Indigenous people comprise about 2.4% of the Australian population and 29% of the population of the Northern Territory (NT). Many experience significant socio-economic deprivation and cultural marginalisation, which impacts negatively on their health. Commonly encountered health risk factors include tobacco smoking, excess body weight, misuse of alcohol and exposure to violence. For many Indigenous people, barriers to good health include poor access to culturally acceptable health services.

Health conditions more common in Indigenous than non-Indigenous people include diabetes, renal disease, injuries, diseases of respiratory organs and the cardiovascular system, and infectious diseases. While these health problems have been reported widely, the risk of cancer in Indigenous Australians has been less well documented.

The cancer incidence data described in this report comes predominantly from a collaborative project undertaken to estimate cancer incidence in Indigenous and non-Indigenous South Australians during 1977-2001. Collaborating partners included members of the South Australian Department of Health Epidemiology Branch and Aboriginal Health Division, the Aboriginal Health Council of South Australia and The Cancer Council South Australia. The purpose of the project was to estimate the incidence of all cancers combined, and of individual cancer types, as a basis for broader consultation with Indigenous groups and for the planning of cancer services.

Registry data indicates that although Indigenous Australians have an age-standardised incidence of cancer for all cancer types combined that is no higher than the incidence for the non-Indigenous population, their age-standardised cancer death rates are about 45% higher.

This higher mortality is partly due to an elevated incidence in many Indigenous populations of cancer types with a high case fatality. Examples include cancers of the lung, oesophagus/pharynx/mouth (intra-oral), pancreas, stomach, liver and gallbladder, and cancers of unknown organ origin. By comparison, a lower incidence is often observed in Indigenous than non-Indigenous Australians, of cancer types with a low case fatality. Examples include cancers of the female breast, bowel, prostate, skin (melanoma) and lip.

The elevation in cancer mortality in Indigenous populations is not entirely explained by differences in cancer type, in that Indigenous populations generally have more advanced cancers at diagnosis. Moreover, even after adjusting for cancer type and stage of progression of cancer at diagnosis, higher case fatalities still present in Indigenous than non-Indigenous populations, suggesting poorer outcomes of treatment. In particular, poorer outcomes are generally seen in Indigenous populations living in remote and rural settings.

In this report, cancer data is presented for Indigenous and non-Indigenous Australians, to provide an overview of differences in incidence and outcomes. Although there is an emphasis on South Australian data, to which there was more ready access, reference is also made to data from other states and territories. Possible reasons for differences between Indigenous and non-Indigenous cancer statistics are suggested, along with implications for the provision of preventive services, screening and other early detection services and of treatment and support services for Indigenous people affected by cancer.
made to validate the Indigenous status of cancer patients. The State Cancer Registry collaborated in that study with the (then) Aboriginal Health Organisation, local hospital staff, regional medical record administrators and local Aboriginal health agencies to check the accuracy and completeness of recording of Indigenous status. As a result, a more accurate definition of incidence was achieved by Indigenous status than otherwise would have been possible.

Similar projects conducted in the NT and Queensland have greatly increased the quality of data available on cancer in Indigenous Australians. Reference is also made in this report to the data from these jurisdictions.

**Epidemiological methods**

Relativities of incidence (all cancer types combined) between Indigenous and non-Indigenous South Australians, as determined in the 1988-1994 project, were generalised to the broader 1977-2001 period, with apportioning by cancer type according to the distribution of cancer types by age and sex for that broader period. The data were standardised by age and sex to the world population, as employed by the International Agency for Research on Cancer, to facilitate international comparison. The direct method of standardisation was used for the international data and for all cancer types combined in SA, whereas the indirect method was substituted for individual cancer types in SA, due to small numbers of these cancers in the Indigenous population, in order to gain greater statistical precision. It was assumed in this context that incidence differences by Indigenous status were consistent by age.

Use was made of 95% confidence limits when identifying likely non-random differences between incidence rates for Indigenous and non-Indigenous populations. Where differences were indicated, risk factors were investigated using the international literature. Members of the Department of Health Aboriginal Health Division and the Aboriginal Health Council of South Australia then considered these risk factors to determine the ones potentially most applicable to Indigenous Australians.

