

ORIGINAL RESEARCH

The burden of non-melanoma skin cancers in Auckland, New Zealand

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ABSTRACT

Background/Objectives: As the New Zealand Cancer Registry does not require mandatory reporting of non-melanoma skin cancers (NMSC), basal cell carcinomas (BCC) and squamous cell carcinomas (SCC), the clinical burden of these diseases is unknown.

Methods: A retrospective review of all patients with histopathology performed allowed us to estimate invasive BCC and SCC in the Auckland region in 2008 (population 1.44 million).

Results: During this period, a total of 21 236 NMSC were diagnosed among 13 996 patients, consisting of 5611 SCC lesions (26%) and 15 525 (74%) BCC. The Auckland incidence rates per 100 000 were 425 for SCC and 1177 for BCC. The overall rate of NMSC per 100 000 was 1906.5 (standardised to the census data of Australia 2001); 1385 for BCC and 522 for SCC. Using published data on incidence trends and population growth, we estimate that 29 000–33 000 NMSC would have been excised in Auckland in 2016, and 78 000–87 000 in New Zealand.

Conclusion: Auckland has the highest reported incidence of invasive NMSC in the world. We believe that high-risk cutaneous SCC and complex BCC should be recorded. Our study provides information for clinicians and health economists on the scale of the problem.

Key words: burden of disease, epidemiology, skin cancer.

WHAT THIS RESEARCH ADDS

- Our study provides information for clinicians and health economists on the scale of the problem of invasive non-melanoma skin cancer in Auckland.
- Non-melanoma skin cancer is a large issue in Australia and New Zealand and there is evidence to recommend a registry for high-risk and resource-intensive cases.

INTRODUCTION

In view of the aging population and the projected increase in non-melanoma skin cancer (NMSC) of approximately 22% from 2010 to 2015 in Australia, clinicians warn that NMSC is becoming a critical burden on the New Zealand health system.¹ It is a disease affecting primarily Caucasian individuals with the risk of NMSC increasing with patients' age and their cumulative sun exposure.² Conservative estimates for the year 2007–2008 are that NZ \$57 million was spent on public hospital care in New Zealand for all skin cancers and related conditions, and at least \$26 million was spent in the private sector.³ Treating NMSC is estimated to cost US \$4.3 billion each year in the USA.⁴ A recent study by Whiteman and colleagues suggests that, with the high rates of melanoma in the elderly and the aging of New Zealand's population, the number of people diagnosed with melanoma in New Zealand will not decrease.⁵

NMSC includes both squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) and it is the most commonly diagnosed group of cancers in New Zealand.⁶

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Mandatory reporting to the New Zealand Cancer Registry was abandoned in 1958 because of incomplete reporting and the inability of the registry to allocate resources to manage the large number of reports.⁷

In Australia the incidence of NMSC continues to increase⁹ with the cost of treatment increasing by 86% between 1997 and 2010, making it the most expensive cancer to treat.¹ The situation in New Zealand is less clear. A retrospective study investigating the incidence of NMSC in central New Zealand found a statistically significant annual percentage increase in NMSC of 4.1% per year, with a faster incremental rate for BCC than SCC over a 10-year period.⁶

We report the incidence of NMSC in the Auckland region of New Zealand in 2008, which includes a population catchment for the three district health boards of 1 303 068 non-Māori and 137 133 Māori, according to the 2006 census data.¹⁰

MATERIALS AND METHODS

A computerised search of all patients with histopathologically confirmed invasive BCC and SCC was undertaken of the district health boards of Waitemata, Auckland, and Counties Manukau and of Diagnostic Medlab databases for 2008. Data were quality controlled to exclude double registration (biopsy followed by excision). A follow up was conducted by the clinical research coordinator. The results were recorded on a standard Excel spreadsheet. Ethical approval was obtained for this retrospective study.

The eligible population included all inhabitants within the boundaries of the three Auckland district health boards. The inclusion criteria included all cutaneous invasive BCC and SCC reported on histopathology in the Auckland region from 1 January to 31 December 2008. Patients with many skin cancers were included and there was no limit on the age of the patient. *In situ* disease (SCC *in situ* and superficial BCC), recurrent disease at the same site, incorrect or absent data were excluded.

The data collected include the type of NMSC, anatomical site, histological type, metastases in 5-year follow up, and patients' characteristics including their age, sex and ethnicity.

The individual BCC and SCC counts were used to estimate annual incidence rates per 100 000 using 2006 age and gender census data for the three Auckland district health boards. Additionally, the rates were standardised to

the 2001 Australian population, as per the census data, to enable comparisons of published incidence data. The 95% confidence intervals were calculated using the standard Poisson approximation for rate data.

