-39	7,000	6,000
40-44	7,000	6,000
45-49	7,000	6,000
50-54	7,000	5,000
55-59	6,000	4,000
60-64	5,000	4,000
65-69	4,000	3,000
70-74	3,000	2,000
75-79	2,000	1,000
80-84	1,000	500
85+	1,000	500
Total	100,000	100,000

The calculation of an age-standardised rate is based upon the age-specific rates introduced in section A2.1.2. These rates are multiplied by the standard population for that age class (also known as the weight), with the products summed and divided by the total standard population. In mathematical terms, if a_i is the age-specific rate for age class i and w_i is the standard population of age group i, with A the number of age intervals then the age-standardised rate, ASR, is given by:

$$ASR = \frac{\sum_{i=1}^{A} a_i w_i}{\sum_{i=1}^{A} w_i}$$

This value is the standard measure used for making comparisons between different populations, however while useful within this context it cannot be interpreted as a measure of the actual number of events within a population due to the removal of the age effect and corresponds to the crude rate in the standard population rather than that being studied.

Standardised rate ratio

Given its purpose as a comparative measure, it is useful to introduce a derivative of the age-standardised rate known as the standardised rate ratio, which is the ratio of two age-standardised rates. It represents the relative risk of disease in one population compared to another and is beneficial for presentational purposes as it allows the presentation of a single percentage rather than two absolute values. Its calculation is straightforward; if ASR_1 is the age-standardised rate for population 1 and ASR_2 is the age-standardised rate for population 2 then the standardised rate ratio of population 1 compared to population 2, denoted $SRR_{1\text{-}2}$, is given by:

$$SRR_{1-2} = \frac{ASR_1}{ASR_2}$$

This ratio can either be quoted as a ratio, be expressed as a percentage by multiplying by 100, with 100% referring to the events in the reference population, or be expressed as the percentage difference of one age-standardised rate compared to another by subtracting 1 and multiplying by 100. The later has been used in this report, as it is the easiest to interpret.

Indirect standardisation

The indirect method of age-standardisation is a comparison of the observed number of events within a population and the number of events expected in a reference population of the same size. When considering incidence of cancer the expected number is calculated by applying the age specific incidence rates of a reference population to the observed population (i.e. the population being studied). The formula for the standardised incidence ratio (SIR) is:

$$SIR = \frac{\sum_{i=1}^{A} r_i}{\sum_{i=1}^{A} \frac{a_i n_i}{100{,}000}}$$

where a_i is the age specific incidence rate in the reference population, n_i is the observed population in age group i and r_i is the observed number of cases in age group i. The formula is also valid for mortality data with a_i as the age specific mortality rate and the result known as the standardised mortality ratio (SMR).

The result is usually expressed as a percentage by multiplying by 100, with 100% referring to the events in the reference population. This measure is frequently used for geographic analysis with the reference population being that for an entire country (e.g. Ireland) and SIRs or SMRs calculated for smaller geographic units (e.g. district councils/counties) giving an indication of how cancer levels in these areas compare to that of the entire country.

A2.1.4: Cumulative risk

Another commonly used measure which is of particular interest to the general public, but is not as useful as age-standardised rates, is the cumulative risk, which gives the risk of an individual developing cancer during a particular age span (usually 0 to 74) assuming the absence of other causes of death. Like age-standardised rates it is based upon age-specific rates but is expressed as a percentage rather than a rate. It is derived using the formula:

$$CR_{0-74} = 100\left[1 - \exp\left(-\frac{1}{100}\sum_{i=1}^{A}\frac{a_i t_i}{100000}\right)\right]$$

where a_i is the age-specific rate for age class i, t_i is the duration of age class i, A is the number of age intervals between 0 and 74 (or the upper age of the age span under consideration) and CR_{0-74}, is the cumulative risk of developing cancer before the age of 75.

A2.1.5: Unknown values

In the discussion on data quality in appendix A1 it was noted that both NICR and NCRI have a high level of completion in the data fields required for analysis. In particular both age and sex are 100% complete for all cancers (excluding non-melanoma skin cancer). Thus while corrections to age-standardised rates are possible in the event that age is missing in a small percentage of cases, these are not required for this report.

Geographic and socio-economic information is less complete, however incomplete records must be catered for otherwise any ASRs or SIR/SMRs will be an underestimate of the true value. In this event records with an unknown district council, county or deprivation quintile are redistributed within the relevant country according to the distribution of the records with a known district council, county or deprivation quintile. This assumption is not completely justified as missing geographic information is more likely to occur for the elderly and in rural areas but the adjustment will bring the estimated rate closer to the true value.

A2.1.6: Confidence intervals and statistical significance

This highlights an important factor of age-standardised rates in that they are only estimates of the true value, as uncertainty exists due to random fluctuations in the number of events between different populations. In order to quantify this uncertainty any rates in this report are accompanied by 95% confidence intervals to indicate the range within which there is a 95% probability that the true value is likely to fall. The size of the confidence intervals depends upon the number of events and the size of the population within

which they occur, with rates made up of a small number of observations within a large population being less stable and having large confidence intervals. The formulae used to calculate confidence intervals for the incidence and mortality measures used in this report are given in table A2.2.

Table A2.2: Formulae for confidence intervals of incidence and mortality measures

Measure	95% confidence interval
Age-standardised rate (ASR)	$ASR \pm 1.96\sigma$ where $\sigma^2 = \frac{\sum_{i=1}^{A}\left[a_i w_i^2 (100000 - a_i)/n_i\right]}{\left(\sum_{i=1}^{A} w_i\right)^2}$
Standardised rate ratio (SRR_{1-2})	$\exp\left[\mathrm{Ln}(SRR_{1-2}) \pm 1.96\sqrt{\frac{\sigma_1^2}{ASR_1^2} + \frac{\sigma_2^2}{ASR_2^2}}\right]$
Standardised incidence ratio (SIR)	$SIR \pm 100\left[1.96 \times \left(\frac{\sqrt{\sum_{i=1}^{A} r_i}}{\sum_{i=1}^{A} \frac{a_i n_i}{100000}}\right)\right]$

Rates for two different time periods or population groups are considered to differ only if the 95% confidence intervals for the two age-standardised rates do not overlap. Alternatively, in the case of ratios, the rates for a population differ from those of the reference population only if the confidence interval does not include 100%. This is known as statistical significance and for significant differences the level of certainty about any difference can be quantified by calculating the p-value. This measure provides the probability that any difference observed between two rates is due to chance. Thus a p-value of 0.001 indicates a 99.9% probability that differences are genuine and not a result of random factors.

A2.1.7: Trend analysis

Trends in ASRs are assessed by calculation of the annual percentage change (APC), which is the percentage increase, or decrease per year in the age-standardised rate. From our earlier discussion regarding fluctuations in rates over time it is not appropriate to select the rates corresponding to the beginning and end of the trend and calculate the percentage difference. Using an average over several years provides a better estimate; however a much better approach is through the use of curve fitting or regression.

A full discussion of regression is well outside the scope of this appendix but in summary it is the mathematical technique that allows a series of points in a trend to be estimated by a simple formula. In this case we are assuming that the age-standardised rate, ASR, depends upon the calendar year according to the equation

$$Ln(ASR) = mx + b$$

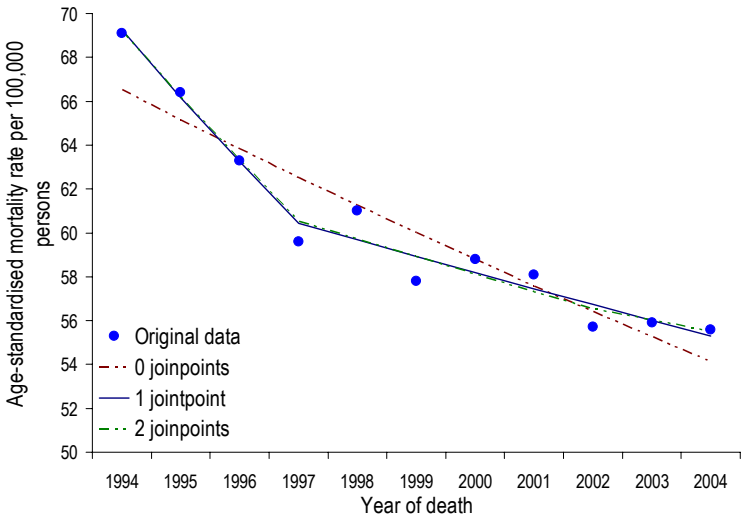
where x is the calendar year, b is a constant and the annual percentage change (APC) is given by

$$APC = 100 \times (e^m - 1)$$

The formula, or model, is known as a log-linear model and is not the only type we could have chosen, however the curve it creates is a good fit for the data available and is a commonly used model in cancer incidence and mortality studies.

The calculation makes the assumption that the age-standardised rates increase or decrease at a constant rate over the period examined. While this is a reasonable assumption for incidence and mortality rates, it is not reasonable to assume that there is no change in the trend during the time period for which data exists. To investigate whether changes in trends occur during the years for which data exists the JoinPoint regression program developed by the US National Cancer Institute[230-231] was used. This software reads trend data and divides the trend into an increasing number of separate sections, which are connected by points known as joinpoints. For each number of joinpoints (starting at 0) it fits the simplest model that the data allow up to a maximum number dictated by the user (with 3 selected for this report)

Figure A2.1: Example of trend analysis using joinpoint regression (lung cancer mortality in Ireland). The addition of one joinpoint is statistically significant; however the addition of a second is not. Thus the results indicate a single change of trend between 1994 and 2004 that occurred in 1997.



giving a set of possible fits to the data (4 in the analysis in this report) ranging from the best possible fit using a straight line to the best possible fit using the maximum number of joinpoints. Statistical tests are conducted to assess whether the addition of joinpoints from one model to another is statistically significant thereby allowing the user to test whether an apparent change in trend is statistically significant. See figure A2.1 for an example.

A2.2: Treatment analysis

The majority of analysis of treatment is through the derivation of the number of patients receiving different types of treatment and their characteristics, with these numbers frequently presented as a percentage of the total number. While this is fairly straightforward, random fluctuations in values (see section A2.1.6) mean that caution needs exercised when comparing either two proportions or the overall distribution of treatment (or other factors) between two sets of patients. Statistical tests exist for both scenarios and are utilised in this report to identify those differences that are statistically significant. Statistical decisions with regard to differences in proportions are based upon the assumption that any differences are normally distributed about zero, while the chi-square test is used to test for differences between the distribution of patient or tumour characteristics of two different cohorts. In both cases a 95% confidence level is applied.

