AYA CANCER NETWORK AOTEAROA

ADVANCING CANCER CARE FOR 12-24 YEAR OLDS

ADOLESCENT & YOUNG ADULT CANCER INCIDENCE AND SURVIVAL IN AOTEAROA 2008 -2017

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Executive Summary

This is the second national report to present comprehensive statistics on cancer in adolescents and young adults in New Zealand. This report focuses on the ten-year period between 2008 and 2017, which follows the establishment of AYA Cancer Services and the six regional AYA keyworkers. The purpose of this analysis is to identify changes in our cancer incidence and survival over time, to add to our understanding of the burden of cancer for our young people, and to support the development of the AYA Cancer Strategy. A summary of the major findings is highlighted below;

Cancers in AYA are rare compared to the older population, but not unexpected

- Approximately 190 AYA aged 12-24 years are diagnosed with cancer each year. If those aged 25-29 years were also included in New Zealand's AYA age range, the annual total would increase to 351, close to one young person being diagnosed with cancer every day.

- For those aged 12-24 years, each year we would expect approximately 25 young people to be diagnosed with gonadal germ cell tumours, 25 with Hodgkin lymphomas, 21 with melanoma, 15 with gastro-intestinal carcinomas, 12 with acute lymphoblastic leukaemia, and 12 with non-Hodgkin lymphomas.

The average annual number of cancer cases is relatively stable

- Cancer incidence is 211 per million for the 15-19 years age group, 313 per million per million for the 20-24 years age group and 554 per million for the 25-29 years age group.

- Although the cancer incidence rates represent a small decline from the 2000-2009 period, the average annual number of cancers rose slightly due to the increase in our AYA population over this time.

Melanoma rates are on the decline

- Pleasingly, in 2008-2017 there were a fewer new cases of melanoma each year, down to 21 from 31 a year in 2000-2009. This significant reduction indicates that public health campaigns have been successful in promoting greater awareness of Sun Smart practices and early warning signs.

There are clear ethnic differences in the spectrum of cancers diagnosed

- Leukaemia incidence among Pacific Peoples is well over double that of non-Māori/non-Pacific Peoples. In the past decade, the incidence of gonadal germ cell tumours among Pacific Peoples has increased significantly.

- Compared to non-Māori/non-Pacific Peoples, Māori have a significantly higher incidence of Ewing tumour and carcinoma of the gastro-intestinal tract.

- With an incidence rate of only 121.3 per million, incidence rates for Asian AYA are less than half the rates recorded for any other prioritised ethnic group.

Overall AYA five-year survival is improving

- Compared to 2000-2009, survival in 2008-2017 increased to 81.1% (+6.0%) for 15-19 year olds and to 86.3% (+1.7%) for 20-24 year olds.

- Survival increased to 83.6% for males (+5.8%) and to 84.9% for females (+1.4%).

Five-year survival is improving for most common AYA cancers…. but not all

- Survival estimates for 15-24 year olds diagnosed with acute lymphoid leukaemia are now 78.6% (+10.4%), 89.4% for non-Hodgkin lymphoma (+10.6%), and 62.2% for bone tumours (+13.7%).

- Survival for the 140 young people (15-29 years) who were diagnosed with breast cancer between 2008 and 2017 improved significantly from 63.5% in 2000-2009 to 87.0% (+23.5%).

- Survival for 15-24 year olds diagnosed with malignant CNS tumours (58.8%) showed no improvement from 2000-2009. This was the poorest survival rate across the ten major AYA diagnostic groups.

The ethnic survival gap still exists…. but it is narrowing

- Five-year survival for AYA 15-24 years was 77.6% for Māori and 81.0% for Pacific Peoples compared to 86.7% for non-Māori/non-Pacific Peoples.

- The 2008-2017 period saw five-year survival rates improve by 8.1% for Māori and 9.7% for Pacific Peoples aged 15-24 years.

- Notably, these five-year survival gains for Māori and Pacific Peoples were not evident for the 25-29 year age group which is not currently supported by AYA Cancer Services.

Where a young person lives makes a difference to their survival

- Five-year survival rates across the six AYA Cancer Services ranged from 77.4% to 90.8%.

- The highest survival rates were recorded for those living in major urban areas, close to a tertiary cancer centre, and in the least deprived areas.

New Zealand AYA cancer survival rates remain behind Australia

- New Zealand five-year cancer survival rates for AYA aged 15-24 years (84.2%) remain below what is being achieved in Australia (89.0%). This gap has narrowed to 4.8% compared to a gap in 2000-2009 period of 6.6%.

Closing the Gap

The AYA survival rates for the 2000-2009 period painted a bleak picture when they were published back in 2013. Our young people were more likely to die of cancer in New Zealand than if they had lived elsewhere. Many of these excess deaths were Māori and Pacific adolescents.

Over the past decade we have seen innovative and responsive actions to close the gap for our young people with cancer. This report provides strong evidence that these efforts are working. There is much to celebrate. Melanoma rates are declining. Survival rates are improving, notably for our adolescents, males, and Māori and Pacific AYA.

But there is a great deal of work yet to be done. Ethnic survival disparities still exist, particularly for young Māori. While we have excellent survival rates for many common AYA cancers, five-year survival remains less than 70% for AYA diagnosed with central nervous system tumours (59%), bone tumours (62%), and soft tissue sarcomas (69%). And although the survival gaps have narrowed, our overall cancer survival rates are still 5% below what has been achieved for AYA in Australia.

Finally, while incidence and survival are important measures of the burden of cancer for our young people there are many other factors to consider. This incidence and survival report tells us what has already occurred for AYA who were diagnosed with cancer up to twelve years ago. Moreover, it is beyond the scope of this analysis to examine many of the factors which are known to influence AYA patient outcomes, such as potential diagnostic delays, referral pathways, enrolment in clinical trials, and access to appropriate support services. Incidence and survival statistics do not tell us anything about the experiences of young people who are undergoing cancer treatment right now or about the quality of life for AYA cancer survivors. Such data – collected and analysed as close to real-time as possible – will be vital to address the disparities which have been identified and to drive further improvements for our young people with cancer.

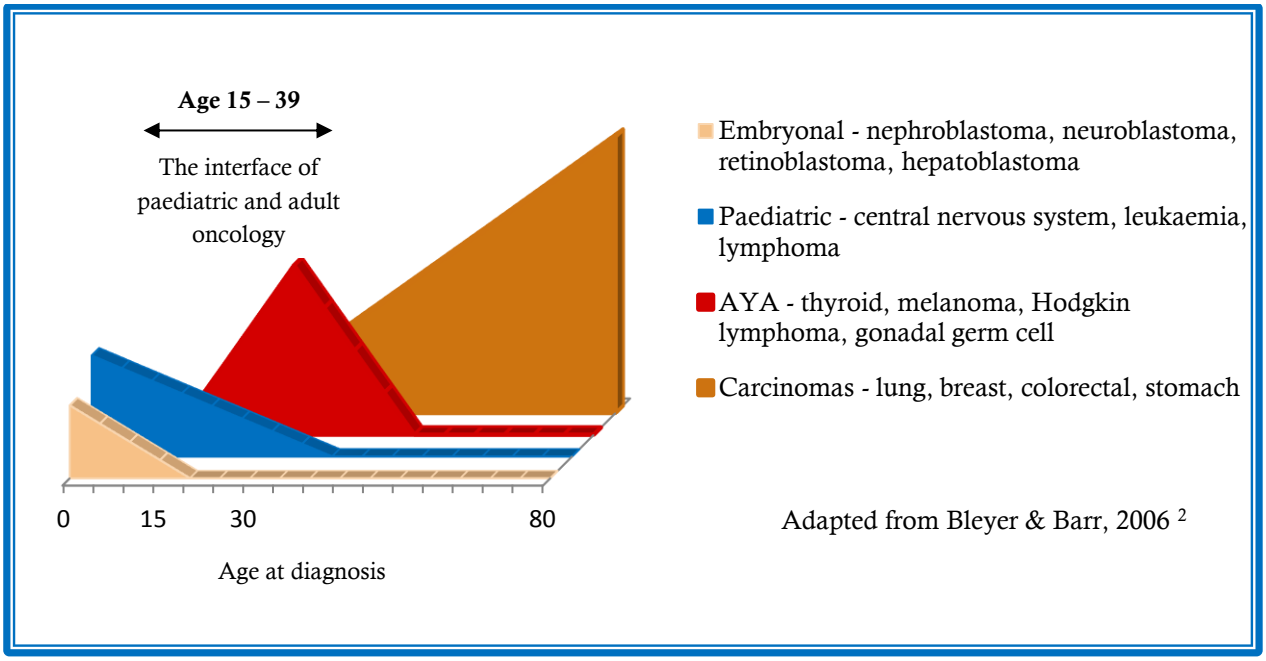
1 Introduction

1.1 Cancer in Adolescents and Young Adults

Each year approximately 190 young New Zealanders aged 12 to 24 years are told that they have cancer. In New Zealand, people in this age group are commonly known as Adolescents and Young Adults (AYAs). The age definition for AYA of 12-24 years comes from New Zealand's AYA Service Specifications.[1] However, there is no universally defined AYA age range. Internationally, the US Surveillance Epidemiology & End Results programme and the Canadian Cancer Society define AYA as 15-29 years, while the Journal of AYA Oncology and Livestrong Young Adult Alliance favour an upper bound of 39 years, the 23 countries contributing to EUROCARE use 15-24 years, Australia uses both 15-24 and 15-29 years, while the United Kingdom defines teenagers and young adults (TYA) as those aged between 13 and 24.

A distinct range of cancers affect AYA. The spectrum of AYA cancers includes some paediatric cancers such as acute lymphoblastic leukaemia, while malignant bone tumours peak in the teenage years. Thyroid cancer, Hodgkin lymphoma, and testicular cancer become increasingly common in this age group.[2-4] There is an increase in the incidence of cancers with an environmental influence, such as malignant melanoma and cervical carcinoma. However, most cancer diagnosed in AYA do not appear to be linked to environmental or inherited factors.[2-4]

Figure 1.1 The interface of paediatric and adult oncology



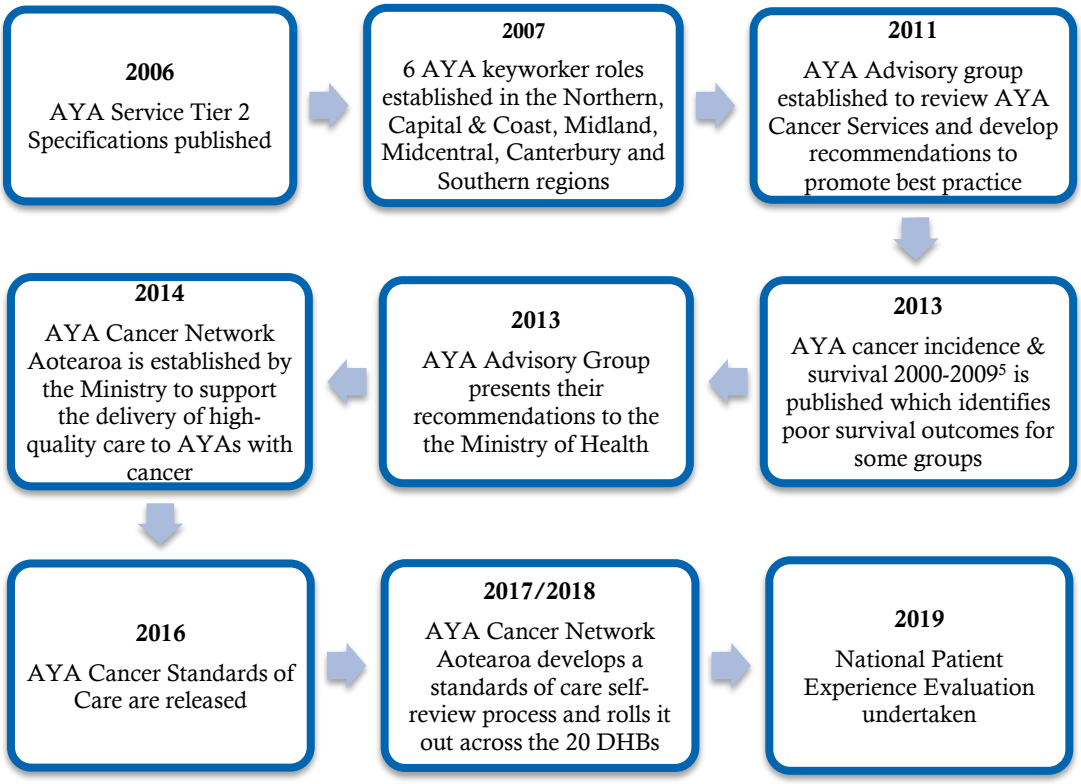
In the last few decades we have not seen the same survival improvements for AYAs diagnosed with cancer compared to other age groups. This 'AYA gap' is often attributed to factors such as differences in tumour biology, the low rates of enrolment of AYA in clinical trials, and an arbitrary age-based division between paediatric and adult oncology that may not best meet the patient's treatment or psychosocial needs.

1.2 Key developments in AYA cancer services

It is now widely recognised that the AYA cancer population have distinct and unique developmental needs which require high quality, age-appropriate, and multidisciplinary care.

In recent years many important initiatives have been undertaken to improve the outcomes for AYA cancer patients in Aotearoa New Zealand.

Figure 1.2 Timeline of key developments in AYA cancer services



The AYA Cancer Network intends to prepare and release a national strategy for AYA cancer services in 2020. Therefore, it is timely to update our incidence and survival statistics to determine if New Zealand is on the right track, particularly with regards to our commitment to address existing inequities in health care delivery within the AYA population. We have elected to report incidence and survival from 2008 until 2017, as this ten-year period immediately follows the establishment of the six regional AYA Cancer Services and keyworker roles.

1.3 Study Objectives

The purpose of this research is to;

- Determine cancer survival and incidence for the AYA population between 2008 and 2017
- Identify changes in cancer incidence and survival within the AYA population since the previous 2000-2009 analysis was conducted
- Collect national data about our AYA population - including AYA cancer survival by geographic location, patient access to AYA keyworker support, and treatment setting by age (i.e. referral to paediatric c.f. adult services)

2 Methodology

2.1 Ethics

This study was given expedited approval by the Northern B Health and Disability Ethics Committee (ethics ref: 19/NTB/112) in September 2019.

2.2 Data sources

The New Zealand Cancer Registry (NZCR)

The NZCR is a population-based register of all primary malignant tumours diagnosed in New Zealand, apart from non-melanoma skin cancers. The NZCR also includes ethnicity data and dates of deaths, sourced from the patient NHI numbers.

The New Zealand Children's Cancer Registry (NZCCR)

The NZCCR is a national registry for all children (aged 0-14 years) treated in New Zealand's two specialist paediatric cancer centres. It also includes AYA patients (aged 15+) who were treated in a paediatric setting or who participated in a clinical trial run through one of the centres.

The six AYA keyworker datasets

The AYA keyworkers maintain and collect uniformed data of all AYAs with a diagnosis of cancer under the care of their regional AYA cancer services.

2.3 Key study variables

Age and Sex

Age and sex were taken directly from the National Health Index Number. The AYA Cancer Network currently defines AYA as those aged between 12 and 24 years. However, we have elected to include young adults up to 29 years of age in some analyses while those aged 12-14 years have largely been excluded.

12-14 year olds are almost always treated exclusively in a paediatric setting and their outcomes have already been reported by the National Child Cancer Network.[6]

Those aged 25-29 years are thought to face many similar challenges to their younger counterparts. This age group has been included in this study to inform decision making around whether the age range should be extended to allow 25-29 year olds to access AYA services.

The AYA Cancer Classification Scheme

The AYA cancer classification scheme was developed to address the unique spectrum of cancers affecting the AYA population.[7] It is structured into 3 levels of hierarchical classifications: 10 main diagnostic groups, 32 diagnostic subgroups, and 2 to 9 divisions of selected subgroups. The AYA cancer classification was derived from the site and morphology code supplied by the NZCR. Table 2.3 provides a brief description of the 10 major diagnostic groups.

Table 2.3a The AYA Cancer Classification Scheme

	Description
1	*Leukaemias:* Leukaemias are blood cancers which develop following the malignant transformation of haematopoietic stem cells in the bone marrow. This subgroup includes acute lymphoblastic leukaemia (ALL), which is one of the most common childhood cancers, and acute myeloid leukaemia (AML), which is more commonly develops in adulthood.
2	*Lymphomas:* Lymphoma is the general term for cancers which develop in the lymphatic system. Lymphomas are divided into two distinct categories; Hodgkin lymphomas (HL) and non-Hodgkin lymphoma (NHL).
3	*Central Nervous System and other intracranial and intraspinal neoplasms*: Central Nervous System (CNS) tumours may arise in the brain, its adjacent coverings, or the spinal cord. Although non-malignant CNS tumours are also covered by the AYA Classification Scheme, this analysis includes only malignant CNS tumours as per NZCR registration criteria.
4	*Osseous and chondromatous neoplasms, Ewing tumour, and other neoplasms of bone:* Although not quite technically correct, we have elected to simply refer to this diagnostic group as 'bone tumours' throughout this report. The two main specified groups are osteosarcoma and Ewing tumour. Osteosarcomas most commonly grow in the long bones of the leg. Ewing sarcomas develop from primitive mesenchymal elements in bones throughout the body and may also sometimes arise in soft tissue.
5	*Soft tissue sarcomas:* Soft tissue sarcomas arise in tissues that connect, support and surround other body structures, such as muscles, fat cells, tendons and nerves. There are over fifty different types of soft tissue sarcomas which can develop in any location in the body.
6	*Germ cell and trophoblastic neoplasms:* Germ cell tumours develop from primitive tissue remnants of embryonal tissues. Most malignant germ cell tumours form in the gonads (testicles or ovaries) although germ cell tumours may also arise in the central nervous system and other non-gonadal sites.
7	*Melanoma and skin carcinomas:* Melanoma is the most serious form of skin cancer and as such is the only form registered by the NZCR. Melanomas are usually caused by DNA damage which can occur following exposure to ultraviolet light from the sun. Genetics also play a part in an individuals' risk of developing melanoma. New Zealand has one of the highest melanoma rates in the world.
8	*Other and unspecified carcinomas:* Carcinomas first develop in the cells that make up the skin or tissue lining organs such as the lungs, liver, and kidneys. Although rarely diagnosed in children, carcinoma is the most common form of cancer in adults and the risk increases with age.
9	*Miscellaneous specified neoplasms not otherwise specified:* This diagnostic group includes embryonal and paediatric tumours, such as Wilms' tumour and neuroblastoma, which still occasionally develop in this older age group. It also includes other specified tumours such as Langerhans cell histiocytosis.
10	*Unspecified malignant neoplasms:* Nearly all cancers in New Zealand are microscopically verified, therefore this category is rarely used.

