Disparities in cancer survival

The current cancer landscape in Australia is one of increasing crude incidence, falling age-adjusted death rates and better survival, reflecting an ageing population and the likelihood that our health system is performing well for early detection and treatment of cancer. However, inequalities in cancer survival among people in rural, regional and remote areas of Australia and disparities in cancer treatment, particularly in respect to colorectal, lung and breast cancer, are probably partly responsible. Other factors closely aligned with cancer risk and poorer survival in rural and remote Australia include: greater levels of socio-economic disadvantage, limited access to specialist cancer treatment services and a greater proportion of Indigenous people who have their cancers diagnosed at more advanced stages and may receive poorer treatment. In the absence of more complete data, the survival pattern we see in remote parts of Australia probably represents the cancer experience of Indigenous Australians. Questions about the ways in which all of these factors collectively explain the survival picture in Australia will remain unanswered, unless we enrich our data sources, enhance cancer surveillance and work to better understand how the health system responds to the needs of different population subgroups, in particular our Indigenous people.

Table 1. Five-year relative risk of excess all cancer death due to cancer with 95% confidence intervals Area Health Services in NSW 1994–2000 *

<table>
<thead>
<tr>
<th>Area Health Service category</th>
<th>Relative excess risk of death</th>
<th>95% CI</th>
<th>Higher than the state average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan</td>
<td>0.96</td>
<td>(0.93-1.00)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.88</td>
<td>(0.86-0.91)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.06</td>
<td>(1.02-1.09) *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.11</td>
<td>(1.06-1.16) *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.01</td>
<td>(0.98-1.04)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.91</td>
<td>(0.89-0.94)</td>
<td></td>
</tr>
<tr>
<td>Other urban</td>
<td>0.99</td>
<td>(0.95-1.03)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.98</td>
<td>(0.95-1.01)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>(0.97-1.04)</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>0.95</td>
<td>(0.91-0.99)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.00</td>
<td>(0.97-1.04)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.07</td>
<td>(1.02-1.13) *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.09</td>
<td>(1.02-1.16) *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.12</td>
<td>(1.06-1.18) *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.04</td>
<td>(0.95-1.12)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.01</td>
<td>(0.97-1.06)</td>
<td></td>
</tr>
</tbody>
</table>


+ Relative risk of excess death compares observed relative survival with that expected from a Poisson model including terms for age, sex, follow-up year, site and spread of disease at diagnosis, and site and spread of disease by follow-up year interaction terms, with the NSW average rates as the reference. State average in this case =1.

# all sites except testis cancer combined as one group.
affect people living in regional, rural and remote areas, which in turn might affect their survival prospects. The best evidence comes from patterns of care studies, such as for colorectal cancer and data linkage studies, that can account for the many clinical and non-clinical factors influencing care and survival. Patterns of care studies for colorectal cancer patients diagnosed in NSW 2000–01 show small surgical caseloads in rural areas and a greater likelihood that patients residing outside highly accessible areas would have their surgery in rural hospitals. This was not as apparent for chemotherapy, though rural patients were more likely to be treated in public, rather than private facilities.

Patients in remote to very remote areas, who were referred to radiotherapy for high-risk rectal cancer, were less likely to have treatment compared to those from more accessible areas (Table 3). This was apparently not the case for chemotherapy for this cancer, but may have been so for node positive colon cancer (Table 4). Treating specialists were less likely themselves to follow up patients who lived in areas with limited access to services.

Despite small numbers of patients available for these analyses, these findings are consistent with other data showing that rural and remote residents with colorectal cancer across the country were less likely to receive some treatments, according to the national guidelines, and were more likely to be treated by relatively inexperienced clinicians. Data linkage studies from Western Australia also corroborate these findings, showing an association between survival and completion of chemotherapy and that treatment in rural hospitals, compared with teaching or private hospitals, was a strong predictor of failure to complete therapy.