Details on both the normal distribution with its use in testing for differences in proportions and on the chi-square test for differences between distributions can be found in numerous statistical texts[232].

A2.2.1: Relative risk

In analysis of cancer incidence, age-standardisation is used when making comparisons between incidence rates by different population groups, as age is a very strong factor in the development of cancer. Likewise there are many factors that can influence whether a patient receives treatment. For any thorough understanding of differences between patient groups these factors must therefore be identified and controlled for. This is done through logistic regression, which in this report is used to identify and quantify the degree to which various patient characteristics (e.g. age, sex) and tumour details (e.g. stage, basis of diagnosis) can influence treatment receipt while controlling for the interaction between these factors.

The methodology behind logistic regression is similar to other forms of regression. However the outcome and variables used in the model are dichotomous (i.e. have only two possibilities) rather than continuous which was the case for the regression models used for trend analysis of incidence (see section A2.1.7). This means that potential factors are split into more than one variable in the event that more than two divisions are insufficient to fully represent the group of cancer patients being studied. Thus while sex can be represented by a single variable, age is split into several distinct groups. Additionally the models developed in this report to identify factors influencing treatment are multivariate with age and sex initially assumed to be factors and further variables added to improve the models predictive power. The set of variables used in the multivariate models are sex, age, stage at diagnosis, basis of diagnosis, deprivation quintile, cell type, year of diagnosis and country. The later is omitted in separate models for Northern Ireland and Republic of Ireland. It is recognized however that these models could be further improved by the addition of further variables.

With the factors influencing treatment identified, odds ratios (the ratio of the odds of an event occurring in one patient group to the odds of it occurring in a baseline patient group) are derived from the coefficients to the variables of the logistic regression model by taking the exponential function of these coefficients. However while analysis of odds ratios can lead to useful statistical conclusions in their own right, a more useful and easy to interpret measure of the likelihood of a group of patients receiving treatment relative to a baseline group is the relative risk, which can be derived from the odds ratio using the approach suggested by Zhang and Yu[233]. If OR is the odds ratio of a group of patients receiving treatment compared to a baseline group and the proportion of cases treated in the baseline group is given by P_0, then the relative risk RR of the patient group to the baseline is given by:

$$RR = \frac{OR}{(1 - P_0)(OR \times P_0)}$$

Analysis of relative risk will lead to the same conclusions as examination of odds ratios; however the relative risk can be interpreted as the percentage of patients receiving treatment compared to the baseline value, or as a percentage difference between the two groups.

When comparing relative risks from two different logistic models (e.g. for Northern Ireland and Republic of Ireland) the confidence intervals accompanying the relative risk give some indication of whether or not there is a significant difference between the two, with confidence intervals that do not overlap indicating a significant difference. A better comparative measure however is known as the test for interaction[234] which gives the p-value for one relative risk RR_1 compared to another RR_2. This test is based upon the normal distribution with a z-value given by:

$$z = \frac{Ln(RR_1) - Ln(RR_2)}{\sqrt{\sigma(Ln(RR_1))^2 + \sigma(Ln(RR_2))^2}}$$

A significant difference indicated by confidence intervals around relative risks RR_1 and RR_2 will also be identified via this test; however the test may also identify significant differences in cases where the confidence intervals overlap by small amounts.

A2.3: Survival analysis

Survival refers to the proportion of patients who survive a given amount of time after a diagnosis of cancer. It is one of the best indicators as to the efficiency of diagnostic and treatment methods in a geographic area and is widely used by cancer registries as a broad indicator as to the effectiveness of health services in the treatment of cancer. Unfortunately it is also one of the most difficult cancer measures to calculate, with many different techniques and types of measure in existence.

A2.3.1: Observed survival

The most fundamental, and perhaps of most relevance to patients, is observed survival, which is the probability that a patient with cancer will be alive at the end of a particular length of time as measured from the date of diagnosis. It is independent of the cause of death and can be calculated using several different techniques. In this report the Kaplein-Meier method has been used to calculate the observed survival, S_i, for a time i after the date of diagnosis. Using this method S_i is calculated using the formula

$$S_i = \prod_{k=1}^{i} 1 - \frac{d_k}{n_k - \frac{1}{2}w_k}$$

where k is a predefined time interval between the date of diagnosis and i, d_k is the number of deaths from any cause occurring during interval k, n_k is the number of patients alive entering interval k and w_k is the number of patients withdrawn alive during the k^{th} interval.

It is worth noting how the observed survival is calculated by breaking the overall time period being measured, i, into intervals of length k. The choice of these intervals can have an impact upon the final result, albeit a small one. In this report we have used intervals of three months for the first year after diagnosis, six months for the next two years and one-year after that point.

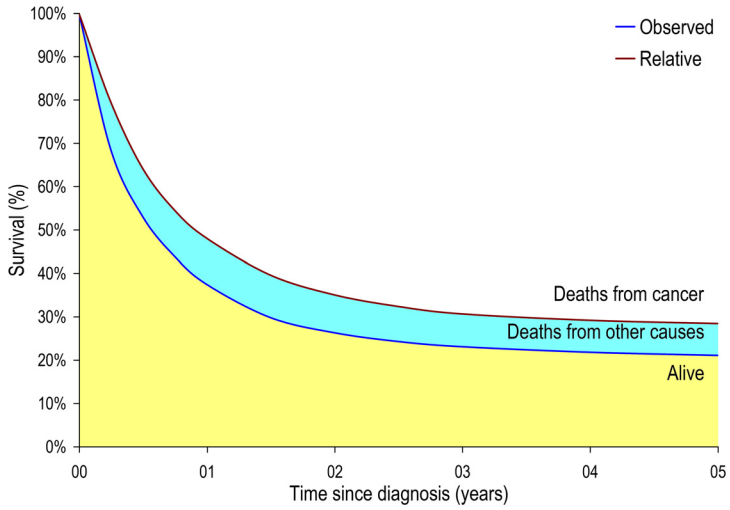
The number of patients, n_k, who are still alive entering interval k is dependent upon the survival experience of each individual patient. This is determined by assessing whether each patient is alive or dead at the date that the start of interval k refers to by using the date of death for that patient. Those alive at the start of interval k but who have died by the end of the interval contribute to the value of d_k for that interval while those alive at the end of interval k contribute to the value of n_{k+1} for the next interval. However these values can only be determined for intervals during which follow up data (i.e. alive or dead status) for each patient is known. The date beyond which this information is not available for a patient is known as the censor date, with the alive or dead status of the patient on this date known as the vital status. Due to follow up data on patients coming from death registrations in Ireland, the censor date is the same for all patients, although allowance is made in the Kaplein-Meier method for some patients, w_k, to be withdrawn alive from an interval for reasons such as emigration (known as lost to follow up). For this report the censor date is 31st December 2004 while no patients have been withdrawn due to being lost to follow up.

Having to apply a censor date however does mean that there are restrictions as to the length of survival time that can be calculated. For example due to the lengthy follow up time required to derive five-year observed survival, it is only possible to report on the survival experience of patients diagnosed 7-8 years in the past. Thus for this report the most up to date five-year observed survival data is for patients diagnosed in 1999.

A2.3.2: Relative survival

Observed survival for cancer patients includes death from causes other than cancer, some of which may be related to cancer or its cause (e.g. other smoking related illnesses) or may even be completely unconnected to the disease (e.g. accidental death). It is thus not the best survival measure for monitoring the effectiveness of treatment of the disease or its impact on society. Instead measures that remove other causes of death from survival figures are preferred. The most commonly used of these types of measures, but not the only one, is relative survival, which is used in this report. (Fig. A2.2)

Figure A2.2: Typical survival curves using observed and relative survival



Relative survival is the ratio of the observed survival of a given group of patients to the expected survival for a group of persons in the general population with the same characteristics (usually sex and age, but also country in this report). The expected survival can be calculated using several different techniques. The method used in this report is the Ederer II method[235] which is calculated in a similar way to observed survival by using the formula:

$$E_i = \prod_{k=1}^{i} 1 - \sum_{h=1}^{n_k} \frac{P_k(h)}{n_k}$$

where E_i is the expected survival for a time i after the date of diagnosis, k is the same predefined time interval between the date of diagnosis and i that is used in the calculation of observed survival, n_k is the number of patients alive entering interval k and $P_k(h)$ is the probability of a similar person, h, in the general population surviving to the end of period i. This later value is taken from life tables derived by the Office of National Statistics (ONS)[236] (for Northern Ireland) and Central Statistics Office (CSO)[237] (for Republic of Ireland) which use information on deaths from all causes in the general population along with mid-year population estimates to develop estimates of life expectancy by age and sex.

Confidence intervals

As with the other statistical measures used in this report observed and relative survival values are accompanied by 95% confidence intervals. These are derived directly from the standard error using the following formula:

$$RS \times \exp\left[\pm 1.96 \frac{\sigma}{RS}\right]$$

where RS refers to the relative survival rate with σ as the standard error.

