

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.
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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

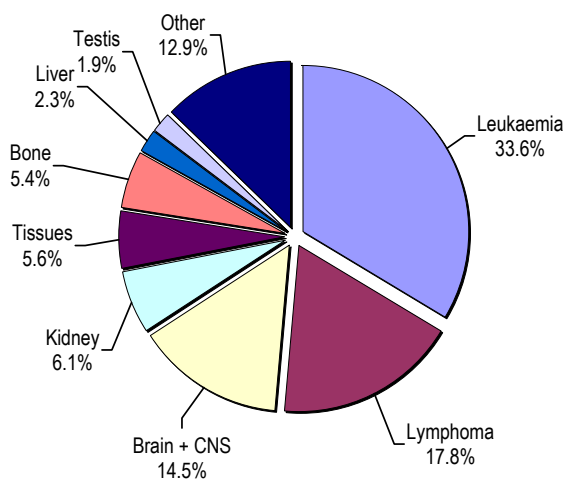
During 2000-2004 leukaemia was the most common type of childhood cancer making up 33.5% of all cases (excluding NMSC). Brain cancer and lymphoma were the other major type contributing 16.3% and 13.4% of cases respectively. Cancers which are rare among adults, such as bone cancer and cancer of the connective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

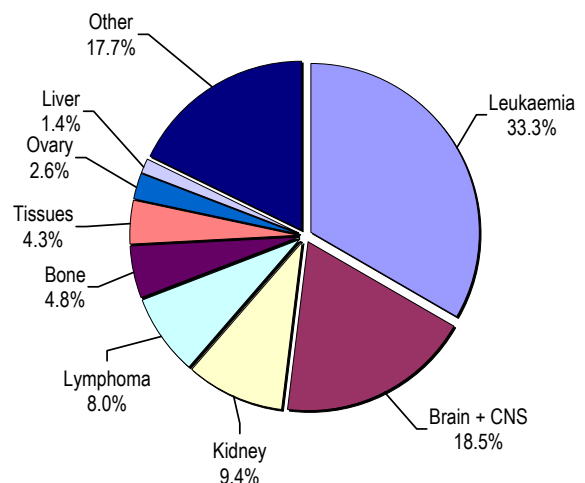
For two of the four most common cancers diagnosed among people of all age groups in Ireland during 2000-2004 (female breast cancer or prostate cancer) there were no childhood cases registered, while there were less than five cases of childhood lung cancer or colorectal cancer throughout 2000-2004.

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

(a) Boys



(b) Girls



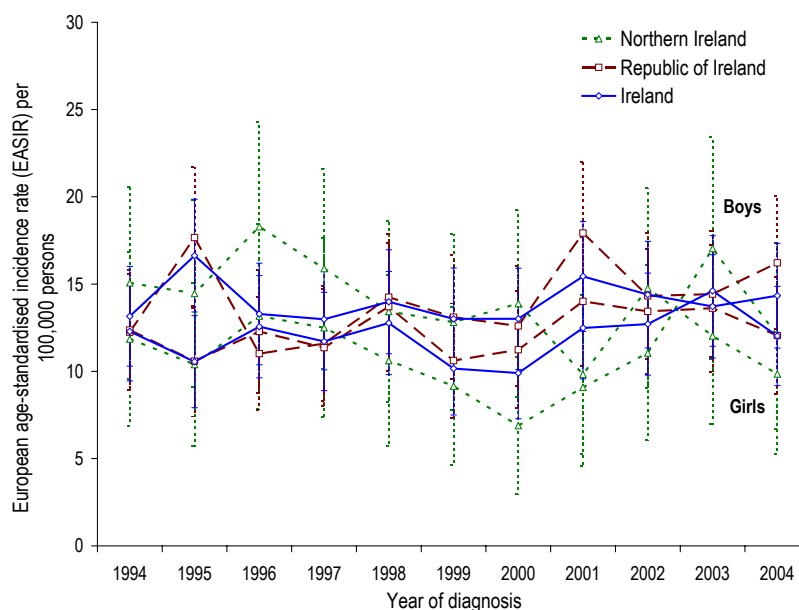
CNS: Central nervous system

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

Year	Boys						Girls					
	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	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