Prioritised ethnicity

According to Ministry of Health ethnicity data protocols, individuals may select up to three ethnic groups that they identify with. When a prioritised ethnicity system is used, each respondent is assigned to a single ethnic group using a priority system: Māori; Pacific Peoples; Asian; and European/Other.

Prioritised output is often used in the health and disability sector to ensure that Māori and Pacific Peoples, whose health status is lower on average than that of other New Zealanders, are not swamped by the European group. Assigning a single ethnicity simplifies the data as the ethnic group populations sum to the total New Zealand population. However, there are also limitations in the use of prioritised ethnicity, namely that there are an increasing number of young people who identify with more than one ethnic group and its use goes against the principle of self-identification.[8]

The 2000-2009 analysis used three prioritised ethnic groups: Māori; Pacific Peoples; and non-Māori/non-Pacific Peoples. To aide comparisons with the previously published data we have used these same groupings in this analysis. In addition, for the first time we have also provided incidence and survival estimates for those of prioritised Asian ethnicity. Of those aged 15-24, approximately one in seven are of prioritised Asian ethnicity so it is important that we identify and address any unique incidence or survival patterns for this group. This data is discussed in sections 3.8 and 4.5, with additional tables provided in the Appendix.

Table 2.3b New Zealand's AYA population by prioritised ethnicity

	Average resident population estimates[1]	Prioritised ethnicity by age group (%)[2]				
		Māori	Pacific Peoples	Asian	All Other	Total
15-19 years	315 660	22.0	8.9	12.2	56.9	100.0
20-24 years	314 447	18.6	8.0	17.3	56.1	100.0
Total 15-24 years	**630 107**	**20.2**	**8.5**	**14.8**	**56.5**	**100.0**
25-29 years	290 778	15.6	7.2	19.5	57.7	100.0
Total 15-29 years	**920 885**	**18.8**	**8.1**	**16.3**	**56.9**	**100.1**

[a] Average annual resident population estimates as at 30 June provided by Stats NZ
[b] Proportion of each age quintile according to prioritised ethnicity based on Stats NZ estimates produced for the MOH

Domicile and treatment centre

Using the domicile code at the time of diagnosis provided by the NZCR, we were able to determine the DHB and AYA Cancer Region for each patient, whether they lived in an urban or rural area* and how far away they lived ('as the crow flies') from the tertiary hospital in their cancer region. A deprivation score (1, low – 5, high) was assigned using the Index of Deprivation produced by the University of Otago.[9]

A key study objective was to ensure consistency of referral pathways and support for newly diagnosed AYA patients. Records from the NZCCR were used to identify whether adolescent patients were treated in a paediatric or adult setting.

The AYA keyworker dataset and domicile code from the NZCR was used to determine which cancer region(s) the patients were treated in (as some AYA are referred for treatment outside of their region). Data matching

* Under the New Zealand Standard Areas Classification "Main Urban" is defined as a population of greater than 30,000, "Secondary Urban" = 10,000 - 29.999, "Minor Urban" = 1,000 - 9999 and "Rural" = a population <1,000.

with the AYA keyworker dataset also allowed us to identify the characteristics of those AYA who were not referred to an AYA keyworker following their cancer diagnosis in order to improve referral pathways for future patients. This analysis has been provided in a separate report which will be available on the AYA Cancer Network Aotearoa's website https://ayacancernetwork.org.nz

2.4 Incidence calculations

Incidence is reported as the number of new primary cancer cases diagnosed in a specified population, for example 15-19 year olds, during a one year period. Due to the relatively small number of cases diagnosed annually, cancer incidence is usually expressed as a rate per 100,000 or 1,000,000 population per year.

Since the risk of cancers varies by age group, it is common practice to age-standardise incidence rates to allow for more valid comparisons over time or between populations that have different age structures. The incidence rates presented in this report have been calculated by the direct age-standardisation method, where the age-specific incidence rates were weighted according to the 2013 New Zealand census population.

Incidence was reported according to age quintile at diagnosis, sex, prioritised ethnicity, AYA diagnostic group and subgroup. Incidence calculations replicated those used in the previous New Zealand study to allow for comparisons between the two time periods.

2.5 Survival calculations

Relative survival ratios are calculated by dividing the observed survival (i.e. the proportion of people who remain alive following their cancer diagnosis) by the expected survival of a group from the general population which is comparable with respect to age, sex, and the time-period under investigation.

Relative survival was calculated using the period method. The final date of follow up was December 31st 2018, and those who were still alive at that date were censored. To avoid bias, patients whose cancer diagnosis was based on death certificate only, autopsy only, or who had a survival time of zero days were excluded. Expected survival data was calculated according to the Ederer II method using life-tables for the total New Zealand resident population produced by Stats NZ.

Survival was reported according to age group at diagnosis, sex, prioritised ethnicity, AYA diagnostic group and subgroup. According to standard international practice, the survival analysis focussed on five-year survival however cumulative relative survival up to ten years was also reported.

2.6 Confidence intervals and statistical significance

A confidence interval (CI) is used to report the level of accuracy of statistical estimates. The reported 95% confidence intervals can be interpreted as indicating that there is a 95% probability that the true cancer incidence/survival lies somewhere within the reported lower and upper values. If two statistics have non-overlapping 95% confidence intervals, they are necessarily significantly different at the $p<0.05$ level.

In general, the more cases involved in calculating the estimate, the smaller the confidence interval. Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period.

2.7 Reading and interpreting this report

This report follows a similar structure to the 2000-2009 analysis. Wherever possible, the findings have been compared with those from the earlier period.

The current age range for AYA is 12-24 years. The focus of this report is on the incidence and survival outcomes for young people aged 15-24. Those who are 12-14 years are treated almost exclusively in paediatrics and therefore data analyses are usually conducted for the 10-14 age quintile in NZCCR analyses. However, some numbers have been provided for 12-14 year olds to assist in decisions around service provision. For similar reasons, data for the 25-29 year age group - considered part of the AYA population in other countries - has also been provided.

For some cancer diagnostic groups and subgroups there were very few cases recorded for AYA in New Zealand within the ten year period; this is reflected in the wide 95% confidence intervals which are reported alongside. Therefore, **any between-group differences in the incidence or survival reported, or any differences in comparison to other published data, should be interpreted extremely cautiously.** Analyses for some diagnostic sub-groups may be censored due to small case numbers.

Finally, the survival estimates reported here are ***not*** relevant for individuals seeking information about their own cancer diagnosis. Cancer survival often greatly differs according to factors such as the location of the primary tumour, disease staging at diagnosis, and the initial tumour response to treatment. For information that is specific to ***your*** cancer diagnosis and treatment, please talk to your oncologist or primary healthcare provider.

3 AYA Cancer Incidence

3.1 Overall AYA cancers by sex and age group

In the ten-year period between 2008 and 2017, 3514 primary malignant cancers were diagnosed in AYA aged 12-29 years, with close to half (45.8%) being diagnosed in older AYA aged 25-29 years. There was little difference in the proportion of cancers diagnosed in males (n=49.1%) compared to females (50.9%).

Table 3.1 Number of cancers diagnosed in AYA aged 15-29 years by sex and age group

	Cancers diagnosed 2008-2017		AYA total population	
	Total cases	% of AYA cancer cases	Population base[a]	% of the total AYA population
Sex				
Male	1 724	49.1	557 018	50.5
Female	1 790	50.9	545 005	49.5
Age Group				
12-14 years	253	7.2	181 143	16.4
15-19 years	665	18.9	315 660	28.6
20-24 years	985	28.0	314 447	28.5
25-29 years	1 611	45.8	290 778	26.4
TOTAL 12-29 YEARS	**3 514**	**100.0**	**1 102 028**	**100.0**

[a] An average of the estimated New Zealand resident population as at June 30 for the years 2008-2017, Stats NZ. Note there may be slight differences in totals due to rounding.

3.2 Annual age-specific cancer incidence by age group

Compared to the 2000-2009 period, cancer incidence per million has decreased for all AYA age groups. The biggest change was seen for those aged 15-19 years, where incidence decreased by 9% from 229 per million in 2000-2009 to 211 per million for the 2008-2017 period. Cancer incidence for the 20-24 age group declined from 326 to 313 per million (a decrease of 4%) while cancer incidence for the 25-29 population dropped from 588 to 554 per million (a decrease of 6%). However, the average number of cancers diagnosed in 15-29 year olds, in fact, went up slightly from 315 to 326 cases per year. This reflects the increase in New Zealand's AYA population over this time.

Table 3.2 also shows the considerable natural fluctuations in the number of cases diagnosed each year, ranging from 54 to 88 cases for adolescents aged 15-19 years, 84 to 113 cases for the 20-24 year old age group, and 131 to 180 cases for AYA aged 25-29 years.

Table 3.2 Annual age-specific cancer incidence (per million) in AYA by age group

	15-19 years			20-24 years			25-29 years		
	Cases	Population base[a]	Age-specific incidence rate (per million)	Cases	Population base[a]	Age-specific incidence rate (per million)	Cases	Population base[a]	Age-specific incidence rate (per million)
2008	69	317 030	217.6	98	288 740	339.4	150	268 570	558.5
2009	88	317 010	277.6	70	292 350	239.4	131	272 210	481.2
2010	76	317 130	239.6	107	299 760	357.0	169	275 040	614.5
2011	54	314 550	171.7	84	307 230	273.4	171	274 890	622.1
2012	61	312 840	195.0	93	310 660	299.4	151	274 520	550.1
2013	49	312 480	156.8	113	314 920	358.8	159	277 490	573.0
2014	69	313 380	220.2	110	321 740	341.9	166	288 610	575.2
2015	72	316 770	227.3	100	331 340	301.8	180	306 050	588.1
2016	58	318 480	182.1	110	337 790	325.6	156	327 210	476.8
2017	69	316 900	217.7	100	339 910	294.2	178	343 200	518.6
Average (95% CI)	**66.5**	**315 657**	**210.7 194.7 - 226.7**	**98.5**	**314 444**	**313.3 293.7 - 332.8**	**161.1**	**290 779**	**554.0 527.0 - 581.1**

[a] Estimated New Zealand resident population as at June 30, Statistics New Zealand

3.3 Average number of cases diagnosed annually by AYA diagnostic group and subgroup

The following table reports the average number of cancers diagnosed each year according to age group and AYA diagnostic group/subgroup. While incidence per million is useful for making comparisons between other populations and time periods, it is the expected number of new cases that is most useful when making decisions around the provision and prioritisation of AYA cancer services, such as improving access to clinical trials.

The current age range for AYA is 12-24 years and approximately 190 of these young people are diagnosed with cancer each year, up slightly from an annual average 184 cases in 2000-2009. If the 25-29 year age group was included in New Zealand's AYA upper age bracket - as it is in other countries - the annual total would increase to 351, close to one young person each day being told that they have cancer.

Between 2008 and 2017, an average of 15 12-24 year olds each year were diagnosed with 'carcinomas of the gastro intestinal tract' compared to just seven in the 2000-2009 period. This is not the dramatic increase it initially appears, but rather reflects the WHO''s re-classification of carcinoid tumours of the appendix as a malignancy in the first revision of the third edition of the International Classification of Diseases for Oncology (ICD-O-3-1)[10], which was adopted by the NZCR at the start of 2014.

In 2008-2017 there were an average of 21 new cases of melanoma each year, down from 31 a year in the earlier period. There were no classification changes for melanomas during this time. Instead, this reduction is likely due to successful public health campaigns around Sun Smart practices and early warning signs.

In terms of the other diagnostic subgroups most frequently diagnosed in those aged 12-24 years, each year we would expect to see approximately 25 young people with gonadal germ cell tumours, 25 with Hodgkin lymphomas, 12 with acute lymphoblastic leukaemia, and 12 with non-Hodgkin lymphomas.

Table 3.3 Average number of AYA cancer cases per year by age group

AYA classification	Average number of cases per year						
	12-14 years	15-19 years	20-24 years	25-29 years	Total 12-24 years	Total 15-24 years	Total 12-29 years
1. Leukaemias	**6.3**	**11.1**	**7.9**	**7.5**	**25.3**	**19.0**	**32.8**
1.1 Acute lymphoid leukaemia	4.3	5.4	2.6	2.4	12.3	8.0	14.7
1.2 Acute myeloid leukaemia	1.3	4.4	3.3	3.3	9.0	7.7	12.3
1.3 Chronic myeloid leukaemia	0.3	1.1	1.7	1.3	3.1	2.8	4.4
1.4 Other & unspecified leukaemia	0.4	0.2	0.3	0.5	0.9	0.5	1.4
2. Lymphomas	**5.4**	**14.9**	**16.3**	**17.0**	**36.6**	**31.2**	**53.6**
2.1 Non-Hodgkin lymphoma	2.2	4.9	4.6	7.8	11.7	9.5	19.5
2.2 Hodgkin lymphoma	3.2	10.0	11.7	9.2	24.9	21.7	34.1
3. CNS tumours	**3.5**	**3.9**	**5.8**	**7.1**	**13.2**	**9.7**	**20.3**
3.1 Astrocytoma	1.2	1.7	3.1	3.9	6.0	4.8	9.9
3.2 Other gliomas	0.4	0.6	0.8	1.9	1.8	1.4	3.7
3.3 Ependymoma	0.3	0.6	0.9	0.5	1.8	1.5	2.3
3.4 Medulloblastoma & other PNET	0.6	0.7	0.8	0.2	2.1	1.5	2.3
3.5 Other specified intracranial and intraspinal neoplasms	0.9	0.1	0.0	0.1	1.0	0.1	1.1
3.6 Unspecified intracranial and intraspinal neoplasms	0.1	0.2	0.2	0.5	0.5	0.4	1.0
4. Bone tumours	**4.5**	**6.3**	**3.4**	**2.7**	**14.2**	**9.7**	**16.9**
4.1 Osteosarcoma	2.0	3.2	1.0	0.6	6.2	4.2	6.8
4.2 Chondrosarcoma	-	0.1	0.4	0.4	0.5	0.5	0.9
4.3 Ewing tumour	2.2	2.7	1.6	1.6	6.5	4.3	8.1
4.4 Other bone tumours	0.3	0.3	0.4	0.1	1.0	0.7	1.1
5. Soft tissue sarcomas	**0.6**	**3.1**	**3.7**	**2.6**	**7.4**	**6.8**	**10.0**
5.1 Fibromatous neoplasms	0.0	0.2	1.1	0.2	1.3	1.3	1.5
5.2 Rhabdomyosarcoma	0.3	1.3	0.7	0.2	2.3	2.0	2.5
5.3 Other soft tissue sarcoma	0.3	1.6	1.9	2.2	3.8	3.5	6.0
6. Germ cell tumours	**1.4**	**8.2**	**18.0**	**29.3**	**27.6**	**26.2**	**56.9**
6.1 Germ cell & trophoblastic neoplasms of gonads	0.7	7.6	16.9	28.2	25.2	24.5	53.4
6.2 Germ cell & trophoblastic neoplasms, non-gonadal sites	0.7	0.6	1.1	1.3	2.4	1.7	3.7
7. Melanomas	**0.7**	**5.6**	**14.7**	**27.0**	**21.0**	**20.3**	**48.0**
7.1 Melanoma	0.7	5.5	14.7	26.6	20.9	20.2	47.5
7.2 Skin carcinomas	-	0.1	-	0.4	0.1	0.1	0.5
8. Carcinomas	**1.8**	**11.8**	**26.3**	**64.2**	**39.9**	**38.1**	**104.1**
8.1 Thyroid carcinoma	0.2	2.6	7.5	15.1	10.3	10.1	25.4
8.2 Other carcinoma of head and neck	0.2	1.3	2.0	3.3	3.5	3.3	6.8
8.3 Carcinomas of trachea, bronchus and lung	0.2	0.5	0.9	0.7	1.6	1.4	2.3
8.4 Carcinoma of breast	-	0.2	2.3	11.5	2.5	2.5	14.0
8.5 Carcinoma of genitourinary (GU) tract	-	1.2	5.4	18.5	6.6	6.6	25.1
8.6 Carcinoma of gastro-intestinal (GI) tract	1.2	5.8	8.0	14.5	15.0	13.8	29.5
8.7 Carcinomas of other and ill-defined sites	-	0.2	0.2	0.6	0.4	0.4	1.0
9. Miscellaneous specified neoplasms, NOS	**1.1**	**1.2**	**2.0**	**2.5**	**4.3**	**3.2**	**6.8**
10. Unspecified malignant neoplasms	**-**	**0.4**	**0.4**	**1.2**	**0.8**	**0.8**	**2.0**
Total cancers diagnosed	**25.3**	**66.5**	**98.5**	**161.1**	**190.3**	**165.0**	**351.4**

3.4 Average number of cases diagnosed annually by domicile

As for section 3.3, this section reports the average annual cases, this time according to the person's area of residence at the time of their cancer diagnosis. Approximately half of the AYA population live within the boundaries of one of the six DHBs that host the AYA cancer services and keyworker for their wider region and close to three quarters reside in a major urban area. Due to population size and the relative rarity of cancer in AYAs, the annual numbers of new AYA diagnoses are very low for some DHBs, particularly West Coast, Wairarapa, Tairāwhiti and Whanganui.