Considerable area variation in treatment patterns for breast cancer has also been reported. Women in rural areas of NSW were more likely to have mastectomies and less likely to have breast conserving surgery. The latter is now an accepted part of best practice for women with early stage breast cancer. This practice pattern appeared to persist after taking into account age and spread of diagnosis. Similar patterns of practice

### Table 2. Five-year relative excess risk* (95% CI) of death, for all cancers by ARIA category of remoteness# in NSW people from 1992 to 1996

<table>
<thead>
<tr>
<th>ARIA category of remoteness</th>
<th>Without stage as a covariate</th>
<th>With stage as a covariate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessible</td>
<td>0.99 (0.96-1.02)</td>
<td>1.02 (0.99-1.04)</td>
</tr>
<tr>
<td>Moderately accessible</td>
<td>1.04 (0.98-1.11)</td>
<td>1.02 (0.96-1.09)</td>
</tr>
<tr>
<td>Remote and very remote</td>
<td>1.35 (1.20-1.51)</td>
<td>1.25 (1.11-1.41)</td>
</tr>
</tbody>
</table>

P<0.0001 P<0.003


* Reference is the highly accessible group where the relative excess risk =1. All models include age, sex, years since diagnosis and ARIA category.

#Department of Health and Aged Care. Accessibility/Remoteness Index of Australia (ARIA). Canberra:The Department, March 1999. (Occasional Papers Series No. 6.)

### Table 3. Chemotherapy and radiotherapy referral for patients with high risk rectal cancer* according to ARIA index of remoteness#

<table>
<thead>
<tr>
<th>ARIA category of remoteness</th>
<th>Proportion of patients referred (n=357) %</th>
<th>Proportion of those referred who were treated (n=273) %</th>
<th>Proportion of patients referred (n=243) %</th>
<th>Proportion of those referred who were treated (n=184) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly accessible</td>
<td>62</td>
<td>47</td>
<td>42</td>
<td>32</td>
</tr>
<tr>
<td>Accessible</td>
<td>74</td>
<td>57</td>
<td>46</td>
<td>34</td>
</tr>
<tr>
<td>Moderately accessible</td>
<td>67</td>
<td>50</td>
<td>67</td>
<td>42</td>
</tr>
<tr>
<td>Remote to very remote</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>0</td>
</tr>
</tbody>
</table>


* Department of Health and Aged Care. Accessibility/Remoteness Index of Australia (ARIA). Canberra:The Department, March 1999. (Occasional Papers Series No. 6.)

* excludes 150 patients with rectosigmoid cancer and includes 8 (1%) of patients in which chemotherapy referral was missing or unknown as well as 15 (3%) of patients in which radiotherapy referral was missing or unknown.

### Table 4. Chemotherapy referral for patients with node positive colon cancer* according to ARIA index of remoteness#

<table>
<thead>
<tr>
<th>ARIA category of remoteness</th>
<th>Proportion of patients referred (n=348) %</th>
<th>Proportion of those referred who were treated (n=274) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly accessible</td>
<td>76</td>
<td>58</td>
</tr>
<tr>
<td>Accessible</td>
<td>71</td>
<td>63</td>
</tr>
<tr>
<td>Moderately accessible</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Remote to very remote</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>


* Department of Health and Aged Care. Accessibility/Remoteness Index of Australia (ARIA). Canberra:The Department, March 1999. (Occasional Papers Series No. 6.)

* Includes 25 (5%) of patients in which chemotherapy referral was either missing or unknown.
were shown earlier for Australia\textsuperscript{26} as a whole and more recently in Western Australia\textsuperscript{17} and Victoria.\textsuperscript{18}

Linked data analyses in Western Australia also suggested breast cancer treatment in rural areas was sub-optimal with regard to open biopsies with frozen section, adjuvant radiotherapy and hormonal therapy.\textsuperscript{19} Using rates of unplanned re-admissions data as an indicator, it also appears that surgical treatment for women in rural hospitals was associated with higher morbidity.\textsuperscript{20} However, this has been disputed in other work.\textsuperscript{21}

