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Childhood cancer incidence in Aotearoa, New Zealand 2015 – 2019

A report on behalf of the New Zealand Children's Cancer Registry Working Group

New Zealand Children's Cancer Registry Working Group

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TE AHO O TE KAHU CANCER CONTROL AGENCY

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Lay summary

What does the data tell us about childhood cancer in Aotearoa, New Zealand?

1. Childhood cancer is rare

There were 765 new children diagnosed with cancer in the 5 years between 2015 and 2019, meaning the overall age standardised incidence rate of childhood cancer in Aotearoa, New Zealand is 169 diagnoses per million per year. In Aotearoa, New Zealand it is estimated that there are 25,000 people diagnosed with cancer each year meaning children account for less than 1% of all cancers diagnosed annually.

2. Most childhood cancers are diagnosed in children under the age of 5 years

The childhood cancer incidence rate is higher among children aged 0-4 years (86.2 diagnosed per million per year) than children aged 5 – 9 years (42.5 diagnosed per million per year) and 10-14 years (40.3 diagnosed per million per year). Between 2015 and 2019, 44% of all childhood cancers were diagnosed in children under 5 years of age. These young children were most commonly diagnosed with leukaemia, central nervous system (brain) tumours, or neuroblastoma. Some childhood cancers such as retinoblastoma exclusively occurred in children under the age 5.

3. Children are diagnosed with different cancers compared to adults

The most common cancers diagnosed in children are leukaemia, brain tumours and lymphomas whereas the most common cancers among adults are breast, lung, prostate and bowel cancer. The incidence of different childhood cancers varies between age groups (0-4, 5-9 and 10-14 years). Younger children (<10 years of age) experience a higher incidence of neuroblastoma, hepatic and renal tumours than older children (>10 years) who experience higher incidence of malignant bone and germ cell tumours.

Context

Childhood cancer refers to any malignant neoplasm diagnosed in a child aged between 0-14 years. Unlike many adult cancers, childhood cancers are not strongly linked to lifestyle or environmental factors and only a small proportion of childhood cancers are attributed to inherited genetic abnormalities or predisposition syndromes. Childhood cancers are more likely to be haematological malignancies or central nervous system tumours, whilst adult cancers the most common cancers among adults are solid carcinomas of the breast, bowel and lung. The relative rarity and heterogeneous nature of child cancer mean specialist paediatric oncology services are required to care, and provide support to children with cancer and their families.

In Aotearoa, New Zealand there are two specialist childhood cancer centres; the Starship Blood and Cancer Centre in Auckland and the Children's Haematology/Oncology Centre (CHOC) based in Christchurch Hospital. These specialist treatment centres work closely with Shared Cancer Centres (SCC's) to ensure that the diagnosis, management and follow-up of children with cancer and is safe, effective and delivered as close to the patient's home (i.e. locally) as possible. The National Child Cancer Network (NCCN) provides oversight of the arrangements between specialist treatment centres and share care centres to ensure a nationally consistent approach is taken.

NCCN upholds and honours its commitment to Te Tiriti o Waitangi, its principles, and its intentions. Consistent with the ngā uaratanga (values) of Te Aho o Te Kahu, Cancer Control Agency, NCCN is whānau centred, knowledge driven and outcomes focussed. NCCN recognizes the five principles of Te Tiriti o Waitangi as outlined within Waitangi Tribunal's Hauroa report (WAI2575) (25) as guiding principles:

- Tino Rangatiratanga**:** The principle of self-determination –the right for Māori to exercise self-determination and mana motuhake in the design, delivery and monitoring of child cancer services.
- Pātuitanga: The principle of partnership – NCCN is committed to working with Māori in a strong and enduring relationship.
- Mana Taurite**:** The principle of equity – NCCN is committed to ensuring equitable access to cancer care and outcomes.
- Whakamarumarutia: The principle of active protection – NCCN takes all reasonable actions to ensure Māori achieve equity and informs Māori of the impact of these actions.
- Kōwhiringa: The principle of options –NCCN is committed to ensuring that child cancer services are provided in a culturally appropriate way that recognises and supports the expression of te ao Māori worldviews.

With a specific focus upon enabling the delivery of high-quality care for all children with cancer regardless of who they are, and where they live, the notion of equity is central to the work of NCCN. NCCN seeks to protect Māori custom, cultural integrity and whanau structures, and reinforces Māori control over Māori wellbeing.

Purpose

The purpose of this report is to provide an updated analysis of the incidence of childhood cancer in Aotearoa, New Zealand for the period 1st January 2015 to the 31st of December 2019. In order to aid comparisons, the methodology replicates the previously published 2000-2009[1] and 2010-2014[2] reports wherever possible.

Sources of data and classification schemes

The incidence data contained within this report relates to children under 15 years of age, resident within Aotearoa, New Zealand, who were diagnosed with a malignant neoplasm or non-malignant

CNS tumour as defined by the International Classification of Childhood Cancer, Third Edition[3] (ICCC-3, **Appendix A)** during the period 2015 – 2019.

Cancer registration data were obtained from the New Zealand Children's Cancer Registry (NZCCR) and New Zealand Cancer Registry (NZCR). The NZCCR is a national cancer registry held by NCCN containing childhood cancer data provided by specialist paediatric oncology centres in Aotearoa, New Zealand. NZCR is a population based cancer registry which collects data on all malignant cancers diagnosed in Aotearoa, New Zealand. Pathological laboratory reports are the primary source of cancer data in NZCR however a small number of registrations are received from death certificates, coroners' reports, and hospital discharge data included on the national minimum dataset (NMDS). Prior to analyses data from both registries were cross-matched to verify and identify anomalies. The total number of cancer registrations included in the final analysis was 765.

The International Association of Cancer Registries (IACR) European Network of Cancer Registries (ENCR) definition of incidence date was adopted whereby the date of the first event in the following order of precedence to occur chronologically was chosen as the incidence date; I. first histological or cytological confirmation of malignancy; II. date of admission to hospital because of malignancy; III. date of first consultation because of malignancy, and IV. date of diagnosis other than I, ii, or iii, date of death because of malignancy.

All cancer data were coded according to the International Statistical Classification of Disease for Oncology, 3rd Edition (ICD-O-3)[4] and converted to the ICCC-3 classification scheme. In keeping with the ICCC-3 classification scheme non-malignant intracranial and intraspinal tumours of benign or uncertain behaviour which are routinely registered in NZCCR but not NZCR were included in the analysis. In addition, despite the 2020 ICD-O-3.2 revision to change Langerhans Cell Histocytosis (LCH) to a non-malignant cancer (behaviour code /1), LCH cases were included within the analyses and are reported within ICCC-3 Group IId, Miscellaneous Lymphoreticular Neoplasms. Non-malignant haematological conditions, conditions not defined by ICCC-3 (e.g. in-situ carcinomas), second primary malignancies, and children from overseas who were diagnosed in Aotearoa, New Zealand were excluded from the analysis.

