Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Viertel Centre for Research in Cancer Control

The generosity of Queenslanders and the Sylvia and Charles Viertel Charitable Foundation makes this research possible.

The Queensland Cancer Fund is an independent, community-based charity and is not government funded.

For information and support contact our Cancer Helpline on 13 11 20, Monday to Friday 8am to 8pm.
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Peter Baade
Lin Fritschi
Joanne Aitken

Viertel Centre for Research in Cancer Control
Queensland Cancer Fund
ACKNOWLEDGEMENTS

The researchers acknowledge and appreciate the work of the staff of the Queensland Cancer Fund, working in the Queensland Cancer Registry. Without their effort in providing accurate and timely data, this publication would not have been possible.

We also appreciate the assistance of Xue Qin Yu, from The Cancer Council New South Wales, who provided us with the specific details of the Empirical Bayes method used for the geographical analysis, and whose valued advice helped in understanding the statistical methodology.

We would like to acknowledge the valuable feedback provided by the two external reviewers on a draft version of this report, Dr Freddy Sitas and Xue Qin Yu from The Cancer Council New South Wales.

Related publications:


# Table of Contents

List of Abbreviations 3

Overview of statistical terms 3

Executive Summary 5

- Introduction 5
  - Scope of this report 8
  - Methods 9
    - Data sources 9
    - Statistical Analysis 9

- Methods 9
  - Data sources 9
  - Statistical Analysis 9

2 Description of geographical areas 10

- Health Areas 10
- Remoteness 10
- Socio-economic Status 11

3 Structure of results 15

4 Overview of Results 16

- Health Areas (Incidence) 16
- Health Areas (Survival) 16
- Remoteness (Incidence) 17
- Remoteness (Survival) 17
- Socio-economic Status (Incidence) 17
- Socio-economic Status (Survival) 17

5 Interpretation 18

- Possible explanations for incidence differentials 18
  - Risk factors 18
  - Screening 18
  - Migration 19
  - Random variation 19
- Possible explanations for survival differentials 19
  - Risk factors 19
  - Access to diagnostic services 19
  - Treatment differentials 20
  - Migration 20
  - Mix of cancer types 20
  - Random variation 20

6 Conclusions 21

7 Detailed Results 26

- All cancers combined 26
- Oesophageal cancer 28
<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach cancer</td>
<td>30</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>32</td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>34</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>36</td>
</tr>
<tr>
<td>Melanoma</td>
<td>38</td>
</tr>
<tr>
<td>Female breast cancer</td>
<td>40</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>42</td>
</tr>
<tr>
<td>Uterine cancer</td>
<td>44</td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td>46</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>48</td>
</tr>
<tr>
<td>Testicular cancer</td>
<td>50</td>
</tr>
<tr>
<td>Kidney cancer</td>
<td>52</td>
</tr>
<tr>
<td>Bladder cancer</td>
<td>54</td>
</tr>
<tr>
<td>Brain cancer</td>
<td>56</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>58</td>
</tr>
<tr>
<td>Leukaemia</td>
<td>60</td>
</tr>
<tr>
<td>Myeloma</td>
<td>62</td>
</tr>
</tbody>
</table>

**Appendix: Statistical methodology**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data source</td>
<td>64</td>
</tr>
<tr>
<td>Incidence</td>
<td>64</td>
</tr>
<tr>
<td>Relative survival</td>
<td>65</td>
</tr>
<tr>
<td>Cohort versus period approach for calculating survival</td>
<td>65</td>
</tr>
<tr>
<td>Adjustment for small numbers</td>
<td>66</td>
</tr>
<tr>
<td>Incidence ratio</td>
<td>66</td>
</tr>
<tr>
<td>Survival ratio</td>
<td>67</td>
</tr>
</tbody>
</table>

**References**

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
</tr>
</tbody>
</table>
List of Abbreviations

ABS  Australian Bureau of Statistics
ARIA  Accessibility / Remoteness Index of Australia
CI  Confidence Interval
EB  Empirical Bayes
LGA  Local Government Areas
QCR  Queensland Cancer Registry
SES  Socio-economic status

Overview of statistical terms

To assist readers in interpreting the information contained throughout this report, a number of statistical terms are briefly explained below. Further details about these statistical terms, and the methods used to generate the results in this report are contained in the Appendix.

Incidence is the number of new cancers diagnosed in a specified time period for a specific population (or geographic area).

Survival is the time between when a person is diagnosed with cancer and when they died.

Relative survival is the ratio of the observed survival of patients diagnosed with a cancer and their expected survival, which is based on the survival of the general population.

Incidence ratio is the ratio of the incidence rate in one geographical area and the incidence rate in a reference population (multiplied by 100). The incidence ratio for the reference population was set to 100. The reference populations for each geographical type are: Queensland average for Health Areas; Major city for Remoteness; and the Middle 80% SES group for SES.

Survival ratio is the ratio of the relative survival in one geographical area and the relative survival in a reference population (multiplied by 100). The reference populations are the same as for the Incidence ratios.

Note that other reports1-3 presenting survival differences have expressed the survival differential in terms of excess mortality (that is, an area with high excess mortality has low survival). We decided to present our results using the survival ratio because the results were more consistent with the survival estimates. For example, when the relative survival estimates were high in a geographical area, the survival ratio was (generally) also high, whereas the excess mortality estimate would be low.

Statistical significance (measured by the p-value) gives an indication of whether the observed result could be achieved “by chance”. In general a p-value <0.05 suggests that the observed difference is unlikely to be explained by chance alone. However this possibility still cannot be ruled out due to the high number of statistical comparisons made throughout this report.

Overall significance is an estimate of how much variation there is between the different geographical areas. If the significance is p<0.05 then we say that the geographical areas are not all the same. If the significance is ≥ 0.05 then we say that there is no evidence of any differences.

Confidence intervals (CI) give an indication of the variation that could be expected in the incidence and survival ratio estimates. Estimates based on smaller numbers are likely to have wider CIs (increased variability) than estimates based on larger numbers (narrower CIs, reduced variability). A 95% confidence interval corresponds to a p-value of 0.05. If the 95% confidence interval does not include 100, then we can say that the estimate is significantly different (based on a p-value of 0.05) to the reference population.
Confidence intervals for individual areas were only considered when the overall statistical test indicated that there were geographical differences. That is, if the overall test showed there was no evidence of geographical variation, we did not consider any individual differences, even if an individual confidence interval was statistically significant.

Adjustment for small numbers is a process by which estimates for each geographical area are adjusted (or “shrunk”) towards the overall mean. This is to reduce the impact (and significance) of undue variation in results based on very small numbers. This process has been used in this and other similar studies when assessing the Health Area differentials. Further details about this method are provided in the Appendix.
Executive summary

Introduction

An understanding of patterns of cancer in Queensland assists health planners, service providers, other health professionals and the general public to assess current needs and relative health burdens caused by each type of cancer. Throughout Australia there has been a strong interest in having more localised estimates available. Cancer registries and State Health departments are asked, usually on an ad-hoc basis, for data on cancer for a specific local area. This may be for planning or resource purposes, or to investigate concerns about whether there is an increased risk of a particular cancer in a certain area. To meet this need, other state health authorities in Australia, and internationally, have recently released publications looking at cancer in smaller geographical areas.2,6

Following requests for similar information from Queensland, the Queensland Cancer Fund has undertaken to produce a report on geographical differentials in cancer across Queensland. This report describes variations in cancer incidence and 5-year relative survival in Queensland according to 14 broad geographical areas (Health Areas), as well as variations across area-based categories of remoteness and socio-economic status.

Methods

The data reported in this publication were obtained from the Queensland Cancer Registry (QCR). The QCR is a population-based cancer registry that maintains a register of all cases of cancer diagnosed among usual residents of Queensland since 1982. Since October 2000 the Queensland Cancer Fund has managed the processing operations of the QCR for Queensland Health.

Cancer incidence data are based on cancer diagnosed among usual residents of Queensland between January 1st 1996 and December 31st 2002. Cancer survival results (using the “period” approach) are based on those cancer patients considered “at risk” between the same period.

Three definitions of geographic area were considered: Health area (14 distinct areas), remoteness (4 distinct categories) and socio-economic status or SES (3 distinct categories). Each definition of geographic area covers Queensland completely, and without overlap. Geographic area was based on the person’s place of usual residence when they were diagnosed with the cancer.

The Health Areas are a set of fourteen (14) distinct geographical areas that cover Queensland, and equate largely to the Commonwealth Sub-regions, a geographic entity defined by the Commonwealth Department of Health and Aged Care. Categories of remoteness in Queensland were defined by the ARIA+ classification6,7, where ARIA stands for Accessibility/Remoteness Index of Australia, which defines remoteness on the basis of five categories: Major City, Inner Regional, Outer Regional, Remote and Very Remote, with the last two categories combined into one for the purposes of this report. We used the Index of Relative Socio-economic Disadvantage8 to rank localities from the least to the most socio-economically disadvantaged. The highest 10% (approximately by population) of SLAs were assigned to the affluent group, the lowest 10% to the disadvantaged group and the middle 80% to the intermediate group9.