Table 3.4a Average number of AYA cancer cases per year by domicile

DHB & AYA Cancer Region	Average number of cases per year						
	12-14 years	15-19 years	20-24 years	25-29 years	Total 12-24 years	Total 15-24 years	Total 12-29 years
Auckland – Northland	**8.9**	**22.8**	**37.2**	**62.0**	**68.9**	**60.0**	**130.9**
Northland	0.8	2.5	3.4	4.9	6.7	5.9	11.6
Waitematā	3.0	5.6	12.2	20.2	20.8	17.8	41.0
Auckland [a]	2.0	6.9	11.0	21.1	19.9	17.9	41.0
Counties Manukau	3.1	7.8	10.6	15.8	21.5	18.4	37.3
Midland	**4.2**	**12.2**	**14.7**	**24.8**	**31.1**	**26.9**	**55.9**
Waikato [a]	2.2	6.2	7.0	12.7	15.4	13.2	28.1
Lakes	0.3	1.6	2.5	3.5	4.4	4.1	7.9
Bay of Plenty	0.9	3.6	4.3	7.3	8.8	7.9	16.1
Tairāwhiti	0.8	0.8	0.9	1.3	2.5	1.7	3.8
Mid Central	**3.8**	**9.1**	**11.4**	**17.7**	**24.3**	**20.5**	**42.0**
Taranaki	1.0	1.8	2.6	4.2	5.4	4.4	9.6
Hawke's Bay	1.4	3.1	3.1	4.7	7.6	6.2	12.3
Whanganui	0.3	0.7	1.2	1.5	2.2	1.9	3.7
Mid Central [a]	1.1	3.5	4.5	7.3	9.1	8.0	16.4
Capital & Coast	**3.3**	**7.7**	**11.7**	**16.3**	**22.7**	**19.4**	**39.0**
Hutt	1.4	2.0	2.7	4.8	6.1	4.7	10.9
Capital & Coast [a]	1.7	5.1	8.2	10.1	15.0	13.3	25.1
Wairarapa	0.2	0.6	0.8	1.4	1.6	1.4	3.0
Canterbury	**4.2**	**10.1**	**16.6**	**27.5**	**30.9**	**26.7**	**58.4**
Nelson Marlborough	0.2	1.5	2.4	4.1	4.1	3.9	8.2
West Coast	0.4	0.3	0.9	1.4	1.6	1.2	3.0
Canterbury [a]	3.1	7.3	11.8	21.1	22.2	19.1	43.3
South Canterbury	0.5	1.0	1.5	0.9	3.0	2.5	3.9
Southern [a]	**0.9**	**4.5**	**6.4**	**12.5**	**11.8**	**10.9**	**24.3**
Proximity to AYA Keyworker							
DHB hosts an AYA Keyworker	11.0	33.5	48.9	84.8	93.4	82.4	178.2
DHB doesn't host an AYA Keyworker	14.3	32.9	49.1	76.0	96.3	82.0	172.3
Urban / Rural							
Main Urban Area	17.1	48.3	74.0	121.6	139.4	122.3	261.0
Secondary Urban Area	1.9	4.5	5.6	10.8	12.0	10.1	22.8
Minor Urban Area	2.6	5.8	6.7	13.9	15.1	12.5	29.0
Rural	3.7	7.8	11.7	14.5	23.2	19.5	37.7
Total [b]	**25.3**	**66.4**	**98.0**	**160.8**	**189.7**	**164.4**	**350.5**

[a] DHB hosts the cancer services for this region, including the AYA Keyworker

[b] Totals vary slightly from other sections due to a small number of NZCR-reported cases having no domicile assigned

Table 3.4b shows the distance ('as the crow flies') between the AYA's domicile recorded at diagnosis and the tertiary hospital in which the AYA cancer service sits. The average distances reported should be taken as indicative only as these numbers don't capture the time and distance travelling by road or the AYA's access to alternative transport options. Depending on their diagnosis, a few AYA patients may never need to travel to a tertiary hospital for their cancer treatment, while others will have to be away from their home and usual support networks for many months.

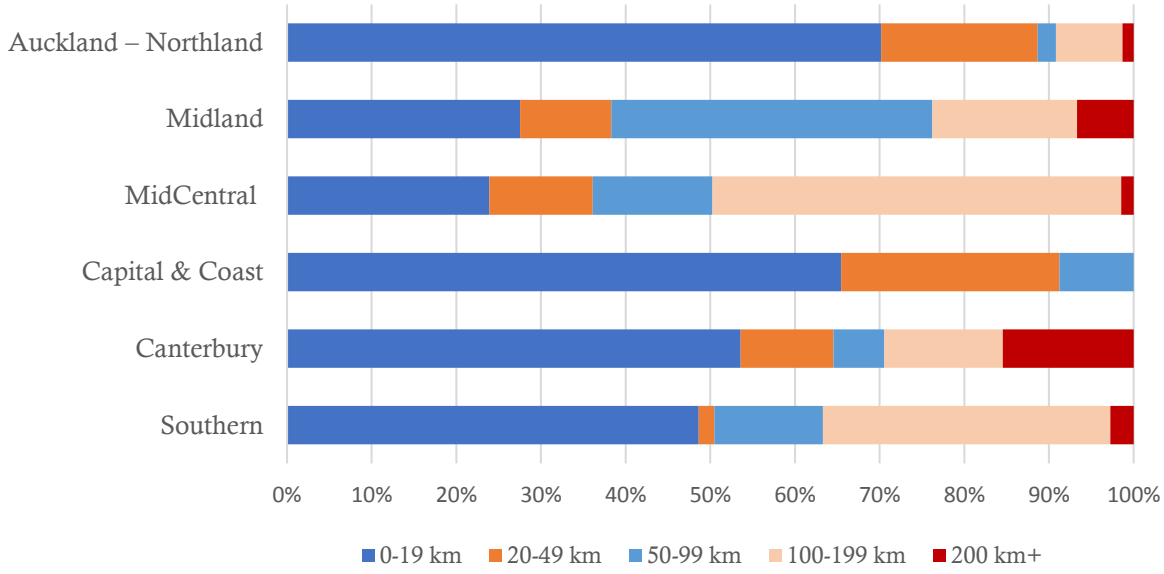
The average distance travelled for AYA living in the Capital & Coast (18.0 km) and Auckland-Northland (27.1 km) cancer regions were considerably less than for those residing in the other four regions. Half of those AYA living in the Mid Central region lived further than 100 kilometres away from Palmerston North Hospital.

Table 3.4b Distance from domicile to regional AYA cancer centre

AYA Cancer Centre	Distance to AYA cancer centre						Average Distance (km)
	n	0-19 km	20-49 km	50-99 km	100-199 km	200 km+	
Auckland – Northland (Auckland Hospital)	600	421	111	13	47	8	**27.1**
Midland (Waikato Hospital)	269	74	29	102	46	18	**75.2**
MidCentral (Palmerston North Hospital)	205	49	25	29	99	3	**92.3**
Capital & Coast (Wellington Hospital)	194	127	50	17	-	-	**18.0**
Canterbury (Christchurch Hospital)	265	142	29	16	37	41	**71.0**
Southern (Dunedin Hospital)	109	53	2	14	37	3	**77.2**
Total [a]	**1 642**	**866**	**246**	**191**	**266**	**73**	**52.5**

[a] Totals vary slightly from other sections due to a small number of NZCR-reported cases having no domicile assigned. The few cases from the Chatham Islands were excluded from this analysis.

Figure 3.4b Distance from domicile to regional AYA cancer centre



3.5 The most common cancers by age group

Figures 3.5a-3.5d show the proportion of cancers registered between 2008 and 2017 for each age group according to major AYA diagnostic group. Leukaemias, lymphomas and CNS tumours were the most commonly registered cancer diagnostic groups in young adolescents aged 12-14 years, with leukaemias accounting for nearly one in four (23%) of all cancers diagnosed. By 15-19 years, lymphomas overtook leukaemias as the most commonly diagnosed cancer group (20%) and melanoma and carcinomas started to account for a greater proportion of cancer cases. For the 20-24 year age group, the three major diagnostic groups of melanoma, carcinomas, and germ cell tumours accounted for nearly two thirds (63%) of all cancers diagnosed and this proportion increased to three quarters (75%) of all new diagnoses for the older 25-29 year age group.

Figure 3.5a Cancers diagnosed in AYA 12-14 years

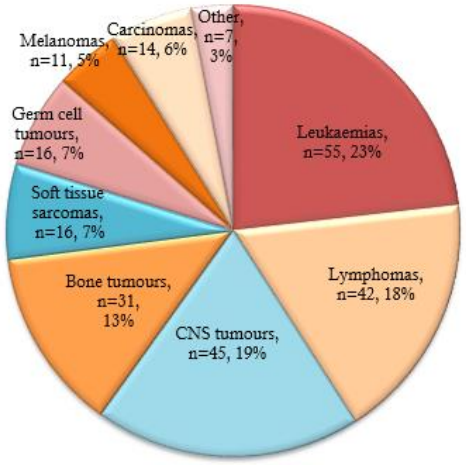


Figure 3.5b Cancers diagnosed in AYA 15-19 years

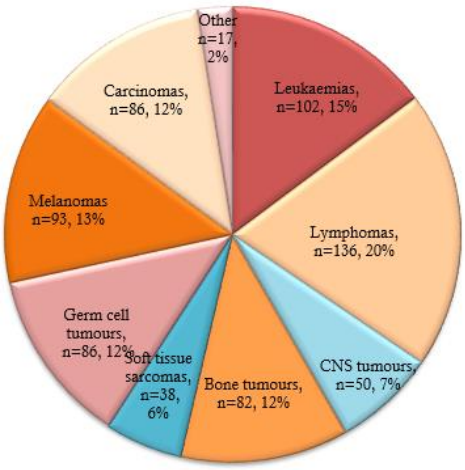


Figure 3.5c Cancers diagnosed in AYA 20-24 years

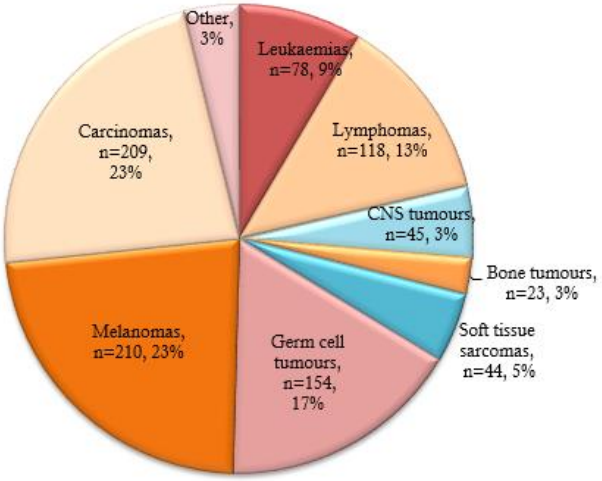
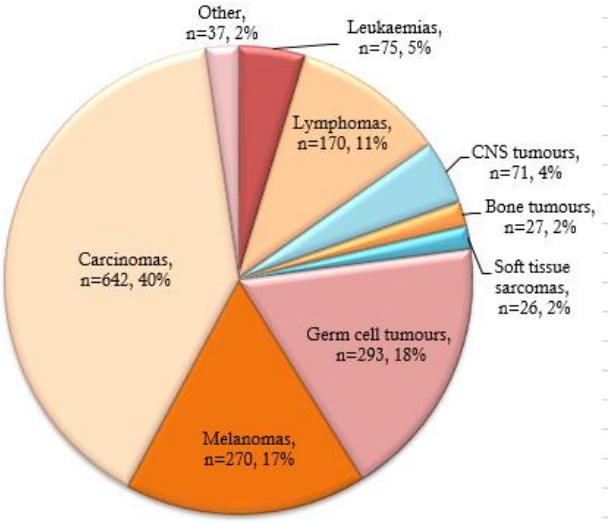


Figure 3.5d Cancers diagnosed in AYA 25-29 years



3.6 Incidence by age and AYA cancer classification scheme

When comparing incidence rates across age groups, adolescents had a significantly higher incidence of malignant bone tumours than older AYA. Incidence rates for leukaemias, lymphomas, CNS tumours, and soft tissue sarcomas were relatively similar across the three age quintiles, while the incidence rates for germ cell tumours, melanoma, and carcinomas increased dramatically during young adulthood.

In 2008-2017, cancer incidence for AYA 15-29 years was 352 per million, 5% lower than for the 2000-2009 period. This was due to fewer melanomas being diagnosed in this period, with age-standardised incidence for melanomas decreasing from 73 to 51 per million.

Conversely, the incidence of carcinomas increased by 17% during this time-period. At a sub-group level, the incidence for most carcinoma groups were stable but there was a statistically significant increase in the incidence of carcinomas of the gastro intestinal tract (IR= 27 per million in 2008-2017 c.f. 19 million in 2000-2009). Specifically, there was a rapid rise in the number of colorectal cancers diagnosed in AYA over this time-period. 193 cases of colorectal cancer were diagnosed among AYA 15-29 years old between 2008 and 2017 (IR = 20.8 per million) compared to 105 cases in the 2000-2009 period (IR = 12.1 per million). As noted in section 3.3, the increase in colorectal cancers reflects the recent reclassification of carcinoid tumours of the appendix as a malignancy.

Fewer miscellaneous and unspecified neoplasms were diagnosed in 2008-2017, reflecting the increasingly high proportion of cancers diagnosed New Zealand which are microscopically verified.

Table 3.6 AYA cancer incidence (per million) by age group and AYA diagnostic group and selected subgroups, 2008-2017

AYA diagnostic group/subgroup	15-19 years		20-24 years		25-29 years		Total 15-29 years (age standardised)	
	IR	95% CI	IR	95% CI	IR	95% CI	IR	95% CI
1. Leukaemias	**35.2**	**(28.6 - 41.7)**	**25.1**	**(19.6 - 30.7)**	**25.8**	**(20.0 - 31.6)**	**28.8**	**(25.3 - 32.3)**
1.1 Acute lymphoid leukaemia	17.1	(12.5 - 21.7)	8.3	(5.1 - 11.5)	8.3	(5.0 - 11.6)	11.3	(9.1 - 13.5)
1.2 Acute myeloid leukaemia	13.9	(9.8 - 18.1)	10.5	(6.9 - 14.1)	11.4	(7.5 - 15.2)	12.0	(9.7 - 14.2)
1.3 Chronic myeloid leukaemia	3.5	(1.4 - 5.4)	5.4	(2.8 - 8.0)	4.5	(2.0 - 6.9)	4.5	(3.1 - 5.8)
2. Lymphomas	**47.2**	**(39.6 - 54.8)**	**51.8**	**(43.9 - 59.8)**	**58.5**	**(49.7 - 67.3)**	**52.3**	**(47.6 - 57.0)**
2.1 Non-Hodgkin lymphoma	15.2	(11.2 - 19.9)	14.6	(10.4 - 18.9)	26.8	(20.9 - 32.8)	18.7	(15.9 - 21.5)
2.2 Hodgkin lymphoma	31.7	(25.5 - 37.9)	37.2	(30.5 - 44.0)	31.6	(25.2 - 38.1)	33.6	(29.8 - 37.3)
3. CNS tumours	**12.4**	**(8.5 - 16.2)**	**18.5**	**(13.7 - 23.2)**	**24.4**	**(18.7 - 30.1)**	**18.2**	**(15.4 - 20.9)**
3.1 Astrocytoma	5.4	(2.8 – 8.0)	9.9	(6.4 - 13.3)	13.4	(9.2 - 17.6)	9.4	(7.4 - 11.4)
3.2 Other gliomas	1.9	(0.4 - 3.4)	2.5	(0.8 - 4.3)	6.5	(3.6 - 9.5)	3.6	(2.3 - 4.8)
3.3 Ependymoma	1.9	(0.4 - 3.4)	2.9	(1.0 - 4.7)	1.7	(0.2 - 3.2)	2.2	(1.2 - 3.1)
3.4 Medulloblastoma & other PNET	2.2	(0.6 - 3.9)	2.5	(0.8 - 4.3)	0.7	(0.0 - 1.6)	1.9	(1.0 - 2.7)
4. Bone tumours	**20.0**	**(15.0 - 24.9)**	**10.8**	**(7.2 - 14.5)**	**9.3**	**(5.8 - 12.8)**	**13.5**	**(11.1 - 15.9)**
4.1 Osteosarcoma	10.1	(6.6 - 13.7)	3.2	(1.2 - 5.2)	2.1	(0.4 - 3.7)	5.2	(3.8 - 6.7)
4.3 Ewing tumour	8.6	(5.3 - 11.8)	5.1	(2.6 - 7.6)	5.5	(2.8 - 8.2)	6.4	(4.8 - 8.1)
5. Soft tissue sarcomas	**9.8**	**(6.4 - 13.3)**	**11.8**	**(8.0 - 15.6)**	**8.9**	**(5.5 - 12.4)**	**10.2**	**(8.2 - 12.3)**
5.1 Fibromatous neoplasms	0.6	(0.0 - 1.5)	3.5	(1.4 - 5.6)	0.7	(0.0 - 1.6)	1.6	(0.8 - 2.5)
5.2 Rhabdomyosarcoma	4.1	(1.9 - 6.4)	2.2	(0.6 - 3.9)	0.7	(0.0 - 1.6)	2.4	(1.4 - 3.4)
5.3 Other soft tissue sarcoma	5.1	(2.6 - 7.6)	6.0	(3.3 - 8.8)	7.6	(4.4 - 10.7)	6.2	(4.6 - 7.8)
6. Germ cell tumours	**26.0**	**(20.4 - 31.6)**	**57.2**	**(48.9 - 65.6)**	**100.8**	**(89.2 - 112.3)**	**59.9**	**(54.9 - 64.8)**
6.1 Germ cell & trophoblastic neoplasms of gonads	24.1	(18.7 - 29.5)	53.8	(45.6 - 61.9)	97.0	(85.7 - 108.3)	56.8	(52.0 - 61.7)
6.2 Germ cell & trophoblastic neoplasms of non-gonadal sites	1.9	(0.4 - 3.4)	3.5	(1.4 - 5.6)	3.8	(1.6 - 6.0)	3.0	(1.9 - 4.2)
7. Melanoma	**17.7**	**(13.1 - 22.4)**	**46.8**	**(39.2 - 54.3)**	**92.9**	**(81.8 - 103.9)**	**51.0**	**(46.4 - 55.5)**
7.1 Melanoma	17.4	(12.8 - 22.0)	46.8	(39.2 - 54.3)	91.5	(80.5 - 102.5)	50.4	(45.8 - 55.0)
8. Carcinomas	**37.4**	**(30.6 - 44.1)**	**83.6**	**(73.5 - 93.8)**	**220.8**	**(203.7 - 237.9)**	**111.0**	**(103.2 - 116.7)**
8.1 Thyroid carcinoma	8.2	(5.1 - 11.4)	23.9	(18.5 - 29.3)	51.9	(43.7 - 60.2)	27.1	(23.8 - 30.5)
8.2 Other carcinoma of head & neck	4.1	(1.9 - 6.4)	6.4	(3.6 - 9.2)	11.4	(7.5 - 15.2)	7.1	(5.4 - 8.8)
8.4 Carcinoma of breast	0.6	(0.0 - 1.5)	7.3	(4.3 - 10.3)	39.6	(32.3 - 46.8)	15.0	(12.5 - 17.4)
8.5 Carcinoma of genitourinary tract	3.8	(1.7 – 6.0)	17.2	(12.6 - 21.8)	63.6	(54.5 - 72.8)	26.9	(23.6 - 30.2)
8.6 Carcinoma of gastro–intestinal tract	18.4	(13.7 - 23.1)	25.4	(19.9 – 31.0)	49.9	(41.8 - 58.0)	30.5	(27.0 - 34.1)
9. Misc. specified neoplasms	**3.8**	**(1.7 - 6.0)**	**6.4**	**(3.6 - 9.2)**	**8.6**	**(5.23 - 12.0)**	**6.2**	**(4.6 - 7.8)**
9.2 Other specified and embryonal tumours, NOS	2.9	(1.4 - 7.0)	4.8	(2.4 - 7.2)	7.9	(4.7 - 11.1)	5.1	(3.6 - 6.5)
10. Unspecified (malig.) neoplasms	**1.3**	**(0.0 - 2.5)**	**1.3**	**(0.0 - 2.5)**	**4.1**	**(1.8 - 6.5)**	**2.2**	**(1.2 - 3.1)**
Total cancers diagnosed	**210.7**	**194.7 - 226.7**	**313.3**	**293.7 - 332.8**	**554.0**	**527.0 - 581.1**	**352.1**	**340.0 - 364.1**

[a] incidence rates (and corresponding confidence intervals) for AYA diagnostic subgroups 1.4, 3.5, 3.6, 4.2, 7.2, 8.3, 8.7, and 9.1 have been censored due to the small number of cases recorded within the ten–year study period.