Rates were compared using the same standardisation (2001 Australian census data) when possible and crude rates when standardisation data were not available or not stated. Some articles did not standardise data and published only crude age-specific data.

RESULTS

There were 21 136 invasive NMSC in 13 996 individuals in 2008. Of these, 10 559 (75%) individuals had a total of 15 525 (73%) BCC and 4385 (25%) individuals had a total of 5611 (27%) SCC in, as shown in Table 1. There was a clear predominance of NMSC in men for both SCC and BCC. The overall age-standardised incidence rate (standardised to the 2001 Australian census data) per lesion and crude rates are displayed in Table 2, which again reflects male predominance. Note the increasing rates with increasing age for all NMSC (Fig. 1). The incidence in men was 50% greater than in women after the age of 80 years.

The mean number of excisions in the multiple BCC group was 2.8 with a range of 2–26 excisions per patient. The mean number of SCC excised was 2.5 with a range of 2–10. The most common site for both SCC and BCC was head and neck followed by the lower limbs for SCC and the torso for BCC. Overall, the torso was the second most common site (Fig. 2). A comparison of NMSC rates published worldwide is shown in Table 3.

DISCUSSION

We have demonstrated that invasive NMSC incidence rates increase with age and the incidence rates in our study are higher than those published previously (see Table 3).^{1,6–9,12} However, the main limitation of studies like this is the different standardisation methods used by the authors. The rates reported in Table 3 should be interpreted with this in mind.

In addition to differences in standardisation methods, Staples and colleague used a different method that relied on patients' recall of NMSC treatment with confirmation from medical professionals, so their article may include non-biopsied lesions. The rates were not based on lesions excised, thereby creating potential bias. The published

Table 1 Number of patients and total number of non-melanoma skin cancer (NMSC) lesions by sex in Auckland region, 2008

Sex	Female		Male		Not stated		Total	
	<i>n</i>	NMSC lesions	<i>n</i>	NMSC lesions	<i>n</i>	NMSC lesions	<i>n</i>	NMSC lesions
NMSC	5835	8046	8151	15 076	10	14	13 996	21 136
BCC	4510	5874	6241	9640	8	11	10 559	15 525
SCC	1794	2172	2586	5434	3	3	4385	5611

BCC, basal cell carcinoma; SCC, squamous cell carcinoma.

reports by O’Dea⁵ and Staples and colleagues⁹ included *in situ* disease, which we excluded.^{6,7}

The Auckland population is made up of 33% of people with Māori, Asian and Polynesian heritage who rarely get NMSC, compared with the European population. Therefore, the true incidence of NMSC is higher for European populations.¹⁰ In total, 12% of people in Auckland region were aged 65 years and over in 2013 compared with 10% in 2006. With population aging and significantly higher rates of NMSC in this age group, the burden of the disease is an important issue to address.^{2,3,6-8} We can extrapolate from this data that approximately 65 000 invasive NMSC were excised in New Zealand during 2008.

We estimate that the numbers and the costs of NMSC treatment have risen substantially, and will continue to rise. Staples and colleagues reported a significant increase in incidence of NMSC in Australia over a 17-year period.⁹ The age-standardised rates of BCC incidence rose by 35% from 1985 to 2002, with an even more dramatic increase of 133% in the incidence of SCC.⁹ For all NMSC the rise was 54% over 17 years, an annual percentage increase of 2.6%. In New Zealand, Brougham and colleagues estimated there

was an annual increase in NMSC incidence of 4.1%.⁷ There has also been a 14% increase in the Auckland population, and a 7% increase in the whole of New Zealand since 2008. Using these estimates we can assume that 30 000–35 000 NMSC were excised in Auckland in 2016; and 78 000–87 000 NMSC excised nationally in 2016. In addition, changes in the age structure of the population will lead to a moderate increase in these numbers in the future.

The incidence reported, however, may not be a complete reflection of the existing extent of NMSC as some samples are not sent for histological evaluation by practitioners and it was impossible to capture this in our study.^{12,15} Askew and colleagues reported that in Australia 55% of NMSC skin excisions were performed in general practice in 2005.¹⁵ There is no requirement that excisions performed in the community be sent for histological evaluation.^{7,8,15-15} Although it is likely that most medical practitioners now send all excisions for histopathological assessment, it is difficult to be certain that the histological evaluation gives a true picture of the incidence.^{15,15} Published rates therefore underestimate the true scale of the problem and cost of managing skin cancer, especially if we add topical treatments for *in situ* lesions.⁸

New Zealand and Australia have the highest incidence of all sun-related skin cancers in the world. This is due to a combination of factors, including the fair skin of people living at latitudes to which they are not accustomed, the ozone hole and the lack of air pollution. This unique UV environment leads to NMSC rates almost 20 times higher than the rest of the world.¹⁶

While it may not be practical to record all NMSC in cancer registries, it is advisable to record high-risk cutaneous squamous cell carcinomas and complex basal cell carcinomas as they have a major impact on health resources and patient morbidity. The criteria for identifying these two entities needs more research.