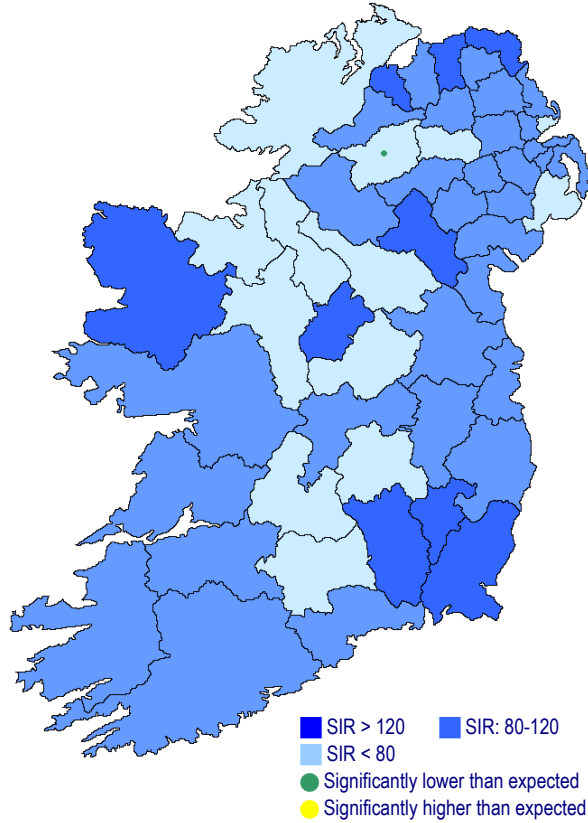
Due to the small number of cases of childhood cancer occurring each year few definite conclusions can be drawn with regard to geographic patterns. None of the district councils or counties in Ireland exhibited significantly higher standardised incidence ratios (SIRs) relative to Ireland as a whole despite 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