Population data (**Table 1** and **Table 2**) was provided by Statistics New Zealand, Tatauranga Aotearoa, and is based on available census records. Ethnicity was prioritised to Māori, Pacific Peoples, Asian, Middle Eastern/Latin American/African (MELAA), Other, and NZ European according to the Ministry of Health data protocols.[5] **Appendix B** outlines the number of cancer cases per ethnic group. In keeping with previous childhood cancer incidence reports, individuals who identified as non-Māori were grouped as one binary group.

Table 1. Population years at risk by ethnicity in Aotearoa, New Zealand, 2015-2019

Prioritised ethnicity	Population	Population distribution %
Māori	1,254,470	26.9%
Non-Māori	3,424,020	73.3%
Total	4,671,580	

Table 2. Population years at risk by age group in Aotearoa, New Zealand, 2015-2019

Age group	Population	Population distribution %
0-4 years	305,224	32.5%
5-9 years	307,994	34.7%
10 –14 years	322,806	32.8%
Total	4,671,580	

Table 3. Population years at risk by sex in Aotearoa, New Zealand, 2015-2019

Sex	Population	Population distribution %
Female	2,277,090	48.7%
Male	2,394,490	51.3%
Total	4,671,580	

Statistical Analysis

Cancer incidence is a measure of the number of new cases of cancer within a defined population over a given period. Cancer incidence rates are typically reported per 100,000 population per year. To account for the small number of children diagnosed with cancer in Aotearoa, New Zealand incidence rates within this report are presented as the number of cases per million population. This is in keeping with other child cancer incidence analyses[6,7] and allows more meaningful interpretation of the small case numbers.

In this report the number of new cases diagnosed in the period 2015 - 2019, the age-specific 'crude' incidence rates, and age-standardised rates were calculated. The age-specific 'crude' rate is the rate at which an event occurs within a specific age group and is calculated by dividing the total number of cases occurring within an age-group by the population of that age group expressed as a unit of the population (in this instance per million) (**Formula 1).** Age-standardised incidence rates adjust the proportions of the population group to a standard (most commonly the World Standard Population) to minimise the effect of age structure on incidence and allow comparisons between populations. Within this report age-standardised incidence rates are reported based upon the World Standard Population[8] weights which assigns weights of 12, 10 and 9 to the age groups 0-4, 5-9 and 10-14 years respectively. Age-specific and age-standardised incidence rates were calculated for each cancer ICCC-3 group and separately for each sex, age group (0-4 years, 5-9 years and 10-14 years) and prioritised ethnicity group (Māori, non-Māori). Incidence rate sex ratios were calculated by dividing the incidence in males by the incidence in females. To prevent the unauthorised identification of individuals where there were less than 5 cases of a particular cancer diagnosed within the five-year period rates were suppressed.

Formula 1. *Age-specific 'crude' incidence rate = new cases/person-years at risk x 1,000,000*

Results

Childhood cancer incidence 2015 – 2019

Table 4 presents a summary of childhood cancer incidence by sex, age group and ethnicity. There were 765 new childhood cancer registrations in Aotearoa, New Zealand between 2015 and 2019, providing an average of 153 new childhood cancer diagnosis per year. The overall Aotearoa, New Zealand childhood cancer age-standardised rate was 169.1 per million per year (95% CI: 157.0 – 181.2). On average 85 boys and 68 girls were diagnosed with cancer annually in the period 2015 to 2019. The age-standardised rate sex ratio was M/F = 1.18 which is reflective of the 1.17 sex ratio observed in children internationally[9]. Forty-four percent of childhood cancers were diagnosed in children under the age of 5 (0-4 years). For both sexes, incidence was highest for children aged 0-4 years, fell to a minimum for children aged 5-9 years, and was slightly higher for children aged 10-14 years. When considering the use of prioritised ethnicity groupings, the age-standardised cancer incidence was comparable between Māori and Non- Māori (159.9 vs 146.0 per million population).[i]

[i] See limitations section for a discussion regarding the use of prioritised ethnicity groupings on population incidence rate calculations

Table 4. Childhood cancer incidence by sex, age group, and ethnicity in Aotearoa, New Zealand, 2015-2019

	Cases		Average cases per year	Crude age-specific incidence rate[a]	Age standardised incidence rate[a,b]	(95% CI)
Sex	n	%				
Female	341	44.6	68.2	149.7	154.4	137.9- 170.9
Male	424	55.4	84.8	177.0	183.0	165.5 - 200.6
Age group						
0-4 years	338	44.2	67.6	222.7	86.2	77.0 - 95.4
5-9 years	214	28.0	42.8	131.4	40.3	34.9 - 45.7
10-14 years	213	27.8	42.6	139.6	42.5	36.8 - 48.3
Prioritised Ethnicity						
Māori	201	26.3	40.2	160.0	159.9	137.8 - 182.0
Non-Māori	564	73.7	112.8	145.0	146.0	133.2 - 158.8
Total	765	**100**	**153**	**167.3**	**169.1**	**157.0 - 181.2**

[a] Per million population per year [b] Age standardised to the World Standard Population

Table 5 presents the average number, crude incidence rate, and age-standardised incidence rate of childhood cancer per each of the main ICCC-3 groups and sub-groups. A breakdown of childhood cancer registrations by ICCC-3 subgroup, sex, age and ethnicity is presented in **Appendix C.**

Leukaemia (ICCC-3 Group I) was the most common cancer diagnosed among children accounting for 29% of all childhood cancer cases. On average 45 cases of leukaemia were diagnosed per year of which most (n=37) were classified as lymphoid leukaemia's (ICCC-3 Group Ia). Central Nervous System (CNS) and miscellaneous intracranial and intraspinal neoplasms (ICCC-3 Group III, commonly referred to as brain and spinal cord tumours) were the second most common cancer group accounting for 23% of all diagnoses (average n=36 new cases annually). A third of CNS tumour cases are classified as astrocytoma (ICCC-3 Group IIIb). Lymphoma (ICCC-3 Group II) accounted for 14% of childhood cancer cases.

Standard patterns of childhood cancer incidence by age were observed during the period 2015 to 2019 **(Figure 1).** For both sexes, incidence was highest for children aged 0-4 years. Although leukaemia was the most common cancer in all age groups, neuroblastomas and other peripheral nervous cell tumours (ICCC-3 Group IV) were more common among younger children than in older children accounting for one in ten cancers within the 0- 4 years age group. In contrast, one in ten cancers in the age group 10 – 14 years were malignant bone tumours (ICCC-3 Group VIII). Hepatic tumours (ICCC-3 Group VII) and retinoblastomas (ICCC-3 Group V) were mostly diagnosed among children under the age of 5 years.

Standard patterns of childhood cancer incidence by sex were also observed **(Figure 2).** There was a higher incidence of Lymphoma and reticuloendothelial neoplasms (ICCC-3 Group II) among males than females (M/F ratio=3:1) particularly for Burkitt lymphomas (M/F ratio = 4:1) and Non-Hodgkin lymphomas (M/F ratio=19:4). Gondal germ cell tumours (ICCC-3 Sub-group Xc) were more frequent among females than males (F/M ratio = 3:1).