3.7 AYA cancer incidence by sex

Between 2008 and 2017, 772 cancers were diagnosed in females aged 15-24 years of age (IR: 250 per million) and 878 in males (IR: 273 per million). Compared to 2000-2009, incidence rates were stable for males (IR: 273 per million c.f. 279 per million in 2000-2009) but decreased for females (IR: 250 per million c.f. 270 per million in 2000-2009).

For the most commonly diagnosed AYA subgroups, Table 3.7 shows that males aged 15-24 years have a higher relative risk (RR) of developing a gonadal germ cell tumour (RR=5.8). They are also significantly more likely than females to develop acute lymphoblastic leukaemia (RR=1.8) and non-Hodgkin lymphoma (RR=1.7) In contrast, males are at lower risk of developing most carcinomas (overall RR=0.4). In this ten-year period, all breast carcinomas, 90% of carcinomas of the genitourinary tract, and three quarters of thyroid carcinomas were diagnosed in females. These sex differences are consistent with those reported for AYA internationally.[11-14]

Compared to 2000-2009, the number of female gastro-intestinal tract tumours increased from an average of 3.2 per year (11.0 per million) to 7.7 per year (25.0 per million). This can be attributed to the reclassification of carcinoid tumour of the appendix as a malignancy. There was approximately a 40% decrease in the number of female AYA diagnosed with melanoma; from 18.1 per year (62.5 per million) to 11.4 per year (37.0 per million). Melanoma rates for male AYA also decreased by almost one third during this time-period (from 12.1 to 8.8 cases per year; 40.7 to 27.4 per million).

Table 3.7 AYA cancer incidence (per million) and relative risk by sex and AYA diagnostic group and selected subgroups

AYA diagnostic group/selected subgroups	Male 15-24 years		Female 15-24 years		Relative risk male to female (95% CI)	
	Cases per year	Age-standardised incidence (per million)	Cases per year	Age-standardised incidence (per million)		
1. Leukaemias	**11.8**	**36.7**	**7.2**	**23.3**	**1.57**	**(1.18 - 2.10)**
1.1 Acute lymphoid leukaemia	5.2	16.2	2.8	9.1	1.78	(1.13 - 2.79)
1.2 Acute myeloid leukaemia	4.4	13.7	3.3	10.7	1.28	(0.82 - 2.01)
2. Lymphomas	**17.3**	**53.8**	**13.9**	**45.0**	**1.19**	**(0.96 - 1.49)**
2.1 Non-Hodgkin lymphoma	6.0	18.7	3.5	11.3	1.65	(1.09 - 2.48)
2.2 Hodgkin lymphoma	11.3	35.2	10.4	33.7	1.04	(0.80 - 1.36)
3. CNS tumours	**5.6**	**17.4**	**4.1**	**13.3**	**1.31**	**(0.88 - 1.96)**
3.1 Astrocytoma	2.7	8.4	2.1	6.8	1.24	(0.70 - 2.18)
4. Osseous & chondromatous neoplasms	**5.5**	**17.1**	**4.2**	**13.6**	**1.2**	**(0.84 - 1.87)**
4.1 Osteosarcoma	2.5	7.8	1.7	5.5	1.41	(0.77 - 2.60)
4.3 Ewing tumour	2.4	7.5	1.9	6.2	1.21	(0.66 - 2.21)
5. Soft tissue sarcomas	**3.4**	**10.6**	**3.4**	**11.0**	**0.96**	**(0.60 - 1.55)**
6. Germ cell & trophoblastic neoplasms	**22.4**	**69.9**	**3.8**	**12.3**	**5.67**	**(4.20 - 7.66)**
6.1 Germ cell and trophoblastic neoplasms of gonads	21.0	65.5	3.5	11.3	5.77	(4.23 - 7.89)
7. Melanoma and skin carcinomas	**8.8**	**27.4**	**11.5**	**37.3**	**0.74**	**(0.56 - 0.97)**
7.1 Melanoma	8.8	27.4	11.4	37.0	0.74	(0.58 - 0.98)
8. Carcinomas	**11.5**	**35.8**	**26.6**	**86.2**	**0.42**	**(0.34 - 0.51)**
8.1 Thyroid carcinoma	2.5	7.8	7.6	24.6	0.32	(0.21 - 0.49)
8.2 Other carcinoma of head and neck	1.9	5.9	1.4	4.5	1.30	(0.66 - 2.59)
8.4 Carcinoma of breast	-	-	2.5	8.1	[a]	[a]
8.5 Carcinoma of genitourinary tract	0.6	1.9	6.0	19.4	[a]	[a]
8.6 Carcinoma of gastro-intestinal tract	6.1	19.0	7.7	25.0	0.76	(0.54 - 1.06)
9. Miscellaneous specified neoplasms, NOS	**1.4**	**4.4**	**1.8**	**5.8**	**0.75**	**(0.37 - 1.50)**
10. Unspecified malignant neoplasms	**0.1**	**0.3**	**0.7**	**2.3**	[a]	[a]
Overall cancer incidence (95% CI)	**87.8**	**273.4 (255.3 - 291.5)**	**77.2**	**250.2 (232.5 - 267.8)**	**1.09**	**(0.99 - 1.2)**

[a] relative risk was not calculated due to the small number of cases for one or both groups

3.8 AYA cancer incidence by ethnicity

Within the rest of this report incidence rates were not reported for those diagnostic groups and subgroups where there were fewer than ten cases registered within the ten-year period, as rates based on small numbers may be distorted due to random fluctuations. However, in this section we have included age standardised incidence rates for all major diagnostic groups and subgroups for the three prioritised ethnic groups, regardless of the number of cases registered. We have chosen to do this because there are many differences between the three prioritised ethnic groups which warrant discussion even though there were very few cases diagnosed amongst one or more ethnic group during the study period (melanoma incidence is an excellent example of this). As in many instances the incidence rates and confidence intervals are derived from a small number of cases, any between-group differences in the incidence reported should be interpreted extremely cautiously.

Compared to 2000-2009, cancer incidence among 15-24 year olds was stable for Māori AYA (285 per million for 2008-2017 c.f. 287 per million in 2000-2009). Although not yet statistically significant, incidence increased by 8.6% for Pacific Peoples (301 c.f. 277 per million in 2000-2009). Conversely, cancer incidence declined for non-Māori /non-Pacific Peoples – down from 280 per million in 2000-2009 to 251 per million in 2008-2017, representing a drop from an average of 120 to 113 cases per year. The overall decline in cancer incidence for non-Māori/non-Pacific AYA reflects the sharp drop in the incidence of melanoma among this group, from 68 to 42 per million (ten cases fewer each year). Melanoma is rarely diagnosed in Māori or Pacific AYA, and therefore the reduction in melanoma cases would have had a negligible impact on overall incidence rates for these prioritised ethnic groups.

Leukaemia incidence among Pacific Peoples was 60.7 per million, consistent with the 2000-2009 period of 61.4 per million, and once again well over double that of non-Māori/non-Pacific Peoples (23.8 per million). By diagnostic subgroup, Pacific AYA had a significantly higher incidence of acute myeloid leukaemia (27.4 per million) than non-Māori/non-Pacific Peoples (9.4 per million). The incidence of gonadal germ cell tumours among Pacific Peoples increased significantly, from 14.7 per million in 2000-2009 to 43.6 per million for the 2008-2017 period, now similar to the rates recorded for Māori (52.7 per million).

As for the earlier period, Māori had a significantly higher incidence of Ewing tumours (14.5 per million c.f. 4.7 per million in non-Māori/Pacific Peoples) and 'carcinoma of the gastro-intestinal tract' (41.9 c.f. 15.8 per million). Certain Māori families in New Zealand have been identified as carriers of a CDH1 gene mutation which is linked to stomach cancer. Twenty eight of the 31 cases (90.3%) of 'carcinoma of the stomach' (a subgroup of 'group 8.6 carcinoma of gastro-intestinal tract') were diagnosed in AYA of Māori ethnicity. The high number of cases diagnosed in Māori AYA is likely to be due to the comprehensive screening and surveillance programme which is in place for members of these families.

For the first time, this analysis also included Asian as a fourth prioritised ethnic group (See Appendix A3). Compared to all other prioritised ethnic groups, Asian 15-24 year olds were significantly less likely to be diagnosed with cancer. With an incidence rate of only 121.3 per million (95% CI 99.0-143.5), incidence rates for Asian AYA were less the half the rates recorded for Māori (IR: 285.2), Pacific Peoples (IR: 301.4) or those of any other ethnicity (IR: 293.4).

Table 3.8 AYA cancer incidence (per million) by ethnicity and AYA diagnostic group and selected subgroups

	Māori			Pacific Peoples			Non- Māori / Pacific Peoples		
	Total cases	Age-standardised incidence (per million) (95% CI)		Total cases	Age-standardised incidence (per million) (95% CI)		Total cases	Age-standardised incidence (per million) (95% CI)	
1. Leukaemias	**51**	**39.3**	**(28.5 - 50.1)**	**33**	**60.7**	**(40.0 - 81.4)**	**106**	**23.8**	**(19.2 - 28.3)**
1.1 Acute lymphoid leukaemia	18	13.8	(7.4 - 20.2)	15	27.4	(13.5 - 41.3)	47	10.6	(7.6 - 13.6)
1.2 Acute myeloid leukaemia	20	15.3	(8.6 - 22.0)	15	27.4	(13.5 - 41.3)	42	9.4	(6.5 - 12.2)
2. Lymphomas	**56**	**43.9**	**(32.4 - 55.5)**	**23**	**42.9**	**(25.3 - 60.4)**	**233**	**52.0**	**(45.3 - 58.7)**
2.1 Non-Hodgkin lymphoma	21	16.2	(9.3 - 23.2)	12	22.2	(9.6 - 34.8)	62	13.9	(10.4 - 17.3)
2.2 Hodgkin lymphoma	35	27.7	(18.5 - 36.9)	11	20.6	(8.4 - 32.8)	171	38.2	(32.4 - 43.9)
3. CNS tumours	**19**	**14.8**	**(8.1 - 21.5)**	**48**	**15.1**	**(4.6 - 25.6)**	**70**	**15.6**	**(11.9 - 19.2)**
3.1 Astrocytoma	9	7.2	(2.5 - 12.0)	6	11.2	(2.2 - 20.2)	33	7.3	(4.8 - 9.8)
4. Bone tumours	**30**	**23.0**	**(14.7 - 31.2)**	**15**	**27.9**	**(13.8 - 42.1)**	**52**	**11.7**	**(8.5 - 14.9)**
4.1 Osteosarcoma	7	5.2	(1.3 - 9.0)	11	20.3	(8.3 - 32.3)	24	5.4	(3.3 - 7.6)
4.3 Ewing tumour	19	14.5	(8.0 - 21.1)	3	5.7	(0.0 - 12.1)	21	4.7	(2.7 - 6.8)
5. Soft tissue sarcomas	**14**	**11.1**	**(5.3 - 16.9)**	**8**	**15.3**	**(4.7 - 25.9)**	**46**	**10.3**	**(7.3 - 13.3)**
6. Germ cell tumours	**68**	**55.1**	**(41.9 - 68.2)**	**25**	**47.3**	**(28.7 - 65.9)**	**169**	**37.4**	**(31.8 - 43.1)**
6.1 Germ cell & trophoblastic neoplasms of gonads	65	52.7	(39.8 - 65.5)	23	43.6	(25.7 - 61.4)	157	34.8	(29.3 - 40.2)
7. Melanoma and skin carcinomas	**13**	**10.5**	**(4.8 - 16.2)**	**1**	**2.0**	**(0.0 - 5.8)**	**189**	**41.8**	**(35.8 - 47.7)**
8. Carcinomas	**100**	**81.1**	**(65.2 - 97.0)**	**43**	**80.9**	**(56.7 - 105.1)**	**238**	**52.7**	**(46.0 - 59.4)**
8.1 Thyroid carcinoma	18	15.0	(8.0 - 21.9)	14	26.3	(12.5 - 40.1)	69	15.2	(11.6 - 18.8)
8.2 Other carcinoma of head and neck	6	4.9	(1.0 - 8.9)	4	7.3	(0.1 - 14.5)	23	5.1	(3.0 - 7.2)
8.4 Carcinoma of breast	6	5.1	(1.0 - 9.1)	4	7.6	(0.2 - 15.1)	15	3.3	(1.6 - 4.9)
8.5 Carcinoma of genitourinary tract	14	11.7	(5.6 - 17.8)	4	7.6	(0.2 - 15.1)	48	10.6	(7.6 - 13.6)
8.6 Carcinoma of gastro–intestinal tract	53	41.9	(30.6 - 53.2)	14	26.3	(12.5 - 40.1)	71	15.8	(12.1 - 19.5)
8.7 Carcinoma of other & ill-defined sites	1	0.9	(0.0 - 2.5)	-	-	-	3	0.7	(0.0 - 1.4)
9. Misc. specified neoplasms	**6**	**4.8**	**(1.0 - 8.7)**	**2**	**3.9**	**(0.0 - 9.3)**	**24**	**5.3**	**(3.2 - 7.5)**
10. Unspecified (malig.) neoplasms	**2**	**1.7**	**(0.0 - 4.0)**	**3**	**5.5**	**(0.0 - 11.8)**	**3**	**0.7**	**(0.0 - 1.4)**
Overall cancer incidence (95% CI)	**359**	**285.2**	**255.6 - 314.8**	**161**	**301.4**	**254.8 - 348.1**	**1 130**	**251.2**	**236.6 - 265.9**

3.9 Changes in AYA cancer incidence over time

Compared to the 2000-2009 period, the biggest changes in cancer incidence for 15-24 year olds were seen for the melanomas and 'carcinomas of the gastro-intestinal tract'. Pleasingly, melanoma incidence declined by 37.4% during this period, dropping from being the most common cancer overall for AYA in 2000-2009 to be ranked fourth in 2008-2017 – behind carcinomas, lymphomas, and germ cell tumours. New Zealand's melanoma incidence rate of 32.3 per million is now lower than the rate of 44.1 per million reported by Australia for the 2010-2014 period,[11] but remains significantly higher than the rates reported elsewhere.[12-13]

Conversely, the incidence of carcinomas rose by 20.5% during this time. This can mostly be attributed to the rise in the number of 'carcinomas of the gastro-intestinal tract, which increased by 78%. Notably, the incidence rate for the group '8.6.1: carcinoma of the colon and rectum' was 9.9 per million (95% CI: 7.8-11.9), with 69 cases recorded between 2014 and 2017 compared to 21 cases in the 2008-2013 period. As noted in Section 3.3, this reflects the reclassification of 'carcinoid tumours of the appendix' as a malignancy in the WHO's 1st revision of the ICD-O-3, which was adopted by the NZCR at the start of 2014. Similarly, substantial increases in the incidence of colon cancers among AYA have recently been reported by other countries for the same reason.[11-13]

The substantial decline in melanoma incidence during this period has resulted in a decline in New Zealand's overall AYA cancer incidence from 274.7 to 262.0 per million. Unfortunately, it is difficult to make comparisons with other AYA incidence rates published internationally due to differences in the time periods, age range, and the way in which incidence rates have been reported. However, New Zealand's overall AYA cancer incidence rate does appear to be slightly lower than those reported by England (rates for males and females aged 13-24 years 282.8 & 314.5 per million respectively),[12] Australia (307.6 per million),[11] and France (289.4 per million).[13]

Table 3.9 Changes in AYA cancer incidence over time, AYA 15-24 years

AYA diagnostic group/subgroup	2000-2009			2008-2017			% increase / decrease
	Cases per year	Age-specific incidence (per million)[a] (95% CI)		Cases per year	Age-specific incidence (per million)[a] (95% CI)		
1. Leukaemias	18.0	30.9	(26.4 - 35.4)	19.0	30.1	(25.9 - 34.4)	↓ 2.6
1.1 Acute lymphoid leukaemia	8.3	14.3	(11.2 - 17.4)	8.0	12.7	(9.9 - 15.5)	↓ 11.2
1.2 Acute myeloid leukaemia	7.3	12.5	(9.6 - 15.4)	7.1	12.2	(9.5 - 14.9)	↓ 2.4
2. Lymphomas	25.4	43.6	(38.2 - 49.0)	31.2	49.5	(44.0 - 55.0)	↑ 13.5
2.1 Non-Hodgkin lymphoma	8.8	15.1	(12.0 - 18.3)	9.5	15.1	(12.0 - 18.1)	NC
2.2 Hodgkin lymphoma	16.6	28.5	(24.2 - 32.8)	21.7	34.5	(29.9 - 39.0)	↑ 21.1
3. CNS tumours	9.5	16.3	(13.0 - 19.6)	9.7	15.4	(12.3 - 18.5)	↓ 5.5
4. Osseous & chondromatous neoplasms	10.5	18.2	(14.7 - 21.6)	9.7	15.4	(12.3 - 18.5)	↓ 15.4
5. Soft tissue sarcomas	8.2	14.0	(11.0 - 17.1)	6.8	10.8	(8.2 - 13.4)	↓ 22.9
6. Germ cell & trophoblastic neoplasms	24.0	41.0	(35.8 - 46.1)	26.2	41.6	(36.6 - 46.7)	↑ 1.5
7. Melanoma and skin carcinomas	30.3	51.6	(45.8 - 57.4)	20.3	32.3	(27.8 - 36.7)	↓ 37.4
8. Carcinomas	29.5	50.2	(44.5 - 56.0)	38.1	60.5	(54.5 - 66.6)	↑ 20.5
8.1 Thyroid carcinoma	*8.6*	*14.6*	*(11.6 - 17.7)*	*10.1*	*16.1*	*(12.9 - 19.2)*	↑ 10.3
8.2 Other carcinoma of head and neck	*3.4*	*5.8*	*(3.9 - 7.8)*	*3.3*	*5.2*	*(3.5 - 7.0)*	↓ 10.3
8.4 Carcinoma of breast	*1.8*	*3.0*	*(1.6 - 4.4)*	*2.5*	*4.0*	*(2.4 - 5.5)*	↑ 33.3
8.5 Carcinoma of genitourinary tract	*6.9*	*11.7*	*(9.0 - 14.5)*	*6.6*	*10.5*	*(8.0 - 13.0)*	↓ 10.3
8.6 Carcinoma of gastro-intestinal tract	*7.2*	*12.3*	*(9.4 - 15.1)*	*13.8*	*21.9*	*(18.3 - 25.6)*	↑ 78.0
9. Misc. specified neoplasms	4.0	6.8	(4.7 - 8.9)	3.2	5.1	(3.3 - 6.8)	↓ 25.0
10. Unspecified (malig.) neoplasms	1.2	2.0	(0.9 - 3.2)	0.8	1.3	(0.4 - 2.2)	↓ 35.0
Total cancers diagnosed	**160.6**	**274.7**	**261.2 - 288.1**	**165.0**	**262.0**	**249.4 - 274.7**	↓ **4.6**

NC = No change

4 AYA Cancer Survival

Section 4 reports the relative survival for those AYA diagnosed with cancer between January 1st 2008 and December 31st 2017, with follow up to December 31st 2018. Relative survival is calculated by dividing the observed survival (i.e. the proportion of people who remain alive following their cancer diagnosis) by the expected survival of a group from the general population which is comparable with respect to age, sex, and the period under investigation. The focus of this section is survival for AYA aged 15-24 years, with additional survival estimates provided for the older 25-29 year age group in sections 4.3 and 4.5.