We used a statistical method to make allowance for the smaller numbers across the Health Areas. This method meant that if the numbers of a specific cancer in a specific Health Area was small, then it was “shrunk” towards the Queensland average. The degree of “shrinkage” generally increased as the area-specific count became smaller. This method, known as the Empirical Bayes (EB) method, has been used recently for the same purpose by The Cancer Council New South Wales2,3. Standard statistical models were used to assess differentials by SES and remoteness.
Results

Differentials by Health Areas

Incidence: Variations in cancer incidence across Queensland were common. Each of the 14 Health Areas had at least one cancer for which the incidence rate was significantly different to the Queensland average. Although there are many exceptions, incidence rates tended to be lower in areas away from the south-east corner of Queensland and higher in the south-east corner.

Survival: Variations in survival across the 14 Health Areas were less common (compared to incidence) however there was a clearer pattern evident. All but two of the 14 Health Areas (Darling Downs/South West and Redcliffe/Caboolture) had at least one cancer for which survival was significantly different to the Queensland average. Significant survival differences were seen in nine of the 19 cancers (colorectal cancer, lung cancer, ovarian cancer, prostate cancer, leukaemia and myeloma and all cancers combined). For all of these cancers there was a strong pattern that the further away from Brisbane people lived, the lower the 5-year survival.

Differentials by remoteness

Incidence: For specific cancers, there were few consistent changes in incidence with increasing remoteness. When combining all cancer types together the incidence was lower in more rural and remote areas, although this difference only achieved statistical significance for remote areas.

Survival: Survival differences by remoteness categories reflected those observed for the 14 Health Areas. For each of the 7 cancers that differed by remoteness (all cancers combined, colorectal, lung, cervical, prostate and kidney cancer and non-Hodgkin lymphoma), the survival was significantly lower in regional/remote areas compared to Brisbane.

Differentials by socio-economic status

Incidence: Incidence patterns according to socio-economic status were generally mixed. Incidence was higher in affluent areas for colorectal cancer, female breast cancer, non-Hodgkin lymphoma, leukaemia and myeloma. In contrast incidence was higher in disadvantaged areas for stomach, lung, cervical, ovarian and bladder cancer.

Survival: For those 6 cancers that showed a significant variation in survival by socio-economic status (all cancers combined, stomach cancer, melanoma, prostate cancer and brain cancer), survival was lower in disadvantaged areas and/or higher in affluent areas.
Conclusions

• There are a large number of potential explanations for the observed differentials in cancer incidence and survival in this report. These include differences in risk factors, diagnostic and/or screening services, treatment differentials, or migration between areas. In a descriptive report such as this it is not possible to assess the contribution of these reasons to the observed differentials. Any specific geographical differences identified in this report should not be viewed in isolation, rather the interpretation of these results should focus on the general patterns across Queensland.

• Among the various possible explanations for the variation in incidence across the Health Areas, differences in risk factors and access to diagnostic services, including cancer screening services, are likely to be important.

• The higher incidence of stomach, lung, cervical, ovarian and bladder cancer in disadvantaged areas generally reflects what is already known about risk factors in those areas. For example smoking is strongly related to lung and bladder cancer10, and smoking is also more prevalent among lower socio-economic groups11. The pattern of higher incidence of female breast cancer among affluent areas is also consistent with previous research12.

• The reduction in cancer survival in more rural or remote areas is consistent with other recently published Australian studies, both nation-wide13 and in New South Wales2. It is not clear whether earlier detection, improved treatment, or a combination of these reasons are primarily responsible for the improved survival around the south-east corner of Queensland. Although these Queensland results do not take into account the stage (or level of progression) of the cancer, results from New South Wales3 (who do collect a broad measure of the spread of cancer) indicate that similar levels of regional variation were observed whether adjusting for spread of disease or not.

• Survival differences by areas of socioeconomic status also reflect what has been reported nationally.13 According to the definition of socioeconomic status developed by the Australian Bureau of Statistics, which was then applied to this publication, areas defined as affluent were those areas whose residents were more likely to be employed, have high incomes and have high educational attainment.8 In contrast residents of areas classed as disadvantaged were more likely to be unemployed or else employed in unskilled occupations, and have lower educational attainment.8 In addition, nearly all of these affluent areas were in Brisbane, while most of the disadvantaged areas were outside Brisbane. Combined, these differences may explain the differences in survival, in that the characteristics of less affluent areas may result in later detection and less adequate treatment and support services.13

• Rather than specific differences being viewed in isolation, it is hoped that these results will be used as a platform on which to design other research projects looking at possible reasons for the observed differentials in cancer incidence and survival across Queensland.
1 Introduction

An understanding of patterns of cancer in Queensland helps health planners, service providers, other health professionals and the general public to assess current needs and understand the relative health burdens caused by each type of cancer. Previously, most of the published reports on cancer in Queensland have been for the whole of Queensland14-16.

Throughout Australia there has been a strong interest in having more localised estimates available. Cancer registries and State Health departments are asked, usually on an ad-hoc basis, for data on cancer for a specific local area. This may be for planning or resource purposes, or to investigate concerns about whether there is an increased risk of a particular cancer in a certain area. To meet this need, other state health authorities in Australia, and internationally, have recently released publications looking at cancer in smaller geographical areas2-5.

Following requests for similar information from Queensland, the Queensland Cancer Fund has undertaken to produce a report on geographical differentials in cancer across Queensland. This report describes variations in cancer incidence and 5-year relative survival in Queensland according to 14 broad geographical areas (Health Areas), as well as variations across area-based categories of remoteness and socio-economic status. It compliments the recently released Internet-based information dissemination system of Queensland Health17 by including cancer incidence and survival data, statistical adjustment for small numbers, and appropriate discussion and interpretation of the data presented.

Scope of this report

This report considers the geographical variation in cancer incidence and survival in Queensland between 1996 and 2002 across 14 geographical areas (called “Health areas”) which are based on single or aggregated Health Districts across Queensland. This follows the general model presented by New South Wales in their investigation of geographical variation in cancer incidence, mortality and survival across the 17 Health Service Areas of NSW2,3. These 14 Health Areas in Queensland enable meaningful and stable estimates of incidence and survival to be presented, particularly when compared to the option of presenting data for each of the 485 distinct localities (or statistical local areas18) across Queensland. This Queensland report also looks at incidence and survival differentials across area-based categories of remoteness and socio-economic status, both of which have been previously shown to be associated with cancer incidence and/or survival.1,13,19-21

To maintain the emphasis on usual residence at diagnosis, we did not include mortality differentials in this report (which are based on usual residence at death). Mortality is, of course, closely related to survival.

This report is not designed to identify clusters of cancers, for example, if there are concerns about a higher cancer risk among specific employees, or around an industry environment. These concerns are generally addressed by a specific research investigation, usually co-ordinated by the Chief Health Officer of the relevant state health department. These investigations are able to consider both data-related and non-data-related information. In contrast, this report is based solely on data from the Queensland Cancer Registry (QCR), and hence does not have the scope to include all the local issues that may be relevant to a cluster investigation. Without this additional information, the very small numbers of cancers diagnosed in each of the nearly 500 statistical local areas of Queensland make interpretation driven by these descriptive data alone very difficult.

It is primarily for this reason that this report does not present data by these individual local areas. Although reporting by these small areas has recently been done for Western Australia4, we felt that studies of very small geographical areas are more suited for specific cluster investigations (mentioned above) when a specific concern has been identified.
This report does not include any adjustment for stage or seriousness of cancer when it was diagnosed. As is the case for all cancer registries in Australia, complete staging data is not routinely collected by the QCR (although New South Wales collects a measure of degree of cancer spread). The major implications of the absence of stage information are that we cannot differentiate between early/late diagnosis and better/worse management of the cancer as possible reasons for geographical differences. Recent results from New South Wales found that similar levels of regional variation were observed whether they adjusted for spread of disease or not.

Methods

Full details of the data sources and statistical analysis methodology are described in the Appendix. A summary of those details is provided below.

Data sources

The data reported in this publication were obtained from the QCR. The QCR is a population-based cancer registry that maintains a register of all cases of cancer diagnosed among usual residents of Queensland since 1982. Since October 2000 the Queensland Cancer Fund has managed the processing operations of the QCR for Queensland Health.

Cancer incidence data are based on cancer diagnosed among usual residents of Queensland between January 1st 1996 and December 31st 2002. Cancer survival results (using the “period” approach) are based on those cancer patients considered “at risk” between the same period.