**Cancer incidence**

**All cancer types**

Indigenous Australians presented a 45% higher cancer death rate than other Australians of equivalent age, with elevations of a similar magnitude applying to males and females, at least in SA, WA, NT and Queensland. The age standardised ratio of Indigenous to non-Indigenous cancer deaths (95% confidence limits) for males was 1.45 (1.34, 1.57), females 1.46 (1.33, 1.58) and for both

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**Figure 1:** Estimated annual age-standardised (world population) cancer incidence per 100,000 (95% confidence limits) in South Australia by race, and in comparison regions of the world

1977 – 2001 SA estimates*

<table>
<thead>
<tr>
<th>Region</th>
<th>Incidence Rate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>280.06 [278.65, 281.46]</td>
</tr>
<tr>
<td>South Australia (Other)</td>
<td>267.42 [241.24, 295.67]</td>
</tr>
<tr>
<td>South Australia (Indig)</td>
<td>253.37 [250.78, 256.34]</td>
</tr>
<tr>
<td>Europe</td>
<td>251.26 [250.78, 251.74]</td>
</tr>
<tr>
<td>United Kingdom/Ireland</td>
<td>227.51 [226.10, 228.91]</td>
</tr>
<tr>
<td>Korea</td>
<td>224.35 [223.49, 225.21]</td>
</tr>
<tr>
<td>Japan</td>
<td>204.90 [202.53, 207.26]</td>
</tr>
<tr>
<td>Singapore</td>
<td>204.31 [202.96, 205.65]</td>
</tr>
<tr>
<td>Central &amp; South America</td>
<td>191.08 [189.27, 192.89]</td>
</tr>
<tr>
<td>Philippines</td>
<td>185.35 [184.71, 185.98]</td>
</tr>
<tr>
<td>China</td>
<td>149.34 [144.38, 154.29]</td>
</tr>
<tr>
<td>Pakistan</td>
<td>135.83 [134.62, 137.04]</td>
</tr>
<tr>
<td>Thailand</td>
<td>125.14 [123.65, 126.63]</td>
</tr>
<tr>
<td>Vietnam</td>
<td>122.61 [120.83, 124.39]</td>
</tr>
<tr>
<td>Africa</td>
<td>110.44 [109.82, 111.06]</td>
</tr>
</tbody>
</table>

1.45 (1.37, 1.54). More recently, published NSW data has pointed to a larger 69% elevation.4

While cancer death rates are elevated in Indigenous Australians, incidence data from the NT, SA, and Queensland do not show an elevation.2,4 While the SA incidence was relatively high in an international context, both for Indigenous and non-Indigenous people (Figure 1), a 5% lower incidence was suggested for Indigenous residents. Since confidence intervals overlapped, it seems that this difference could well have occurred by chance.

The question arises as to why the Indigenous population has a higher cancer death rate when incidence rates are not elevated. Is it due to differences in type of cancer? Do Indigenous people get more lethal types or are their cancers found later, with reduced prospects for cure? Or are other factors involved?

In fact, the present data show that Indigenous people get more lung, oral-pharyngeal-oesophageal, pancreatic, stomach, liver and gallbladder cancers, and cancers of unspecified organ origin, where prospects for survival are relatively low.10 In addition, Indigenous Australians have an elevated risk of cervical cancer.

By comparison, the present data show that Indigenous people get fewer cancers of the skin (melanoma), lip, prostate, female breast and bowel, where prospects for survival are relatively high.10 In addition, Indigenous Australians appear to be at lower risk of some haematological cancers.