For some diagnostic groups and subgroups there were very few cases recorded, and in such cases the true survival cannot be reliably estimated; this is reflected in the wide 95% confidence intervals which are reported alongside. In such cases, any between-group differences in survival or any differences in comparison to other published data should be interpreted extremely cautiously. Differences between the survival estimates reported for the 2000-2009 period are non-statistically significant unless stated otherwise. Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period.

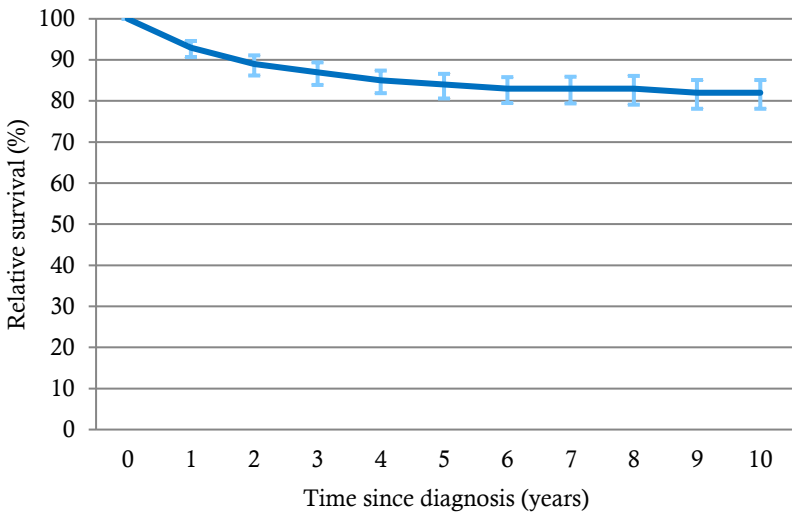
4.1 Overall AYA 15-24 year cancer survival

Pleasingly, overall survival for AYA 15-24 year olds diagnosed with cancer increased in 2008-2017 compared to the previously reported 2000-2009 period. Overall relative survival for AYA was 93.1% at one year of follow-up (+1.1%), 86.6% at three years (+4%), and 84.2% at five years (+3.6%). Ten-year survival for those AYA diagnosed in the year 2008 that were followed up for the full ten-year duration was 82.0%, an increase of 4.3%.

Table 4.1 Overall 15-24 year cancer survival, 2008-2017

Years since diag-nosis	Total			c.f. 2000-2009
	n	Cumulative relative survival (95% CI)		
1	1 635	93.1	(91.7 - 94.2)	↑1.1%
2	1 521	88.7	(87.0 - 90.2)	↑2.1%
3	1 298	86.6	(84.8 - 88.3)	↑4.0%
4	1 124	84.8	(82.9 - 86.5)	↑3.5%
5	956	84.2	(82.2 - 86.0)	↑3.6%
6	789	83.4	(81.3 - 85.3)	↑3.2%
7	641	82.7	(80.6 - 84.7)	↑3.0%
8	518	82.8	(80.6 - 84.7)	↑4.0%
9	411	82.3	(80.1 - 84.4)	↑3.7%
10	263	82.0	(79.6 - 84.1)	↑4.3%

Figure 4.1 Overall 15-24 year cancer survival, 2008-2017



4.2 Survival by AYA diagnostic group

4.2.1 Five-year survival by AYA diagnostic group and subgroup

Five- year survival estimates for most diagnostic groups and major subgroups were higher than reported for 2000-2009 (See Figure 4.2.1). An exception was malignant CNS tumours which were 58.8% for 2008-2017 compared to 60.9% in 2000-2009. Five-year survival for AYA 15-24 years was greater than 90% for lymphomas (95.3%), germ cell tumours (93.7%), and melanomas (93.0%).

Table 4.2.1 provides survival estimates for all ten AYA diagnostic groups and 32 subgroups for AYA aged 15-24 years and 15-29 years.

Between 2008 and 2017, 140 15-29 year olds were diagnosed with breast carcinoma, with most cases among those in the upper age bracket. Five-year survival for breast cancer improved significantly from 63.5% in 2000-2009 (95% CI 53.0-72.3) to 87.0% in 2008-2017 (95% CI 79.3-92.0).

Survival for 15-24 year olds diagnosed with acute lymphoid leukaemia, a group which had been of concern in the 2000-2009 analysis improved from 68.2% to 78.6%. Survival for non-Hodgkin lymphoma also increased from 78.8% to 89.4%. Survival for bone tumours, at only 48.5% in 2000-2009, increased to 62.2%, mostly attributed to survival gains for Ewing tumours (63.5%, up from 43.5%).

Figure 4.2.1 Survival for AYA 15-24 years compared to the 2000-2009 period

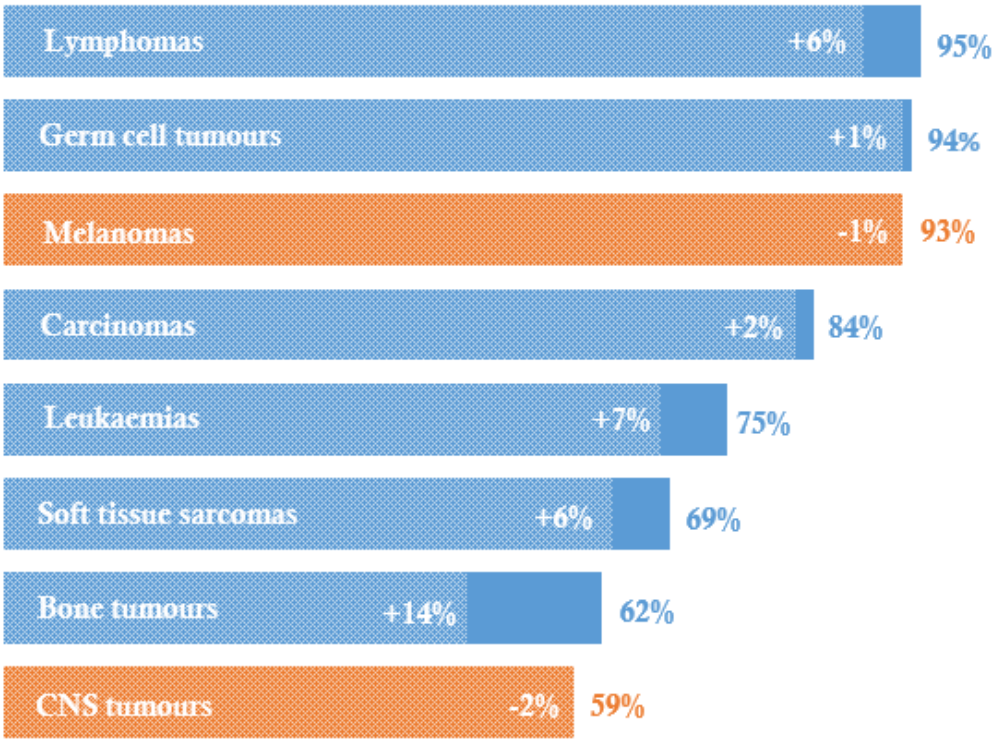


Table 4.2.1 Five-year survival by AYA diagnostic group and selected subgroups

	Survival 2008-2017 15-24 years			Survival 2008-2017 15-29 years		
	Total cases	Five-year survival (%) (95% CI)		Total cases	Five-year survival (%) (95% CI)	
1. Leukaemias	**188**	**75.3**	**(68.1 - 81.1)**	**263**	**75.8**	**(69.8 - 80.8)**
1.1 Acute lymphoid leukaemia	80	78.6	(67.1 - 86.5)	104	79.3	(69.5 - 86.3)
1.2 Acute myeloid leukaemia	75	68.1	(55.7 - 77.7)	108	68.4	(58.3 - 76.5)
1.3 Chronic myeloid leukaemia	28	88.3	(66.9 - 96.4)	41	85.8	(68.2 - 94.1)
1.4 Other & unspecified leukaemia	5	60.1	(12.6 - 88.4)	10	79.7	(39.7 - 94.7)
2. Lymphomas	**310**	**95.3**	**(92.1 - 97.2)**	**478**	**92.6**	**(89.7 - 94.7)**
2.1 Non-Hodgkin lymphoma	94	89.4	(80.9 - 94.3)	170	85.9	(79.6 - 90.4)
2.2 Hodgkin lymphoma	216	97.8	(94.3 - 99.3)	308	96.3	(93.2 - 98.1)
3. CNS tumours	**96**	**58.8**	**(47.4 - 68.5)**	**166**	**62.8**	**(53.9 - 70.5)**
3.1 Astrocytoma	47	54.8	(38.5 - 68.5)	86	49.4	(36.5 - 61.1)
3.2 Other gliomas	14	44.6	(15.7 - 70.4)	32	74.4	(51.4 - 87.8)
3.3 Ependymomo	15	71.7	(40.8 - 88.5)	20	78.6	(52.3 - 91.6)
3.4 Medulloblastoma & other PNET	15	69.7	(36-6 - 87.9)	17	73.5	(42.7 - 89.6)
3.5 Other specified intracranial & intraspinal neoplasms	1	[b]	[b]	2	100.3	[a]
3.6 Unspecified intracranial and intraspinal neoplasms	4	50.2	(5.8 - 84.8)	9	78.1	(36.6 - 94.3)
4. Bone tumours	**96**	**62.2**	**(50.6 - 71.9)**	**123**	**57.7**	**(47.4 - 66.7)**
4.1 Osteosarcoma	41	54.9	(35.7 - 70.6)	47	48.9	(31.8 - 64.0)
4.2 Chondrosarcoma	5	100.2	[a]	9	89.1	(43.4 - 98.6)
4.3 Ewing tumour	43	63.5	(46.7 - 76.4)	59	59.4	(44.6 - 71.4)
4.4 Other bone tumours	7	57.3	(7.6 - 88.8)	8	48.7	(7.7 - 81.8)
5. Soft tissue sarcomas	**68**	**68.6**	**(55.9 - 78.4)**	**94**	**69.3**	**(58.6 - 77.8)**
5.1 Fibromatous neoplasms	13	100.3	[a]	15	100.3	[a]
5.2 Rhabdomyosarcoma	20	43.6	(21.5 - 63.8)	22	42.4	(21.0 - 62.5)
5.3 Other soft tissue sarcoma	35	71.6	(53.5 - 83.7)	57	71.5	(57.6 - 81.6)
6. Germ cell tumours	**262**	**93.7**	**(89.6 - 96.2)**	**554**	**95.7**	**(93.4 - 97.2)**
6.1 Germ cell & trophoblastic neoplasms of gonads	245	94.2	(90.2 - 96.7)	526	96.1	(93.9 - 97.6)
6.2 Germ cell & trophoblastic neoplasms of non-gonadal sites	17	84.5	(49.9 - 96.2)	28	87.7	(65.7 - 96.2)
7. Melanomas	**203**	**93.0**	**(88.3 - 95.9)**	**473**	**95.1**	**(92.6 - 96.8)**
7.1 Melanoma	202	93.0	(88.3 - 95.9)	468	95.1	(92.5 - 96.8)
7.2 Skin carcinomas	1	100.1	[a]	5	100.3	[a]
8. Carcinomas	**374**	**83.6**	**(79.1 - 87.3)**	**1 010**	**83.7**	**(81.1 - 86.0)**
8.1 Thyroid carcinoma	98	95.3	(87.6 - 98.4)	244	99.6	(97.2 - 100.0)
8.2 Other carcinoma of head and neck	33	86.3	(66.8 - 94.9)	66	87.6	(75.1 - 94.2)
8.3 Carcinoma of trachea, bronchus & lung	13	68.0	(35.1 - 86.9)	20	58.9	(34.1 - 77.1)
8.4 Carcinoma of breast	25	90.3	(65.3 - 97.7)	140	87.0	(79.3 - 92.0)
8.5 Carcinoma of genitourinary tract	66	87.1	(75.7 - 93.5)	251	84.5	(79.1 - 88.6)
8.6 Carcinoma of gastrointestinal tract	135	73.1	(63.2 - 80.8)	279	70.5	(64.2 - 76.0)
8.7 Carcinoma of other ill-defined sites	4	50.1	(5.8 - 84.7)	10	69.5	(31.9 - 89.2)
9. Miscellaneous neoplasms, NOS	**30**	**72.3**	**(47.2 - 87.0)**	**55**	**77.3**	**(61.4 - 87.4)**
9.1 Other paediatric & embryonal tumours, NOS	8	56.3	(15.8 - 83.7)	10	55.0	(19.5 - 80.5)
9.2 Other specified & embryonal tumours, NOS	22	80.5	(49.7 - 93.6)	45	83.5	(66.2 - 92.5)
10. Unspecified malignant neoplasms	**8**	**74.2**	**(29.8 - 93.0)**	**20**	**59.1**	**(34.4 - 77.2)**
Total cancers diagnosed	**1 635**	**84.2**	**(82.2 - 86.0)**	**3 236**	**85.5**	**(84.1 - 86.7)**

[a] Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period
[b] Five-year relative survival could not be calculated as no cases had a full five-years of follow up

4.3 Survival by age group

4.3.1 Overall survival by age group

Survival estimates for AYA aged 20-24 years and 25-29 years are remarkably similar with one-year survival at 95%, three-year survival at 89%, five-year survival at 86-87% and ten-year survival at 84%.

Overall cancer survival estimates for the two older AYA age quintiles were consistently higher than for adolescents aged 15-19 years, with these differences often reaching statistical significance. However, although survival estimates for 15-19 year olds were typically 5-6% below that for those aged 20-24 and 25-29 years, we did also see the biggest survival improvements in this younger AYA quintile. Since the 2000-2009 period, three-year survival rose from 77.5% to 83.3% and five-year survival increased from 75.1% to 81.1%. In comparison, five-year relative survival for 10-14 year olds in 2005-2014 was 84.0% (see Appendix 5).[6]

The 2008-2017 period also saw less of a decline in survival over the ten-year follow-up period. The ***ten***-year survival estimate for 15-19 year olds diagnosed with cancer in 2008-2017 is now higher than the ***three***-year survival estimate for those diagnosed in the 2000-2009 period.

Table 4.3.1 AYA cancer relative survival by age group, 2008-2017

Years since diag-nosis	15-19 years				20-24 years				25-29 years			
	n	relative survival (95% CI)		change c.f. 2000-2009	n	relative survival (95% CI)		change c.f. 2000-2009	n	relative survival (95% CI)		change c.f. 2000-2009
1	659	90.8	(88.3 - 92.8)	↑ 0.6%	976	94.6	(93.0 - 95.9)	↑ 1.2%	1 601	94.7	(93.5 - 95.7)	↑ 0.2%
2	598	85.6	(82.6 - 88.1)	↑ 3.0%	923	90.8	(88.8 - 92.5)	↑ 1.3%	1 515	90.6	(89.1 - 92.0)	↓ 0.3%
3	501	83.3	(80.1 - 86.0)	↑ 5.8%	797	88.9	(86.7 - 90.8)	↑ 2.5%	1 285	89.0	(87.3 - 90.5)	↑ 0.8%
4	440	81.5	(78.2 - 84.4)	↑ 5.0%	684	87.0	(84.6 - 89.1)	↑ 2.1%	1 126	87.4	(85.6 - 89.0)	↑ 1.0%
5	375	81.1	(77.7 - 84.0)	↑ 6.0%	581	86.3	(83.7 - 88.4)	↑ 1.7%	952	86.8	(84.9 - 88.4)	↑ 1.4%
6	315	80.3	(76.8 - 83.3)	↑ 5.1%	474	85.5	(82.9 - 87.8)	↑ 1.6%	802	85.9	(83.9 - 87.6)	↑ 2.2%
7	269	79.0	(75.4 - 82.3)	↑ 4.5%	372	85.3	(82.6 - 87.6)	↑ 1.8%	661	85.4	(83.3 - 87.2)	↑ 2.7%
8	221	79.1	(75.4 - 82.3)	↑ 5.0%	297	85.3	(82.6 - 87.6)	↑ 3.0%	530	85.2	(83.1 - 87.1)	↑ 3.2%
9	180	79.1	(75.4 - 82.4)	↑ 5.7%	231	84.5	(81.5 - 87.0)	↑ 3.1%	377	85.0	(82.8 - 86.9)	↑ 3.5%
10	121	79.2	(75.5 - 82.4)	↑ 8.2%	142	83.8	(80.4 - 86.6)	↑ 1.4%	236	84.1	(81.6 - 86.4)	↑ 2.9%

NC = no change

4.3.2 Five-year relative survival by age group and AYA cancer classification scheme

Survival rates for 15-19 year olds were above 90% for lymphomas (93.4%) and melanomas (90.9%) but lowest across the age groups for CNS tumours (49.1%) and soft tissue sarcomas (53.2%) (See Figure 4.3.2a). By diagnostic subgroup, five-year survival for 15-19 year olds with Ewing tumours and acute lymphoid leukaemias, identified as groups of concern in the 2000-2009 analysis, rose in 2008-2017; from 45.9% to 73.1% for Ewing tumours and from 57.6% to 76.3% for acute lymphoid leukaemias. These remain below the survival rates reported for AYA 10-14 years for Ewing tumours (79.6%) and lymphoid leukaemias (91.6%) (See Appendix 5).

Compared to younger and older AYA, those aged 20-24 recorded the highest five-year survival rates for soft tissue sarcomas (81.4%) and lymphomas (96.9%). Figure 4.3.2b also shows that bone tumour survival improved from 43.5% in 2000-2009 to 61.5% in 2008-2017.