There were 29 children between 2015 and 2019 who were diagnosed with a rare cancer.[b] These cases of cancer made up less than 3% of all childhood cancers diagnosed meaning that these individual types of cancer may be diagnosed in Aotearoa, New Zealand less than once every 5 years. These types of rare cancer can be grouped as:

1. Rare cancers that only affect children (e.g. pancreatoblastoma, malignant rhabdoid tumours and melanotic neuroectordermal tumours)
2. Cancers that are common in adults but rare in children (e.g. cancers of the digestive system, thyroid, and adrenal gland)
3. Rare hormonal/endocrine cancers (e.g. phaeochromocytoma)
4. Rare brain tumours (e.g. meningioma)
5. Rare skin cancers (e.g. melanoma)

[b] *A rare disease is typically defined as a disease with a low prevalence affecting less than 5 per 10,000 persons[8]. Childhood cancer overall is considered a rare disease and consensus on the definition of a rare childhood cancer has not been established. However, the Italiam Tumori Rari in Eta Pediatricia defines a paediatric rare cancer as one with an incidence of less than two cases per million population per year and the Children's Oncology Group (COG) define rare paediatric cancers as those listed in the ICCC-3 subgroup XI.*

Table 5. Childhood cancer in Aotearoa, New Zealand 2015 – 2019 by diagnosis grouped according to the International Classification of Childhood Cancer, Third Edition (ICCC-3)

	ICCC-3 Diagnostic Group / Subgroup	n of cases 2015-2019	Average cases per year	% of all cancers	% of ICCC-Group	Age standardised rate[a] (95% CI)	
	All childhood cancers	**765**	**153**			**169.1**	**157.0-181.2**
I.	**Leukaemias, myeloproliferative & myelodysplastic diseases**	**225**	**45**	**29.4**		**51.5**	**44.7-58.2**
Ia	Lymphoid leukaemias	184	37	24.1	81.8		
Ib	Acute myeloid leukaemias	36	7	4.7	16.0		
Ic	Chronic myeloproliferative diseases	<5	1	0.4	1.3		
Id	Other myeloproliferative diseases	<5	0	0.3	0.9		
Ie	Other and unspecified leukaemia	0	-	-	-		
II.	**Lymphoma & reticuloendothelial neoplasms**	**112**	**22**	**14.6**		**23.2**	**18.9-27.5**
IIa	Hodgkin lymphomas	32	6	4.2	28.6		
IIb	Non-Hodgkin lymphomas (excl. Burkitt lymphomas)	23	5	3.0	20.5		
IIc	Burkitt lymphomas	25	5	3.3	22.3		
IId	Miscellaneous lymphoreticular neoplasms	32	6	4.2	28.6		
IIe	Unspecified lymphomas	<5	1	0.5	2.2		
III.	**Central nervous system & intracranial/intraspinal neoplasms**	**179**	**36**	**23.4**		**39.2**	**33.4-45.0**
IIIa	Ependymomas and choroid plexus tumours	17	3	2.2	9.5		
IIIb	Astrocytomas	55	11	7.2	30.7		
IIIc	Intracranial and intraspinal embryonal tumours	50	10	6.5	27.9		
IIId	Other gliomas	28	6	3.7	15.6		
IIIe	Other specified intracranial and intraspinal neoplasms	25	5	3.3	14.0		
IIIf	Unspecified intracranial and intraspinal neoplasms	<5	1	0.5	2.2		
IV.	**Neuroblastoma & other peripheral nervous cell tumours**	**42**	**8**	**5.5**		**10.2**	**7.16-13.4**
IVa	Neuroblastoma & ganglioneuroblastoma	42	8	5.5	100.0		
IVb	Other peripheral nervous cell tumours	0	-	-	-		
V.	**Retinoblastoma**	**17**	**3**	**2.2**	100.0	**4.3**	**2.6-6.3**
VI.	**Renal tumours**	**47**	**9**	**6.1**		**10.7**	**7.6-13.8**
VIa	Nephroblastoma & other non-epithelial renal tumours	36	7	4.7	76.6		
VIb	Renal carcinomas	11	2	1.4	23.4		
VII.	**Hepatic tumours**	**9**	**2**	**1.2**		**2.2**	**0.7-3.6**
VIIa	Hepatoblastoma	9	2	1.2	100.0		
VIIb	Hepatic carcinomas	0	-	-	-		
VIIc.	Unspecified malignant hepatic tumours	0	-	-	-		
VIII.	**Malignant bone tumours**	**32**	**6**	**4.2**		**6.2**	**4.05-8.4**
VIIIa	Osteosarcomas	14	3	1.8	43.8		

Table 5. Continued

	ICCC-3 Diagnostic Group / Subgroup	n of cases 2015-2019	Average cases per year	% of all cancers	% of ICCC-Group	Age standardised rate[a] (95% CI)	
VIIIb.	Chondrosarcomas	0	-	-	-		
VIIIc.	Ewing tumours & related bone sarcomas	13	3	1.7	40.6		
VIIId.	Other specified malignant bone tumours	5	1	0.7	15.6		
VIIIe.	Unspecified malignant bone tumours	0	-	-	-		
IX.	**Soft tissue and other extraosseous sarcomas**	**40**	**8**	**5.2**		**8.5**	**5.8-11.2**
IXa.	Rhabdomyosarcomas	18	4	2.4	45.0		
IXb.	Fibrosarcomas & other fibrous neoplasms	<5	1	0.5	10.0		
IXc.	Kaposi sarcomas	0	-	-	-		
IXd.	Other specified soft tissue sarcomas	15	3	2.0	37.5		
IXe.	Unspecified soft tissue sarcomas	<5	1	0.4	7.5		
X.	**Germ cell tumours, trophoblastic tumours & neoplasms of gonads**	**31**	**6**	**4.1**		**6.5**	**4.1-8.8**
Xa.	Intracranial & intraspinal germ cell tumours	13	3	1.7	41.9		
Xb.	Malignant extracranial & extragonadal germ cell tumours	9	2	1.2	29.0		
Xc.	Malignant gonadal germ cell tumours	8	2	1.0	25.8		
Xd.	Gonadal carcinomas	<5	0	0.1	3.2		
Xe.	Other & unspecified malignant gonadal tumours	0	-	-	-		
XI.	**Other epithelial neoplasms & melanomas**	**30**	**6**	**3.9**		**5.7**	**3.6-7.7**
XIa	Adrenocortical carcinomas	<5	1	0.4	10.0		
XIb	Thyroid carcinomas	6	1	0.8	20.0		
XIc	Nasopharyngeal carcinomas	<5	1	0.4	10.0		
XId	Melanomas	6	1	0.8	20.0		
XIe	Skin carcinomas	0	-	-	-		
XIf	Other & unspecified carcinomas	12	2	1.6	40.0		
XII.	**Other & unspecified malignant neoplasms**						
XIIa	Other specified malignant tumours	0	-	-	-		
XIIb.	Other unspecified malignant tumours	<5	-	-	-		

a Per million population per year b Age standardised to the World Standard Population
**<5 denote rare cancers types which occurred in less than 5 children between the period 2015-2019. Please refer to the in text description of rare cancers on page 8.*