Age-standardisation

Survival from cancer is dependent upon age at diagnosis. Thus when comparing survival from different populations the same difficulties that occur when comparing incidence and mortality rates are also apparent, with populations having high percentages of younger people having better survival that those with high percentages of older people. To compensate we thus apply the direct age-standardisation approach that was used with incidence and mortality rates to all relative survival rates. As before this involves the application of a standard population to age-specific relative survival rates. However it is necessary to bear in mind that the population at risk when investigating survival differs from that for incidence in that the latter refers to the entire population while survival relates only to patients with cancer. Thus different standard populations are required, not only from that used for the age-standardisation of incidence data but also for those cancer sites that have significantly different age distributions for patients than usual, such as testicular cancer which is more predominant in young men and prostate cancer which is more common in the very elderly. In this report we use the same standard populations as those used in the EUROCARE-IV[238] study, which were those suggested by Corazziari et al[239]. (Tab. A2.3)

Table A2.3: Standard cancer populations used in age-standardisation of relative survival

Standard 1		Standard 2		Standard 3		Standard 4	
Age class	**Population**	**Age class**	**Population**	**Age class**	**Population**	**Age class**	**Population**
15-44	7,000	**15-44**	28,000	**15-44**	60,000	**15-54**	19,000
45-54	12,000	**45-54**	17,000	**45-54**	10,000	**55-64**	23,000
55-64	23,000	**55-64**	21,000	**55-64**	10,000	**65-74**	29,000
65-75	29,000	**65-75**	20,000	**65-75**	10,000	**75-84**	23,000
75+	29,000	**75+**	14,000	**75+**	10,000	**85+**	6,000
Total	100,000	**Total**	100,000	**Total**	100,000	**Total**	100,000
Cancer sites							
All except for those requiring standards 2-4		Nasopharynx, soft tissues, melanoma, cervix uteri, brain, thyroid, bone		Testes, Hodgkin's disease		Prostate	

Source: Corazziari et al[239]

A2.3.3: Conditional survival

Observed and relative survival is measured from the point that patients are diagnosed with cancer; however the start date in survival analysis can be any date that has relevance to the patient provided that the length of time being analysed is clearly defined. Using this flexibility the long-term survival of patients who have already survived a certain amount of time can be determined by using start dates for survival analyses that are a certain amount of time after diagnosis. In other words it is possible to derive the probability that a patient will survive a certain amount of time if that patient has already survived to a certain point. This measure is known as conditional survival and in this report we present conditional survival data for patients who are alive at one-year increments from date of diagnosis up to a maximum of five-years.

Patients who survive a minimum amount of time obviously have higher overall relative survival than all patients measured from diagnosis. However the benefit of examining conditional survival is in the possible identification of a point where 100% of those who survive to that point are from then on cancer free. For example suppose five-year relative survival from diagnosis for all patients was 50% but six-year relative survival from diagnosis was 70% for patients who survived a minimum of one-year. This would show that the group of patients who were alive one-year from diagnosis was much closer to being cancer-free than the group of patients alive at diagnosis. Extending further if seven-year relative survival was 100% for those were still alive two years after diagnosis it could be safely concluded this group of patients was cancer-free. Given that this is an investigation of long-term survival the analysis in this report is thus restricted to those diagnosed in 1994-96.

A2.3.4: Period analysis

The method of deriving survival results thus far described is known as cohort analysis and is the method widely used by cancer registries in survival analysis. One recognised disadvantage of using this method is that due to the lengthy follow up time required to derive five-year relative and observed survival, it is only possible to report on the survival experience of patients diagnosed 7-8 years in the past.

Period analysis was introduced in 1997 by Brenner & Gefeller[240] as a method for obtaining more up-to-date estimates of survival, which can complement those obtained by traditional methods. This approach involves using the year that patients survive to instead of the year that they are diagnosed with cancer. Thus survival data for patients diagnosed in 2000-2004 can be estimated using the period approach by examining the survival experience of patients who have survived to 2000-2004. (Fig. A2.3)

Figure A2.3: Method of deriving most up to date survival estimates using cohort analysis (1997-1999, solid box) and period analysis (2000-2004, dashed box). Cells represent the minimum and maximum years of follow up data available for each year of diagnosis.

Year of diagnosis	Year of follow up										
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
1994	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10
1995		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
1996			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
1997				0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
1998					0-1	1-2	2-3	3-4	4-5	5-6	6-7
1999						0-1	1-2	2-3	3-4	4-5	5-6
2000							0-1	1-2	2-3	3-4	4-5
2001								0-1	1-2	2-3	3-4
2002									0-1	1-2	2-3
2003										0-1	1-2
2004											0-1

A2.3.5: Modelling of excess mortality

Survival is dependent upon many factors, age having one of the biggest impacts. However there are other factors that potentially have an even larger impact (e.g. stage at diagnosis). While these are investigated in this report primarily by calculating age-standardised relative survival for these factors (when data is available) a full understanding on how these factors interact can only be obtained by attempting to model survival using these factors. Modelling of any description can be particularly tricky, especially in the case of survival, which is a continuous variable rather than a binary one as in the case of treatment. Traditionally Cox's proportional hazards model is used to model observed survival, however in this report we have focused on relative survival and thus use techniques appropriate to this measure. As with most other survival techniques thus far encountered there are several possible approaches to this task. In this report we have selected the method utilised by Dickman et al[241], which relies upon Poisson regression to model the number of deaths and patients entering each survival interval and calculate excess mortality for each factor incorporated into the model. The excess mortality is inversely related to survival with low survival compared to the baseline inducing relatively high excess mortality. The ratio of excess mortality to that of the baseline is known as the excess hazard ratio.

The variables used in these investigations are those that are readily available in the compiled dataset and are known to contribute to cancer survival. For the majority of cancer sites these are the same variables as used in modelling of treatment, with receipt of treatment also included as a potential factor. However the models presented in this report are still of a very basic nature, particularly for those cancers were treatment and stage data is incomplete and it is therefore acknowledged that there is potential for considerable improvement in this area.

A2.4: Prevalence

Prevalence refers to the number of people living in a population with a diagnosis of cancer. Most cancer registries have difficulty in providing an exact figure for this value for a variety of reasons. In the context of Ireland the problems are threefold:

- There is no point at which cancer is considered cured. While some people diagnosed with cancer may be cancer free within a few years, others may need treatment for a considerable length of time. Thus in order to develop prevalence figures, either an assumption must be made as to an average "cure" point (sometimes arbitrarily taken as being five-years) or all people who have been diagnosed with cancer and are still alive at a certain point must be included.
- The cancer registries in Ireland have information on people diagnosed with cancer from 1994 onwards (Northern Ireland has data from 1993 but is excluded from this report for the purpose of creating data for all of Ireland). Unfortunately with regard to measuring prevalence, this means that there is no information on members of the population who had a diagnosis of cancer prior to 1994. Thus any prevalence figures produced would be an undercount of the true value.
- Neither NICR nor NCRI have information on those cancer patients who have emigrated from Ireland since diagnosis, which might result in a slight inflation of the prevalence figures.

Figures for overall prevalence are thus not provided in this report, however prevalence figures for people diagnosed within the most recent eleven-years (1994-2004) and five-years (2000-2004) are provided. These would be equivalent to prevalence figures that assume that a patient can be considered cancer free within eleven-years and five-years respectively. More detailed analysis is provided using the later definition, as IARC occasionally uses this definition to estimate prevalence[242].

A2.5: International comparisons

Cancer statistics on incidence and survival are available from the cancer registries in most countries in the European Union as well as North America and Australia; however caution needs to be exercised when making comparisons between statistical measures in Ireland and these countries for a variety of reasons:

- Incidence and survival rates in different countries use different diagnostic periods to those in this report. Given that cancer rates change over time any differences observed between countries could be the result of differences in the time period being examined as opposed to regional variations.
- In some cases incidence and survival rates from other countries only represent a fraction of the population, as the cancer registries do not always cover the entire country.

- Confidence intervals for rates from other countries are not always provided. In such an event it cannot be ascertained whether or not differences between countries are statistically significant.
- Different age structures exist in different countries. Given that cancer is strongly dependent upon age any differences in rates may be a factor of differences in the age distribution of the population. While most cancer registries regularly produce age-standardised rates to compensate for this, different standard populations are used in different parts of the world.
- While most cancer registries use the ICD10 classification for recording cancer, as illustrated in Appendix 1 coding techniques can differ between countries.

These problems are widely recognised, thus various international collaborations are regularly undertaken to address these issues (with the exception of complete coverage of a country which little can be done about). While still flawed, the results provide the best possible comparisons of incidence and survival between countries. The results from these collaborations are used in this report and are briefly described below.

A2.5.1: Incidence

International data for incidence of cancer in various countries comes from the IARC publication "Cancer incidence in five continents: Volume IX"[243] which collated and published information on 60 countries world wide using data from 225 cancer registries. Both NICR and NCRI supplied data to this volume, which was published in 2007 and reported on cancers diagnosed in 1998-2002.

The primary measure produced by IARC for this publication was age-standardised incidence rates, which were standardised using the world standard population. The ICD10 classification was used to identify each cancer site, although for some records this was changed from the code supplied by each contributing registry in order to maintain consistency across different countries. These changes were based upon the ICD-O-2 or ICD-O-3 topography and morphology codes supplied by the registry and were made primarily in situations where these codes were inconsistent with the supplied ICD10 code as derived by IARC[244].

Due to size constraints only a few of the countries included in the compendium have been included in this report. The number of cases diagnosed by sex and five-year age group, available online as a companion to the publication, was used to reproduce the published rates as this approach also allowed aggregated data for the European Union (EU) to be derived. Data for this political entity was derived in two ways:

- Using the 15 countries making up the EU from 1995-2004 (EU-15). This was derived using data from Republic of Ireland, UK (including Northern Ireland), France, Germany, Italy, Spain, Denmark, Belgium, Netherlands, Sweden, Finland and Austria. The remaining three countries, Luxembourg, Greece and Portugal, are not included in the compendium while some of the data for individual countries does not cover 100% of the population.
- Using the 27 countries making up the EU from 2007 to present (EU-27). This was derived using data from the twelve countries listed above plus data from Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. However data from Romania, Cyprus and Hungary is not available.

Data from the USA has also been included for comparative purposes. This data comes from SEER, which collates data from 14 different cancer registries in the USA but does not represent 100% of the population.

Data quality differs between the various countries. An overview of these differences is supplied in table A2.4 and refers to the data used by IARC in the production of the compendium.

A2.5.2: Survival

Survival data for 20 countries within Europe are available from the EUROCARE-IV study that was conducted in 2007 and investigated patients diagnosed with cancer in 1995-1999 with follow up to the end of 2003[238]. Both Northern Ireland and Republic of Ireland provided data for this study with results for most cancer sites available. The participating European countries are listed in table A2.5, however not all participating cancer registries (e.g. France, Germany and Spain) cover 100% of the population of their country. Consequently, despite the large sample size, caution should be exercised when interpreting survival differences between Ireland and these countries.