Five-year survival for 25-29 year olds diagnosed with lymphoma (87.7%, 95% CI 81.4-92.0) was up slightly from the 2000-2009 period but was significantly lower than what was recorded for 20-24 year olds (96.9%, 95 CI 92.2-98.9). Bone tumour survival for this older age group was 42.2%, compared to 62.7% and 61.5% for 15-19 year olds and 20-24 year olds respectively.

Figure 4.3.2a Survival for AYA 15-19 years compared to the 2000-2009 period

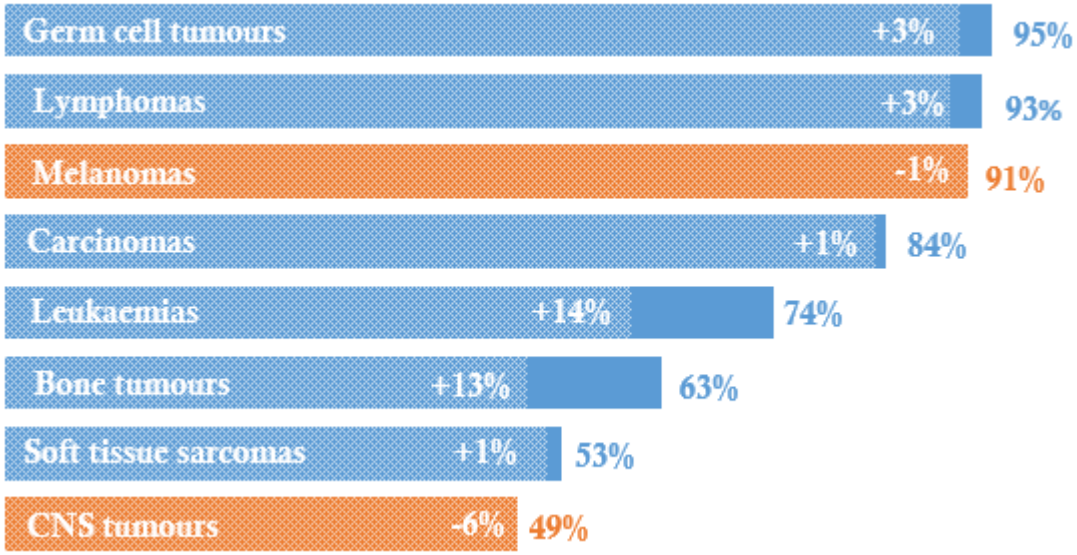


Figure 4.3.2b Survival for AYA 20-24 years compared to the 2000-2009 period

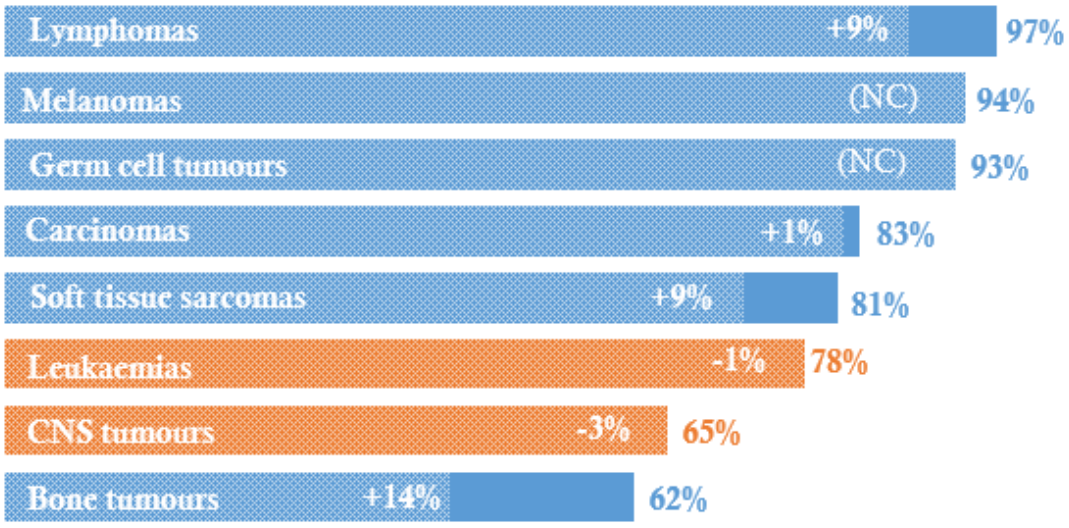


Table 4.3.2 AYA five-year relative survival by AYA cancer classification scheme, 2008-2017

AYA diagnostic group and subgroup	15-19 years			20-24 years			25-29 years		
	n	Five-year relative survival (%) (95% CI)		n	Five-year relative survival (%) (95% CI)		n	Five-year relative survival (%) (95% CI)	
1. Leukaemias	**110**	**73.5**	**(63.8 - 81.0)**	**78**	**78.1**	**(66.4 - 86.2)**	**75**	**77.1**	**(64.9 - 85.6)**
1.1 Acute lymphoid leukaemia	54	76.3	(61.7 - 86.0)	26	83.2	(60.4 - 93.7)	24	81.7	(57.9 - 93.0)
1.2 Acute myeloid leukaemia	43	66.7	(50.1 - 79.0)	32	70.0	(49.8 - 83.4)	33	69.4	(50.3 - 82.3)
2. Lymphomas	**148**	**93.4**	**(87.9 - 96.6)**	**162**	**96.9**	**(92.2 - 98.9)**	**168**	**87.7**	**(81.4 - 92.0)**
2.1 Non-Hodgkin lymphoma	49	85.7	(72.0 - 93.1)	45	93.5	(80.5 - 98.1)	76	81.7	(70.8 - 88.8)
2.2 Hodgkin lymphoma	99	97.2	(91.1 - 99.3)	117	98.2	(92.2 - 99.8)	92	92.6	(83.9 - 96.8)
3. CNS tumours	**38**	**49.1**	**(32.3 - 64.0)**	**58**	**64.8**	**(49.1 - 76.7)**	**70**	**67.7**	**(52.0 - 79.3)**
3.1 Astrocytoma	16	50.2	(24.6 - 71.3)	31	56.7	(35.1 - 73.6)	39	40.0	(20.0 - 59.4)
4. Bone tumours	**62**	**62.7**	**(47.8 - 74.5)**	**34**	**61.5**	**(41.6 - 76.4)**	**27**	**42.2**	**(21.9 - 61.3)**
4.1 Osteosarcoma	31	51.0	(29.3 - 69.2)	10	70.3	(33.0 - 89.5)	6	16.7	(0.8 - 51.9)
4.3 Ewing tumour	27	73.1	(51.3 - 86.3)	16	47.8	(21.5 - 70.2)	16	47.4	(18.6 - 71.8)
5. Soft tissue sarcomas	**31**	**53.2**	**(33.9 - 69.3)**	**37**	**81.4**	**(64.4 - 90.7)**	**26**	**71.0**	**(48.1 - 85.3)**
6. Germ cell tumours	**82**	**95.4**	**(87.7 - 98.5)**	**180**	**92.8**	**(87.3 - 96.0)**	**292**	**97.5**	**(94.8 - 99.0)**
6.1 Germ cell neoplasms of gonads	76	95.0	(86.7 - 98.3)	169	93.9	(88.5 - 96.8)	281	97.8	(95.0 - 99.2)
7. Melanoma	**56**	**90.9**	**(79.1 - 96.3)**	**147**	**93.9**	**(88.3 - 96.9)**	**270**	**96.7**	**(93.5 - 98.4)**
8. Carcinomas	**117**	**84.2**	**(75.2 - 90.2)**	**257**	**83.4**	**(77.8 - 87.7)**	**636**	**83.8**	**(80.4 - 86.6)**
8.1 Thyroid carcinoma	26	91.7	(70.2 - 98.0)	72	96.8	(86.9 - 99.4)	146	98.6	(93.8 - 99.8)
8.2 Other carcinoma of head & neck	13	67.0	(33.6 - 86.4)	20	100.3	[a]	33	89.2	(68.6 - 96.7)
8.4 Carcinoma of breast	2	100.2	[a]	23	89.5	(63.3 - 97.5)	115	86.3	(77.6 - 91.8)
8.5 Carcinoma of genitourinary tract	12	91.1	(50.9 - 98.9)	54	86.3	(73.3 - 93.3)	185	83.5	(76.9 - 88.4)
8.6 Carcinoma of gastrointestinal tract	57	84.0	(69.2 - 92.1)	78	66.1	(52.6 - 76.6)	144	67.7	(58.9 - 75.1)
9. Miscellaneous neoplasms	**11**	**76.9**	**(34.0 - 94.0)**	**19**	**66.7**	**(31.0 - 87.0)**	**25**	**82.3**	**(58.8 - 93.2)**
10. Unspecified neoplasms	**4**	**100.2**	[a]	**4**	**45.1**	**(3.3 - 83.1)**	**12**	**49.1**	**(19.7 - 73.3)**
Overall five-year cancer survival	**659**	**81.1**	**(77.7 - 84.0)**	**976**	**86.3**	**(83.7 - 88.4)**	**1 601**	**86.8**	**(84.9 - 88.4)**

[a] Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period
[b] Five-year relative survival could not be calculated as no cases had a full five-years of follow up

4.4 Survival by sex

4.4.1 Five-year relative survival for all AYA cancers, by sex

At five years of follow up, survival was 83.6% for males, a significant improvement of 5.8% from the 77.8% survival recorded in 2000-2009. For female AYA, survival increased slightly, from 83.5% to 84.9%.

Survival for males diagnosed with acute lymphoid leukaemia was 81.4% compared to 58.2% in 2000-2009. During this period survival for females diagnosed with non-Hodgkin lymphoma also improved from 81.4% to 94.4%.

Table 4.4.2 Five-year survival by sex and AYA diagnostic group and selected subgroups

	Males 15-24 years			Females 15-24 years		
	Total Cases	Five-year survival (%) (95% CI)		Total Cases	Five-year survival (%) (95% CI)	
1. Leukaemias	**117**	**74.0**	**(64.2 - 81.5)**	**71**	**77.1**	**(65.3 - 85.4)**
1.1 Acute lymphoid leukaemia	52	81.4	(66.8 - 90.2)	28	73.7	(52.2 - 86.7)
1.2 Acute myeloid leukaemia	43	59.7	(42.2 - 73.5)	32	78.1	(59.4 - 89.0)
2. Lymphomas	**171**	**95.0**	**(90.3 - 97.6)**	**139**	**95.5**	**(90.1 - 98.1)**
2.1 Non-Hodgkin lymphoma	59	86.5	(74.5 - 93.2)	35	94.4	(79.2 - 98.7)
2.2 Hodgkin lymphoma	112	99.5	(94.0 - 100.3)	104	96.0	(89.3 - 98.6)
3. CNS tumours	**56**	**57.8**	**(42.7 - 70.2)**	**40**	**61.8**	**(44.8 - 75.0)**
3.1 Astrocytoma	27	50.1	(29.4 - 67.7)	20	64.4	(39.3 - 81.3)
4. Bone tumours	**54**	**63.4**	**(47.7 - 75.6)**	**42**	**62.0**	**(44.1 - 75.7)**
4.1 Osteosarcoma	24	59.0	(32.6 - 78.1)	17	50.0	(22.1 - 72.7)
4.3 Ewing tumour	24	62.5	(40.1 - 78.6)	19	64.9	(37.4 - 82.7)
5. Soft tissue sarcomas	**34**	**55.8**	**(37.6 - 70.7)**	**34**	**81.5**	**(63.0 - 91.3)**
6. Germ cell tumours	**224**	**93.4**	**(88.8 - 96.2)**	**38**	**94.9**	**(80.7 - 98.8)**
6.1 Germ cell & trophoblastic neoplasms of gonads	210	94.2	(89.6 - 96.8)	35	94.4	(79.2 - 98.7)
7. Melanomas	**88**	**91.9**	**(83.4 - 96.3)**	**115**	**93.8**	**(87.3 - 97.1)**
8. Carcinomas	**113**	**81.6**	**(71.8 - 88.3)**	**261**	**84.5**	**(79.1 - 88.6)**
8.1 Thyroid carcinoma	24	82.9	(54.9 - 94.5)	74	98.7	(90.4 - 100.0)
8.2 Other carcinoma of head and neck	19	89.5	(63.4 - 97.6)	14	82.8	(46.6 - 95.5)
8.4 Carcinoma of breast	-	-	-	25	90.3	(65.3 - 97.7)
8.5 Carcinoma of genitourinary tract	6	82.2	(24.1 - 97.6)	60	87.7	(75.8 - 94.0)
8.6 Carcinoma of gastrointestinal tract	60	76.4	(60.8 - 86.6)	75	70.8	(57.1 - 80.9)
9. Miscellaneous neoplasms, NOS	**13**	**76.4**	**(30.8 - 94.3)**	**17**	**68.9**	**(36.0 - 87.3)**
10. Unspecified malignant neoplasms	**1**	**0.0**	[a]	**7**	**85.9**	**(33.5 - 98.0)**
Total cancers diagnosed	**871**	**83.6**	**(80.7 - 86.0)**	**764**	**84.9**	**(82.0 - 87.3)**

[a] Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period

4.5 Survival by ethnicity

The following section reports AYA cancer survival by prioritised ethnicity; Māori, Pacific Peoples, and non-Māori/non-Pacific Peoples. As noted earlier, any between-group differences must be interpreted with caution as even seemingly large between-group differences may not be statistically significant due to the small number of cases.

4.5.1 Relative survival for all AYA cancers, 15-24 years by ethnicity

The 2008-2017 period saw AYA cancer survival rates for Māori and Pacific Peoples improve at each year of follow up, with five-year survival improving by 8.1% for Māori and 9.7% for Pacific Peoples compared to 2000-2009 (see Table 4.5.1 and Figure 4.5). The survival gains were not as large for the non-Māori/non-Pacific Peoples group, which had a five-year survival improvement of 2.5%.

Notably, one-year survival for Pacific Peoples improved from 78.2% in 2000-2009 to 90.6% in 2008-2017. Although survival for Pacific Peoples decreased by 7.3% to 83.3% in the year following, this was the only year in which a statistically significant difference was identified between survival estimates for Pacific Peoples compared with non-Māori/non-Pacific Peoples. Survival estimates for Pacific Peoples remained stable thereafter and by ten years, the survival estimate for Pacific AYA was 3.1% below that for non-Māori/non-Pacific Peoples, whereas in the previous period the gap was 12.9%.

Although the ethnic survival gap has narrowed during this period, Māori continued to have significantly poorer survival than non-Māori/non-Pacific AYA at each year of follow up. Five-year survival for Māori was 77.6%, 9.1% lower than the survival rate for non-Māori/non-Pacific Peoples.

For the first time we have also reported survival for AYA of Asian prioritised ethnicity (see Appendix 4). The five-year survival estimate for the 112 Asian 15-24 year olds included in the survival analysis was the highest of the four ethnic groups at 89.2% (95% CI: 81.6-93.9).

When comparing AYA survival rates to those reported for children aged 0-14 years,[6] five-year survival rates were similar for Pacific Peoples (78.5% for children c.f. 81.0% for AYA), and Māori (79.4% for children c.f. 77.6% for AYA) and identical for non-Māori/non-Pacific Peoples (85.7%) (See Appendix 5).

Table 4.5.1 Relative survival for all AYA cancers, 15-24 years by ethnicity

Years since diag-nosis	Māori				Pacific Peoples				Non-Māori/Non-Pacific Peoples			
	n	relative survival (95% CI)		change c.f. 2000-2009	n	relative survival (95% CI)		change c.f. 2000-2009	n	relative survival (95% CI)		change c.f. 2000-2009
1	356	**89.4**	(85.7 - 92.2)	⬆ 0.7%	158	**90.6**	(84.8 - 94.2)	⬆12.4%	1 121	**94.6**	(93.1 - 95.8)	⬆0.6%
2	318	**85.0**	(80.8 - 88.3)	⬆ 4.6%	143	**83.3**	(76.4 - 88.4)	⬆10.9%	1 060	**90.6**	(88.7 - 92.2)	⬆1.2%
3	268	**82.0**	(77.4 - 85.7)	⬆ 8.1%	119	**82.6**	(75.6 - 87.8)	⬆11.3%	911	**88.7**	(86.6 - 90.5)	⬆ 2.9%
4	227	**78.9**	(74.0 - 83.0)	⬆ 7.8%	101	**80.9**	(73.6 - 86.4)	⬆ 9.6%	796	**87.2**	(85.0 - 89.1)	⬆ 2.4%
5	187	**77.6**	(72.5 - 81.9)	⬆ 8.1%	89	**81.0**	(73.6 - 86.5)	⬆ 9.7%	680	**86.7**	(84.4 - 88.7)	⬆ 2.5%
6	154	**77.1**	(71.9 - 81.5)	⬆ 7.6%	73	**81.0**	(73.7 - 86.5)	⬆ 9.6%	562	**85.7**	(83.3 - 87.8)	⬆ 2.1%
7	120	**74.9**	(69.2 - 79.8)	⬆ 5.3%	59	**81.1**	(73.7 - 86.6)	⬆ 9.7%	462	**85.4**	(82.9 - 87.5)	⬆ 2.5%
8	89	**75.0**	(69.3 - 79.8)	⬆ 6.5%	50	**81.1**	(73.7 - 86.6)	⬆12.7%	379	**85.4**	(82.9 - 87.6)	⬆ 3.1%
9	67	**75.0**	(69.3 - 79.8)	⬆ 6.4%	36	**81.1**	(73.8 - 86.7)	⬆12.6%	308	**84.8**	(82.1 - 87.1)	⬆ 2.8%
10	43	**75.1**	(69.4 - 79.9)	⬆ 9.3%	22	**81.2**	(73.8 - 86.7)	⬆12.7%	198	**84.3**	(81.4 - 86.8)	⬆ 2.9%

4.5.2 Five-year relative survival for all AYA cancers by age group and ethnicity

Table 4.5.2 shows that the largest survival gains compared to the 2000-2009 period were seen for Māori (+8.7%) and Pacific adolescents (+11.2%). Compared to non-Māori/non-Pacific AYA aged 20-24 years, a wider survival gap was identified for Māori (8.8%) than for Pacific Peoples (3.7%).

Five-year survival estimates for Māori (79.9%) and Pacific (76.7%) 25-29 year olds were both significantly below that for non-Māori/non-Pacific Peoples (89.4%). There was also a comparative lack of survival improvements seen for Māori and Pacific Peoples aged 25-29 years compared to those age 15-24 years who are currently supported by AYA Cancer Services. This finding can be seen as an endorsement of the work undertaken in the past decade by AYA Cancer Services, the AYA Cancer Network Aotearoa, and others to address New Zealand's ethnic survival disparities and to provide targeted support for Māori and Pacific 12-24 year olds undergoing cancer treatment.