Figure 1. Proportional distribution of childhood cancer in Aotearoa, New Zealand 2015 – 2019 by diagnostic group and age at diagnosis

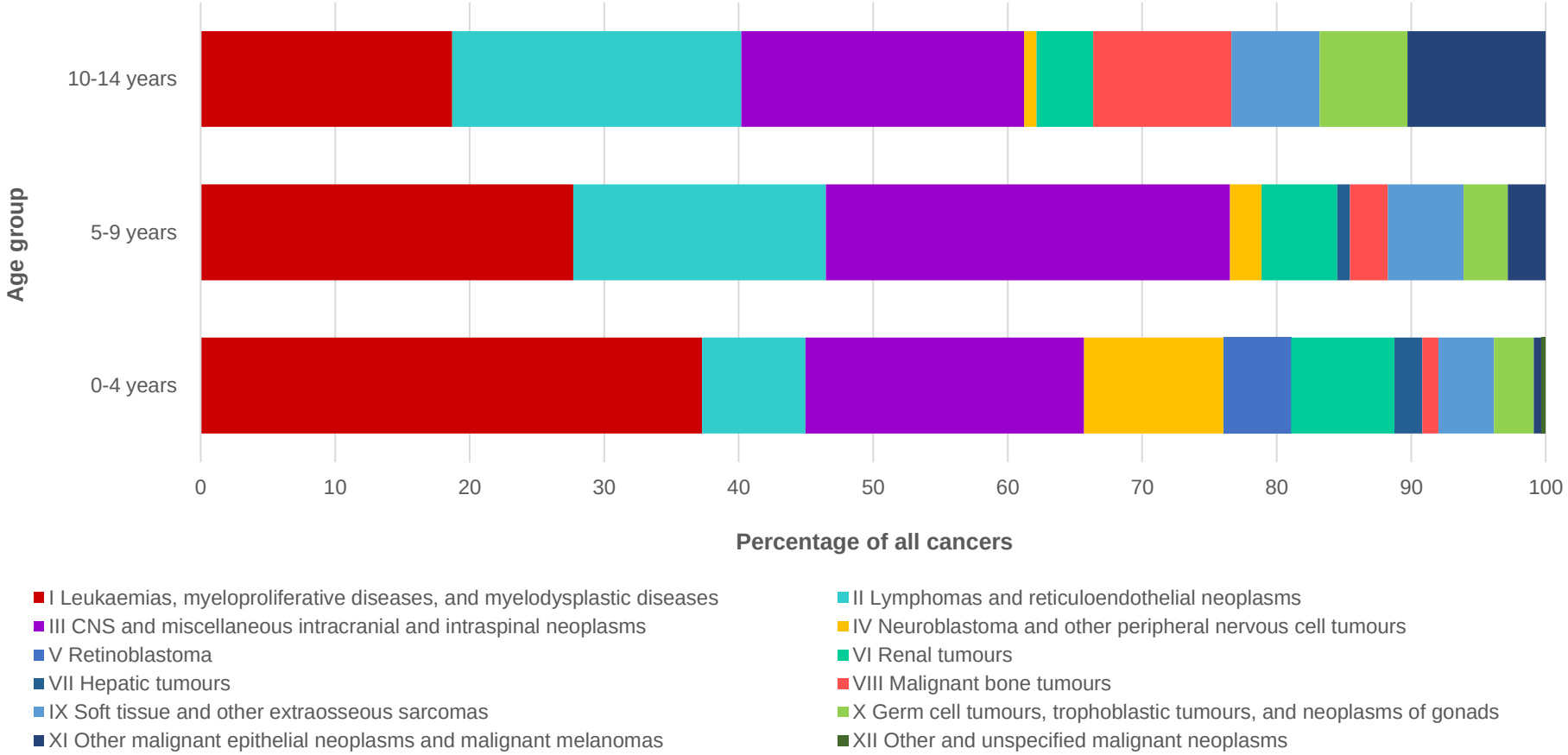
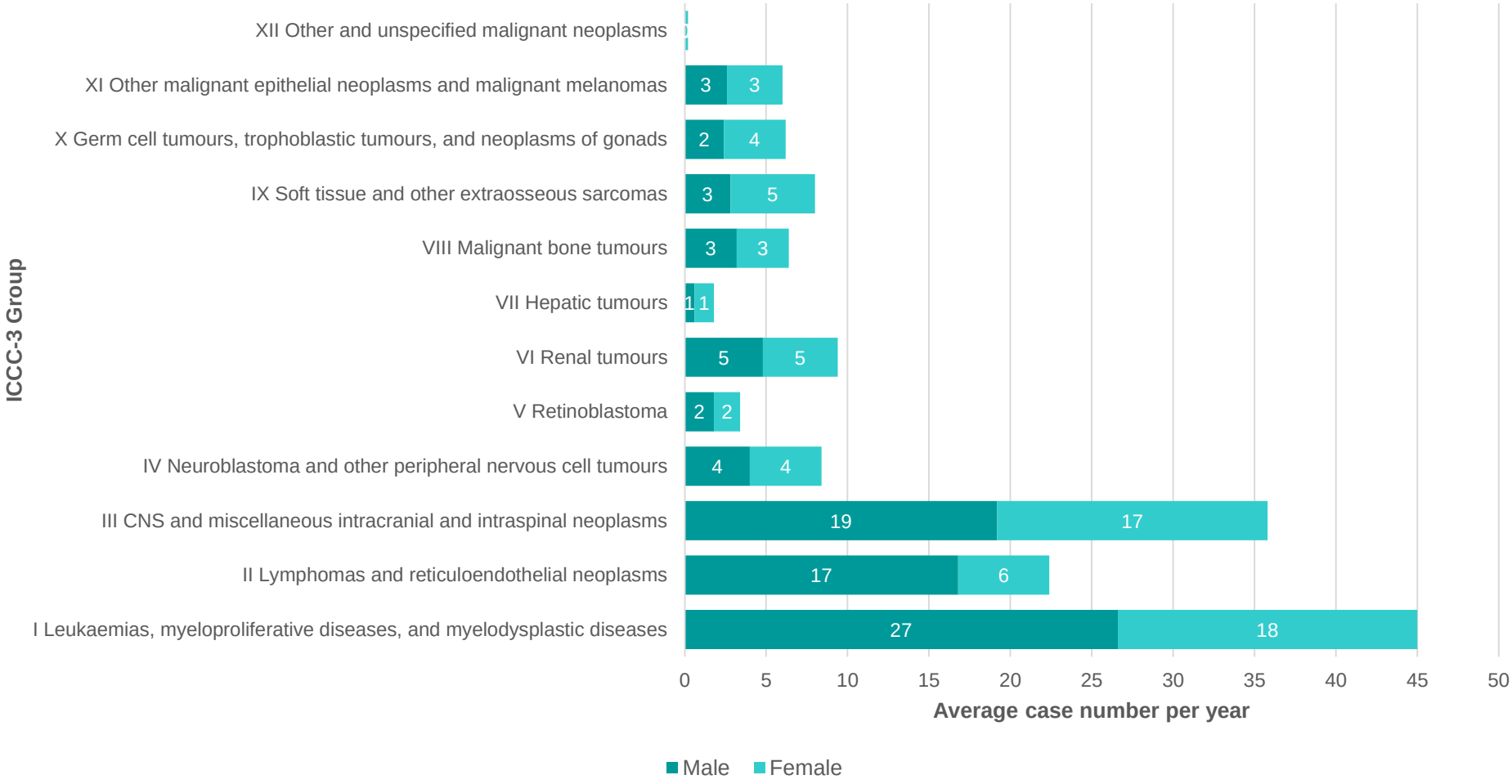