Statistical Analysis

We used a statistical method to make allowance for the small numbers in some Health Areas. This method meant that if the numbers of a specific cancer in a specific Health Area was small, then it was “shrunk” towards the Queensland average. The degree of “shrinkage” generally increased as the area-specific count became smaller. This method, known as the Empirical Bayes (EB) method, has been used recently for a similar purpose.

There were fewer categories for Remoteness (4) and SES (3), and so the EB method was not able to be applied. Therefore we used standard regression techniques to look at these geographical differentials. The largest category in each grouping (ie. Major City for Remoteness and Middle 80% for SES) had populations well over half of the Queensland total, so they were used as the reference populations (rather than the Queensland average).
2 Description of geographical areas

Three definitions of geographic area were considered: Health area (14 distinct areas), remoteness (4 distinct categories) and socio-economic status or SES (3 distinct categories). Each definition of geographical area covers Queensland completely, and without overlap.

Geographic area was based on the person’s place of usual residence when they were diagnosed with the cancer. It is not always possible to equate increased risk of cancer diagnosis in a particular area with increased risk factors in that area. A person could be exposed to a risk factor for many years while living at location A, then move to location B where they were diagnosed with the cancer. So even though they were diagnosed at location B, the contributing factors to the development of the cancer would have been in location A.

Statistical local areas (SLAs) were the building blocks used to create these larger geographic groupings. SLAs are part of the Australian Standard Geographic Classification used by the Australian Bureau of Statistics. They correspond either to Local Government Areas (LGAs) or suburbs in larger LGAs. SLAs cover Queensland without gaps or overlaps. In 2002 there were 485 SLAs in Queensland with a median population of 5330 (range: 57 to 67772). For each of the area definitions described below, the data from the relevant SLAs in a specific category were first combined, and then all analyses were undertaken on the combined data. Records that had missing or undefined SLAs (about 0.5% of all records) were excluded from the analysis.

Health Areas

The Health Areas are a set of fourteen (14) distinct geographical areas that cover Queensland (Figure 1). These areas aggregate the Health Service Districts used by Queensland Health, and equate largely to the Commonwealth Sub-regions, a geographic entity defined by the Commonwealth Department of Health and Aged Care. These areas have also been used in the Health Status Indicators Dissemination Tool published on the Queensland Health Internet site.

To assist interpretation, three of these Health Areas have been renamed for the purposes of this report. These areas are now “Brisbane (North)” (formerly Prince Charles Hospital and District), “Brisbane (South)” (formerly QEII Hospital and District) and “Brisbane (Bayside)” (formerly Bayside).

Remoteness

Categories of remoteness in Queensland (Figure 2) were defined by the ARIA+ classification, where ARIA stands for Accessibility/Remoteness Index of Australia. The ARIA+ classification is an enhancement of the original ARIA classification, and defines remoteness on the basis of five categories: Major City, Inner Regional, Outer Regional, Remote and Very Remote. For the purposes of this report, due to the small number of people diagnosed with some cancers in the more remote areas, we have combined Remote and Very Remote into the “Remote” category.

Full details of the differences between the ARIA+, ARIA and other remoteness classifications have been described elsewhere. It is possible that the choice of classification could impact on the results obtained in this study. While we acknowledge the potential limitations of any remoteness classification in terms of final interpretation, we chose the ARIA+ classification to be consistent with other recently published geographical reports.
Socioeconomic Status (SES)

Although occupation is collected by the Queensland Cancer Registry, it is not reported well enough to provide an index of socio-economic status. Other standard approximations of socio-economic status (eg. income, education) are not collected. Consequently, we defined socio-economic status according to where the person lived at the time of diagnosis of the cancer (Figure 3).

The Index of Relative Socio-economic Disadvantage (developed by the Australian Bureau of Statistics) is based on the percentage of people in the SLA with low income, low educational attainment or who are unemployed or employed in relatively unskilled occupations. Although there are other indices of socio-economic status, this is a measure widely used for these type of descriptive analyses. We used this index to rank SLAs from the least to the most socio-economically disadvantaged. The highest 10% (approximately by population) of SLAs were assigned to the affluent group, the lowest 10% to the disadvantaged group and the middle 80% to the intermediate group. The middle 80% was not further subdivided because, in Queensland, many of these SLAs were not homogenous and included neighbourhoods with markedly different socio-economic characteristics. Nearly all the affluent areas were in Brisbane, while many of the disadvantaged areas were outside Brisbane.

The advantages of using the upper and lower 10% categories, in contrast to the often-used quintiles, are two-fold. First if there is a socioeconomic gradient, then it is likely to be most evident at the two end-points of the socioeconomic scale. SLAs in the middle group often consist of both high and low SES areas, which when averaged out, result in “middle” grouping, whereas those in the two end-points of the socioeconomic scale are much more homogenous. Secondly, since the areas with very low (and very high) socioeconomic status have not varied markedly over time, this makes it simpler to combine data over several years.
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Figure 1: Details of Health Areas

<table>
<thead>
<tr>
<th>Far North</th>
<th>Northern / North West</th>
<th>Mackay</th>
<th>Fitzroy / Central West</th>
<th>Darling Downs / South West</th>
<th>Wide-Bay / Burnett</th>
<th>Sunshine Coast</th>
<th>West Moreton</th>
<th>Logan / Beaudesert</th>
<th>Redcliffe/ Caboolture</th>
<th>Brisbane (North)</th>
<th>Brisbane (South)</th>
<th>Brisbane (Bayside)</th>
<th>Gold Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002 population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>213,740</td>
<td>236,922</td>
<td>127,304</td>
<td>195,031</td>
<td>252,982</td>
<td>238,705</td>
<td>255,407</td>
<td>175,737</td>
<td>284,467</td>
<td>171,105</td>
<td>546,874</td>
<td>425,009</td>
<td>182,764</td>
<td>379,051</td>
</tr>
</tbody>
</table>

Selected localities 1

- Cairns
- Atherton
- Weipa
- Torres
- Townsville
- Mt Isa
- Bowen
- Cloncurry
- Prosperpine
- Sarina
- Charters Towers
- Rockhampton
- Gladstone
- Emerald
- Winton
- Toowoomba
- Gatton
- Stanthorpe
- Charleville
- Bundaberg
- Maryborough
- Gympie
- Kingaroy
- Noosa
- Caloundra
- Nambour
- Ipswich
- Maroochydore
- Esk
- Boonah
- Woodridge
- Springwood
- Beenleigh
- Logan City
- Dalby
- Monto
- Landsborough
- Chinchilla
- Gayndah
- Brisbane (CBD)
- Kilsyth
- Brisbane (North)
- Deagon
- Nambour
- Deception Bay
- Brisbane (Bayside)
- East Brisbane
- Calamvale
- Eight Mile Plains
- Hope Island
- Southport
- Cleveland
- Redland Bay
- Burleigh Heads
- Wynnum
- Mudgeeraba
- Carindale
- Rochedale
- Chandler
- Coolangatta
- Nerang
- Alderley
- Eight Mile Plains
- Eight Mile Plains
- Eight Mile Plains
- Eight Mile Plains

1. This does not necessarily include all major localities in each Health Area, however it is meant as a guide as to the general composition of each Health Area.
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Figure 2: Details of Remoteness Areas

<table>
<thead>
<tr>
<th>Major City</th>
<th>Inner Regional</th>
<th>Outer Regional</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002 population</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,970,545</td>
<td>961,059</td>
<td>661,795</td>
<td>113,776</td>
</tr>
</tbody>
</table>

Selected localities ¹

- Annerley
- Brisbane City
- Burpengary
- Calamvale
- Cleveland
- Coopers Plains
- Deception Bay
- Gold Coast
- Ipswich
- Kenmore
- Norman Park
- Northgate
- Redcliffe
- Rochedale
- Springwood
- St Lucia
- Stafford
- Tingalpa
- Windsor
- Wynnum

- Boonah
- Bribie Island
- Bundaberg
- Caboolture
- Caloundra
- Dalby
- Esk
- Gladstone
- Gympie
- Kilcoy
- Kingaroy
- Laidley
- Landsborough
- Maroochydore
- Maryborough
- Noosa
- Rockhampton
- Toowoomba
- Warwick
- Bowen
- Cairns
- Chinchilla
- Emerald
- Gayndah
- Goondiwindi
- Kilkivan
- Mackay
- Miriam Vale
- Monto
- Murgon
- Proserpine
- Roma
- Sarina
- Stanthorpe
- Townsville
- Cloncurry
- Doomadgee
- Lockhart River
- Moreton Island
- Mount Isa
- Palm Island
- Taroom
- Weipa
- Wujal Wujal

¹ This does not necessarily include all major localities in each remoteness category, however it is meant as a guide as to the general composition of each Remoteness Category.
Figure 3: Details of SES Areas

<table>
<thead>
<tr>
<th>Most affluent areas (Highest 10%)</th>
<th>Middle 80%</th>
<th>Most disadvantaged areas (Lowest 10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002 population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>253,003</td>
<td>3,227,288</td>
<td>226,884</td>
</tr>
</tbody>
</table>

Selected localities

- Albany Creek
- Ashgrove
- Bellbrowie
- Bridgewater Downs
- Burbank
- Carsseldine
- Chelmer
- Fig Tree Pocket
- Hamilton
- Jindalee
- Kenmore Hills
- Middle Park
- Mount Ommaney
- Paddington
- Pinjarra Hills
- Riverhills
- Sherwood
- Taringa
- Toowong
- Upper Kedron
- Wellington
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedron
- Upper Kedro
3 Structure of results

Only those cancers with enough numbers for meaningful and robust incidence and survival estimates were considered. This included all cancers combined, as well as 18 of the most common cancers diagnosed in Queensland (shown in Tables 1 to 4). Although data for leukaemia is sometimes reported separately for children and adults, due to small numbers in specific geographic areas in this report we have combined the results for all ages.