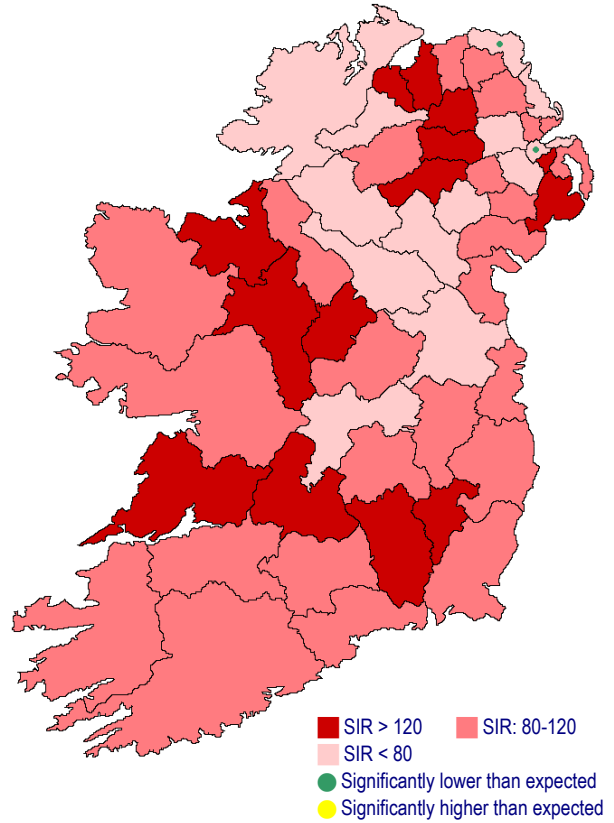
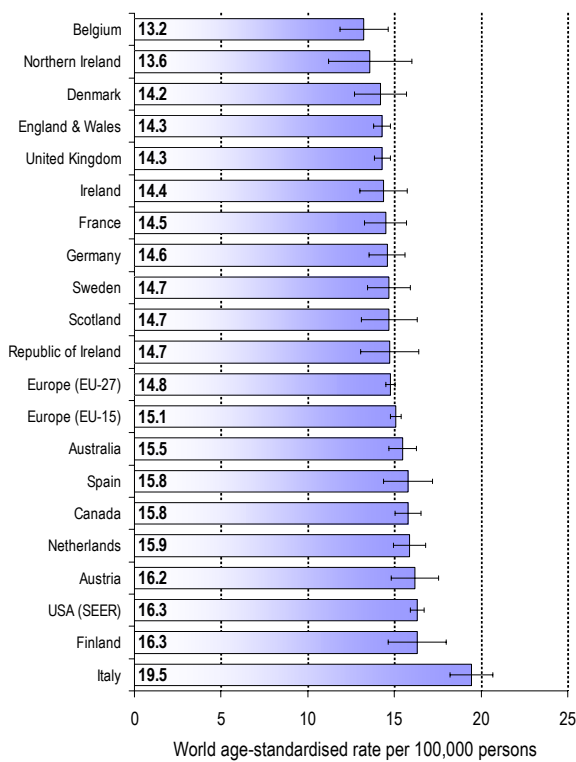
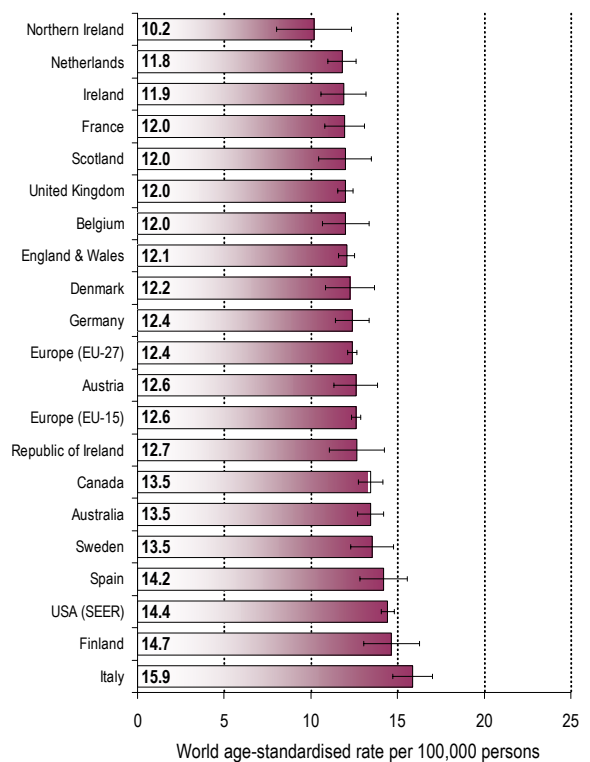


Figure 4.4: International comparisons of world age-standardised incidence rates for childhood cancer: 1998-2000

(a) Boys



(b) Girls



Source: IARC¹⁸

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)

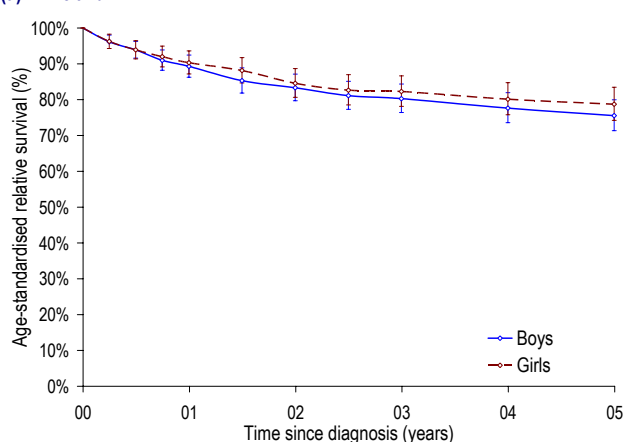
There was no significant variation in one or five-year relative survival by sex or between Northern Ireland and Republic of Ireland for those diagnosed in 2000-2004. (Fig. 4.5, Tab. 4.3)