Figure 2. Average number of childhood cancers in Aotearoa, New Zealand 2015 – 2019 by sex grouped according to the International Classification of Childhood Cancer, Third Edition (ICCC-3)



Childhood cancer incidence in Aotearoa, New Zealand: Comparisons over time

Across the period 2015 – 2019 the number of children diagnosed with cancer per year ranged from 140 (year 2017) to 163 (year 2016). Annual cases, crude rates and age-standardised rates are presented in **Figure 3.**

Overall, the incidence of childhood cancer in Aotearoa, New Zealand has remained stable over the past ten years. The marked increase in incidence seen between the periods 2000-2009 (average childhood cancer case number per year: 132) and 2010-2019 (average childhood cancer case number per year: 152) can be attributed to changes in child cancer registration practices which were introduced in 2010 following the adoption of the International Classification of Diseases of Oncology (ICD-O-3-1). It was during this period that cancers such as Langerhans Cell Histiocytosis and carcinoid tumours of the appendix were recorded for the first time. Globally childhood cancer incidence rates are trending upwards; the reason for these rises are unclear but diagnostic improvements and changes in registration practice are often cited as the explanation.

Figure 3. Annual child cancer incidence in Aotearoa, New Zealand, 2000 – 2019

Childhood cancer incidence in Aotearoa, New Zealand: Comparisons with the other countries

Childhood cancer incidence rates in Aotearoa, New Zealand are comparable to rates reported in Australia and from other high-income countries in Europe and North America **(Table 6).** Comparisons between countries should be interpreted cautiously given differences in the coverage of population registries and inclusion of intracranial and intraspinal tumours of benign or uncertain behaviour.

Table 6. International incidence of childhood cancer

Country	Age-standardised rate	Age-specific rate 0-4 years	Age-specific rate 5-9 years	Age-specific rate 10-14 years
New Zealand	169	223	131	140
Australia[6]	174	237	139	149
Geographical area[10]				
Oceania	152.9	209.6	110.3	124.7
Western Europe	159.9	213.1	123.6	129.3
Southern Europe	170.8	218.2	135.4	146.8
Northern Europe	153.0	205.5	113.9	126.6
Eastern Europe	143.8	196.1	108.8	113.0
West Asia	140.9	175.9	114.6	123.5
Southeast Asia	119.8	154.1	96	100.4
South Asia	87.5	95.5	84.9	79.6
East Asia	135.8	190.3	93.3	110.4
USA, White NH	170.5	239.4	122.9	131.5
USA, White Hispanic	163.6	218.2	124.3	134.3
USA, Black	122.9	158.5	92.5	109.0
USA, API	115.6	158.8	84.3	92.8
USA, Native America	82.8	114.7	57.7	68.0
Canada	165.0	235.6	116.2	125.0
South America	133.9	174.9	107.9	108.1
Central America and Caribbean	129.2	164.7	104	109.9
Sub-Saharan Africa	56.3	70.1	52.4	42.3
North Africa	110.9	132.2	101.2	93.3

Discussion

This report is based on data collected by the New Zealand Children's Cancer Registry (NZCCR) and provides an estimate of the childhood cancer burden in Aotearoa, New Zealand in terms of incidence. This data is important to clinicians, health services and policy makers to help determine the resource required to diagnose and treat children with cancer. There were no unexpected patterns or trends and the findings are in keeping with child cancer incidence rates reported in other high-income countries. Childhood cancer remains a rare disease and is most common among children under the age of 5 years of age. The most common cancers diagnosed among children in Aotearoa, New Zealand were leukaemia, CNS tumours and lymphomas. The findings presented within this report indicate that, although stable, the incidence rate of childhood cancer in Aotearoa, New Zealand has slowly risen over the past twenty years. This is in keeping with global childhood cancer incidence rates and is likely explained by changes in registry practice and population growth.

While this report presents high quality data on the number of children diagnosed in Aotearoa, New Zealand between 2015 and 2019, caution should be taken when interpreting the findings and making judgements about the pattern of childhood cancer in Aotearoa, New Zealand.

Small case numbers and age-standardised rates

Age-standardised rates are routinely used to compare rates across different geographic regions. Statistically, when calculating age-standardised rates Poisson distribution is typically used to model the occurrence of events and to derive the confidence intervals for these rates. The stata function 'distrate' was used in this report to calculate the age-standardised rate and associated confidence intervals. Stata automatically applies the Tiwari method to calculate confidence intervals for directly standardised rates which is also used by the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute. Whilst the Tiwari method is considered valid when case numbers are small there is no consensus on how 'small' is too small.[11] Statistical simulation[12,13] studies indicate that a minimum of 10 events must have occurred for a directly standardised rate to be published. Within this report, there were several cancer types of which there were fewer than 10 diagnoses within the 5-year period 2015 to 2019 for which age-standardised rates have therefore not been reported. The small case numbers of childhood cancer in Aotearoa, New Zealand are also reflected in the wide 95% confidence intervals which are reported for age-standardised rates. Caution should be taken when interpreting these figures and making comparisons to other reports of childhood cancer incidence.

Prioritised ethnicity[14]

In Aotearoa, New Zealand there are three main methods of ethnicity characterisation: prioritised, total response, and single/combination. The prioritised method classifies individuals into one ethnic group in a prioritised order as follows; Māori, Pacific Peoples, Asian, Middle Eastern/Latin American/African (MELAA), Other, and European. The total response method counts each ethnicity that an individual identifies with as a separate binary group; this method produces a sum of ethnic group counts which are larger than the actual population/sample size. Single combination involves constructing separate binary groups for each ethnicity but unlike the total response method each individual can only be counted in each group once. In keeping with previous NZCCR childhood cancer incidence and survival analyses, prioritised Māori and Non-Māori ethnicity were used. The decision to group Pacific Peoples, Asian, Middle Eastern/Latin American/African (MELAA), Other, and European as a single 'Non-Māori' group is due to the average annual count of cancer being less than 15 cases per year in some ethnic groups. The small case numbers are not due to ethnic variations but instead based upon the rarity of childhood cancer in Aotearoa, New Zealand in general. This approach (use of prioritised ethnicity) is used across health research as it enables a 'lens' on Māori health outcomes. However, use of prioritised ethnicity classifications is known to undercount non-Māori ethnic groups and grouping of Māori as an ethnic group does not account for whakapapa and genealogy which are the traditional foundation to Māori identity. In the context of child cancer incidence, the use of prioritised ethnicity may mean that incidence estimates do not accurately represent the true breakdown of cancer occurring in each ethnic group in Aotearoa, New Zealand. For example, it is recognised that the use of binary prioritised ethnic groups inflates risk in the Māori category as Māori are prioritised in

the hierarchy (e.g. anyone identifying as a combination ethnicity such as Māori/NZ European will be classified within the Māori group).