Apart from those cancers that are sex-specific, results are presented for males and females combined in a further attempt to increase the numbers and the stability of the estimates. In addition, we have only reported on breast cancer among females, since although breast cancer is diagnosed among males, this is a predominately female-specific disease.

The first four tables summarise the geographical variation in cancer incidence and survival. The subsequent pages describe the geographical patterns in more detail, with two pages for each cancer. The first page shows the geographic differences in incidence and survival using maps and graphs. The second page shows the actual incidence and survival estimates in a data table.

Colour coding is used in the maps and graphs. Darker colours are used to indicate “worse” outcomes, which are high incidence or low survival, and lighter colours were used to indicate “better” outcomes (low incidence or high survival). If an estimate was not statistically significant (ie. the CI included 100) then it was assumed to be the same as the reference population (ie. 100). Similarly, if the overall significance was ≥ 0.05 then all areas were assumed to be equal. This means that an area is only lighter or darker when there is significant variation overall, and the individual confidence interval does not include 100.

To make presentation and summarising the results easier we have grouped the geographical differentials into five categories according to the significance and magnitude of the geographical variation. Estimates that were at least 20% below, and significantly different to, the reference average were “Very low”, estimates that were not more than 20% below, and significantly different to, the reference average were Low. Corresponding definitions were used for “Very high” and “High”. Regardless of the value of the estimate, if it was not significantly different to the reference average, it was assumed that there was no difference.

For some graphs of the Health Area differentials, the adjusted geographical estimates were estimated to all be 100 (the value of the reference population). This means that there was insufficient variation in the estimates for the modelling (or “shrinking”) process to detect any meaningful variation, and all the adjusted estimates were considered equal to 100 (for example ovarian cancer incidence). Further details of the statistical methodology are described in the Appendix.
4 Overview of Results

Health Areas (Incidence)

- Overall there were 19 cancers (including all cancers combined) and 14 Health Areas, resulting in 266 comparisons for incidence considered in this report (and the same number for survival).
- 70 of the Health Area comparisons of incidence showed statistically significant differences. Of these 70, 31 had incidence rates that were significantly higher than the state average, while 39 were significantly lower (Table 1).
- Cancers with the greatest variability in incidence were melanoma (12 areas with significant differences), female breast cancer (9 areas), lung and prostate cancer (8 areas), followed by bladder cancer and all cancers combined (7 areas with significant differences).
- Health areas with the greatest variability in incidence were Far North (10 cancers significantly different, predominantly low incidence), Darling Downs/South West (8 cancers, predominantly low incidence), Northern / North West (7 cancers, predominantly low incidence). The three Health Areas of Redcliffe/Caboolture, Brisbane (North) and Brisbane (Bayside) had 4, 6 and 6 cancers respectively different to the Queensland average, and these differences were mainly higher incidence than the Queensland average. Logan/Beaudesert also had six cancers in which the incidence was different to the Queensland average; these were split equally between higher and lower incidence.
- All Health Areas had at least two cancers in which the incidence was statistically significantly higher or lower than the Queensland average.
- There was no statistically significant variation in incidence across the 14 Health Areas for stomach cancer, pancreatic cancer, ovarian cancer, testicular cancer, brain cancer or myeloma.

Health Areas (Survival)

- Survival differentials were less common than the incidence differentials, with 34 (out of 266) of the Health Area comparisons resulting in statistically significant differences, 17 of which were higher (better) survival than the state average, and 17 which had lower survival (Table 2).
- Cancers with the greatest variability in survival were all cancers combined (8 areas with significant differences), colorectal cancer and lung cancer (5 areas) and prostate cancer (4 areas).
- Health areas with the greatest variability in survival were Northern / North West (5 cancers, predominantly low survival), and Brisbane (North) and Sunshine Coast (4 cancers, both with predominantly high survival).
- Where variation occurred, cancer survival was generally poorer in those Health Areas furthest away from Brisbane, and best in those areas closest to Brisbane.
- Darling Downs/South West and Redcliffe/Caboolture both had no statistically significant evidence of any difference in cancer survival (compared to Queensland) for any of the cancers considered in this report.
- There was no statistically significant variation in survival across Health Areas for oesophageal cancer, stomach cancer, pancreatic cancer, melanoma, female breast cancer, cervical cancer, uterine cancer, testicular cancer, bladder cancer or brain cancer.
**Remoteness (Incidence)**

- The incidence patterns by remoteness were fairly random. Even when there was a significant remoteness effect, it was usually not a consistent trend from Major City areas through to Remote areas. This may have been influenced, at least in part, by the small numbers of cancers in remote areas. For example there were about six cervical cancers diagnosed per year in remote areas over the study period.

- No remoteness differentials in incidence were observed for stomach cancer, colorectal cancer, pancreatic cancer, lung cancer, uterine cancer, ovarian cancer, testicular cancer, kidney cancer, bladder cancer, leukaemia or myeloma.

**Remoteness (Survival)**

- Where there were remoteness differentials in survival, the survival was consistently lower in more remote areas. This pattern was evident for all cancers combined, colorectal cancer, lung cancer, prostate cancer, kidney cancer and non-Hodgkin lymphoma.

- The only exception to this pattern was for cervical cancer, however the increased survival in remote areas was based on about six diagnoses of cervical cancer per year over the seven years.

**Socio-economic status (Incidence)**

- For some cancers (colorectal cancer, female breast cancer, melanoma, non-Hodgkin lymphoma, leukaemia and myeloma), incidence was higher in more affluent areas (or lower in disadvantaged areas).

- Conversely, for stomach cancer, lung cancer, cervical cancer, ovarian cancer and bladder cancer the incidence was higher for people living in more disadvantaged areas.

**Socio-economic status (Survival)**

- For those five cancers where there was a significant socio-economic difference in survival (all cancers combined, stomach cancer, melanoma, prostate cancer and brain cancer), the survival was higher in more affluent areas, and/or lower in the most disadvantaged areas.
5 Interpretation

Any differences that are identified in this report need to be viewed as areas for further research or investigation. This report can not provide definitive reasons for any observed geographical variation. In the section below we have provided a range of possible reasons for the variations observed, and the accompanying limitations, which are based on previously published findings from other studies and general statistical principles. Each of these explanations can influence incidence and survival on their own, or in combination with other possible reasons.

Dedicated research studies are required to properly investigate and explain any findings in this report. Such studies could include, among other issues, looking at various person-specific factors such as smoking history, residential and family history, and diet, as well as area-level factors such as air, water and soil quality, and access to and performance of health services.

In the statistical analysis for this report we looked at differentials across each of the three geographical classifications separately. This was required due to privacy restrictions on accessing more detailed geographical data from the Queensland Cancer Registry. As such we could not explore whether the incidence or survival differentials observed across one classification (eg. Health Areas) were at least partly explained by another (eg. SES).

Possible explanations for incidence differentials

Risk factors

The term “risk factor” relates to the various causes of, or contributors to, cancer. Typically the risk factors vary for individual cancers, although some risk factors are known to contribute to a range of cancer types. Risk factors can be grouped into area-specific (such as air, water and soil quality, or industrial activity) or person-specific (such as smoking history, diet, alcohol intake and family history). Risk factors can also be modifiable (such as diet or air quality) or unmodifiable (such as family history). Most of the evidence for known risk factors is based on the results of scientific research studies. However, for many cancers the evidence for specific risk factors is inconclusive, and there may be risk factors for a specific cancer that are as yet unknown.

Screening

Cancer screening is the application of a test to an apparently cancer-free group to identify those people likely to have the disease25. A screening test is not designed to be definitive, so people with a positive screen then need a second test to confirm or negate the initial test. The screening test is designed to pick up cancers before they present symptoms, and, assuming there is a suitable treatment, therefore increase their potential for survival or cure.