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

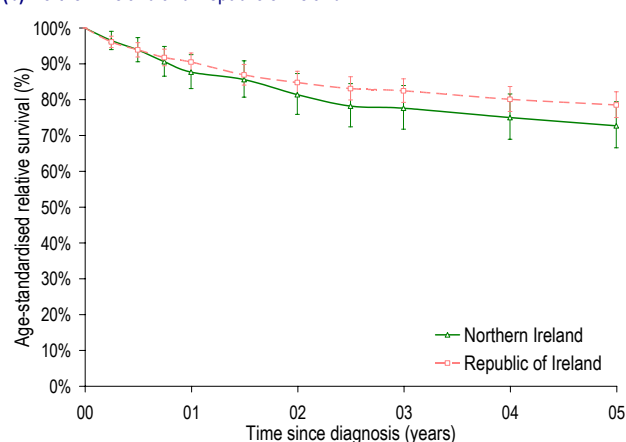
		Relative survival (95% CI)		
		Boys	Girls	All
1-year	Northern Ireland	86.0% (79.4%, 93.1%)	90.5% (87.1%, 93.9%)	87.7% (83.1%, 92.6%)
	Republic of Ireland	90.5% (87.1%, 93.9%)	90.6% (86.9%, 94.3%)	90.5% (88.0%, 93.0%)
	Ireland	89.3% (86.3%, 92.4%)	90.3% (87.2%, 93.6%)	89.8% (87.6%, 92.0%)
5-year	Northern 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%)

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)

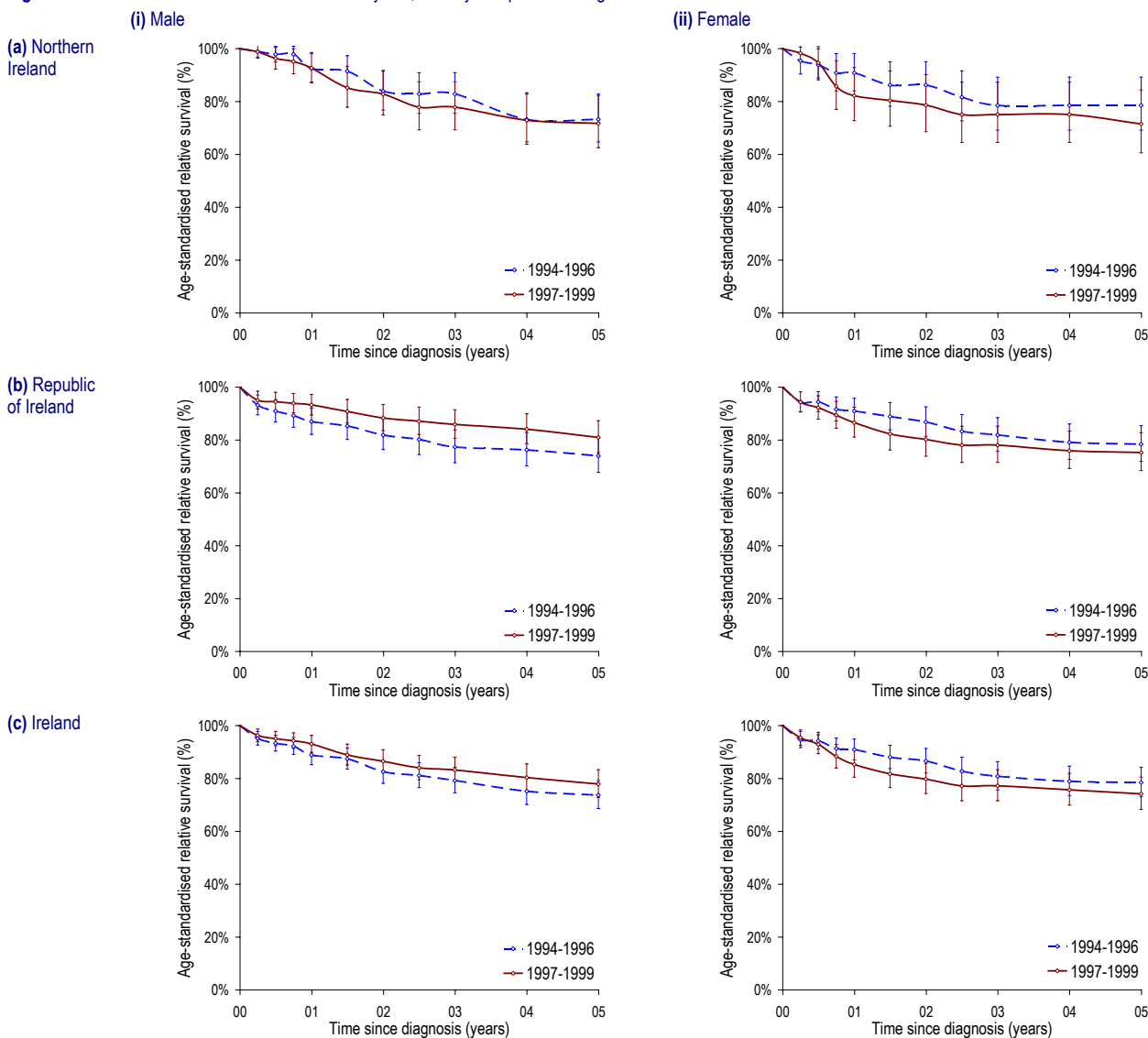
Table 4.4: Relative survival for childhood cancer by sex, country and period of diagnosis: 1994-1999