Cancers more common in Indigenous people

Lung cancer

A 48% higher incidence was found for Indigenous than other South Australians (Figure 2). Higher elevations were observed in Indigenous populations of the NT and Queensland.1,4 As most lung cancers are attributed to tobacco smoking, the opportunity exists to decrease the incidence of this disease through reducing smoking.10,12

Intra-oral, pharyngeal and oesophageal cancers

The incidence of these cancers was about three-and-a-half times as high in Indigenous as other South Australians (Figure 2). A corresponding elevation was also seen in the Indigenous population of the NT.1 Again, this underscores the importance of tobacco control.13 Excess alcohol consumption is another risk factor for these cancers, plus diets low in fruit and vegetables.10,11,13

Pancreatic cancer

The incidence was approximately twice as high in Indigenous as other South Australians (Figure 2), with corresponding elevations presenting in NT incidence and NSW mortality data.15 Again, tobacco smoking is

Figure 2: Age-standardised (world population) cancer incidence per 100,000 (95% confidence limits) by race in South Australia: 1977-2001 estimated annual rates*

<table>
<thead>
<tr>
<th>Cancer site</th>
<th>Indigenous</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-oral, pharynx, oesophagus</td>
<td>29.7 [21.1, 40.6]</td>
<td>8.5 [8.3, 8.8]</td>
</tr>
<tr>
<td>Pancreas</td>
<td>44.4 [33.0, 58.4]</td>
<td>11.4 [6.1, 19.5]</td>
</tr>
<tr>
<td>Stomach</td>
<td>16.6 [10.0, 25.9]</td>
<td>8.0 [7.8, 8.3]</td>
</tr>
<tr>
<td>Lung</td>
<td>29.9 [29.5, 30.4]</td>
<td>8.0 [7.8, 8.3]</td>
</tr>
<tr>
<td>Liver</td>
<td>10.1 [5.5, 17.0]</td>
<td>7.4 [1.3, 15.5]</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>10.1 [5.2, 17.6]</td>
<td>2.3 [2.1, 2.4]</td>
</tr>
<tr>
<td>Cervix</td>
<td>33.6 [22.9, 47.4]</td>
<td>8.0 [7.6, 8.3]</td>
</tr>
<tr>
<td>Unspecified</td>
<td>24.1 [16.0, 34.9]</td>
<td>8.8 [8.7, 9.1]</td>
</tr>
</tbody>
</table>

*Data source: SA Cancer Registry
associated with this cancer, and possibly poor diet.\textsuperscript{10,11,13} In addition, diabetes has been cited as a risk factor.\textsuperscript{13}

\textbf{Stomach cancer}

This cancer had an incidence about twice as high in Indigenous as other South Australians (Figure 2). Diets high in salt and low in fruit and vegetables may predispose to these cancers.\textsuperscript{10,11,13} Incidence figures for Indigenous people are variable around Australia,\textsuperscript{14} which may reflect variations in \textit{Helicobacter pylori} infection.

\textbf{Liver cancer}

A marked elevation in incidence was evident in the Indigenous population of SA, at about seven times that of other South Australians (Figure 2). A greater excess was suggested in the NT.\textsuperscript{3} Apart from excess alcohol intake, risk factors include hepatitis B and C infection, and tobacco smoking.\textsuperscript{10,11,13} Hepatitis B vaccination has been used to combat this cancer in some populations.\textsuperscript{10,11}

\textbf{Gallbladder cancer}

The incidence of this cancer was about four times as high in Indigenous as other South Australians (Figure 2). The reasons are not clear, although there may have been a contribution from obesity and an elevated prevalence of gallstones and chronic inflammation.\textsuperscript{10,11,13} Multiple pregnancies have also been raised as a possible risk factor in some studies.\textsuperscript{13}

\textbf{Cervical cancer}

A four-fold elevation in incidence applied to Indigenous compared with non-Indigenous South Australians (Figure 2). Corresponding elevations were evident from the NT and Queensland data.\textsuperscript{3,4} These elevations have implications for screening programs and for priority setting when delivering human papillomavirus vaccination.\textsuperscript{14}

\textbf{Unspecified cancers}

Cancers of unknown organ origin had an incidence about three times as high in Indigenous as non-Indigenous South Australians (Figure 2). NT data also show an elevation for the Indigenous population.\textsuperscript{3} These cancers are often found when already well advanced and are often fatal. Lack of access to diagnostic facilities for regional and remote Indigenous communities would be a likely contributor.