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Ethics

Approval for the collection, analysis and publication of NZCCR data has been provided by the Multi-region Ethics Committee (Ethics ref: MEC/11/EXP/134)

Appendix A. International Childhood Cancer Classification, Third Edition (ICCC-3)

The classification of childhood cancer is based on tumour morphology and primary site with an emphasis on morphology rather than the emphasis on primary site for adults. The tables below provide the International Classification for Childhood Cancer (ICCC) definitions based on site and morphology coded according to ICD-O-3.

Reference document: Steliarova-Foucher E, Stiller C, Lacour B, Kaatsch P. International Classification of Childhood Cancer, Third Edition. Cancer 2005;103:1457-67. © 2005 American Cancer Society

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
I. Leukemias, Myeloproliferative And Myelodysplastic Diseases					
(a) Lymphoid leukemias					
(a.1) Precursor cell leukemias	9811-9818, 9837	420, 421, 423, 424, 809	3	001	011
	9835, 9836	000-809	3	001	011
(a.2) Mature B-cell leukemias	9823	420, 421, 423, 424, 809	3	002	011
	9826, 9832, 9833, 9940	000-809	3	002	011
(a.3) Mature T-cell and NK cell leukemias	9827	420, 421, 423, 424, 809	3	003	011
	9831, 9834, 9948	000-809	3	003	011
(a.4) Lymphoid leukemia, NOS	9591	420, 421, 423, 424	3	004	011
	9820	000-809	3	004	011
(b) Acute myeloid leukemias	9840, 9861, 9865-9867, 9869-9874, 9891, 9895-9897, 9898, 9910, 9911, 9920, 9930, 9931	000-809	3	005	012
(c) Chronic myeloproliferative diseases	9863, 9875, 9876, 9950, 9960-9964	000-809	3	006	013
(d) Myelodysplastic syndrome and other myeloproliferative diseases	9945, 9946, 9975, 9980, 9982-9987, 9989, 9991, 9992	000-809	3	007	014
(e) Unspecified and other specified leukemias	9800, 9801, 9805-9809, 9860, 9965-9967	000-809	3	008	015
II. Lymphomas and reticuloendothelial neoplasms					
(a) Hodgkin lymphomas	9650-9655, 9659, 9661-9665, 9667	000-809	3	009	021

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
(b) Non-Hodgkin lymphomas (except Burkitt lymphoma)					
(b.1) Precursor cell lymphomas	9727-9729	000-809	3	010	022
	9811-9818, 9837	000-419, 422, 440-779	3	010	022
(b.2) Mature B-cell lymphomas (except Burkitt lymphoma)	9597, 9670, 9671, 9673, 9675, 9678-9680, 9684, 9688-9691, 9695, 9698, 9699, 9712, 9731-9735, 9737, 9738, 9761, 9762, 9764-9766, 9769, 9970, 9971	000-809	3	011	022
	9823	000-419, 422, 440-779	3	011	022
(b.3) Mature T-cell and NK-cell lymphomas	9700-9702, 9705, 9708, 9709, 9714, 9716-9719, 9724-9726, 9767, 9768	000-809	3	012	022
	9827	000-419, 422, 440-779	3	012	022
(b.4) Non-Hodgkin lymphomas, NOS	9591	000-419, 422, 440-779, 809	3	013	022
	9760	000-809	3	013	022
(c) Burkitt lymphoma	9687	000-809	3	014	023
(d) Miscellaneous lymphoreticular neoplasms	9740-9742, 9750, 9751, 9754-9759	000-809	3	015	024
(e) Unspecified lymphomas	9590, 9596	000-809	3	016	025
III. CNS and Miscellaneous Intracranial and Intraspinal Neoplasms					
(a) Ependymomas and choroid plexus tumor					
(a.1) Ependymomas	9383, 9391-9394, 9396	000-809	0-1, 3	017	031
(a.2) Choroid plexus tumor	9390	000-809	0-1, 3	018	031
(b) Astrocytomas	9380	723	0-1, 3	019	032
	9384, 9400-9411, 9420-9424, 9425, 9440-9442	000-809	0-1, 3	019	032
(c) Intracranial and intraspinal embryonal tumors					
(c.1) Medulloblastomas	9470-9472, 9474-9478, 9480	000-809	0-1, 3	020	033
(c.2) Primitive neuroectodermal tumor (PNET)	9473	000-809	0-1, 3	021	033

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
(c.3) Medulloepithelioma	9501-9504	700-729	0-1, 3	022	033
(c.4) Atypical teratoid/rhabdoid tumor	9508	000-809	0-1, 3	023	033
(d) Other gliomas					
(d.1) Oligodendrogliomas	9450, 9451, 9460	000-809	0-1, 3	024	034
(d.2) Mixed and unspecified gliomas	9380	700-722, 724-729, 751, 753	0-1, 3	025	034
	9382, 9385	000-809	0-1, 3	025	034
(d.3) Neuroepithelial glial tumors of uncertain origin	9381, 9430, 9431, 9444, 9445	000-809	0-1, 3	026	034
(e) Other specified intracranial and intraspinal neoplasms					
(e.1) Pituitary adenomas and carcinomas	8158, 8290	751	0-1, 3	027	035
	8270-8281, 8300	000-809	0-1, 3	027	035
(e.2) Tumours of the sellar region (craniopharyngiomas)	9350-9352, 9432, 9582	000-809	0-1, 3	028	035
(e.3) Pineal parenchymal tumors	9360-9362, 9395	000-809	0-1, 3	029	035
(e.4) Neuronal and mixed neuronal-glial tumors	9412, 9413, 9492, 9493, 9505-9507, 9509	000-809	0-1, 3	030	035
(e.5) Meningiomas	9530-9539	000-809	0-1, 3	031	035
(f) Unspecified intracranial and intraspinal neoplasms	8000-8005	700-729, 751-753	0-1, 3	032	036
IV. Neuroblastoma And Other Peripheral Nervous Cell Tumors					
(a) Neuroblastoma and ganglioneuroblastoma	9490, 9500	000-809	3	033	041
(b) Other peripheral nervous cell tumors	8680-8683, 8690-8693, 8700, 9520-9523	000-809	3	034	042
	9501-9504	000-699, 739-768, 809	3	034	042
V. Retinoblastoma	9510-9514	000-809	3	035	050
VI. Renal Tumors					
(a) Nephroblastoma and other non-epithelial renal tumors					
(a.1) Nephroblastoma	8959, 8960	000-809	3	036	061