Screening can influence incidence in at least two ways. The first is by detecting cancers earlier than they would have been detected otherwise. The introduction of a screening test would then often result in a sharp increase in incidence as these screen-detected cancers are diagnosed, followed by a decrease, since those cancers that would have been detected later have already been diagnosed. This outcome was clearly visible with prostate cancer during the 1990s, when the incidence increased sharply following the introduction of prostate-specific antigen (PSA) testing, followed by a similar level of decrease in incidence.

The second way in which screening can influence incidence is by detecting cancers that would not have progressed to cause symptoms within the normal lifespan of the person involved. Therefore by detecting these “indolent” cancers, screening may be seen as artificially increasing the observed incidence rate. Unfortunately it is usually impossible to know the difference between indolent cancers and those with the potential to cause symptoms (and mortality).
Systematic population-based screening programs are usually only implemented if there is an appropriate screening test and an effective management or treatment strategy once those screen-detected cancers are diagnosed. In Australia there are long-running formal screening programs for breast cancer and cervical cancer, and a national colorectal cancer screening program using faecal occult blood testing has begun nationally. Therefore differences in screening rates between areas are likely to be reflected in the incidence differentials. Screening can also be conducted on an ad-hoc basis, such as clinical skin examinations for melanoma.

Migration

The place a person was living when they were diagnosed with a cancer does not necessarily reflect the place where the cancer first occurred and progressed. For example a person may have lived in an area with very high pollution and low air quality, then they moved to a well-developed residential area with very high air quality and low pollution where they were then diagnosed with cancer. Since there is no population-based data on cancer patients’ residential movements, we are unable to ascertain to what extent this scenario might occur.

Random variation

Another possible explanation for the incidence differentials is random variation. The use of robust and previously-used statistical methods in this report reduces the likelihood of this explaining the observed differentials. However there remains a chance that at least some of the observed variation in incidence is due to chance. Random variation decreases as the number of cancers diagnosed in an area increases. For example, if there were 10 cases of a cancer in one year, then it would be quite plausible for the counts to increase or reduce by 50% (ie. from 5 to 15) and still be within what could be expected by “chance”. However if there were 1000 cases in a year, then it would be extremely unlikely to have the same relative variation, and the range that could be expected by “chance” would reduce to about plus or minus 5% (ie. from 950 to 1050). Thus, results based on very small numbers should be interpreted with high degree of caution.

Statistical significance is based on probabilities, so even if a p-value is equal to 0.05, there is still a 1 in 20 chance that the observed difference was due to the extreme play of chance alone.

Possible explanations for survival differentials

Risk factors

The rate at which a cancer progresses is not the same for all cancers, even those of the same type. Some cancers are “aggressive”, which means their natural progression to cause mortality is relatively fast. Some factors (eg obesity) have been suggested to increase the likelihood of a cancer being aggressive.

Access to diagnostic services

Cancer survival is the time from the cancer diagnosis to the patient’s death. The earlier the cancer is diagnosed, the longer the patient will be observed to have survived, even if the earlier diagnosis did not change the natural progression of the disease. This is what we refer to as “lead time bias”, when the earlier diagnosis inflates the observed survival even though the patients do not live any longer. However for most cancers, the treatment options are more successful if the cancer is detected earlier, rather than when it is first detected at an advanced stage. Therefore any geographical differences in access to and/or efficiency of cancer diagnostic services will be reflected by differences in cancer survival.

Diagnosis services also include screening which is discussed previously (for incidence).
This report does not include any adjustment for stage or seriousness of cancer when it was diagnosed. As is the case for all cancer registries in Australia, complete staging data is not routinely collected by the Queensland Cancer Registry (although New South Wales collects a measure of degree of cancer spread). The major implications of the absence of stage information are that we cannot differentiate between early/late diagnosis and better/worse management of the cancer as possible reasons for geographical differences. For example if we knew that the stage of cancers when detected was similar across the geographical areas, then any differences in survival could be attributed to management differences with more confidence.

**Treatment differentials**

Effective treatment, of course, can increase survival. The effectiveness of treatment can often depend on how early the cancer was detected, and so the impact of treatment on survival is often related to the effectiveness of screening, or early detection.

Treatment differentials can also be related to the level of supportive or general medical care available in the area, and the speed at which patients are referred to the treating hospital or physician.

**Migration**

Survival estimates are based on where the patient lived when they were diagnosed, which is not necessarily where they lived during their remaining lifetime. As such the observed survival is not always attributable to living in the particular area, rather it can depend on the ability of residents to access treatment (possibly in another geographical area).

**Mix of cancer types**

The survival differentials for all cancers combined can be influenced by the mix of cancer types for that geographical area. For example, even though the overall incidence of cancer might be the same for two geographical areas, if one area has a higher proportion of melanomas (with very high survival) while the other has a higher proportion of lung cancers (with low survival), then the all cancer survival will be different simply due to the mix of cancers.

**Random variation**

As noted above (for incidence), random variation could be an explanation for the observed survival differentials, even though the use of robust and previously-used statistical methods would minimise this likelihood.
6 Conclusions

There are a large number of potential explanations for the observed differentials in cancer incidence and survival in this report. These include differences in risk factors, diagnostic and/or screening services, treatment differentials, or migration between areas. In a descriptive report such as this it is not possible to assess the specific contribution of each of these reasons to the observed differentials. Any particular geographical difference identified in this report should not be viewed in isolation, rather the interpretation of these results should focus on the general patterns across Queensland.

Among the various possible explanations for the variation in incidence across the Health Areas, differences in risk factors and access to diagnostic services, including cancer screening services, are likely to be important.

The higher incidence of stomach, lung, cervical, ovarian and bladder cancer in disadvantaged areas generally reflects what is already known about risk factors in those areas. For example smoking is strongly related to lung and bladder cancer\(^{10}\), and smoking is also more prevalent among lower socio-economic groups\(^{11}\). The pattern of higher incidence of female breast cancer among affluent areas is also consistent with previous research\(^{12}\).

The reduction in cancer survival in more rural or remote areas is consistent with other recently published Australian studies, both nation-wide\(^{13}\) and in New South Wales\(^2\). It is not clear whether earlier detection, improved treatment, or a combination of these reasons are primarily responsible for the improved survival around the south-east corner of Queensland. Although these Queensland results do not take into account the stage (or level of progression) of the cancer, results from New South Wales\(^3\) (who do collect a broad measure of the spread of cancer) indicate that similar levels of regional variation were observed whether adjusting for spread of disease or not.

Survival differences by areas of socioeconomic status also reflect what has been reported nationally.\(^{13}\) According to the definition of socioeconomic status developed by the Australian Bureau of Statistics, which was then applied to this publication, areas defined as affluent were those areas whose residents were more likely to be employed, have high incomes and have high educational attainment.\(^8\) In contrast residents of areas classed as disadvantaged were more likely to be unemployed or else employed in unskilled occupations, and have lower educational attainment.\(^8\) In addition, nearly all of these affluent areas were in Brisbane, while most of the disadvantaged areas were outside Brisbane. Combined, these differences may explain the differences in survival, in that the characteristics of less affluent areas may result in later detection and less adequate treatment and support services.\(^{13}\)

Rather than specific differences being viewed in isolation, it is hoped that these results will be used as a platform on which to design other research projects looking at possible reasons for the observed differentials in cancer incidence and survival across Queensland.
Table 1: Summary of incidence differentials across the 14 Health Areas

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Far North</th>
<th>Northern / North West</th>
<th>Mackay</th>
<th>Fitzroy / Central West</th>
<th>Darling Downs / South West</th>
<th>Wide-Bay / Burnett</th>
<th>Sunshine Coast</th>
<th>West Moreton</th>
<th>Logan / Beaudesert</th>
<th>Redcliffe / Caboolture</th>
<th>Brisbane (North)</th>
<th>Brisbane (South)</th>
<th>Brisbane (Bayside)</th>
<th>Gold Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Malignant Neoplasms</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>
| Oesophageal cancer    | High      | Low                   | Low       | Low                    | Low                         | Low                 | Low            | Low          | Low
t | Low                   | Low                   | Low             | High              | Low        |
| Stomach cancer        | No significant variation in incidence across Health Areas |
| Colorectal cancer      | High      | High                  | Low       | Low                    | Low                         | Low                 | Low            | Low          | Low                | Low                   | Low              | Low             | High              | Low        |
| Pancreatic cancer      | No significant variation in incidence across Health Areas |
| Lung cancer            | High      | Low                   | Low       | Low                    | Low
t | Low                   | Low             | High          | High                | Low                   | Low              | Low             | High              | Low        |
| Melanoma               | Low       | Very low              | Very high | High                  | Low                         | Low                 | Low            | High         | High                | High                   | Low              | Low             | High              | Low        |
| Breast cancer          | Low       | Low                   | Low       | Low                    | Low
t | Low                   | Low             | High          | High                | Low                   | Low              | Low             | High              | Low        |
| Uterine cancer         | Low       | Low                   | Low       | Low                    | Low                         | Low                 | Low            | Low          | Low                | Low                   | Low              | Low             | High              | Low        |
| Ovarian cancer         | No significant variation in incidence across Health Areas |
| Prostate cancer        | Very low  | High                  | Low       | Low                    | Low
t | Low                   | Low             | High          | High                | Low                   | High              | Low             | Low              | High        |
| Testicular cancer       | No significant variation in incidence across Health Areas |
| Kidney cancer          | Low       | Low                   | Low       | Low                    | Low
t | Low                   | Low             | High          | High                | Low                   | High              | Low             | High              | Low        |
| Bladder cancer          | Low       | Low                   | Low       | Low                    | Low
t | Low                   | Low             | High          | High                | Low                   | High              | Low             | High              | Low        |
| Brain cancer           | No significant variation in incidence across Health Areas |
| N-H Lymphoma           | Low       | Low                   | Low       | Low                    | Low                         | Low                 | Low            | High          | High                | High                   | Low              | Low             | High              | Low        |
| All Leukaemias         | Low       | Low                   | Low       | Low                    | Low                         | Low                 | Low            | High          | High                | High                   | Low              | Low             | High              | Low        |
| Myeloma                | No significant variation in incidence across Health Areas |