Table 4.5.2 Five-year relative survival for all AYA cancers by age group and ethnicity

AYA diagnostic group and subgroup	15-19 years				20-24 years				25-29 years			
	n	Five-year relative survival (%) (95% CI)		change c.f. 2000-2009	n	Five-year relative survival (%) (95% CI)		change c.f. 2000-2009	n	Five-year relative survival (%) (95% CI)		change c.f. 2000-2009
Māori	143	**74.5**	(66.0 - 81.3)	↑8.7%	213	**79.7**	(73.0 - 84.9)	↑7.1%	288	**79.9**	(74.4 - 84.3)	↑2.5%
Pacific Peoples	75	**76.8**	(65.2 - 85.0)	↑11.2%	83	**84.8**	(74.5 - 91.2)	↑6.8%	117	**76.7**	(67.2 - 83.8)	NC
Non-Māori/Non-Pacific Peoples	441	**83.9**	(79.9 - 87.2)	↑5.0%	680	**88.5**	(85.6 - 90.8)	↑0.8%	1 196	**89.4**	(87.4 - 91.1)	↑1.5%
Total	659	**81.1**	(77.7 - 84.0)	↑6.0%	976	**86.3**	(83.7 - 88.4)	↑1.7%	1 536	**86.8**	(84.9 - 88.4)	↑1.4%

NC = no change

4.5.3 Five-year relative survival by ethnicity and AYA cancer classification scheme

When comparing across prioritised ethnicity and diagnostic groups, the poorest survival was for Māori AYA diagnosed with CNS tumours (34.8%). The 2000-2009 analysis showed particularly poor survival for Māori diagnosed with bone tumours (37.0%) and while this improved to 52.1% for the 2008-2017 period it was still the lower than the survival rate reported for Pacific Peoples (79.6%) and non-Māori/non-Pacific Peoples (63.4%).

Table 4.5.3 AYA cancer five-year relative survival by ethnicity and AYA diagnostic group and selected subgroups

AYA Diagnostic group and subgroup	Māori			Pacific Peoples			Non-Māori/Non-Pacific Peoples		
	n	Five-year relative survival (%) (95% CI)		n	Five-year relative survival (%) (95% CI)		n	Five-year relative survival (%) (95% CI)	
1. Leukaemias	**51**	**75.0**	**(59.8 - 85.2)**	**32**	**71.7**	**(52.4 - 84.3)**	**105**	**76.6**	**(66.7 - 84.0)**
1.1 Acute lymphoid leukaemia	18	75.4	(46.4 - 90.3)	15	73.0	(42.8 - 89.1)	47	82.4	(67.5 - 90.9)
1.2 Acute myeloid leukaemia	20	79.9	(54.6 - 92.1)	14	64.4	(34.4 - 83.5)	41	63.3	(45.5 - 76.7)
2. Lymphomas	**55**	**91.1**	**(79.6 - 96.4)**	**23**	**96.0**	**(73.2 - 99.7)**	**232**	**96.2**	**(92.5 - 98.1)**
2.1 Non-Hodgkin lymphoma	21	80.7	(55.9 - 92.5)	12	92.0	(54.1 - 99.1)	61	91.9	(81.3 - 96.7)
2.2 Hodgkin lymphoma	34	97.3	(81.1 - 99.9)	11	100.3	[a]	171	97.7	(93.5 - 99.3)
3. CNS tumours	**19**	**34.8**	**(14.6 - 56.1)**	**8**	**62.7**	**(23.0 - 86.3)**	**69**	**64.9**	**(51.1 - 75.7)**
4. Bone tumours	**30**	**52.1**	**(30.9 - 69.7)**	**15**	**79.6**	**(48.8 - 93.1)**	**51**	**63.4**	**(47.1 - 75.9)**
4.1 Osteosarcoma	7	28.7	(4.1 - 61.4)	11	81.2	(43.0 - 95.2)	23	52.7	(24.9 - 74.5)
4.3 Ewing tumour	19	63.8	(35.9 - 82.2)	3	66.9	(5.4 - 94.9)	21	62.1	(38.2 - 79.1)
5. Soft tissue sarcomas	**14**	**56.9**	**(27.9 - 78.0)**	**8**	**74.2**	**(29.8 - 93.1)**	**46**	**71.3**	**(55.6 - 82.3)**
6. Germ cell tumours	**68**	**91.7**	**(80.6 - 96.7)**	**25**	**92.3**	**(71.9 - 98.2)**	**169**	**94.7**	**(89.6 - 97.4)**
7. Melanoma	**13**	**83.7**	**(48.5 - 95.9)**	**1**	**100.2**	[a]	**189**	**93.6**	**(88.8 - 96.4)**
8. Carcinomas	**98**	**81.3**	**(71.4 - 88.1)**	**41**	**81.5**	**(64.6 - 90.9)**	**235**	**85.1**	**(79.2 - 89.4)**
8.1 Thyroid carcinoma	17	87.7	(58.6 - 97.0)	14	91.8	(54.0 - 99.0)	67	98.1	(86.3 - 99.9)
8.2 Other carcinoma of head & neck	6	100.4	[a]	4	75.2	(12.8 - 96.4)	23	85.3	(60.4 - 95.2)
8.4 Carcinoma of breast	6	100.2	[a]	4	100.2	[a]	15	83.4	(47.1 - 95.8)
8.5 Carcinoma of genitourinary tract	14	93.0	(59.2 - 99.2)	4	100.2	[a]	48	84.2	(69.4 - 92.2)
8.6 Carcinoma of gastrointestinal tract	52	77.2	(62.2 - 86.9)	13	62.0	(25.2 - 84.9)	70	72.0	(56.5 - 82.8)
9. Miscellaneous neoplasms	**6**	**75.2**	**(12.8 - 96.4)**	**2**	**50.1**	**(0.6 - 91.2)**	**22**	**77.1**	**(49.3 - 91.0)**
10. Unspecified neoplasms	**2**	**50.1**	**(0.6 - 91.3)**	**3**	**66.8**	**(5.4 - 94.7)**	**3**	**100.2**	[a]
Overall five-year cancer survival	**356**	**77.6**	**(72.5 - 81.9)**	**158**	**81.0**	**(73.6 - 86.5)**	**1 121**	**86.7**	**(84.4 - 88.6)**

[a] Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period

4.6 Survival by residence

The following section reports survival according to urban or rural residence, the level of deprivation, and distance from the tertiary hospital within the six AYA cancer regions. The survival estimates reported in this section need to be interpreted extremely cautiously. The travel distance reported is 'as the crow flies' and does not fully reflect the travel time between the AYA's residence and the tertiary hospital. Also, the NZCR does hold data regarding where an individual received their cancer treatment. Some AYA may have to travel outside of their cancer region for part of their treatment while others may not require their cancer care to be delivered in a tertiary hospital.

Four DHBs had fewer than twenty cases over the entire ten-year study period and therefore the outcome of a single case can have a considerable impact on the survival estimates. This is reflected in the wide confidence intervals reported. In addition, each DHB had a different profile in terms of ethnic composition, levels of deprivation and geographic spread all of which may contribute to any survival differences identified.

Approximately one in five AYA lived more than 100 kilometres from their tertiary hospital and a further 11.6% lived between 50 and 99 kilometres away. Five-year survival rates were lowest for AYA who resided 50-99 km from their region AYA Cancer Centre (77.5% c.f. 86.7% for those less than 20km away). This may indicate that there are travel barriers for AYA in this group. Unlike those who live further away, these young people may not be eligible for travel support but could still find it difficult to travel to their tertiary hospital for treatment and appointments.

We can see a clear trend whereby the highest survival rates are for those who reside within 20km of the tertiary hospital, live in a major urban area, and have low levels of deprivation. Those living in the highest 1evels of deprivation recorded the poorest survival rates, with a survival difference of 9.6% between deprivation levels 1 and 4.

Table 4.6a AYA cancer five-year relative survival by residence at diagnosis

	n	%	Five-year relative survival (95% CI)	
Distance from Treatment Centre				
0-19 km	856	52.5	86.7	(84.0 - 88.9)
20-49 km	246	15.1	84.5	(78.9 - 88.7)
50-99 km	189	11.6	77.5	(70.6 - 83.0)
100+ km	336	20.7	81.0	(76.0 - 85.1)
Rural – Urban Residence				
Main Urban Area	1 210	74.3	84.9	(82.6 - 86.9)
Secondary / Minor Urban Area	227	13.9	82.1	(76.2 - 86.7)
Rural Area	192	11.8	81.4	(74.6 - 86.5)
Level of Deprivation				
Deprivation 1 (Low)	269	16.5	88.8	(84.0 - 92.2)
Deprivation 2	280	17.2	86.9	(82.0 - 90.5)
Deprivation 3	314	19.3	85.0	(80.2 - 88.7)
Deprivation 4	314	19.3	79.2	(74.0 - 83.5)
Deprivation 5 (High)	452	27.8	82.5	(78.4 - 85.9)
Total [b]	**1 629**	**100.0**	**84.2**	**(82.2 - 86.0)**

[a] Totals vary slightly from other sections due to a small number of NZCR-reported cases having no domicile assigned. The few cases from the Chatham Islands were excluded from this analysis

Survival estimates for the six AYA cancer regions ranged from 77.4% - 90.8%. The difference in survival for those residing in the Midland AYA cancer region (77.4%) compared to those in the South Island (Canterbury: 87.8%, and Southern 90.8%) reached statistical significance.

Table 4.6b AYA cancer five-year relative survival by DHB and AYA Cancer Region

DHB / AYA Region of Residence at diagnosis	n	%	Five-year relative survival (95% CI)	
Auckland – Northland	**593**	**36.4**	**84.8**	**(81.4 - 87.7)**
Northland	59	3.6	75.9	(61.8 - 85.4)
Waitematā	177	10.9	83.6	(76.8 - 88.6)
Auckland [a]	178	10.9	90.8	(85.3 - 94.4)
Counties-Manukau	179	11.0	82.8	(75.5 - 88.1)
Midland	**267**	**16.4**	**77.4**	**(71.6 - 82.2)**
Waikato [a]	131	8.0	80.4	(71.9 - 86.5)
Lakes	40	2.5	72.6	(55.8 - 83.9)
Bay of Plenty	79	4.8	75.6	(63.8 - 84.1)
Tairāwhiti	17	1.0	75.1	(46.2 - 90.0)
MidCentral	**202**	**12.4**	**80.7**	**(74.1 - 85.8)**
Taranaki	44	2.7	90.7	(76.7 - 96.6)
Hawke's Bay	60	3.7	71.5	(56.9 - 82.0)
Whanganui	18	1.1	71.0	(43.5 - 87.0)
MidCentral [a]	80	4.9	84.5	(74.0 - 91.0)
Capital & Coast	**194**	**11.9**	**86.3**	**(80.2 - 90.7)**
Hutt	47	2.9	85.5	(59.9 - 93.5)
Capital & Coast [a]	133	8.2	86.8	(79.3 - 91.7)
Wairarapa	14	0.9	85.4	(52.8 - 96.4)
Canterbury	**265**	**16.3**	**87.8**	**(82.9 - 91.3)**
Nelson-Marlborough	38	2.3	91.8	(76.2 - 97.5)
West Coast	12	0.7	83.6	(48.3 - 95.9)
Canterbury [a]	190	11.7	87.8	(81.8 - 91.9)
South Canterbury	25	1.5	84.2	(63.0 - 93.9)
Southern DHB [a]	**108**	**6.6**	**90.8**	**(83.3 - 95.1)**
TOTAL	**1 629**	**100.0**	**84.2**	**(82.2 - 86.0)**

[a] DHB where AYA regional cancer services (including the AYA keyworkers) are based

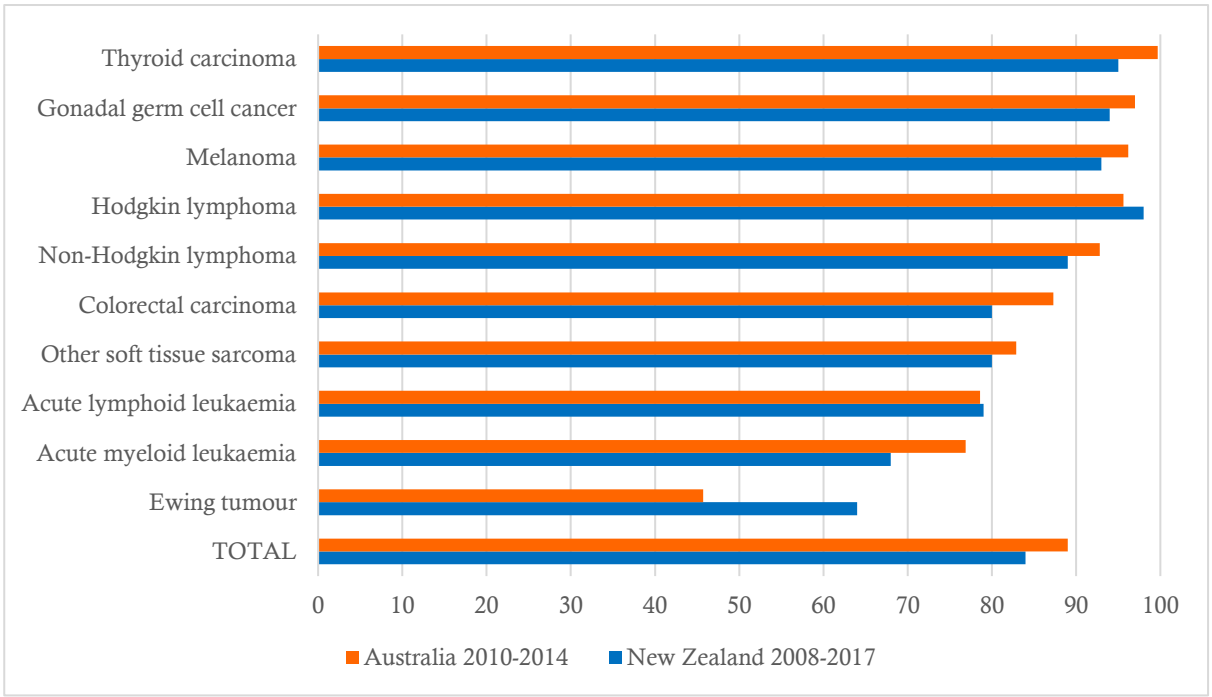
4.7 International AYA cancer survival international comparisons

The lack of international agreement on the AYA age-range and how AYA cancers should be classified makes it difficult to compare New Zealand survival rates with data published by other countries. However, it is important that we do compare AYA cancer survival with international benchmarks where possible in order to set targets for improvement. The following section includes data from Australia, France and the United Kingdom for a similar time-period. It must be emphasised that any differences in the survival reported should be interpreted extremely cautiously due to differences in inclusion criteria, statistical methods used, and the small number of New Zealand AYA cases for many of the diagnostic groups/subgroups.

New Zealand's overall five-year relative survival rate for those aged 15-24 years (84.2%) was lower than that reported by Australia for the 2010-2014 period (89.0%, see Figure 4.7a).[11] However, this has narrowed from the 6.6% survival gap identified for the 2000-2009 period. Figure 4.7b shows that for the ten most commonly diagnosed cancers in Australia the greatest survival differences were for those AYA with colorectal carcinoma and acute myeloid leukaemia. New Zealand reported a higher survival rate for Ewing tumours (63.5%) than Australia (45.7%).

For the 2000-2015 period, France reported an observed survival rate of 86.6% for 15-24 year olds.[13] England – which uses a Teenagers and Young Adults age definition of 13-24 years – reported similar survival rates to New Zealand for their most recently reported 2007-2011 period; five-year survival for males was 84% and for females was 87%.[12]

Figure 4.7b New Zealand survival 2008-2017 compared to survival for the 10 most commonly diagnosed cancers in Australia 2010-2014



Appendix

A1 Abbreviations

AYA	Adolescents and Young Adult(s)
CI	Confidence interval
CNS	Central Nervous System
DHB	District Health Board
ICCC-3	International Classification of Childhood Cancer, Third edition
ICD-O-3-1	International Classification of Diseases for Oncology, third edition, first revision
NC	No Change
NZCCR	New Zealand Children's Cancer Registry
NZCR	New Zealand Cancer Registry
MOH	Ministry of Health
PNET	Peripheral Neuro Ectodermal Tumours
RR	Relative risk
SEER	Surveillance, Epidemiology and End Results (U.S. Cancer Statistics)
TYA	Teenagers and Young Adults
WHO	World Health Organisation

A2 AYA cancer classification scheme based on ICD-O-3 Site and Histology[12]

Diagnostic Group / Subgroup	ICD-O-3 Histology	ICD-O-3 Site
1 Leukemias		
1.1 Acute lymphoid leukemia	C000-C809	9826-9827, 9835-9837
1.2 Acute myeloid leukemia	C000-C809	9840, 9861, 9866-9867, 9871-9874, 9891, 9895-9897, 9910, 9920
1.3 Chronic myeloid leukemia	C000-C809	9863, 9875-9876
1.4 Other and unspecified leukemia	C000-C809	9742, 9800-9801, 9805, 9820, 9823, 9831-9834, 9860, 9870, 9930-9931, 9940, 9945-9946, 9948, 9963-9964
2 Lymphomas		
2.1 Non-Hodgkin lymphoma	C000-C809	9590-9591, 9596, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687, 9689-9691, 9695, 9698-9702, 9705, 9708-9709, 9714, 9716-9719, 9727-9729
2.2 Hodgkin lymphoma	C000-C809	9650-9655, 9659, 9661-9665, 9667
3 CNS and Other Intracranial and Intraspinal Neoplasms (all behaviours)		
3.1. Astrocytoma		
3.1.1 Specified low-grade astrocytic tumors	*C723*	*9380*
	C000-C809	*9410-9411, 9420-9421, 9424*
3.1.2 Glioblastoma and anaplastic astrocytoma	*C000-C809*	*9401, 9440-9442*
3.1.3 Astrocytoma, NOS	C000-C809	9400
3.2 Other glioma	C000-C722, C724-C809	9380
	C000-C809	9381-9384, 9423, 9430, 9450-9451, 9460
3.3 Ependymoma	C000-C809	9391-9394
3.4. Medulloblastoma and other PNET		
3.4.1 Medulloblastoma	*C716*	*9470-9474*
3.4.2 Supratentorial PNET	*C000-C715, C717-C809*	*9470-9474*
3.5 Other specified intracranial and intraspinal neoplasms	C000-C699, C730-C750, C754-C809	9350-9351, 9360-9362, 9390, 9480, 9530-9535, 9537-9539, 9541, 9550, 9562, 9570
	C700-C729, C751-C753	9161, 9361-9362, 9390, 9530-9531, 9535, 9538, 9540, 9560, 9571
	C700	9532, 9534, 9537, 9539
	C753	9360
	C711	9480, 9539
	C713	9480, 9533
	C719	9350
	C714,C717	9480
	C709	9539
3.6 Unspecified intracranial and intraspinal neoplasms		
3.6.1 Unspecified malignant intracranial and intraspinal neoplasms	C700-C729, C751-C753	8000-8005
3.6.2 Unspecified benign/borderline intracranial and intraspinal neoplasms	C700-C729, C751-C753	8000-8005
4 Osseous & Chondromatous Neoplasms		
4.1 Osteosarcoma	C000-C809	9180-9187, 9192-9194
4.2 Chondrosarcoma	C000-C809	9220-9221, 9230-9231, 9240, 9242-9243
4.3 Ewing tumor	C000-C809	9260, 9364-9365
4.4 Other specified and unspecified bone tumors	C000-C809	8812, 9250, 9261, 9370-9372
	C400-C419	8000-8005, 8800-8803, 8805-8806, 9200