Table A2.4: Data quality of cancer incidence (excluding NMSC) in countries contributing to the IARC publication "Cancer incidence in five continents: Volume IX"

	% MV	% DCO	% other & unspecified		% MV	% DCO	% other & unspecified
Republic of Ireland	84.4%	2.8%	5.5%	**Finland**	92.8%	7.9%	1.7%
Northern Ireland	80.5%	1.4%	5.5%	**Sweden**	98.3%	0.0%	4.7%
England & Wales	78.6%	4.3%	5.5%				
Scotland	84.8%	0.6%	5.2%	**Ireland (NI+ROI)**	83.2%	2.4%	5.5%
France	95.7%	3.1%	3.0%	**UK (Inc. NI)**	79.3%	3.9%	5.5%
Spain	88.1%	3.6%	4.1%	**EU-15 countries**	85.8%	3.9%	4.2%
Italy	84.5%	1.4%	2.5%	**EU-27 countries**	84.9%	4.2%	4.1%
Germany	81.7%	12.4%	3.0%				
Belgium	93.5%	4.2%	5.5%	**Australia**	90.8%	1.4%	3.7%
Netherlands	95.2%	0.0%	4.5%	**Canada**	87.0%	1.5%	3.6%
Denmark	89.6%	0.4%	4.7%	**USA (SEER)**	94.3%	1.1%	2.6%
Austria	90.4%	7.9%	1.7%				

Source: IARC[243]; MV: Microscopically verified, DCO: Death certificate only
Note: Other & unspecified refers to cancers coded as C26, C39, C48, C76 & C80

The methodology used in the EUROCARE-IV study is similar to the survival methodology used throughout this report with the exception that the Hakulinen method as opposed to the Ederer II method was used to derive expected survival. The differences between five-year age standardised relative survival results using these two methods is minor, with typical differences of less than 0.2%.

Table A2.5: European countries covered by the EUROCARE-IV study and population coverage by participating cancer registries

Country	Population coverage	Country	Population coverage	Country	Population coverage
Northern Ireland	100%	**Denmark**	100%	**Norway**	100%
Republic of Ireland	100%	**Finland**	100%	**Poland**	9%
England	100%	**France**	17%	**Portugal**	43%
Wales	100%	**Germany**	1%	**Slovenia**	100%
Scotland	100%	**Iceland**	100%	**Spain**	16%
Austria	100%	**Italy**	28%	**Sweden**	100%
Belgium	58%	**Malta**	100%	**Switzerland**	17%
Czech Rep.	8%	**Netherlands**	34%		

Source: EUROCARE-IV[238]

A2.6: Statistical software

The SPSS statistical software package was used to develop the All-Ireland datasets and produce all incidence, mortality, treatment and prevalence data, including the logistic regression models for treatment application. The STATA software package was used to produce all survival data including modelling of excess mortality. Dr. Paul Dickman[245] original developed the syntax used for survival analysis with some modifications made by Dr. Paul Walsh (National Cancer Registry, Ireland).

A2.7: Accuracy and rounding

The majority of values presented in this report are rounded to one decimal place with the exception of average numbers of cases/deaths that are rounded to the nearest whole number. All percentage values, calculations of differences, significance tests etc however are calculated using the maximum number of decimal places available rather than the rounded figures available in tables. Totals and percentages presented in the body of the text may thus occasionally differ from those calculated directly from values presented in tables.

Glossary

Age-specific rate: The rate that events occur per 100,000 persons of a particular age class. It is calculated using the formula:

$$a_i = \frac{r_i}{n_i} \times 100{,}000$$

where a_i is the age-specific rate for age class i, n_i is the number of events in age class i and n_i is the number of person years of observation in age class i.

Age-standardised rate (ASR): The rate per 100,000 persons that has been adjusted to take account of different age structures between geographic areas or time periods by adopting a reference population. It is calculated by the direct method using the following formula:

$$ASR = \frac{\sum_{i=1}^{A} a_i w_i}{\sum_{i=1}^{A} w_i}$$

where ASR is the age-standardised rate, a_i is the age-specific rate for age class i, w_i is the standard population of age class i and A is the number of age intervals.

Annual percentage change (APC): The percentage increase or decrease per year in the age-standardised rate (ASR). It is calculated by fitting a regression line to the natural logarithm of the rates using calendar year as a regression variable, i.e. y = mx + b, where y = ln(ASR), x is the calendar year, and b is a constant. The annual percentage change (APC) is thus given by

$$APC = 100 \times (e^m - 1)$$

The calculation assumes that the age-standardised rates increase or decrease at a constant rate over the period examined.

Behaviour: The manner in which a tumour acts, i.e. benign, in situ or malignant.

Benign tumour: A tumour that neither invades nor destroys the tissue in which it originates, nor spreads to distant sites in the body.

Cancer: A disease resulting from the breakdown in the normal growth of body cells as a result of faults or damage to the genes that control for cell growth.

Cancer registry: An organisation that collects comprehensive information on all new cases of cancer occurring in a defined population.

Cancer site: The body place that a cancer originates in, e.g. lung, breast or prostate.

Cell type: Classification of a cancer according to the type of cell that the tumour resembles. The most common categories include: carcinoma, lymphoma, leukaemia, sarcoma and glioma. Carcinomas represent the most common cancers with sub categories frequently used including adenocarcinoma, squamous cell carcinoma and basal cell carcinoma.

Censor date: The date at which a patient was last known to be alive or dead.

Census output area: The smallest geographic area commonly used in Northern Ireland. Census output areas are derived from the results of the 2001 Census and aggregate exactly to electoral ward and district council. There are 5,022 COAs in Northern Ireland with an average of 335 persons resident in each area.

Chemotherapy: Treatment of cancer through the use of drugs to kill cancer cells.

Confidence interval: The range of values calculated to have a specified (usually 95%) probability of containing the true value of an observation. Thus the 95% confidence interval for a rate is the range of values within which there is a 95% probability of finding the true value for the rate.

Cohort analysis: The traditional method of survival analysis that is based upon the survival experience of patients diagnosed with cancer during a particular period of time and who have been followed up until the most recent date possible. See observed and relative survival.

Conditional survival: The probability of survival given that survival for a certain length of time has already occurred.

County: A geographic area used in Ireland. There are a total of 32 counties, 26 of which are in Republic of Ireland, the boundaries of which are used for administrative purposes. Local Government in Northern Ireland no longer uses the six counties in Northern Ireland.

Crude rate: The rate per 100,000 persons that an event occurs among a given population. It is calculated by using the formula:

$$C = \frac{R}{N} \times 100{,}000$$

where C is the crude rate, R is the number of events and N is the population within which the events occur.

Cumulative risk: The risk of an individual developing cancer before age 75 assuming the absence of other causes of death. It is derived using the formula:

$$CR_{0-74} = 100\left[1 - \exp\left(-\frac{1}{100}\sum_{i=1}^{A}\frac{a_i t_i}{100000}\right)\right]$$

where a_i is the age-specific rate per 100,000 persons for age class i, t_i is the duration of age class i, A is the number of age intervals between 0 and 74 and CR_{0-74} is the cumulative risk of developing cancer before the age of 75.

Deprivation quintile: The division of census output areas (in Northern Ireland) and electoral districts (in Republic of Ireland) into five groups of approximately equal population size based upon their level of economic deprivation.

Diagnosis: The process whereby the nature of a patient's illness is identified through medical examination.

Direct method: See age-standardised rate.

District council: A geographic area in Northern Ireland defined for Local Government purposes. There are currently 26 district councils in Northern Ireland. District councils are also referred to as Local Government Districts (LGDs).

Ederer II method: See expected survival.

Electoral district: A small geographic area used in the Republic of Ireland.

European standard population: A standard population using the age distribution per 100,000 persons given in the table below. The same age distribution is used for males and females.

Age class	Population	Age class	Population	Age class	Population	Age class	Population
0-4	8,000	25-29	7,000	50-54	7,000	75-79	2,000
5-9	7,000	30-34	7,000	55-59	6,000	80-84	1,000
10-14	7,000	35-39	7,000	60-64	5,000	85+	1,000
15-19	7,000	40-44	7,000	65-69	4,000		
20-24	7,000	45-49	7,000	70-74	3,000	Total	100,000

Excess hazard ratio: The ratio of excess mortality among a group of patients relative to that of a control or baseline group.

Excess mortality: The additional deaths found among a group of patients with cancer, having allowed for the expected mortality rate among persons of the same age and sex in the general population.

Expected survival: The survival expected in a subset of the general population whose characteristics are the same as that of the group of cancer patients being studied. The method used in this report is the Ederer II method, which uses the formula:

$$E_i = \prod_{k=1}^{i} 1 - \sum_{h=1}^{n_k} \frac{P_k(h)}{n_k}$$

where E_i is the expected survival for a time i after the date of diagnosis, k is the same predefined time interval between the date of diagnosis and i as used in the calculation of observed survival, n_k is the number of patients alive entering interval k and $P_k(h)$ is the probability of a similar person, h, in the general population surviving to the end of interval k. This later value is taken from life tables derived from population data and deaths from all causes.

Hormone therapy: The treatment of cancer through the addition, removal or blockage of hormones.

ICD10: The tenth edition of the International Classification of Diseases and Related Health Problems, which is published by the World Health Organisation (WHO). It provides a detailed description of known diseases and injuries and is used in the production of morbidity and mortality statistics.

Incidence: The number of new cases of a cancer diagnosed in a particular period for a particular population.

In situ tumour: An early cancer that has not spread to neighbouring tissue.

Kaplein-Meier method: See observed survival.

Lead-time bias: An artificial increase in survival time as measured from the date of diagnosis where earlier detection has not resulted in a delay to the patient's death. The only impact is that patients and services are aware they have cancer for a longer period of time.

Life table: A table that shows the life expectancy of a person at each age and sex. Also usually included in life tables is:

- the probability that a person of a given age will die before their next birthday;
- the number of people out of 100,000 live births who survive to a given age;
- the number of people who die at a given age.

Local Government District: See district council.

Logistic regression: A form of regression used to determine the relationship between variables and a binary (i.e. coded to 0 or 1) dependent variable.

Log-linear model: A mathematical model in which a continuous variable, y, is related to an explanatory variable, x, by the following equation:

$$Ln(y) = mx + b$$

where b is a constant value and m is the gradient of the straight line that best fits the data.

Malignant tumour: A cancerous tumour that can invade and destroy nearby tissue and spread to other parts of the body.

Microscopic verification: A diagnosis of cancer based upon microscopic verification of a tissue specimen including histological confirmation, examination of cytology specimens, and diagnoses of leukaemia based on haematological examination.