Very low: At least 20% below the Queensland average; Low: 1-20% below the Queensland average; High: 1-20% above the Queensland average; Very high: At least 20% above the Queensland average. Values are only highlighted if there is significant (p<0.05) geographical variation for that cancer type, and the specific value if significantly (p<0.05) different to the Queensland average.
Table 2: Summary of survival differentials across the 14 Health Areas

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Far North</th>
<th>Northern / North West</th>
<th>Mackay</th>
<th>Fitzroy / Central West</th>
<th>Darling Downs / South West</th>
<th>Wide-Bay / Burnett</th>
<th>Sunshine Coast</th>
<th>West Moreton</th>
<th>Logan / Beaudesert</th>
<th>Redcliffe / Caboolture</th>
<th>Brisbane (North)</th>
<th>Brisbane (South)</th>
<th>Brisbane (Bayside)</th>
<th>Gold Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Malignant Neoplasms</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Oesophageal cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>Low</td>
<td></td>
<td></td>
<td>High</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung cancer</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melanoma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervical cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterine cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td>Very Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>Low</td>
<td></td>
<td></td>
<td>Low</td>
<td>Low</td>
<td>Very High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testicular cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-H Lymphoma</td>
<td>Very Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>Very High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Leukaemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myeloma</td>
<td>Very Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Very low: At least 20% below the Queensland average; Low: 1-20% below the Queensland average; High: 1-20% above the Queensland average; Very high: At least 20% above the Queensland average. Values are only highlighted if there is significant (p<0.05) geographical variation for that cancer type, and the specific value if significantly (p<0.05) different to the Queensland average.
Table 3: Summary of incidence and survival differentials across the Remoteness areas

<table>
<thead>
<tr>
<th></th>
<th>Incidence</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Major City</td>
<td>Inner Regional</td>
</tr>
<tr>
<td>All Malignant Neoplasms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oesophageal Cancer</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Stomach cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melanoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cervical cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uterine cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prostate cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testicular cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kidney cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Leukaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myeloma</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Very low: At least 20% below the “reference” average; Low: 1-20% below the “reference” average; High: 1-20% above the “reference” average; Very high: At least 20% above the “reference” average.

Values are only highlighted if there is significant (p<0.05) geographical variation for that cancer type, and the specific value if significantly (p<0.05) different to the Queensland average.

1: Although the values were not statistically significant, they are included since the overall Remoteness differential was statistically significant.
Table 4: Summary of incidence and survival differentials across SES areas

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Incidence</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affluent</td>
<td>Middle</td>
</tr>
<tr>
<td>All cancers</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Oesophageal cancer</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Stomach cancer</td>
<td>Very high</td>
<td>Very low</td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Lung cancer</td>
<td></td>
<td>Very high</td>
</tr>
<tr>
<td>Melanoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>Very low</td>
<td>Very high</td>
</tr>
<tr>
<td>Uterine cancer</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td></td>
<td>Very high</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>Very high</td>
<td>Low</td>
</tr>
<tr>
<td>Testicular cancer</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Kidney cancer</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Bladder cancer</td>
<td></td>
<td>Very high</td>
</tr>
<tr>
<td>Brain cancer</td>
<td>No significant variation in incidence by SES</td>
<td></td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>Very high</td>
<td></td>
</tr>
<tr>
<td>All Leukaemia</td>
<td>Very high</td>
<td></td>
</tr>
<tr>
<td>Myeloma</td>
<td>Very high</td>
<td></td>
</tr>
</tbody>
</table>

Very low: At least 20% below the “reference” average; Low: 1-20% below the “reference” average; High: 1-20% above the “reference” average; Very high: At least 20% above the “reference” average. Values are only highlighted if there is significant (p<0.05) geographical variation for that cancer type, and the specific value if significantly (p<0.05) different to the Queensland average. 1: Although the values were not statistically significant, they are included since the overall SES differential was statistically significant. Middle SES is the reference category.
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

7 Detailed Results

All cancers combined

Incidence

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Queensland Cancer Fund**

**BY HEALTH AREA**

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;3&lt;/sup&gt;</th>
<th>95% CI</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;5&lt;/sup&gt;</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>804</td>
<td>455.9</td>
<td>93.0 [90.9, 95.2]</td>
<td>59.2</td>
<td>82.0 [78.3, 86.0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern/North West</td>
<td>906</td>
<td>489.5</td>
<td>99.2 [97.0, 101.4]</td>
<td>59.5</td>
<td>84.4 [80.9, 88.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>486</td>
<td>498.4</td>
<td>100.9 [98.1, 103.8]</td>
<td>63.5</td>
<td>93.3 [88.0, 99.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>795</td>
<td>498.0</td>
<td>99.3 [97.0, 101.7]</td>
<td>63.3</td>
<td>94.6 [90.2, 99.4]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>1,137</td>
<td>474.0</td>
<td>96.3 [94.4, 98.3]</td>
<td>63.7</td>
<td>101.4 [97.3, 105.7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>1,259</td>
<td>483.7</td>
<td>97.9 [96.0, 99.8]</td>
<td>62.2</td>
<td>98.6 [94.9, 102.6]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>1,323</td>
<td>501.4</td>
<td>101.3 [99.4, 103.2]</td>
<td>66.9</td>
<td>116.7 [112.1, 121.6]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Moreton</td>
<td>701</td>
<td>500.5</td>
<td>100.9 [98.4, 103.4]</td>
<td>63.1</td>
<td>96.1 [91.3, 101.4]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>876</td>
<td>470.2</td>
<td>95.9 [93.7, 98.1]</td>
<td>64.7</td>
<td>92.4 [88.1, 97.0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>899</td>
<td>525.2</td>
<td>105.8 [103.4, 108.1]</td>
<td>64.2</td>
<td>103.2 [98.6, 108.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>2,425</td>
<td>505.7</td>
<td>102.4 [101.0, 103.9]</td>
<td>66.9</td>
<td>112.7 [109.5, 116.2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>1,825</td>
<td>486.3</td>
<td>98.6 [96.9, 100.2]</td>
<td>64.5</td>
<td>104.3 [101.0, 107.9]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>862</td>
<td>536.3</td>
<td>107.7 [105.2, 110.1]</td>
<td>64.5</td>
<td>101.7 [97.0, 106.8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold Coast</td>
<td>1,830</td>
<td>485.8</td>
<td>98.6 [96.9, 100.2]</td>
<td>63.3</td>
<td>102.6 [99.3, 106.1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BY REMOTENESS AND SES**

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;7&lt;/sup&gt;</th>
<th>95% CI</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;8&lt;/sup&gt;</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>8,475</td>
<td>493.0</td>
<td>100.0</td>
<td>64.7</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td>4,753</td>
<td>506.9</td>
<td>103.4 [92.1, 116.1]</td>
<td>64.9</td>
<td>101.7 [98.9, 104.6]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer Regional</td>
<td>2,557</td>
<td>470.7</td>
<td>93.3 [83.1, 104.7]</td>
<td>60.8</td>
<td>84.2 [81.4, 87.0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>344</td>
<td>448.1</td>
<td>84.4 [75.2, 94.7]</td>
<td>60.1</td>
<td>76.5 [70.9, 82.7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Socio-economic status (SES)**

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;7&lt;/sup&gt;</th>
<th>95% CI</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;8&lt;/sup&gt;</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affluent</td>
<td>993</td>
<td>502.8</td>
<td>102.8 [92.5, 114.2]</td>
<td>70.0</td>
<td>121.8 [115.3, 128.8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>14,082</td>
<td>490.6</td>
<td>100.0</td>
<td>63.9</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>1,053</td>
<td>500.7</td>
<td>97.3 [87.6, 108.1]</td>
<td>59.3</td>
<td>83.3 [79.5, 87.4]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Oesophageal Cancer