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
(a.2) Rhabdoid renal tumor	8963	649	3	037	061
(a.3) Kidney sarcomas	8964-8967	000-809	3	038	061
(b) Renal carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8130-8141, 8143, 8155, 8190-8201, 8210, 8211, 8221-8231, 8240, 8241, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8325, 8401, 8430, 8440, 8480-8490, 8504, 8510, 8550, 8560-8562, 8570-8573, 9013	649	3	039	062
	8311, 8312, 8316-8319, 8361	000-809	3	039	062
(c) Unspecified malignant renal tumors	8000-8005	649	3	040	063
VII. Hepatic Tumors					
(a) Hepatoblastoma and mesenchymal tumors of liver					
(a.1) Hepatoblastoma	8970, 8975	000-809	3	041	071
(a.2) Rhabdoid hepatic tumor	8963	220, 221	3	042	071
(a.3) Embryonal sarcoma of liver	8991	220, 221	3	043	071
(b) Hepatic carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8140, 8141, 8143, 8148, 8155, 8158, 8190-8201, 8202, 8210, 8211, 8230, 8231, 8240, 8241, 8244-8246, 8260-8264, 8310, 8320, 8323, 8401, 8430, 8440, 8470, 8480-8490, 8503, 8504, 8510, 8550, 8560-8562, 8570-8573, 9013	220, 221	3	044	072
	8160-8162, 8170-8180	000-809	3	044	072
(c) Unspecified malignant hepatic tumors	8000-8005	220, 221	3	045	073
VIII. Malignant Bone Tumors					
(a) Osteosarcomas	9180-9187, 9191-9195, 9200	400-419, 760-768, 809	3	046	081
(b) Chondrosarcomas	9210, 9220, 9240	400-419, 760-768, 809	3	047	082

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
	9211-9213, 9221, 9222, 9230, 9241-9243	000-809	3	047	082
	9231	400-419	3	047	082
(c) Ewing tumor and related sarcomas of bone					
(c.1) Ewing tumor and Askin tumor of bone	9260	400-419, 760-768, 809	3	048	083
	9365	400-419	3	048	083
(c.2) Peripheral neuroectodermal tumor (pPNET) of bone	9364	400-419	3	049	083
(d) Other specified malignant bone tumors					
(d.1) Malignant fibrous neoplasms of bone	8810, 8811, 8818, 8823, 8830	400-419	3	050	084
	8812, 9262	000-809	3	050	084
(d.2) Malignant chordomas	9370-9372	000-809	3	051	084
(d.3) Odontogenic malignant tumors	9270-9275, 9280-9282, 9290, 9300-9302, 9310-9312, 9320-9322, 9330, 9340-9342	000-809	3	052	084
(d.4) Miscellaneous malignant bone tumors	9250, 9261	000-809	3	053	084
(e) Unspecified malignant bone tumors	8000-8005, 8800, 8801, 8803-8805	400-419	3	054	085
IX. Soft Tissue And Other Extraosseous Sarcomas					
(a) Rhabdomyosarcomas	8900-8905, 8910, 8912, 8920	000-809	3	055	091
	8991	000-218, 239-809	3	055	091
(b) Fibrosarcomas, peripheral nerve sheath tumors and oth fibrous neoplasms					
(b.1) Fibroblastic and myofibroblastic tumors	8810, 8811, 8813-8817, 8821, 8823, 8834-8835	000-399, 440-768, 809	3	056	092
	8820, 8822, 8824-8828, 9150, 9160	000-809	3	056	092
(b.2) Nerve sheath tumors	9540-9571	000-809	3	057	092
(b.3) Other fibromatous neoplasms	9491, 9580	000-809	3	058	092
(c) Kaposi sarcoma	9140	000-809	3	059	093

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
(d) Other specified soft tissue sarcomas					
(d.1) Ewing tumor and Askin tumor of soft tissue	9260	000-399, 440-449, 470-759	3	060	094
	9365	000-399, 470-639, 659-768, 809	3	060	094
(d.2) Peripheral neuroectodermal tumor (pPNET) of soft tissue	9364	000-399, 440-449, 470-699, 739-768, 809	3	061	094
(d.3) Extrarenal extrahepatic rhabdoid tumor	8963	000-218, 239-639, 659-699, 739-768, 809	3	062	094
(d.4) Liposarcomas	8850-8858, 8860-8862, 8870, 8880, 8881	000-809	3	063	094
(d.5) Fibrohistiocytic tumors	8830	000-399, 440-768, 809	3	064	094
	8831-8833, 8836, 9251, 9252	000-809	3	064	094
(d.6) Leiomyosarcomas	8890-8898	000-809	3	065	094
(d.7) Synovial sarcomas	9040-9044	000-809	3	066	094
(d.8) Blood vessel tumors	9120-9125, 9130-9133, 9135-9138, 9141, 9142, 9161, 9170-9175	000-809	3	067	094
(d.9) Osseous and chondromatous neoplasms of soft tissue	9180-9187, 9191-9195, 9200, 9210, 9220, 9240	220, 300-388, 470-509, 600-619, 649, 670-679, 696, 700-729	3	068	094
	9231	000-399, 440-768, 809	3	068	094
(d.10) Alveolar soft parts sarcoma	9581	000-809	3	069	094
(d.11) Miscellaneous soft tissue sarcomas	8587, 8710-8714, 8806, 8840-8842, 8921, 8990, 8992, 9045, 9373	000-809	3	070	094
(e) Unspecified soft tissue sarcomas	8800-8805	000-399, 440-768, 809	3	071	095
X. Germ Cell Tumors, Trophoblastic Tumors And Neoplasms Of Gonads					
(a) Intracranial and intraspinal germ cell tumors					
(a.1) Intracranial and	9060-9065	700-729, 751-	0-1, 3	072	101

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
intraspinal germinomas		753			
(a.2) Intracranial and intraspinal teratomas	9080-9084	700-729, 751-753	0-1, 3	073	101
(a.3) Intracranial and intraspinal embryonal carcinomas	9070, 9072	700-729, 751-753	0-1, 3	074	101
(a.4) Intracranial and intraspinal yolk sac tumor	9071	700-729, 751-753	0-1, 3	075	101
(a.5) Intracranial and intraspinal choriocarcinoma	9100, 9101	700-729, 751-753	0-1, 3	076	101
(a.6) Intracranial and intraspinal tumors of mixed forms	9085	700-729, 751-753	0-1, 3	077	101
(b) Malignant extracranial and extragonadal germ cell tumors					
(b.1) Malignant germinomas of extracranial and extragonadal sites	9060-9065	000-559, 570-619, 630-699, 739-750, 754-768, 809	3	078	102
(b.2) Malignant teratomas of extracranial and extragonadal sites	9080-9084	000-559, 570-619, 630-699, 739-750, 754-768, 809	3	079	102
(b.3) Embryonal carcinomas of extracranial and extragonadal sites	9070, 9072	000-559, 570-619, 630-699, 739-750, 754-768, 809	3	080	102
(b.4) Yolk sac tumor of extracranial and extragonadal sites	9071	000-559, 570-619, 630-699, 739-750, 754-768, 809	3	081	102
(b.5) Choriocarcinomas of extracranial and extragonadal sites	9100, 9101, 9103-9105	000-559, 570-619, 630-699, 739-750, 754-768, 809	3	082	102
(b.6) Oth/unspec malig mixed germ cell tumors of extracranial/extragonadal	9085, 9086	000-559, 570-619, 630-699, 739-750, 754-768, 809	3	083	102
(c) Malignant gonadal germ cell tumors					
(c.1) Malignant gonadal germinomas	9060-9065	569, 620-629	3	084	103
(c.2) Malignant gonadal teratomas	9080-9084, 9090, 9091	569, 620-629	3	085	103