Mid-year population estimate: An estimate of the population in a region. Population estimates are based upon the number of births, deaths and migration flows for regions that have occurred since the last population census.

Morphology: The type of cell affected by cancer.

Mortality: The number of deaths from a particular cause for a particular period of time and population.

Mortality:Incidence ratio: The ratio of the number of deaths due to cancer in a given time period to the number of newly diagnosed cases of cancer.

Observed survival: The probability, S_i, that a patient with cancer will be alive at the end of a particular length of time, i, after the date of diagnosis. It is calculated using the formula

$$S_i = \prod_{k=1}^{i} 1 - \frac{d_k}{n_k - \frac{1}{2}w_k}$$

where k is a predefined time interval between the date of diagnosis and i, d_k is the number of deaths from any cause occurring during interval k, n_k is the number of patients alive entering interval k and w_k is the number of patients withdrawn alive during the k^{th} interval.

Odds ratio: The ratio of the odds of an event occurring in one patient group to the odds of it occurring in a baseline patient group.

Passive follow up: A method of cancer registration in which the status of a patient is identified by the matching of cancer registrations with death registrations. This approach is used by both NICR and NCRI.

Pathology: The identification of cancer through the study of cells through a microscope.

Period analysis: An approach used to estimate patient survival for more recent periods of time that cannot be obtained using cohort analysis due to insufficient follow up time. This approach utilises the survival experience of patients still alive in the period of interest rather than of those diagnosed during the period.

Poisson regression: A form of regression that models count data using a log-linear model.

Prevalence: The number of current cases of a disease within a population.

P-value: The probability of an event occurring given a null hypothesis is true. In any statistical tests in this report the null hypothesis is taken to be that there is no difference between two mean values or rates. A small p-value (typically less than 0.05) suggests that the two means or rates tested are significantly different. In this case the result is called statistically significant.

Radiotherapy: The application of radiation to either destroy or reduce the size of malignant tumours.

Relative risk: The ratio of the probability of an event occurring in a group of patients compared to the control or baseline group of patients.

Relative survival: The ratio of the observed survival of a given group of patients to the expected survival for a group of persons in the general population with the same characteristics (usually sex and age, but also country in this report).

Screening: A method of checking for the presence of cancer when there are no signs or symptoms.

Stage: A measure of how far a malignancy has spread in the body. Staging is carried out using a number of laboratory and clinical tests at diagnosis. The most common classification used is the TNM stage that includes information on the extent of the primary tumour (T), the absence or presence of lymph node metastasis (N) and the absence or presence of distant metastasis (M).

Standardised incidence ratio (SIR): The ratio of the number of newly diagnosed cancers observed in a given population to the number of cases expected in a reference population of the same size. The expected number of incidence is calculated by applying a standard set of age-specific rates to the given population. The formula for the standardised incidence ratio (SIR) is:

$$SIR = \frac{\sum_{i=1}^{A} r_i}{\sum_{i=1}^{A} \frac{a_i n_i}{100000}}$$

where a_i is the age-specific rate in the reference population, n_i is the observed population in age class i and r_i is the observed number of cases in age class i.

Standardised mortality ratio (SMR): The ratio of the number of cancer deaths observed in a given population to the number of deaths expected in a reference population of the same size. The SMR is calculated in the same manner as the standardised incidence ratio using deaths due to cancer instead of the number of newly diagnosed cases.

Statistical significance: See p-value.

Standardised rate ratio: The ratio of two age-standardised rates which have used the same standard population.

Surgery: An operational procedure conducted to remove cancerous tissue or control its spread. Investigative surgery conducted to diagnose or investigate the presence of cancer is not included in the definition of surgery used throughout this report.

Survival curve: A plot of survival probability against time.

TNM stage: See stage.

Topography: The site/part of the body in which the tumour is present.

Tumour: An abnormal mass of tissue resulting from uncontrolled cell growth and causing a swelling of the body. Tumours may have one of four behaviours: benign, in situ, uncertain or malignant.

Uncertain tumour: A tumour, which at the time of diagnosis, cannot be classified as either benign or malignant.

Vital status: Whether or not a patient is alive or dead at the censor date.

World standard population: A standard population using the age distribution per 100,000 persons given in the table below: The same age distribution is used for males and females.

Age class	Population	Age class	Population	Age class	Population	Age class	Population
0-4	12,000	25-29	8,000	50-54	5,000	75-79	1,000
5-9	10,000	30-34	6,000	55-59	4,000	80-84	500
10-14	9,000	35-39	6,000	60-64	4,000	85+	500
15-19	9,000	40-44	6,000	65-69	3,000		
20-24	8,000	45-49	6,000	70-74	2,000	Total	100,000

Abbreviations

APC	Annual percentage change
ASIR	Age-specific incidence rate
ASMR	Age-specific mortality rate
ASR	Age-standardised rate
ASRS	Age-standardised relative survival
CI	Confidence interval
CNS	Central nervous system
COA	Census output area
CPD	Central postcode directory
CR_{0-74}	Cumulative risk before age 75
CSO	Central statistics office
DCO	Death certificate only
DHSSPSNI	Department of Health and Social Services and Public Safety, Northern Ireland
DOHC	Department of Health and Children
EASIR	European age-standardised incidence rate
EASMR	European age-standardised mortality rate
ED	Electoral District
EU	European Union
EU-15	European Union using the 15 countries making up the EU from 1995-2004
EU-27	European Union using the 27 countries making up the EU from 2007 to present
GP	General Practitioner
GRO	General Register Office
HNPCC	Hereditary non-polyposis colorectal cancer
HPV	Human papillomavirus
HRT	Hormone replacement therapy
IARC	International Agency for Research on Cancer
ICD9	International classification of diseases: Version 9
ICD10	International classification of diseases: Version 10
ICD9-CM	International classification of diseases: Version 9 – Clinical modification
ICD-O-2	International classification of diseases for oncology: 2nd revision
ICD-O-3	International classification of diseases for oncology: 3rd revision
LGD	Local Government District
M:I	Mortality:Incidence
MV	Microscopic verification
NCI	National Cancer Institute
NCRI	National Cancer Registry, Ireland
NHL	Non-Hodgkin's lymphoma
NI	Northern Ireland
NICR	Northern Ireland Cancer Registry
NISRA	Northern Ireland Statistics and Research Agency
NHS	National Health Service
NMSC	Non-melanoma skin cancer
NSCLC	Non-small cell lung cancer
OPCS	Classification of surgical operations and procedures
OR	Odds ratio

PAS	Patient administration system
ROI	Republic of Ireland
RR	Relative risk
SAHRU	Small Area Health Research Unit
SCLC	Small cell lung cancer
SIR	Standardised incidence ratio
SMR	Standardised mortality ratio
SNOMED	Systemized nomenclature of medicine
SRR	Standardised rate ratio
TRO	Tumour registration officer
TVO	Tumour verification officer
WASIR	World age-standardised incidence rate

References and further Information

References

01: Introduction

1. Verdecchia A, Francisci S, Brenner H et al. Recent cancer survival in Europe: a 2000-02 period analysis of EUROCARE-4 data. Lancet Oncol 2007; 8: 784-96.
2. Stewart BW and Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.
3. Schottenfeld D and Fraumeni JF Jr, editors. Cancer epidemiology and prevention 2nd edition. New York: Oxford University Press; 1996.
4. Adami H, Hunter D and Trichopoulos D, editors. Textbook of cancer epidemiology. New York: Oxford University Press; 2002.
5. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
6. Northern Ireland Statistics and Research Agency. Mid-year population estimates. Available from http://www.nisra.gov.uk. Accessed Sept. 2007.
7. Information Management Unit, Department of Health and Children. Public Health Information System Version 9 Table 01: Population denominator data by sex and age group. Available from http://www.inispho.org. Accessed Sept. 2007.
8. Northern Ireland Statistics and Research Agency. Registrar General Northern Ireland annual report 2006. Belfast: TSO; 2007.
9. Central Statistics Office. Report on vital statistics 2004. Dublin: Stationery Office; 2006.
10. Walsh PM, Comber H and Gavin AT. All-Ireland cancer statistics: 1994-96. Belfast/Cork: NICR/NCRI; 2001.
11. Campo J, Comber H and Gavin AT. All-Ireland cancer statistics: 1998-2000. Belfast/Cork: NICR/NCRI; 2004.

02: All cancers

12. Stewart BW, Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.
13. Schottenfeld D, Fraumeni JF Jr, editors. Cancer epidemiology and prevention 2nd edition. New York: Oxford University Press; 1996.
14. Adami H, Hunter D, Trichopoulos D, editors. Textbook of cancer epidemiology. New York: Oxford University Press; 2002.

03: All cancers (excluding NMSC)

15. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
16. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
17. Stewart BW and Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.

04: Childhood cancer (Ages 0-14, all cancers excluding NMSC)

18. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
19. Cancer Research UK. http://www.cancerhelp.org.uk/help/default.asp?page=6860 “Children’s cancers” (Accessed November 2006).
20. Cancer Research UK. http://info.cancerresearchuk.org/cancerstats/childhoodcancer/?a=5441 “UK Childhood cancer statistics” (Accessed January 2007).

05: Cancer of the head and neck (C00-C14, C30-C32)

21. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
22. Cancer Research UK. Symptoms of mouth cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=13030. Accessed July 2008.
23. Cancer Research UK. Nasopharyngeal cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=17356. Accessed July 2008.
24. Cancer Research UK. Laryngeal cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=5593. Accessed July 2008.
25. Blot WJ, McLaughlin JK, Winn DM et al. Smoking and drinking in relation to oral and pharyngeal cancer. Cancer Res 1988; 48: 3282−7.
26. Muscat JE, Richie JP, Thompson S and Wynder EL. Gender differences in smoking for oral cancer. Cancer Res 1996; 56: 5192-7.
27. Austin DF and Reynolds P. Laryngeal cancer. In: Schottenfeld D and Fraumeni JF Jr, editors. Cancer epidemiology and prevention 2nd edition. New York, Oxford University Press, 1996.
28. Cancer Research UK. Risks and causes of laryngeal cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=5592. Accessed July 2008.
29. Tavani A, Gallus S, La Vecchia C et al. Diet and risk of oral and pharyngeal cancer. An Italian case control study. Eur J Cancer Prev 2001; 10: 191-5.
30. World Cancer Research Fund. Lung. In: Food, nutrition and the prevention of cancer: A global perspective (Part II, Cancers, nutrition and food). Washington DC: American Institute for Cancer Research, 1997, pp 130-47.
31. Cancer Research UK. Definite risks for mouth and oropharyngeal cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=13053. Accessed July 2008.
32. Herrero R, Castellsague X, Pawlita M et al. Human papillomavirus and oral cancer: The International Agency for Research on Cancer multicenter study. J Natl Cancer Inst 2003; 95(23): 1772-83.

