

Title: Cancer Incidence and Survival for New Zealanders aged 25-29 years, 2000-2009: an analysis of the New Zealand Cancer Registry

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Adolescents and young adults (AYA) are affected by a distinct range of cancers. Internationally, survival rates for AYA cancers have not shown the same improvements over time as have been seen for other age groups. This concerning trend has become commonly referred to as 'the AYA gap'. A recent analysis of New Zealand cancer incidence and survival for AYA aged 15-24 years from 2000-2009, conducted on behalf of the AYA Cancer Advisory Group, highlighted poor survival rates for bone tumours compared to those achieved internationally and poorer survival for AYA of Maori and Pacific Island descent compared to non-Maori/Pacific Peoples. New Zealand's AYA Cancer Service currently defines AYA as 12-24 years however there is no universal definition of the AYA age range and an upper bound of 29 years is often used in other published data. This study was undertaken to identify the spectrum of cancers specifically affecting New Zealanders aged 25-29 years and to determine whether the ethnic disparities and poorer outcomes for some tumour groups observed in the 15-24 year population were also evident for this upper AYA age bracket.

Diagnostic and demographic information for all cancers diagnosed in those aged 25-29 years between January 1 2000 and December 31 2009 were provided by the New Zealand Cancer Registry. Date and cause of death was obtained from the National Mortality Collection, with follow up to the 31st December 2010. All primary malignant cancers were identified and re-coded according to the AYA Cancer Classification Scheme. Age-specific incidence and relative survival estimates were calculated using the SAS and STATA software packages respectively.

On average, 154 new cases of cancer are diagnosed each year in New Zealanders aged 25-29 years. This is approximately equal to the annual number of cancers diagnosed among those aged 15-24 years (161) and greater than the average number of new diagnoses in the entire child population (133). Overall incidence is 588 cancers per year for every million 25-29 year olds in the New Zealand population. Carcinomas are the most commonly diagnosed cancer in 25-29 year olds (51 per year, 33% of total cancers diagnosed), followed by melanomas (38, 25%) and germ cell tumours (25, 16%). The predominant cancers are substantially different to those diagnosed in the younger AYA population; lymphomas and leukaemias are the two most commonly diagnosed cancers in 15-19 year olds, but are overtaken by carcinomas, melanomas and germ cell tumours with increasing age.

There are no significant differences in the average number of cancers diagnosed in males (70) and females (84) in this age group each year. The most common cancers for males are germ cell tumours (24 per year, 33% of all cancers diagnosed), followed by melanomas (14, 20%), carcinomas (10, 14%), and lymphomas (9, 13%). In female, carcinomas make up half of all cancers diagnosed (41 per year, 49%), followed by melanomas (24, 29%); these two groups alone accounting for nearly 80% of all cancers diagnosed. Incidence of gonadal germ cell tumours is significantly greater in males (relative risk, RR=18.6). Conversely, males are at lower risk of developing melanomas (RR=0.6) and carcinomas (RR=0.3), notably thyroid carcinomas (RR=0.2) and carcinomas of the genitourinary tract (RR=0.1).

By ethnicity, cancer incidence in 25-29 year olds ranges from 532 per million for Pacific Peoples to 727 per million for Maori. Overall cancer incidence among non-Maori/Pacific Peoples aged 25-29 years is 626 per million. There are many notable differences in incidence according to ethnicity. Nearly one third of all

cancers diagnosed among non-Maori/Pacific Peoples in the 25-29 year population are melanomas (37 cases per year, 195 per million). However, melanomas are significantly less likely to be diagnosed in Maori (1 case per year, 34 per million) or Pacific Peoples (<1 case per year, 6 per million).

Compared to non-Maori/Pacific Peoples, Maori have the highest incidence of bone tumours (16 per million c.f. 6 per million) and gonadal germ cell tumours (207 per million c.f. 88 per million). Maori also have a higher incidence of carcinomas (307 per million c.f. 190 per million), specifically breast carcinomas (79 per million, c.f. 36 per million) and genitourinary carcinomas (97 per million c.f. 67 per million). Although not reaching statistical significance, leukaemia incidence in Pacific Peoples is approximately double that of both non-Maori/Pacific Peoples and Maori (54 per million c.f. 26 per million in both Maori and non-Maori/Pacific Peoples). This trend was also identified in the New Zealand child and the 15-24 year populations for the same time period. These results in combination are suggestive of a biological predisposition in Pacific Peoples for leukaemias, which warrants further investigation.

Overall relative survival for the New Zealand 25-29 year population for the 2000 to 2009 period was 94.5% at one year, 88.2% at three years and 85.4% at five years. Germ cell tumours and melanomas had very high five-year survival (97.9% and 94.5% respectively), while five-year survival for bone tumours (31.2%), central nervous system tumours (59.8%) and leukaemias (67.8%) was considerably lower. Five-year survival for all lymphomas was 83.1%, however survival was significantly higher for Hodgkin (89.5%) compared to Non-Hodgkin lymphomas (76.2%). Five-year survival for carcinomas overall was 81.7% although this varied considerably according to diagnostic subgroup, ranging from 99.3% for thyroid carcinoma to 33.4% for carcinomas of the trachea, bronchus & lung. There were no significant differences in cancer survival according to gender.

Overall cancer survival was consistently higher for each year of follow-up in non-Maori/Pacific Peoples compared to both Maori and Pacific Peoples. At five-years, survival was 87.9% in non-Maori/Pacific Peoples compared to 77.4% in Maori and 76.7% in Pacific Peoples. These results are consistent with the survival trends seen in 15-24 year olds. The differences in overall survival by ethnicity could potentially be influenced by the melanoma group. Melanoma incidence is significantly higher in non-Maori/Pacific Peoples compared to Maori and Pacific Peoples and has high survival rates. Hence, five-year survival excluding melanomas was calculated and found to remain significantly higher in non-Maori/Pacific Peoples (84.9%) compared to Maori (76.1%), however the difference between non-Maori/Pacific compared to Pacific Peoples (76.5%) was no longer statistically significant. Maori (71.6%) and Pacific Peoples (75.1%) had lower five-year survival for carcinomas than non-Maori/Pacific Peoples (85.5%), the difference between Maori and non-Maori/Pacific Peoples reaching statistical significance. Notable differences between Maori and non-Maori/Pacific Peoples, although not reaching statistical significance, include the poor survival for Maori diagnosed with bone tumours (16.8% c.f. 43.2%), breast carcinomas (46.9% c.f. 69.9%) and CNS tumours (34.1% c.f. 68.4%).

Five year survival rates for 25-29 year olds in New Zealand compared to Australia were similar for most diagnostic subgroups, but New Zealand's survival was significantly lower than Australia for lymphomas (83.1% c.f. 92.0%) and most dramatically for bone tumours, where survival was less than half that of Australia (31.2% c.f. 65.5%).

The main findings of this study are largely consistent with the findings from the earlier analysis of AYA aged 15-24 years; namely the higher incidence of bone tumours and poorer survival for bone tumours in Maori, the high incidence of leukaemias in Pacific Peoples and the overall poor survival in Maori and Pacific compared to non-Maori/Pacific Peoples. In addition this study highlights that young Maori woman are at greater risk both of developing breast cancer and of dying from their disease. It is intended that this data will be utilised for a range of purposes such as providing accurate, up-to-date information to this age group about their risk of developing cancer, prioritizing the opening of new clinical trials, informing a review of the current age definition of AYA for access to AYA cancer services, and identifying future research priorities in order to improve the outcomes for young New Zealanders diagnosed with cancer.