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
(c.3) Gonadal embryonal carcinomas	9070, 9072	569, 620-629	3	086	103
(c.4) Gonadal yolk sac tumor	9071	569, 620-629	3	087	103
(c.5) Gonadal choriocarcinoma	9100-9105	569, 620-629	3	088	103
(c.6) Malignant gonadal tumors of mixed forms	9085	569, 620-629	3	089	103
(c.7) Malignant gonadal gonadoblastoma	9073	569, 620-629	3	090	103
(d) Gonadal carcinomas	8010-8041, 8044, 8050-8075, 8082, 8120-8123, 8130-8141, 8143, 8153, 8190-8201, 8210, 8211, 8213, 8221-8241, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8380-8384, 8430, 8440-8442, 8450, 8470, 8480-8490, 8504, 8510, 8550, 8560-8562, 8570-8573, 9000, 9014	569, 620-629	3	091	104
	8313, 8443, 8444, 8451, 8474, 9015	000-809	3	091	104
	8158, 8243, 8410, 8452, 8460-8463, 8471-8473, 8576	569	3	091	104
(e) Other and unspecified malignant gonadal tumors	8590-8671	000-809	3	092	105
	8000-8005	569, 620-629	3	092	105
XI. Other Malignant Epithelial Neoplasms And Malignant Melanomas					
(a) Adrenocortical carcinomas	8158	740	3	093	111
	8370-8375	000-809	3	093	111
(b) Thyroid carcinomas	8010-8041, 8050-8075, 8082, 8120-8122, 8130-8141, 8158, 8190, 8200, 8201, 8211, 8230, 8231, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8324, 8333, 8430, 8440, 8480, 8481, 8510, 8560-8562, 8570-8573, 8589	739	3	094	112
	8330-8332, 8334-8337, 8340-8347, 8350, 8588	000-809	3	094	112
(c) Nasopharyngeal	8010-8041, 8050-8075,	110-119	3	095	113

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
carcinomas	8082, 8083, 8120-8122, 8130-8141, 8190, 8200, 8201, 8211, 8230, 8231, 8244-8246, 8260-8263, 8290, 8310, 8320, 8323, 8430, 8440,8480, 8481, 8500-8551, 8560-8562, 8570-8576				
(d) Malignant melanomas	8720-8780, 8790	000-809	3	096	114
(e) Skin carcinomas	8010-8041, 8050-8075, 8078, 8081, 8082, 8090-8098, 8100-8110, 8140, 8143, 8147, 8190, 8200, 8211, 8240, 8246, 8247, 8260, 8263, 8310, 8320, 8323, 8390-8420, 8430, 8480, 8540, 8542, 8560, 8570-8573	440-449, 519, 609, 632	3	097	115
(f) Other and unspecified carcinomas					
(f.1) Carcinomas of salivary glands	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	079-089	3	098	116
(f.2) Carcinomas of colon and rectum	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	180, 182-189, 199, 209, 210-218	3	099	116
(f.3) Carcinomas of appendix	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	181	3	100	116
(f.4) Carcinomas of lung	8010-8077, 8080-8086, 8098, 8120-8158, 8163,	340-349	3	101	116

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
	8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333,8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030				
(f.5) Carcinomas of thymus	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	379	3	102	116
(f.6) Carcinomas of breast	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	500-509	3	103	116
(f.7) Carcinomas of cervix uteri	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	530-539	3	104	116
(f.8) Carcinomas of bladder	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	670-679	3	105	116
(f.9) Carcinomas of eye	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310,	690-699	3	106	116

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
	8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030				
(f.10) Carcinomas of other specified sites	8010-8077, 8080-8086, 8098, 8120-8157, 8163, 8190-8265, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	000-069, 090-109, 129-179, 239-339, 380-399, 480-488, 510-518, 529, 540-559, 570-608, 619, 630-631, 637-639, 659-669, 680-689, 700-729, 750-759	3	107	116
	8158, 8290	000-069, 090-109, 129-179, 239-339, 380-399, 480-488, 510-529, 540-559, 570-619, 630-639, 659-669, 680-689, 750, 752-759	3	107	116
(f.11) Carcinomas of unspecified site	8010-8077, 8080-8086, 8098, 8120-8158, 8163, 8190-8265, 8290, 8310, 8314-8315, 8320-8324, 8333, 8360, 8380-8384, 8401, 8402, 8405, 8406, 8410, 8430-8442, 8450, 8452-8454, 8460, 8461, 8470, 8480-8586, 8589, 8941, 8983, 9000, 9010-9014, 9016, 9020, 9030	760-768, 809	3	108	116
XII. Other And Unspecified Malignant Neoplasms					
(a) Other specified malignant tumors					
(a.1) Malignant gastrointestinal stromal tumor	8936	000-809	3	109	121
(a.2) Pancreatoblastoma	8971	000-809	3	110	121
(a.3) Pulmonary blastoma and pleuropulmonary blastoma	8972, 8973	000-809	3	111	121
(a.4) Other complex mixed and stromal neoplasms	8930-8935, 8940, 8950, 8951, 8974, 8980-8982	000-809	3	112	121

Site Group	ICD-O-3 Histology	ICD-O-3 Primary Site	ICD-O-3 Behavior	Extended Recode	Regular Recode
(a.5) Mesothelioma	9050-9055	000-809	3	113	121
(a.6) Other specified malignant tumors	9110, 9363	000-809	3	114	121
(b) Other unspecified malignant tumors	8000-8005	000-218, 239-399, 420-559, 570-619, 630-639, 659-699, 739-750, 754-809	3	115	122
Not classified by SEER or in situ				999	999

Appendix B. Childhood cancer cases by prioritised ethnicity

	Prioritised ethnicity	n	%
Māori	Māori	201	26.27
Non-Māori	European	377	49.28
	Pacific Peoples	83	10.85
	Asian	83	10.85
	MELAA	17	2.22
	Other	<5	-
	Not specified	<5	-

Appendix C. Childhood cancer incidence by ICCC-3 sub-group sex, age and prioritised ethnicity in Aotearoa New Zealand, 2015 – 2019

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