\textbf{Cancers less common in Indigenous people}

\textbf{Skin cancer (melanoma)/lip cancer}

The incidence of melanoma was 95\% lower in Indigenous than non-Indigenous South Australians (Figure 3). This would reflect the protective effects of skin colouring for these sun-related cancers.\textsuperscript{15} Probably for similar reasons, no lip cancers were observed in the Indigenous population (Figure 3).
Prostate cancer

Indigenous South Australians had an incidence almost 80% lower than the non-Indigenous population (Figure 3). Insofar as these cancers have an upper socio-economic gradient, it would be expected that incidence rates would be lower in Indigenous people. There are probably a number of explanations whereby Indigenous women tend to have their first full-term pregnancy at a younger age, and to have a higher parity, which is likely to be protective against breast cancer. In addition, their participation in breast screening programs is less common, such that breast cancer detection rates are likely to be lower.

Female breast cancer

The incidence in Indigenous women was about half that in non-Indigenous women (Figure 3). Corresponding findings also applied for the NT and Queensland. There are probably a number of explanations whereby these cancers have an upper socio-economic gradient, this finding would be expected. In combination, faecal occult blood testing (FOBT), which can increase the detection rate for these cancers, may be less common in the Indigenous population.

Haematological cancers

The incidence of these cancers was about 42% lower in Indigenous than non-Indigenous South Australians (Figure 3). Confirmatory evidence has been found for the NT, in that lymphoma risk tended to be lower in the Indigenous population. These cancers have been linked to immune system disorders. Further research is warranted to explore differences and reasons for differences in incidence between Indigenous and non-Indigenous Australians.

Differences in survival

The results so far presented indicate that cancers in Indigenous Australians include a higher proportion of the more lethal types and a lower proportion of the less lethal types. However, this appears not to account fully for differences in survival.

In SA, the five-year survival from cancer of Indigenous patients was 37% in 1988-1994, as compared with about 56% for other South Australians. Had non-Indigenous patients had the same distribution of cancer types as Indigenous patients, and the same age profile, their five-year survival still would have been 49%, which greatly exceeds the 37% for Indigenous patients.

Cancers are found at a more advanced stage of progression in Indigenous than non-Indigenous patients, as indicated by SA, Queensland and NT data. However, further adjustment of survival for Indigenous and non-Indigenous patients in SA, by stage of progression of cancer at diagnosis, still left a survival deficit for Indigenous patients (p=0.058).

More recent survival data from the NT and Queensland are confirmatory, in that survival differences were not fully explained by type of cancer or stage of progression of cancer at diagnosis. In the NT, the deficit in survival in Indigenous patients after stage adjustment was observed in those who primarily spoke an Indigenous language. There is also evidence from the NT and Queensland that Indigenous patients obtain less comprehensive treatment, which would be less conducive to cure. In addition, higher levels of morbidity are likely to compromise the treatment of many Indigenous patients.

Future direction

Steps that could be taken to reduce cancer incidence in Indigenous Australians have been specified already. They include addressing specific risk factors, such as smoking, poor diet, excess alcohol consumption and obesity, and undertaking vaccination programs. In addition, earlier detection should be pursued through screening and related early detection initiatives. These control measures are the same as those required by the non-Indigenous population. However, additional challenges present in many Indigenous communities due to socio-economic deprivation, cultural marginalisation and geographic isolation.

Cancer control initiatives for Indigenous people are likely to be most effective when there is a devolution of decision-making to local communities to define their health needs and priorities. Mainstream health services should include Indigenous people in their governance structures and partner with the Indigenous health sector to promote culturally acceptable services, as advocated by the Australian Health Ministers’ Advisory Council. Service providers should be educated about Indigenous culture and about culturally safe and respectful care, as built into the action plans of a number of Australian Health agencies. Outreach health services should be introduced, wherever practicable, for remote Indigenous populations, and appropriate transport and accommodation should be available when remote residents need to travel to metropolitan centres for care.

References