Diagnostic Group / Subgroup	ICD-O-3 Histology	ICD-O-3 Site
5 Soft Tissue Sarcomas		
5.1 Fibromatous neoplasms	C000-C809	8810-8811, 8813-8815, 8820-8824, 8830, 8832-8833, 8835-8836, 9252
5.2 Rhabdomyosarcoma	C000-C809	8900-8904, 8910, 8912, 8920-8921, 8991
5.3 Other soft tissue sarcoma		
5.3.1 Specified soft tissue sarcoma		
5.3.1.1 Specified (excluding Kaposi sarcoma)	C000-C809	8804, 8825, 8840-8897, 8982-8983, 8990, 9040-9044, 9120-9139, 9141-9150, 9170, 9251, 9561, 9580-9581, 9970
	C000-C699, C730-C750, C754-C809	9540, 9560, 9571
5.3.1.2 Kaposi sarcoma	C000-C809	9140
5.3.2 Unspecified soft tissue sarcoma	C000-C399, C420-C809	8800-8803, 8805-8806
6 Germ Cell and Trophoblastic Neoplasms		
6.1 Germ cell and trophoblastic neoplasms of gonads	C569,C620-C629	9060-9065, 9070-9073, 9080-9085, 9090-9091, 9100-9102, 9105
6.2 Germ cell and trophoblastic neoplasms of non-gonadal sites		
6.2.1 Intracranial (all behaviors)	C700-C729, C751-C753	9060-9065, 9070-9073, 9080-9085, 9090-9091, 9100-9102, 9105
6.2.2 Other non-gonadal	C000-C568, C570-C619, C630-C699, C730-C750, C754-C809	9060-9065, 9070-9073, 9080-9085, 9090-9091, 9100-9102, 9104-9105
7 Melanoma and Skin Carcinomas		
7.1 Melanoma	C000-C809	8720-8723, 8726, 8728, 8730, 8740-8746, 8761, 8770-8774, 8780
7.2 Skin carcinomas	C440-C449	8010-8589
8 Carcinomas		
8.1 Thyroid carcinoma	C739	8010-8589
8.2 Other carcinoma of head and neck		
8.2.1 Nasopharyngeal carcinoma	C110-C119	8010-8589
8.2.2 Other sites in lip, oral cavity and pharynx	C000-C109, C120-C148	8010-8589
8.2.3 Nasal cav,mid ear,sinuses,larynx,oth ill-def head/neck	C300-C329, C760	8010-8589
8.3 Carcinoma of trachea,bronchus, and lung	C330-C349	8010-8589
8.4 Carcinoma of breast	C500-C509	8010-8589
8.5 Carcinoma of genitourinary tract		
8.5.1 Carcinoma of kidney	C649	8010-8589
8.5.2 Carcinoma of bladder	C670-C679	8010-8589
8.5.3 Carcinoma of gonads	C569,C620-C629	8010-8589
	C000-C809	8590-8593
8.5.4 Carcinoma of cervix and uterus	C530-C559	8010-8589
8.5.5 Carc of other and ill-def sites, geniourinary tract	C510-C529, C570-C579, C600-C619, C630-C639, C659,C669, C680-C689	8010-8589

Diagnostic Group / Subgroup	ICD-O-3 Histology	ICD-O-3 Site
8.6 Carcinoma of gastrointestinal tract		
8.6.1 Carcinoma of colon and rectum	C180-C218	8010-8589
8.6.2 Carcinoma of stomach	C160-C169	8010-8589
8.6.3 Carcinoma of liver and intrahepatic bile ducts	C220-C221	8010-8589
8.6.4 Carcinoma of pancreas	C250-C259	8010-8589
8.6.5 Carcinoma other and ill-def sites, gastrointestinal tract	C150-C159, C170-C179, C230-C249, C260-C269	8010-8589
8.7 Carcinoma of other and ill-def sites		
8.7.1 Adrenocortical carcinoma	C740-C749	8010-8589
8.7.2 Carcinoma of other and ill-defined sites, NOS	C149, C219, C222-C229, C270-C299, C350-C439, C450-C499, C561-C568, C580-C599, C640-C648, C650-C658, C660-C668, C690-C738, C750-C759, C761-C809	8010-8589
	C809	9010
9 Miscellaneous specified neoplasms, NOS		
9.1 Other pediatric and embryonal tumors, NOS		
9.1.1 Wilms tumor	C000-C809	8959-8960
9.1.2 Neuroblastoma	C000-C809	9490, 9500
9.1.3 Other pediatric and embryonal tumors, NOS	C000-C809	8963-8964, 8970-8973, 8981, 9363, 9501-9523
9.2 Other specified and embryonal tumors, NOS		
9.2.1 Paraganglioma and glomus tumors	C000-C809	8680-8711
9.2.2 Other specified gonadal tumors	C000-C809	8600-8650, 9000
	C569	8670, 9013-9015, 9054
9.2.3 Myeloma, mast cell, misc. lymphoreticular neo., NOS	C000-C809	9731-9741, 9743-9764, 9766, 9769, 9960
9.2.4 Other specified neoplasms, NOS	C000-C809	8930-8951, 8980, 9020, 9050-9053, 9110, 9160, 9270-9330, 9950, 9962, 9980, 9982
	C421	9961, 9975, 9989
	C000-C699, C730-C750, C754-C809	9161
10 Unspecified Malignant Neoplasms	C000-C399, C420-C699, C730-C750, C754-C809	8000-8005
Unclassified		

Retrieved from: **http://seer.cancer.gov/ayarecode/**

A3 Cancer incidence for AYA for four prioritised ethnic groups

	Māori 15-24 years 2008-2017			Pacific Peoples 15-24 years 2008-2017			Asian 15-24 years 2008-2017			All Other 15-24 years 2008-2017		
	Total cases	Age-standardised incidence (per million) (95% CI)		Total cases	Age-standardised incidence (per million) (95% CI)		Total cases	Age-standardised incidence (per million) (95% CI)		Total cases	Age-standardised incidence (per million) (95% CI)	
1. Leukaemias	**51**	**39.3**	**(28.5 - 50.1)**	**33**	**60.7**	**(40.0 - 81.4)**	**17**	**18.5**	**(9.6 - 27.4)**	**89**	**24.8**	**(19.7 - 30.0)**
1.1 Acute lymphoid leukaemia	18	13.8	(7.4 - 20.2)	15	27.4	(13.5 - 41.3)	7	8.6	(2.2 - 15.1)	40	11.1	(7.7 - 14.6)
1.2 Acute myeloid leukaemia	20	15.3	(8.6 - 22.0)	15	27.4	(13.5 - 41.3)	7	7.1	(1.8 - 12.5)	35	9.8	(6.5 - 13.0)
2. Lymphomas	**56**	**43.9**	**(32.4 - 55.5)**	**23**	**42.9**	**(25.3 - 60.4)**	**18**	**19.4**	**(10.3 - 28.5)**	**215**	**60.0**	**(52.0 - 68.0)**
2.1 Non-Hodgkin lymphoma	21	16.2	(9.3 - 23.2)	12	22.2	(9.6 - 34.8)	9	9.7	(3.3 - 16.1)	53	14.8	(10.8 - 18.8)
2.2 Hodgkin lymphoma	35	27.7	(18.5 - 36.9)	11	20.6	(8.4 - 32.8)	9	9.7	(3.3 - 16.1)	162	45.2	(38.2 - 52.2)
3. CNS tumours	**19**	**14.8**	**(8.1 - 21.5)**	**48**	**15.1**	**(4.6 - 25.6)**	**9**	**10.1**	**(3.4 - 16.7)**	**61**	**17.0**	**(12.8 - 21.3)**
3.1 Astrocytoma	9	7.2	(2.5 - 12.0)	6	11.2	(2.2 - 20.2)	3	3.1	(0.0 - 6.7)	30	8.4	(5.4 - 11.4)
4. Bone tumours	**30**	**23.0**	**(14.7 - 31.2)**	**15**	**27.9**	**(13.8 - 42.1)**	**5**	**6.1**	**(0.7 - 11.4)**	**47**	**13.1**	**(9.4 - 16.8)**
4.1 Osteosarcoma	7	5.2	(1.3 - 9.0)	11	20.3	(8.3 - 32.3)	2	2.6	(0.0 - 6.2)	22	6.1	(3.6 - 8.7)
4.3 Ewing tumour	19	14.5	(8.0 - 21.1)	3	5.7	(0.0 - 12.1)	1	2.2	(0.0 - 3.8)	20	5.6	(3.1 - 8.0)
5. Soft tissue sarcomas	**14**	**11.1**	**(5.3 - 16.9)**	**8**	**15.3**	**(4.7 - 25.9)**	**3**	**3.5**	**(0.0 - 7.5)**	**43**	**12.0**	**(8.4 - 15.6)**
6. Germ cell tumours	**68**	**55.1**	**(41.9 - 68.2)**	**25**	**47.3**	**(28.7 - 65.9)**	**17**	**18.8**	**(9.8 - 27.9)**	**152**	**42.5**	**(35.7 - 49.2)**
6.1 Germ cell & trophoblastic neoplasms of gonads	65	52.7	(39.8 - 65.5)	23	43.6	(25.7 - 61.4)	15	16.7	(8.1 - 25.2)	142	39.7	(33.2 - 46.2)
7. Melanoma and skin carcinomas	**13**	**10.5**	**(4.8 - 16.2)**	**1**	**2.0**	**(0.0 - 5.8)**	**2**	**1.8**	**(0.0 - 4.3)**	**187**	**52.3**	**(44.8 - 59.8)**
8. Carcinomas	**100**	**81.1**	**(65.2 - 97.0)**	**43**	**80.9**	**(56.7 - 105.1)**	**41**	**41.0**	**(28.3 - 53.7)**	**197**	**55.0**	**(47.4 - 62.7)**
8.1 Thyroid carcinoma	18	15.0	(8.0 - 21.9)	14	26.3	(12.5 - 40.1)	20	19.7	(10.9 - 28.4)	49	13.7	(9.9 - 17.5)
8.2 Other carcinoma of head and neck	6	4.9	(1.0 - 8.9)	4	7.3	(0.1 - 14.5)	4	4.0	(0.0 - 8.0)	19	5.3	(2.9 - 7.7)
8.3 Carcinomas of trachea, bronchus, lung	2	1.7	(0.0 - 4.0)	3	5.7	(0.0 - 12.1)	2	1.8	(0.0 - 4.3)	7	2.0	(0.5 - 3.4)
8.4 Carcinoma of breast	6	5.1	(1.0 - 9.1)	4	7.6	(0.2 - 15.1)	4	4.0	(0.0 - 8.0)	11	3.1	(1.3 - 4.9)
8.5 Carcinoma of genitourinary tract	14	11.7	(5.6 - 17.8)	4	7.6	(0.2 - 15.1)	1	0.9	(0.0 - 2.7)	47	13.1	(9.4 - 16.9)
8.6 Carcinoma of gastro-intestinal tract	53	41.9	(30.6 - 53.2)	14	26.3	(12.5 - 40.1)	9	9.7	(3.3 - 16.1)	62	17.3	(13.0 - 21.6)
8.7 Carcinoma of other & ill-defined sites	1	0.9	(0.0 - 2.5)	-	-	-	1	0.9	(0.0 - 2.7)	2	0.6	(0.0 - 1.3)
9. Misc. specified neoplasms	**6**	**4.8**	**(1.0 - 8.7)**	**2**	**3.9**	**(0.0 - 9.3)**	**1**	**0.9**	**(0.0 - 2.7)**	**23**	**6.4**	**(3.8 - 9.0)**
10. Unspecified (malig.) neoplasms	**2**	**1.7**	**(0.0 - 4.0)**	**3**	**5.5**	**(0.0 - 11.8)**	**1**	**1.3**	**(0.0 - 3.8)**	**2**	**0.6**	**(0.0 - 1.3)**
Overall cancer incidence (95% CI)	**359**	**285.2**	**(255.6 - 314.8)**	**161**	**301.4**	**(254.8 - 348.1)**	**114**	**121.3**	**(98.7 - 143.9)**	**1 016**	**283.7**	**(266.2 - 301.1)**

A4 Five-year relative survival for AYA for four prioritised ethnic groups

	Māori 15-24 years 2008-2017			Pacific Peoples 15-24 years 2008-2017			Asian 15-24 years 2008-2017			All Other 15-24 years 2008-2017		
	Total cases	Five-year relative survival (%) (95% CI)		Total cases	Five-year relative survival (%) (95% CI)		Total cases	Five-year relative survival (%) (95% CI)		Total cases	Five-year relative survival (%) (95% CI)	
1. Leukaemias	51	75.0	(59.8 - 85.2)	32	71.7	(52.4 - 84.3)	16	75.3	(46.5 - 90.0)	89	76.9	(65.8 - 84.8)
2. Lymphomas	55	91.1	(79.6 - 96.4)	23	96.0	(73.2 - 99.7)	18	94.4	(65.2 - 99.5)	214	96.3	(92.5 - 98.3)
3. CNS tumours	19	34.8	(14.6 - 56.1)	8	62.7	(23.0 - 86.3)	9	66.0	(26.9 - 87.8)	60	64.3	(49.1 - 76.1)
4. Bone tumours	30	52.1	(30.9 - 69.7)	15	79.6	(48.8 - 93.1)	5	80.2	(20.4 - 97.2)	46	61.7	(44.6 - 75.0)
5. Soft tissue sarcomas	14	56.9	(27.9 - 78.0)	8	74.2	(29.8 - 93.1)	3	66.8	(5.4 - 94.7)	43	71.7	(55.4 - 83.0)
6. Germ cell tumours	68	91.7	(80.6 - 96.7)	25	92.3	(71.9 - 98.2)	17	100.4	[a]	152	94.0	(88.4 - 97.0)
7. Melanoma and skin carcinomas	13	83.7	(48.5 - 95.9)	1	100.2	[a]	2	100.2	[a]	187	93.5	(88.7 - 96.4)
8. Carcinomas	98	81.3	(71.4 - 88.1)	41	81.5	(64.6 - 90.9)	40	95.0	(81.6 - 99.0)	195	83.2	(76.5 - 88.2)
9. Misc. specified neoplasms	6	75.2	(12.8 - 96.4)	2	50.1	(0.6 - 91.2)	1	[b]	[b]	21	76.2	(47.7 - 90.6)
10. Unspecified (malig.) neoplasms	2	50.1	(0.6 - 91.3)	3	66.8	(5.4 - 94.7)	1	100.2	[a]	2	100.2	[a]
TOTAL	**356**	**77.6**	**(72.5 - 81.9)**	**158**	**81.0**	**(73.6 - 86.5)**	**112**	**89.2**	**(81.6 - 93.9)**	**1 009**	**86.4**	**(84.0 - 88.5)**

[a] Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period
[b] Five-year relative survival figures could not be calculated because no patient was followed-up for the full five-year duration

A5 Five-year relative survival for AYA for four prioritised ethnic groups

The following table summarises survival data for children 10-14 years of age at diagnosis from the NZCCR 2005-2014 survival report.[6] It has been provided here as an indication of survival for younger AYA 12-14 years and allows some comparisons with survival for older AYA. Given that a different classification schemes is used for children (the International Classification of Childhood Cancers, ICCC-3), it is not always possible to make comparisons at a diagnostic group level. Even where the names are similar, there may be subtle differences in the definitions e.g. the ICCC 'Ewing tumours' refers to only Ewing tumours of the bone, while the AYA Classification Scheme it covers Ewing tumours which arise both in the bone and soft tissue.

Table 3.2.2 Five-year relative survival for 10-14 year olds by ethnicity and ICCC classification, 2005-2014

ICCC-3 diagnostic group / selected subgroup		10-14 years		
		Total cases	Five-year relative survival (95% CI)	
All childhood cancers		**412**	**84.0**	**(80.0 - 87.2)**
I.	Leukaemias	99	89.6	(81.3 - 94.4)
I(a)	*Lymphoid leukaemias*	63	91.6	(80.7 - 96.5)
I(b)	*Acute myeloid leukaemias*	25	79.8	(57.9 - 91.2)
II.	Lymphomas	78	96.3	(88.7 - 98.9)
II(a)	*Hodgkin lymphomas*	39	100.2	[a]
II(b)	*Non-Hodgkin lymphomas*	30	96.8	(78.7 - 99.7)
III.	CNS tumours	75	69.0	(57.0 - 78.2)
III(b)	*Astrocytoma*	33	66.7	(47.9 - 80.0)
III(c)	*Intracranial & intraspinal embryonal neoplasms*	14	49.6	(22.3 - 72.1)
IV.	Neuroblastoma	1	[b]	[b]
V.	Retinoblastoma	1	100.1	[a]
VI.	Renal tumours	2	100.1	[a]
VII.	Hepatic tumours	1	[b]	[b]
VIII.	Malignant bone tumours	55	78.9	(64.7 - 87.8)
VIII(a)	*Osteosarcomas*	29	74.9	(54.1 - 87.3)
VIII(c)	*Ewing tumours*	21	79.6	(53.8 - 92.0)
IX.	Soft tissue sarcomas	33	66.4	(47.5 - 79.9)
IX(a)	*Rhabdomyosarcomas*	13	37.8	(13.4 - 62.5)
X.	Germ cell tumours	25	96.2	(75.0 - 99.6)
XI.	Other malignant epithelial	40	92.4	(77.9 - 97.6)
XII.	Other and unspecified	1	[b]	[b]
Ethnicity				
Māori		86	75.1	(64.3 - 83.1)
Pacific Peoples		45	74.3	(58.0 - 85.0)
Non-Māori/Non-Pacific Peoples		281	88.2	(83.7 - 91.5)

[a] Confidence intervals cannot be calculated in instances where there were either no deaths or no survivors within the period.
[b] Five-year relative survival could not be calculated as no cases had a full five years of follow-up.

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