Patterns of care for lung cancer patients diagnosed in 2001-02 in NSW show that the proportion of people having surgery for their cancer was about twice as great for residents of metropolitan and urban health service areas, for residents of rural health service areas. Similarly the proportion of people having combined treatment (chemotherapy and radiotherapy) in the metropolitan and urban areas, was double that of rural areas. Furthermore, greater proportions of people in rural (39\%) compared to metropolitan AHS (29\%), had no treatment at all. Interestingly, chemotherapy treatment alone seems to have been more common in rural areas than others, perhaps reflecting easier rural access to chemotherapy than to thoracic surgery and radiotherapy. Similar patterns were found when data was analysed using categories of remoteness (NSW Lung Cancer Patterns of Care Study, unpublished data, The Cancer Council NSW/NSW Health).

Possible explanations for the disparities in cancer survival

A number of factors associated with rural and remote place of residence might adversely influence cancer survival, such as a later tumour stage at diagnosis, limited access to treatment facilities, socio-economic disadvantage and greater proportions of Indigenous people living in geographically isolated areas, who also suffer social and economic disadvantage.

How certain are we then that poorer survival is directly related to difficulties accessing specialist cancer treatment services? If access to health services were equal to all, irrespective of socio-economic status, race and treatment patterns, would there be comparable outcomes to patients at the same stage of their disease? A review of overseas data suggests that the answer is yes,\textsuperscript{22} but the relevance of these results to the Australian population is uncertain.

To the extent that survival in NSW is worse in the most remote part of the state, it is possible that socio-economic disadvantaged and Indigenous origin play an independent role. How important then, are these and other factors to cancer survival outcomes?

Socioeconomic status

Socioeconomic disadvantage is more common in people living in rural and remote areas and is associated with advanced cancer stage at diagnosis\textsuperscript{23} and poorer survival.\textsuperscript{24} Exactly how it explains poorer survival is not clear, but it is probably aligned with levels of income and education that in turn, influence cancer knowledge and health behaviours, affordability of care and ability to access the full spectrum of cancer detection and treatment services.

Affordability of healthcare may be important, given the greater proportion of economically disadvantaged people in rural and remote areas who are probably less likely to have private health insurance. Patients treated in a private hospital appear to have better survival from colorectal cancer\textsuperscript{24} and prostate cancer,\textsuperscript{25} compared to those treated in public hospitals. Surgical treatment for breast cancer in a regional public hospital is significantly and independently associated with poorer survival outcomes.\textsuperscript{26} However, similar results have not been found elsewhere for colorectal,\textsuperscript{27} lung and breast cancer survival,\textsuperscript{28} when private health insurance was assessed as a predictor of outcomes.

Indigenous origin

Given that Indigenous people are more economically disadvantaged than other Australians,\textsuperscript{29} it is possible that what we attribute to a socio-economic effect on cancer survival in rural and remote areas, may be more an effect of race. Compared with other Australians, survival rates are worse for colorectal, breast, lung, cervix and non-Hodgkin’s lymphoma in Indigenous Australians.\textsuperscript{30} Indigenous people have cancer diagnosed at a later stage and have a lower prospect of surviving their cancer for every stage of disease.\textsuperscript{31}

Most of our information about cancer in Indigenous people has come from the Northern Territory and Western Australia, where high proportions live in remote areas. NSW has the highest concentration of Indigenous people and most of them inhabit rural and remote areas.\textsuperscript{32} Although NSW survival data has not been analysed according to Indigenous status, the combined findings of worse survival in the most remote areas of NSW\textsuperscript{33} and more advanced stage of diagnosed in less accessible areas of the state,\textsuperscript{34} suggest that Indigenous people could contribute substantially to the survival disadvantage of people in remote areas of the state.