Incidence

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]
## Oesophageal cancer (continued)

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Far North</td>
<td>13</td>
<td>7.8</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>11</td>
<td>6.4</td>
</tr>
<tr>
<td>Mackay</td>
<td>5</td>
<td>5.5</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>11</td>
<td>7.0</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>11</td>
<td>4.6</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>14</td>
<td>5.3</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>13</td>
<td>5.0</td>
</tr>
<tr>
<td>West Moreton</td>
<td>8</td>
<td>6.2</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>8</td>
<td>5.1</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>11</td>
<td>6.6</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>25</td>
<td>5.2</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>21</td>
<td>5.8</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>11</td>
<td>6.8</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>23</td>
<td>5.9</td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>98</td>
<td>5.8</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>51</td>
<td>5.3</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>32</td>
<td>6.1</td>
</tr>
<tr>
<td>Remote</td>
<td>5</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>10</td>
<td>5.3</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>164</td>
<td>5.8</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>13</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis.
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunken” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison with the Queensland average (set to 100). Risk estimates have been “shrunken” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunken” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunken” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Stomach cancer

Incidence

BY HEALTH AREA

- At least 20% lower
- 1 to 20% lower
- No difference
- 1 to 20% higher
- At least 20% higher

BY REMOTENESS [100 = Major City]

- Major City
- Inner Regional
- Outer Regional
- Rural

Survival benefit (5-years)

BY HEALTH AREA

- At least 20% lower
- 1 to 20% lower
- No difference
- 1 to 20% higher
- At least 20% higher

BY REMOTENESS [100 = Major City]

- Major City
- Inner Regional
- Outer Regional
- Rural

BY SES [100 = Middle SES]

- Low
- Middle
- High
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Queensland Cancer Fund

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Far North</td>
<td>19</td>
<td>11.6</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>18</td>
<td>10.5</td>
</tr>
<tr>
<td>Mackay</td>
<td>8</td>
<td>8.7</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>14</td>
<td>8.7</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>20</td>
<td>8.2</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>25</td>
<td>9.6</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>27</td>
<td>10.1</td>
</tr>
<tr>
<td>West Moreton</td>
<td>14</td>
<td>10.9</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>20</td>
<td>12.5</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>18</td>
<td>10.3</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>50</td>
<td>10.7</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>39</td>
<td>10.5</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>19</td>
<td>11.9</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>36</td>
<td>9.5</td>
</tr>
<tr>
<td>Overall effect&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>178</td>
<td>10.5</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>91</td>
<td>9.7</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>54</td>
<td>10.5</td>
</tr>
<tr>
<td>Remote</td>
<td>6</td>
<td>7.8</td>
</tr>
<tr>
<td>Overall effect&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>21</td>
<td>11.3</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>283</td>
<td>10.0</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>24</td>
<td>11.7</td>
</tr>
<tr>
<td>Overall effect&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Colorectal cancer

Incidence

BY HEALTH AREA

Survival benefit (5-years)

BY REMOTENESS (100 = Major City)

BY SES (100 = Middle SES)
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Far North</td>
<td>110</td>
<td>65.1</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>127</td>
<td>70.5</td>
</tr>
<tr>
<td>Mackay</td>
<td>69</td>
<td>76.3</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>101</td>
<td>63.4</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>174</td>
<td>72.3</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>164</td>
<td>61.5</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>174</td>
<td>64.2</td>
</tr>
<tr>
<td>West Moreton</td>
<td>81</td>
<td>59.9</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>113</td>
<td>67.3</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>117</td>
<td>67.0</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>316</td>
<td>66.9</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>257</td>
<td>69.3</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>113</td>
<td>70.9</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>257</td>
<td>67.5</td>
</tr>
</tbody>
</table>

**Overall effect**<sup>6</sup> Z=2.588, p=0.023  
Z=3.148, p=0.008

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>1,133</td>
<td>66.8</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>641</td>
<td>67.7</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>359</td>
<td>68.3</td>
</tr>
<tr>
<td>Remote</td>
<td>40</td>
<td>54.7</td>
</tr>
</tbody>
</table>

**Overall effect**<sup>6</sup> Chi-sq=3.791, df=3, p=0.285  
Chi-sq=10.841, df=3, p=0.013

<table>
<thead>
<tr>
<th>Socio-economic status (SES)</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Affluent</td>
<td>133</td>
<td>70.8</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>1,908</td>
<td>67.1</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>131</td>
<td>63.3</td>
</tr>
</tbody>
</table>

**Overall effect**<sup>6</sup> Chi-sq=8.356, df=2, p=0.015  
Chi-sq=3.842, df=2, p=0.146

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values less than 100 suggest a reduced likelihood of surviving for five years after a cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Pancreatic cancer

Incidence

**BY HEALTH AREA**

- Far North
- Northern/North West
- Mackay
- Fitzroy/Central West
- Darling Downs/South West
- Wide Bay Burnett
- Sunshine Coast
- West Moreton
- Logan-Beaudesert
- Redcliffe-Caboolture
- Brisbane (North)
- Brisbane (South)
- Brisbane (Bayside)
- Gold Coast

**BY REMOTENESS**

- Major City
- Inner Regional
- Outer Regional
- Remote

**BY SES**

- Most disadvantaged
- Disadvantaged
- Average
- Well-off

Survival benefit (5-years)

**BY HEALTH AREA**

- Far North
- Northern/North West
- Mackay
- Fitzroy/Central West
- Darling Downs/South West
- Wide Bay Burnett
- Sunshine Coast
- West Moreton
- Logan-Beaudesert
- Redcliffe-Caboolture
- Brisbane (North)
- Brisbane (South)
- Brisbane (Bayside)
- Gold Coast

**BY REMOTENESS**

- Major City
- Inner Regional
- Outer Regional
- Remote

**BY SES**

- Most disadvantaged
- Disadvantaged
- Average
- Well-off
## Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>16</td>
<td>9.9</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>3.6</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>17</td>
<td>10.0</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>6.8</td>
<td>100.0</td>
<td>[98.6, 101.3]</td>
</tr>
<tr>
<td>Mackay</td>
<td>9</td>
<td>9.7</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>7.3</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>15</td>
<td>9.8</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>7.7</td>
<td>100.0</td>
<td>[98.6, 101.3]</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>24</td>
<td>10.1</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>2.0</td>
<td>99.9</td>
<td>[98.6, 101.3]</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>24</td>
<td>9.2</td>
<td>100.0</td>
<td>[99.9, 100.0]</td>
<td>4.0</td>
<td>99.9</td>
<td>[98.6, 101.3]</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>31</td>
<td>11.8</td>
<td>100.0</td>
<td>[100.0, 100.1]</td>
<td>5.3</td>
<td>100.0</td>
<td>[98.6, 101.3]</td>
</tr>
<tr>
<td>West Moreton</td>
<td>12</td>
<td>9.3</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>4.6</td>
<td>100.0</td>
<td>[98.6, 101.4]</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>17</td>
<td>9.9</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>9.6</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>15</td>
<td>8.9</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>8.5</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>44</td>
<td>9.2</td>
<td>100.0</td>
<td>[99.9, 100.0]</td>
<td>9.2</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>35</td>
<td>9.3</td>
<td>100.0</td>
<td>[99.9, 100.0]</td>
<td>6.7</td>
<td>100.1</td>
<td>[98.8, 101.5]</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>17</td>
<td>10.5</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>6.8</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>38</td>
<td>9.9</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>4.6</td>
<td>100.0</td>
<td>[98.6, 101.4]</td>
</tr>
</tbody>
</table>

### Overall effect

- Z=0.009, p=0.993
- Z=0.033, p=0.974

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>160</td>
<td>9.5</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>8.1</td>
<td>100.0</td>
<td>[77.2, 102.0]</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>101</td>
<td>10.7</td>
<td>125.4</td>
<td>[102.1, 154.0]</td>
<td>5.2</td>
<td>86.9</td>
<td>[77.2, 102.0]</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>47</td>
<td>9.1</td>
<td>103.2</td>
<td>[83.6, 127.4]</td>
<td>5.4</td>
<td>87.0</td>
<td>[74.2, 102.0]</td>
</tr>
<tr>
<td>Remote</td>
<td>7</td>
<td>10.0</td>
<td>128.4</td>
<td>[101.9, 161.8]</td>
<td>1.5</td>
<td>77.3</td>
<td>[54.9, 108.8]</td>
</tr>
</tbody>
</table>