33. International Agency for Research on Cancer "Solar and ultraviolet radiation. IARC Monographs on the evaluation of carcinogenic risks to humans (Vol. 55)" Lyon: IARC 1995.

06: Oesophageal cancer (C15)

34. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
35. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
36. Cancer Research UK. Symptoms of oesophageal cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=4486. Accessed July 2007.
37. Nyren O and Adami H-O. Esophageal cancer. In: Adami H, Hunter D and Trichopoulos D, editors. Textbook of cancer epidemiology. Oxford University Press, 2002.
38. Devesa SS, Blot WJ and Fraumeni JF Jr. Changing patterns in the Incidence of esophageal and gastric carcinoma in the United States. Cancer 1998; 83(10): pp2049-53.
39. Cancer Research UK. Risks and causes of oesophageal cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=4484. Accessed July 2007.
40. Lagergren J, Bergstrom R and Nyren O. Association between body mass and adenocarcinoma of the oesophagus and gastric cardia. Ann Intern Med 1999; 130: 883-90.
41. Lagergren J, Bergstrom R, Lindgren A and Nyren O. Symptomatic gastroesphageal reflux as a risk factor of esophageal adenocarcinomas. N Engl J Med 1999; 340(11): 825-31.
42. Murray L, Watson P, Johnston B et al. Risk of adenocarcinoma in Barrett's oesophagus: population based study. BMJ 2003; 327(7414): 534-5.

07: Stomach cancer (C16)

43. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007
44. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
45. Cancer Research UK. Stomach cancer symptoms. Available at http://www.cancerhelp.org.uk/help/default.asp?page=3897. Accessed July 2007.
46. Kono S and Hirohata T. Nutrition and stomach cancer. Cancer Causes Control 1996; 7:41-55.
47. Committee on Medical Aspects of Food and Nutrition Policy. Nutritional aspects of the development of cancer. Department of Health, London, 1998.
48. Cancer Research UK. Stomach cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3903. Accessed July 2007.
49. International Agency for Research on Cancer. Tobacco smoke and involuntary smoking. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 83. Lyon, France, IARC Press, 2004.
50. Peek RM and Blaser MJ. Heliobacter pylori and gastrointestinal tract adenocarcinomas. Nat Rev Cancer 2002; 2(1), 28-37.
51. Murray LJ, McCrum EE, Evans AE and Bamford KB. Epidemiology of Helicobacter pylori infection among 4742 randomly selected subjects from Northern Ireland. Int J Epidemiol 1997; 26(4): 880-7.
52. Hsing AW, Hansson LE, McLaughlin JK et al. Pernicious anemia and subsequent cancer: A population-based cohort study. Cancer 1993, 71(3), 745-50.

08: Colorectal cancer (C18-C21)

53. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
54. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
55. Cancer Research UK. Bowel cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2806. Accessed July 2007.
56. Bueno-de-Mesquita HB, Ferrari P, Riboli E and EPIC Working Group on Dietary Patterns. Plant foods and the risk of colorectal cancer in Europe: preliminary findings. IARC Sci Publ 2002; 156: 89-95.
57. Larsson SC and Wolk A. Meat consumption and risk of colorectal cancer: a meta-analysis of prospective studies. Int J Cancer 2006; 119(11): 2657-64.
58. World Cancer Research Fund. Food, nutrition and the prevention of cancer: A global perspective. Washington DC: American Institute for Cancer Research, 1997.
59. Colditz GA, Cannuscio CC and Frazier AL. Physical activity and reduced risk of colon cancer: implications for prevention. Cancer Causes Control 1997; 8(4): 649-667.
60. Cordain L, Latin RW and Behnke JJ. The effects of an aerobic running program on bowel transit time. J Sports Med Phys Fitness 1986; 26(1): 101-4.
61. Cancer Research UK. Bowel cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2807. Accessed July 2007.
62. Ekbom A, Helmick C, Zack M and Adami HO. Ulcerative colitis and colorectal cancer; a population based study. N Engl J Med 1990; 323: 1228-33.
63. Ekbom A, Helmick C, Zack M and Adami HO. Increased risk of large bowel cancer in Crohn's disease with colonic involvement. Lancet 1990; 336:257-9.
64. Potter JD and Hunter D. Colorectal cancer. In: Adami H, Hunter D and Trichopoulos D, Editors. Textbook of Cancer Epidemiology. Oxford University Press, 2002.
65. Reddy BS and Rao CV. Novel approaches for colon cancer prevention by cyclooxygenase-2 inhibitors. J Environ Pathol Toxicol Oncol 2002: 21(2): 155-64.

09: Liver cancer (C22)

66. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
67. Cancer Research UK. Symptoms of liver cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=4898. Accessed July 2007.

68. Clombo M. Risk Groups and Preventive Strategies. In: Berr F, Bruix J, Hauss J et al (Eds.) Malignant liver tumours: Basic concepts and clinical management. Dodrecht: Kluwer Academic Publishers BV and Falk Foundation 2003; 67-74.
69. Parkin DM, Pisani P, Munoz N and Ferlay J. The global health burden of infection associated cancers. In: Newton R, Beral V and Weiss RA (Eds.) Infections and human cancer. Plainview, NY, Cold Spring Harbor Laboratory Press, 1999, 55-33.
70. Chen C-J, Yu M-W and Liaw Y-F. Epidemiological characteristics and risk factors of hepatocellular carcinoma. J Gastroenterol Hepatol 1997; 12(Suppl); S294-308.
71. Cancer Research UK. Risks and causes of liver cancer. Available from http://www.cancerhelp.org.uk/help/default.asp?page=4897. Accessed July 2007.
72. Stuver S and Trichopoulos D. Cancer of the liver and biliary tract. In: Adami H, Hunter D and Trichopoulos D (Eds.) Textbook of cancer epidemiology. Oxford University Press, 2002.

10: Pancreatic cancer (C25)

73. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
74. Cancer Research UK. Pancreatic cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3104. Accessed July 2007.
75. Wang XL and Wang J. Smoking-gene interaction and disease development: relevance to pancreatic cancer and atherosclerosis. World J Surg 2005; 29(3): 344-53.
76. Stolzenberg-Solomon RZ, Pietinen P, Taylor PR et al. Prospective study of diet and pancreatic cancer in male smokers. Am J Epidemiol 2002; 155(9): 783-92.
77. Cancer Research UK. Pancreatic cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3102. Accessed July 2007.
78. Ojajarvi IA, Partanen TJ, Ahlbom A et al. Occupational exposures and pancreatic cancer; a meta-analysis. Occup Environ Med 2000; 57: 316-22.
79. Lynch HT, Richardson JD, Amin M et al. Variable gastrointestinal and urologic cancers in a Lynch syndrome II kindred. Dis Colon Rectum 1991; 34: 891-5.
80. Fernandez E, La Vecchia C, D'Avanzo B et al. Family history and the risk of liver, gallbladder and pancreatic cancer. Cancer Epidemiol Biomarkers Prev 1994; 3: 209-12.

11: Lung cancer (C32-C33)

81. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
82. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
83. Cancer Research UK. Lung cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2964. Accessed July 2007.
84. Doll R and Peto R. Cigarette smoking and bronchial carcinoma: dose and time relationships among regular smokers and lifelong non-smokers. J Epidemiol Commun Health 1978; 32: 303-13.
85. Proctor RN. The global smoking epidemic: a history and status report. Clin Lung Cancer 2004; 5(6): 371-6.
86. Hackshaw AK, Law MR and Wald NJ. The accumulated evidence on lung cancer and environmental tobacco smoke. BMJ 1997; 315(7114): 980-8.
87. NHS Centre for Reviews and Dissemination. Management of lung cancer effective health care bulletin Vol 4, No 3. University of York 1998.
88. Cancer Research UK. Lung cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2962. Accessed July 2007.
89. Stewart BW and Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.

12: Malignant melanoma (C43)

90. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
91. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
92. Cancer Research UK http://www.cancerhelp.org.uk/help/default.asp?page=3009 "Melanoma symptoms" (Accessed July 2007)
93. International Agency for Research on Cancer "IARC monographs on the evaluation of carcinogenic risks to humans. Vol. 55, Solar and ultraviolet radiation" Lyon, IARC, 1992
94. Cancer Research UK http://www.cancerhelp.org.uk/help/default.asp?page=3006 "Melanoma risks and causes" (Accessed July 2007)
95. Armstrong BK and English DR "Cutaneous malignant melanoma" In: Schottenfeld D and Fraumeni JF Jr (Eds.) "Cancer epidemiology and prevention 2nd ed" New York, Oxford University Press, 1996

13: Breast cancer (C50)

96. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
97. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
98. Cancer Research UK. Breast cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3284. Accessed July 2007.
99. Kesley JL, Gammon MD and John EM. Reproductive factors and breast cancer. Epidemiol Rev 1993; 15; 36-47.
100. Furberg, H., Newman, B., Moorman, P and Millikan, R. Lactation and breast cancer risk. Int J Epidemiol 1999, 28(3): 396-402.
101. Mormoto LM, White E, Chez M et al. Obesity, body size, and risk of postmenopausal breast cancer: the Women's Heath Initiative (United States). Cancer Causes Control 2002: 13(8): 741-51.
102. Thune I and Furberg AS. Physical activity and cancer risk: dose-response and cancer, all sites and site specific. Med Sci Sports Exerc 2001; 33(6 Suppl): S530-50; discussion S609-10.
103. Hamajima N, Hirose K, Tajima K, Rohan T et al. Alcohol, tobacco and breast cancer – collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. Br J Cancer 2002: 87(11): 1234-45.