Stage of disease

Stage of cancer at diagnosis, an important prognostic indicator, is probably influenced by socio-economic status; the more socially and economically advanced a population is, the greater the likelihood of being diagnosed with localised disease.\textsuperscript{35} Studies of Indigenous Australians so far, have not found alternative explanations for diagnosis of their cancers at a relatively more advanced stage. The possible explanatory variables considered have included age, cancer type,\textsuperscript{36} sex, remote residence, marital status, tobacco or alcohol use, chronic disease, access to private health care or time between onset of symptoms and diagnosis.\textsuperscript{37}

The possibility of biological differences between the tumours of Indigenous and non-Indigenous people has also been considered. Some evidence has been found of such differences between white people and African and other Americans, at least in terms of oestrogen and progesterone receptor status.\textsuperscript{38} Differences in histology however, were not found between Indigenous and non-Indigenous Australians.\textsuperscript{39}
Treatment disparities

On the basis of the available evidence, it appears that there are cancer treatment differences for lung, colorectal and breast cancer that would be likely to adversely affect survival in rural, regional and remote areas.

The cancer pattern in Indigenous people suggests that they may receive poorer treatment. For reasons that are most likely related to regular screening for chronic respiratory disease and tuberculosis, Indigenous patients with lung cancer in the Northern Territory are more likely to be diagnosed with localised disease than non-Indigenous people, but they are more likely to die from it.29 Indigenous women are less likely to get breast cancer than non-Indigenous women, but are more likely to die from it.29 Treatment disparities however, do not appear to fully explain the poorer survival in Indigenous people, nor do factors such as stage of diagnosis, co-morbidity, remoteness or socio-economic status.22,31 Significantly, they appear to be less likely to have treatment for cancer22,31 and when offered curative treatment, are less likely to accept and complete it.31 Language and cultural beliefs about cancer appear to be important to their cancer survival.21

If cancer survival is worse for Indigenous people and the socio-economically disadvantaged, to what extent, if any, does the health system pose a barrier to such people who need to access specialised and high-quality cancer services or high-volume surgeons? The possibility that there are systematic differences in the way healthcare institutions or professionals respond to minority groups, or indeed their doctors, has been speculated on both here31 and overseas.19,32 A recent review of racial and ethnic disparities provides compelling evidence of treatment disparities in cancer care for racial and ethnic groups, yet concedes that many other non-clinical factors are also implicated.22 Assessing the health system’s response to different population sub-groups is an area plagued with sensitivities and methodologically difficult to measure, but the study of self-reported discrimination might be a start.40

More detailed information on the many factors that influence treatment for different cancers and population subgroups is needed to complete this picture. Currently, public health data systems do not support detailed analyses of inequities in healthcare, and the infrastructure to support other data systems outside the health arena that could better inform us of the nature of clinical practice variations, is lacking.40 Collecting a wide range of data routinely, as part of the clinical pathway, would help us answer questions about the range of treatments offered to different population sub-groups, whether these treatments were accepted and completed and reasons for non-completion.

Conclusions

In all probability, cancer survival continues to be worse in rural, regional and remote areas, largely for the Indigenous population, and poorer treatment appears to play a part. The exact nature of and reasons for these treatment disparities is not clear, nor is the relationship of other factors connected to patterns of cancer treatment and important to cancer survival, such as access to health services, race and culture, co-morbidity, stage of disease and socio-economic status.

Enhancing and better-coordinating cancer surveillance efforts would go some way in providing an answer, as well as assisting health services to further investigate areas where the greatest disparities lie. In addition, more focused research extending beyond the realms of clinical care is required, to better understand the cancer survival story for socio-economically disadvantaged and Indigenous people. How, for example, does the health system respond to an Indigenous person’s needs and to what extent do language and cultural beliefs about cancer directly influence their ability to understand the full implications of a cancer diagnosis and the need to complete treatment?

Investigating the reasons for disparities in cancer treatment will require input from people in many disciplines such as epidemiology, clinical research, behavioural science, health administration and information technology. In the end, a structured and collaborative approach, addressing specific questions, will help attain the common goal of equity in cancer survival outcomes for all.

References

4 Department of Health and Aged Care. Accessibility/Remoteness Index of Australia (ARIA) Canberra: The Department, March 1999 (Occasional Papers Series No. 6).
14 Barton MB, Frummer M and Gabriel GS 2004. An overview of cancer services in NSW. CCORE.