		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 \pm 95% CI	3.5 \pm 1.2	1.4 \pm 0.8	2.5 \pm 0.7	2.7 \pm 0.7	2.0 \pm 0.6	2.3 \pm 0.5	2.9 \pm 0.6	1.8 \pm 0.5	2.4 \pm 0.4
% difference (NI vs ROI) \pm 95% CI (+ NI higher, - NI lower)							27.4% \pm 57.0	-26.7% \pm 49.2	5.5% \pm 38.2

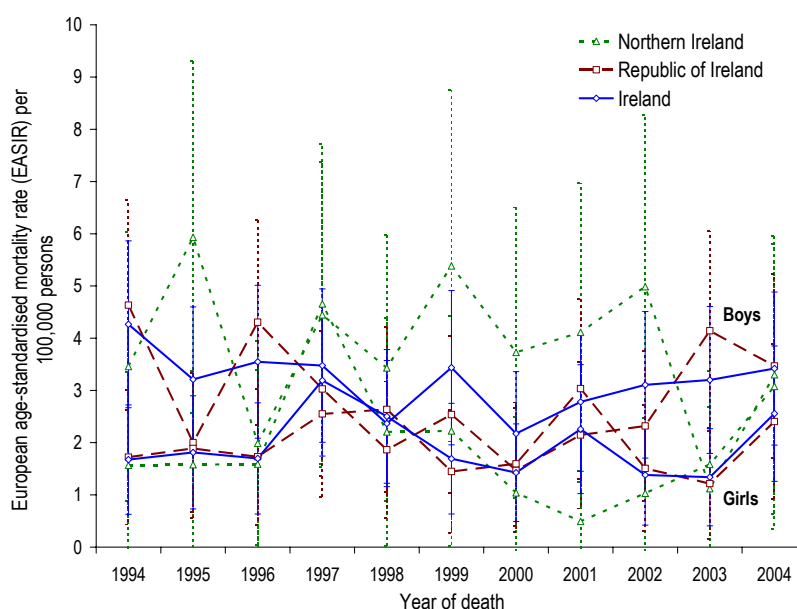
EASMR: European age-standardised mortality rate per 100,000 persons; CI: Confidence interval

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.