104. Cancer Research UK. Definite breast cancer risks. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3293. Accessed July 2007.
105. Green MH. Genetics of breast cancer. Mayo Clin Proc 1997; 72: 54-65.
106. Ellisen LW and Haber DA. Hereditary breast cancer. Annu Rev Med 1998l 49: 425-36.

14: Cervical cancer (C53)

107. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
108. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
109. Cancer Research UK. Cervical cancer symptoms. Available at http://www.cancerhelp.org.uk/help/default.asp?page=2757. Accessed July 2007.
110. Clifford GM, Smith JS, Aquado T and Franceschi S. Comparison of HPV type distribution in high-grade cervical lesions and cervical cancer: a meta-analysis. Br J Cancer 2003; 89(1): 101-5.
111. Cancer Research UK. Cervical cancer risks and causes. Available at http://www.cancerhelp.org.uk/help/default.asp?page=2755. Accessed July 2007.
112. Ho GY, Kadish AS, Burk R et al. HPV 16 and cigarette smoking as risk factors for high-grade cervical intra-epithelial neoplasia. Int J Cancer 1998; 78(3): 281-5.
113. Moreno V, Bosch FX, Munoz N, Meijer CJ et al. Effect of oral contraceptives on risk of cervical cancer in women with human papillomavirus infection: the IARC multicentric case-control study. Lancet 2002; 359(9312): 1085-92.

15: Cancer of the uterus (C54-C55)

114. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
115. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
116. Cancer Research UK. Womb cancer symptoms. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4670. Accessed July 2007.
117. Moller H, Mellengard A, Linding K and Olsen, JH. Obesity and cancer risk: A Danish record-linkage study. Eur J Cancer 1994; 30A(3): 344-50.
118. Brinton LA, Berman ML, Mortel R et al. Reproductive, menstrual and medical risk factors for endometrial cancer: results from a case control study. Am J Obstet Gynecol 1992; 167: 1317-25.
119. Garte S, Zocchetti C and Taioli E. Gene-environment interactions in the application of biomarkers of cancer susceptibility in epidemiology. In: Toniolo P, Bofetta P, Shuker DEG et al, editors. Application of biomarkers in cancer epidemiology. IARC Sci Pub No 142, Lyon, International Agency for Research on Cancer, 1997, 251-64.
120. International Agency for Research on Cancer. IARC monographs on the evaluation of carcinogenic risks to humans: Postmenopausal hormone therapy and hormonal contraception Vol 72. Lyon, IARC 1999.
121. Grady D, Gebretsadik T, Kerlikowske K, et al. Hormone replacement therapy and endometrial cancer risk: a meta analysis. Obst Gynecol 1995; 85: 304-13.
122. Pukkala E, Kyyronen P, Sankila R et al. Tamoxifen and toremifene treatment of breast cancer and risk of subsequent endometrial cancer: A population-based case-control study. Int J Cancer 2002; 100(3): 337-41.
123. Cancer Research UK. Womb cancer risks and causes. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4668. Accessed July 2007.

16: Ovarian cancer (C56)

124. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
125. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
126. Cancer Research UK. Ovarian cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3077. Accessed July 2007.
127. Whittemore AS, Harris R and Itnyre J. Characteristics relating to ovarian cancer risk: collaborative analysis of 12 US case-control studies, II. Invasive epithelial ovarian cancers in white women. Am J Epidemiol 1992; 136: 1184-203.
128. Rosenblatt KA and Thomas DB. Lactation and the risk of epithelial ovarian cancer. The WHO collaborative study of neoplasia and steroid contraceptives. Int J Epidemiol 1993; 22: 192-7.
129. Hankinson SE, Hujnter DJ, Colditz GA et al. Tubal ligation, hysterectomy and risk of ovarian cancer. JAMA 1993; 270: 2813-18.
130. Ness RB, Grisso JA, Vergona R, et al. Oral contraceptives, other methods of contraception and risk reduction for ovarian cancer. Epidemiology 2001; 12(3): 307-12.
131. Cancer Research UK. Ovarian cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=3075. Accessed July 2007.
132. Stewart BW and Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.
133. Ford D, Easton DF, Bishop DT et al. Risks of cancer in BRCA1-mutation carriers. Breast Cancer Linkage Consortium. Lancet 1994; 343(8899): 692-5.

17: Prostate cancer (C61)

134. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
135. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
136. Cancer Research UK. Prostate cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2717. Accessed July 2007.
137. Lesko SM, Rosenberg L and Shapiro S. Family history and prostate cancer risk. Am J Epidemiol 1996; 144: 1041-7.
138. Cerhan JR, Parker AS, Putman SD et al. Family history and prostate cancer risk in a population based cohort of Iowa men. Cancer Epidemiol Biomarkers Prev 1999; 8: 53-60.
139. Ford D, Easton DF, Bishop DT et al. Risks of cancer in BRCA1 mutation carriers. Breast Cancer Linkage Consortium Lancet 1994; 343: 692-5.

140. Breast Cancer Linkage Consortium. Cancer risks in BRCA2 mutation carriers. J Natl Cancer Inst 1999; 91: 1310-16.
141. Cancer Research UK. Prostate cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2718. Accessed July 2007.
142. Zhou JR and Blackburn GL. Bridging animal and human studies: what are the missing segments in dietary fat and prostate cancer? Am J Clin Nutr 1997; 66(6 suppl): 1572S-80S.

18: Testicular cancer (C62)

143. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
144. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
145. Cancer Research UK. Testicular cancer symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2675. Accessed July 2007.
146. Cancer Research UK. Testicular cancer risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=2677 . Accessed July 2007.
147. Jacobsen R, Bostofte E, Engholm G et al. Risk of testicular cancer in men with abnormal semen characteristics: cohort study. Br Med J 2000; 321: 789-92.
148. Rapley EA, Crockford GP, Teare D R et al. Localization to Xq27 of a susceptibility gene for testicular germ-cell tumours. Nat Genet 2000; 24: 197-200.

19: Kidney cancer (C64-C66, C68)

149. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
150. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
151. Cancer Research UK. Symptoms of kidney cancer. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4034. Accessed July 2007
152. Heath CW Jr, Lally CA, Calle EE, et al. Hypertension, diuretics and antihypertensive medications as possible risk factors for renal call cancer. Am J Epidemiol 1997; 145: 607-13.
153. Chow WH, Grindley G, Fraumeni JF Jr and Jarvholm B. Obesity, hypertension and the risk of kidney cancer in men. N Engl J Med 2000; 343(18): 1305-11.
154. Cancer Research UK. Risks and causes of kidney cancer. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4032.. Accessed July 2007.
155. Wolk A, Lindblad P, Adami HO. Nutrition and renal cell cancer. Cancer Causes Control 1996; 7:5-18.
156. Lindblad P and Adami H-O. Kidney cancer. In: Adami H, Hunter D and Trichopoulos D, Editors. Textbook of cancer epidemiology. Oxford University Press, 2002.

20: Bladder cancer (C67)

157. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
158. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
159. Cancer Research UK. Bladder cancer symptoms. Available at http://www.cancerhelp.org.uk/help/default.asp?page=2697. Accessed July 2007.
160. Brennan P, Bogillot O, Cordier S et al. Cigarette smoking and bladder cancer in men: A pooled analysis of 11 case-control studies. Int J Cancer 2000; 86(2): 289-94.
161. Steinmaus CM, Nunez S and Smith AH. Diet and bladder cancer: A meta-analysis of six dietary variables. Am J Epidemiol 2000; 151(7): 693-702.
162. Viscoli CM, Lachs MS and Horwitz RI. Bladder cancer and coffee drinking: a summary of case-control research. Lancet 1993; 341: 1432-7.
163. Negri E and La Vecchia C. Epidemiology and prevention of bladder cancer. Eur J Cancer Prev. 2001; 10(1): 7-14.
164. Koivusalo M, Haukulinen T, Vartiainen T et al. Drinking water mutagenicity and urinary tract cancers: a population-based case-control study in Finland. Am J Epidemiol 1998; 148:704-12.
165. Cancer Research UK. Bladder cancer risks and causes. Available at http://www.cancerhelp.org.uk/help/default.asp?page=2695. Accessed July 2007.
166. Chow WH, Lindblad P, Gridley G et al. Risk of urinary tract cancers following kidney or uterer stones. J Natl Cancer Inst 1997; 89: 1453-7.

21: Brain cancer (C70-C72)

167. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
168. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
169. Cancer Research UK. Brain tumour symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=501. Accessed July 2007.
170. Savitz D and Trichopoulos D. Brain cancer. In: Adami H, Hunter D and Trichopoulos D (Eds.) Textbook of cancer epidemiology. Oxford University Press, 2002.
171. Giles GG and Gonzalez MF. Epidemiology of brain tumors and factors in prognosis. In Kaye AH and Laws ER (Eds.) Brain tumors: An encyclopaedic approach. New York: Churchill Livingstone 1995: 47-68.
172. Thomas TL and Waxweiler RJ. Brain tumors and occupational risk factors: a review. Scand J Work Environ Health 1986; 12: 1-15.
173. Cancer Research UK. Brain tumour risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=5018. Accessed July 2007.
174. Stewart BW and Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.

22: Lymphoma (C81-C85, C96)

175. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
176. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.

177. Cancer Research UK. Symptoms of Hodgkin's lymphoma. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4259. Accessed July 2007.
178. Cancer Research UK. Symptoms of non-Hodgkin's lymphoma. Available at http://www.cancerhelp.org.uk/help/default.asp?page=3039. Accessed July 2007.
179. Melbye M and Adami H-O. Hodgkin's lymphoma. In: Adami H, Hunter D and Trichopoulos D, Editors. Textbook of cancer epidemiology. Oxford University Press, 2002.
180. Cancer Research UK. Risks and causes of Hodgkin's lymphoma. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4258. Accessed July 2007.
181. Levine PH and Hoover RN. The emerging epidemic of non-Hodgkin's lymphoma. Cancer Res 1992; 52: 5425S-5574S.
182. Serraino D, Salamina G, Franceschi S et al. The epidemiology of AIDS-associated non-Hodgkin's lymphoma in the World Health Organisation European Region. Br J Cancer 1992; 66(5): 912-6.
183. International Agency for Research on Cancer. Epstein-Barr Virus and Kaposi's Sarcoma Herpesvirus/Herpesviirus 8. Monographs on the evaluation of carcinogenic risks to humans. Lyon, IARC 1997
184. Wotherspoon AC, Ortiz-Hidalgo C, Falzon MR and Isaacson PG. Helicobacter pylori-associated gastritis and primary B-cell gastric lymphoma. Lancet 1991; 338(8776): 1175-6.
185. Cancer Research UK. Possible risk factors for non-Hodgkin's Lymphoma. Available at http://www.cancerhelp.org.uk/help/default.asp?page=5630. Accessed July 2007.
186. Melbye M and Tricholpulos D. Non-Hodgkin's lymphoma. In: Adami H, Hunter D and Trichopoulos D, Editors. Textbook of cancer epidemiology. Oxford University Press, 2002.