NMSC is a worldwide problem and the rates continue to increase globally.¹⁷ Our higher rates provide an ideal opportunity to set the benchmark for their clinical management and research on educating the population and

Table 2 Age-standardised incidence rate per lesion and crude rates (2001 Australian census data)

	Age-standardised rate	Crude rate
NMSC		
Total	1906 (1885–1930)	1602 (1581–1624)
Female	N/A	1189 (1165–1215)
Male	N/A	2055 (2000–2070)
BCC		
Total	1585 (1365–1405)	1177 (1158–1195)
Female	N/A	868 (846–891)
Male	N/A	1500 (1470–1530)
SCC		
Total	522 (509–534)	425 (414–437)
Female	N/A	321 (308–335)
Male	N/A	555 (517–555)

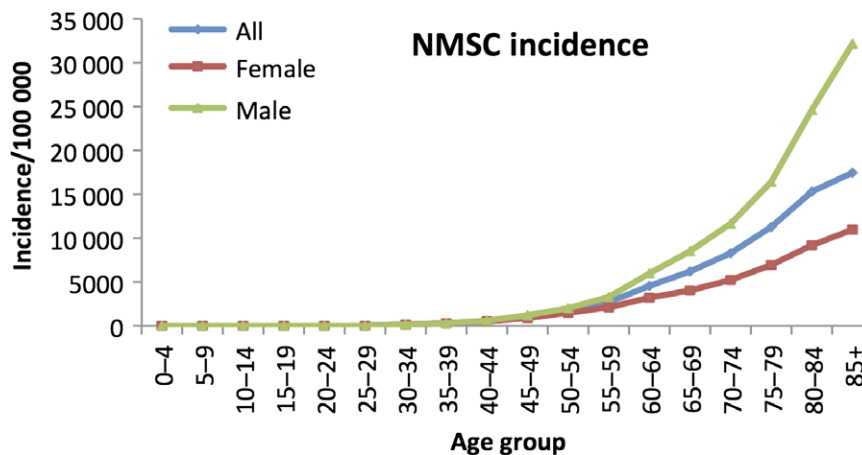


Figure 1 Age-specific rates (crude rates) of non-melanoma skin cancer (NMSC) in different age groups.

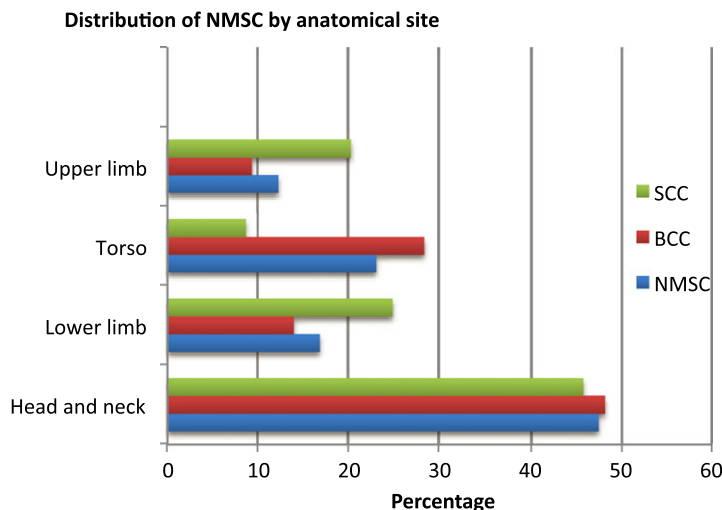


Figure 2 Percentage of lesions anatomic per site.

Table 3 Comparison of NMSC incidence rates published

Country	Year of publication	NMSC	BCC	SCC
New Zealand ⁷	1982		251	154
New Zealand ⁵	1998	1749	1120	628
Australia [†]	2009	1878	1286	592
New Zealand [‡]	2008	1907	1585	522
England ¹¹	2006	99	76	25
Scotland ¹¹	2006	119	90	27
Northern Ireland ¹¹	2007		94	46
Germany ¹¹	2005		55	44
Canada ¹¹	2007		87	54

[†]Standardised to Australian census data 2001. [‡]Current work.

managing high-risk lesions and metastasis. Our study provides information for clinicians and health economists to evaluate the scale of the problem and plan future management.

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