23: Multiple myeloma (C90)

187. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
188. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
189. Cancer Research UK. Myeloma symptoms. Available from http://www.cancerhelp.org.uk/help/default.asp?page=4754. Accessed July 2007.
190. Cancer Research UK. Myeloma risks and causes. Available from http://www.cancerhelp.org.uk/help/default.asp?page=4752. Accessed July 2007.

24. Leukaemia (C91-C95)

191. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
192. Sant M, Aareleid T, Berrino F, et al. EUROCARE-3 survival of cancer patients diagnosed 1990-94 - results and commentary. Ann Oncol. 2003; 14(Suppl 5): 61-118.
193. Cancer Research UK. Acute leukaemia symptoms. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4612. Accessed July 2007.
194. Cancer Research UK. Symptoms of chronic myeloid leukaemia. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4838. Accessed July 2007.
195. Cancer Research UK. Chronic lymphocytic leukaemia symptoms. Available at http://www.cancerhelp.org.uk/help/default.asp?page=17966. Accessed July 2007.
196. United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). Sources and effects of ionizing radiation. UNSCEAR 2000 report to the General Assembly. New York, United Nations, 2000.
197. International Agency for Research on Cancer. Overall evaluations of carcinogenicity: An updating of IARC monographs Vols. 1 to 42 Supplement 7. Lyon, IARC 1997.
198. Doll R, Peto R, Wheatley K, Gray R and Sutherland I. Mortality in relation to smoking: 40 years' observations on male British doctors. Br Med J 1994; 309: 901-11.
199. Cancer Research UK. Acute leukaemia risks and causes. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4610. Accessed July 2007.
200. Cancer Research UK. Chronic lymphocytic leukaemia risks and causes. Available at http://www.cancerhelp.org.uk/help/default.asp?page=17964. Accessed July 2007.
201. Cancer Research UK. Chronic myeloid leukaemia risks and causes. Available at http://www.cancerhelp.org.uk/help/default.asp?page=4836. Accessed July 2007.
202. Yuille MR, Matutes E, Marossy A et al. Familial chronic lymphocytic leukaemia: a survey and review of published studies. Br J Haematol 2000; 109: 794-9.

Appendix 1: Data collection and quality

203. World Health Organisation. ICD10 International Classification of Diseases 10th revision. Geneva: WHO; 1997.
204. World Health Organisation. ICD10 International Classification of Diseases for Oncology 2nd edition. Geneva: WHO; 1990.
205. Ferlay J, Burkhard C, Whelan S and Parkin DM. Check and conversion programs for cancer registries (IARC/IACR Tools for Cancer Registries). Lyon: IARC Technical Report No. 42; 2005.
206. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.
207. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.
208. World Health Organisation. ICD10 International Classification of Diseases 9th revision. Geneva: WHO; 1978.
209. Percy C, editor. ICD-10 to ICD-9 Neoplasms. Baltimore: National Cancer Institute; 1995.
210. Gavin A, Hughes J, Kinnear H, et al. Cancer services audit 1996 & 2001: Oesophagus and stomach. Belfast: Northern Ireland Cancer Registry; 2005
211. Gavin A, Kinnear H, Fitzpatrick D and Ranaghan L. Cancer services audit 1996 & 2001: Breast. Belfast: Northern Ireland Cancer Registry; 2005
212. Gavin A, Hughes J, Ranaghan L and Fitzpatrick D. Cancer services audit 1996 & 2001: Prostate. Belfast: Northern Ireland Cancer Registry; 2005
213. Gavin A, Fitzpatrick D and Ranaghan L. Cancer services audit 1996 & 2001: Lung. Belfast: Northern Ireland Cancer Registry; 2005
214. Kinnear H, Gavin A and Ranaghan L. Cancer services audit 1996 & 2001: Colorectal. Belfast: Northern Ireland Cancer Registry; 2005

215. Monaghan P, Gavin A and Ranaghan L. Cancer services audit 1996 & 2001: Cervix and ovary. Belfast: Northern Ireland Cancer Registry; 2006

216. Kinnear H, Gavin A, Mole D and Ranaghan L. Cancer services audit 2001: Pancreas. Belfast: Northern Ireland Cancer Registry; 2006

217. Bannon F, Kinnear H, Gavin A and Ranaghan L. Cancer services audit 2001/02 & 2004/06: Thyroid. Belfast: Northern Ireland Cancer Registry; 2007

218. Sobin LH and Wittekind C, editors. TNM Classification of Malignant Tumours: 6th Edition. New York: Wiley-Liss; 2002.

219. Capocaccia R, Gatta G, Roazzi P, et al. The EUROCARE-3 database: methodology of data collection, standardisation, quality control and statistical analysis. Ann Oncol 2003; 14(Suppl. 5): 14-27.

220. Northern Ireland Statistics and Research Agency. Central postcode directory. Available from http://www.nisra.gov.uk. Accessed Nov. 2007.

221. Northern Ireland Statistics and Research Agency. Northern Ireland Census 2001: Key Statistics. Available from http://www.nisra.gov.uk. Accessed Sept. 2007.

222. Central Statistics Office, Ireland. Census 2002 Small Area Population Statistics (SAPS). Available from http://www.cso.ie. Accessed Sept. 2007.

223. Northern Ireland Statistics and Research Agency. Northern Ireland Multiple Deprivation Measure 2005. Available from http://www.nisra.gov.uk. Accessed Nov. 2007.

224. Kelly A and Teljeur C. A new national deprivation index for health and health services research. Dublin: Small Area Health Research Unit, Trinity College Dublin; 2004.

225. Northern Ireland Statistics and Research Agency. Mid-year population estimates. Available from http://www.nisra.gov.uk. Accessed Sept. 2007.

226. Information Management Unit, Department of Health and Children. Public Health Information System Version 9 Table 01: Population denominator data by sex and age group. Available from http://www.inispho.org. Accessed Sept. 2007.

Appendix 2: Statistical methodology

227. Boyle P and Parkin DM. Statistical methods for registries. In: Jensen OM, Parkin DM, MacClennan R, et al. Cancer registration principles and methods. Lyon: IARCPress; 1991.

228. Parkin DM and Hakulinen T. Analysis of survival. In: Jensen OM, Parkin DM, MacClennan R, et al. Cancer registration principles and methods. Lyon: IARCPress; 1991.

229. Doll R and Smith PG. Comparison between registries: Age-standardized rates. In: Waterhouse J, Muir C, Shanmugaratnam K and Powell J, editiors. Cancer Incidence in Five Continents, Volume IV. Lyon: IARCPress; 1982.

230. Kim, HJ, Fay, MP, Feuer, EJ and Midthune, DN. Permutation tests for joinpoint regression with applications to cancer rates. Stat Med 2000; 19(3): 335-51.

231. U.S. Institute of Health, National Cancer Institute, Cancer control and population sciences, Statistical research and applications branch. Joinpoint regression program: latest release: Version 3.0 (April 2005). Available from http://srab.cancer.gov/joinpoint. Accessed June 2008.

232. Spiegel MR. Theory and problems of statistics 2nd edition. New York: McGraw Hill; 1991.

233. Zhang J and Yu KF. What's the relative risk? A method of correcting odds ratios in cohort studies of common outcomes. JAMA 1998; 280: 1690-1691.

234. Altman DG and Bland JM. Statistics notes. Interaction revisited: the difference between two estimates. BMJ 2003; 326: 219.

235. Ederer F and Heise H. The effect of eliminating deaths from cancer on general population survival rates; methodological note 11; end results evaluation section. National Cancer Institute; 1959.

236. Office for National Statistics. Northern Ireland, Interim life tables 1980-82 to 2004-06. Available from http://www.statistics.gov.uk. Accessed Jun. 2008.

237. Central Statistics Office. Irish life table No.14 2001-2003. Available from http://www.cso.ie. Accessed Jun. 2008.

238. Berrino F, DeAngelis R, Sant M et al. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study. Lancet Oncol 2007; 8: 773-783.

239. Corazziari I, Quinn M and Capocaccia R. Standard cancer population for estimating age standardising survival ratios. Eur J Cancer 2004; 40: 2307-16.

240. Brenner H and Gefeller O. Deriving more up-to-date estimates of long-term patient survival. J Clin Epidemiol. 1997; 50: 211-216.

241. Dickman PW, Sloggett A, Hills M and Hakulinen T. Regression models for relative survival, Statistics in Medicine 2004; 23:51-64.

242. Stewart BW and Kleihues P, editors. World cancer report. Lyon: IARCPress; 2003.

243. Curado MP, Edwards B, Shin HR et al. Cancer incidence in five continents Volume IX. IARC Scientific Publications No. 160. Lyon: IARCPress; 2007.

244. Ferlay J, Burkhard C, Whelan S and Parkin DM. Check and conversion programs for cancer registries (IARC/IACR Tools for Cancer Registries). Lyon: IARC Technical Report No. 42; 2005.

245. Dickman PW, Coviello E and Hills M. Estimating and modelling relative survival. Stata Journal: In press.

Contact details

Northern Ireland Cancer Registry,
Mulhouse Building,
Grosvenor Road,
Belfast,
BT12 6BJ,
Northern Ireland

Telephone: +4428 9063 2573
Fax: +4428 9024 8017
E-mail: nicr@qub.ac.uk
Web: www.qub.ac.uk/nicr

National Cancer Registry,
Building 6800,
Cork Airport Business Park,
Kinsale Road,
Cork,
Ireland

Telephone: +353 2143 18014
Fax: +353 2143 18016
E-mail: info@ncri.ie
Web: www.ncri.ie