### Overall effect

- Chi-sq=7.644, df=3, p=0.054
- Chi-sq=7.742, df=3, p=0.052

<table>
<thead>
<tr>
<th>Socio-economic status (SES)</th>
<th>Incidence</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affluent</td>
<td>17</td>
<td>9.3</td>
<td>114.7</td>
<td>[90.0, 146.2]</td>
<td>9.5</td>
<td>112.1</td>
<td>[89.0, 141.2]</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>276</td>
<td>9.8</td>
<td>100.0</td>
<td>[100.0, 100.0]</td>
<td>6.4</td>
<td>100.0</td>
<td>[98.7, 101.4]</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>21</td>
<td>10.2</td>
<td>128.3</td>
<td>[101.9, 161.5]</td>
<td>5.9</td>
<td>89.8</td>
<td>[72.8, 110.8]</td>
</tr>
</tbody>
</table>

### Overall effect

- Chi-sq=4.401, df=2, p=0.111
- Chi-sq=2.066, df=2, p=0.352

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Queensland Cancer Fund

Lung cancer

Incidence

**BY HEALTH AREA**

- At least 20% lower
- 1 to 20% lower
- No difference
- 1 to 20% higher
- At least 20% higher

**BY REMOTENESS** [100 = Major City]

**BY SES** [100 = Middle SES]

Survival benefit (5-years)

**BY HEALTH AREA**

- At least 20% lower
- 1 to 20% lower
- No difference
- 1 to 20% higher
- At least 20% higher

**BY REMOTENESS** [100 = Major City]

**BY SES** [100 = Middle SES]
## Lung cancer (continued)

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence Avg. cases per year</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>83</td>
<td>49.0</td>
<td>105.0</td>
<td>[98.1, 112.4]</td>
<td>12.0</td>
<td>88.1</td>
<td>[80.7, 97.0]</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>97</td>
<td>53.8</td>
<td>114.4</td>
<td>[107.2, 122.0]</td>
<td>10.3</td>
<td>89.4</td>
<td>[82.5, 97.0]</td>
</tr>
<tr>
<td>Mackay</td>
<td>46</td>
<td>50.3</td>
<td>105.3</td>
<td>[97.2, 114.2]</td>
<td>10.0</td>
<td>89.1</td>
<td>[80.3, 100.1]</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>71</td>
<td>45.0</td>
<td>97.7</td>
<td>[90.9, 104.9]</td>
<td>9.4</td>
<td>87.1</td>
<td>[79.5, 96.2]</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>97</td>
<td>40.4</td>
<td>88.9</td>
<td>[83.4, 94.8]</td>
<td>12.7</td>
<td>99.5</td>
<td>[91.5, 109.0]</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>125</td>
<td>46.5</td>
<td>99.9</td>
<td>[94.2, 105.9]</td>
<td>14.5</td>
<td>104.8</td>
<td>[97.2, 113.8]</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>114</td>
<td>41.9</td>
<td>91.1</td>
<td>[85.7, 96.7]</td>
<td>14.6</td>
<td>108.9</td>
<td>[100.8, 118.5]</td>
</tr>
<tr>
<td>West Moreton</td>
<td>63</td>
<td>46.2</td>
<td>100.2</td>
<td>[93.1, 107.9]</td>
<td>12.1</td>
<td>95.7</td>
<td>[86.9, 106.5]</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>90</td>
<td>53.2</td>
<td>112.6</td>
<td>[105.4, 120.3]</td>
<td>13.0</td>
<td>94.3</td>
<td>[88.6, 103.5]</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>95</td>
<td>54.0</td>
<td>114.0</td>
<td>[106.9, 121.7]</td>
<td>14.0</td>
<td>101.4</td>
<td>[93.3, 111.0]</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>199</td>
<td>42.5</td>
<td>92.1</td>
<td>[87.7, 96.7]</td>
<td>13.4</td>
<td>101.8</td>
<td>[95.9, 108.5]</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>160</td>
<td>43.2</td>
<td>93.9</td>
<td>[89.0, 99.0]</td>
<td>15.0</td>
<td>105.4</td>
<td>[98.5, 113.2]</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>82</td>
<td>51.7</td>
<td>108.9</td>
<td>[101.7, 116.5]</td>
<td>12.1</td>
<td>92.4</td>
<td>[84.7, 101.6]</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>179</td>
<td>46.4</td>
<td>99.9</td>
<td>[94.9, 105.1]</td>
<td>18.1</td>
<td>115.3</td>
<td>[108.1, 123.6]</td>
</tr>
<tr>
<td>Overall effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Z=2.961, p=0.011</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence Avg. cases per year</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>777</td>
<td>45.9</td>
<td>100.0</td>
<td></td>
<td>14.5</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td>431</td>
<td>45.2</td>
<td>105.8</td>
<td>[88.9, 126.0]</td>
<td>13.5</td>
<td>98.7</td>
<td>[93.1, 104.5]</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>252</td>
<td>47.8</td>
<td>110.3</td>
<td>[92.3, 131.6]</td>
<td>10.8</td>
<td>85.1</td>
<td>[79.5, 91.1]</td>
</tr>
<tr>
<td>Remote</td>
<td>41</td>
<td>57.3</td>
<td>125.0</td>
<td>[103.9, 150.3]</td>
<td>13.8</td>
<td>90.1</td>
<td>[77.3, 105.1]</td>
</tr>
<tr>
<td>Overall effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chi-sq=5.795, df=3, p=0.122</td>
<td>Chi-sq=22.699, df=3, p&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>67</td>
<td>36.4</td>
<td>89.4</td>
<td>[72.8, 109.8]</td>
<td>15.1</td>
<td>104.8</td>
<td>[93.0, 118.2]</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>1,304</td>
<td>45.8</td>
<td>100.0</td>
<td></td>
<td>13.5</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>130</td>
<td>61.7</td>
<td>162.2</td>
<td>[132.8, 198.1]</td>
<td>13.4</td>
<td>93.1</td>
<td>[84.9, 102.0]</td>
</tr>
<tr>
<td>Overall effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chi-sq=29.534, df=2, p&lt;0.001</td>
<td>Chi-sq=3.045, df=2, p=0.218</td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Melanoma**

**Incidence**

**BY HEALTH AREA**

- At least 20% lower
- 11 to 20% lower
- No difference
- 1 to 10% higher
- At least 10% higher

**BY REMOTENESS** [100 = Major City]

**BY SES** [100 = Middle SES]

**Survival benefit (5-years)**

**BY HEALTH AREA**

- At least 20% lower
- 11 to 20% lower
- No difference
- 1 to 10% higher
- At least 10% higher

**BY REMOTENESS** [100 = Major City]

**BY SES** [100 = Middle SES]
Melanoma (continued)

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>104</td>
<td>55.2</td>
<td>84.0</td>
<td>[78.4, 89.9]</td>
<td>91.2</td>
<td>79.7</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>103</td>
<td>52.1</td>
<td>79.4</td>
<td>[74.1, 85.0]</td>
<td>89.9</td>
<td>72.8</td>
</tr>
<tr>
<td>Mackay</td>
<td>86</td>
<td>78.9</td>
<td>120.3</td>
<td>[111.6, 129.5]</td>
<td>94.7</td>
<td>109.4</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>127</td>
<td>73.5</td>
<td>112.6</td>
<td>[105.7, 119.8]</td>
<td>95.3</td>
<td>120.7</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>137</td>
<td>57.7</td>
<td>88.3</td>
<td>[83.1, 93.6]</td>
<td>94.3</td>
<td>115.6</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>173</td>
<td>69.7</td>
<td>105.4</td>
<td>[99.8, 111.3]</td>
<td>91.9</td>
<td>87.0</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>192</td>
<td>76.3</td>
<td>114.9</td>
<td>[109.0, 120.9]</td>
<td>94.4</td>
<td>118.5</td>
</tr>
<tr>
<td>West Moreton</td>
<td>84</td>
<td>55.7</td>
<td>86.6</td>
<td>[80.3, 93.3]</td>
<td>91.2</td>
<td>77.7</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>117</td>
<td>54.0</td>
<td>83.7</td>
<td>[78.4, 89.3]</td>
<td>93.4</td>
<td>90.3</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>117</td>
<td>70.1</td>
<td>106.4</td>
<td>[99.7, 113.5]</td>
<td>91.4</td>
<td>82.3</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>349</td>
<td>70.9</td>
<td>107.6</td>
<td>[103.5, 111.9]</td>
<td>94.3</td>
<td>117.3</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>226</td>
<td>59.3</td>
<td>90.1</td>
<td>[85.9, 94.5]</td>
<td>93.5</td>
<td>104.0</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>122</td>
<td>74.1</td>
<td>112.2</td>
<td>[105.2, 119.6]</td>
<td>95.1</td>
<td>123.3</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>259</td>
<td>70.7</td>
<td>107.4</td>
<td>[102.6, 112.3]</td>
<td>94.8</td>
<td>128.1</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>1,145</td>
<td>65.0</td>
<td>100.0</td>
<td></td>
<td>94.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>666</td>
<td>72.7</td>
<td>121.5</td>
<td>[106.4, 140.0]</td>
<td>93.4</td>
<td>96.5</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>341</td>
<td>59.1</td>
<td>94.3</td>
<td>[81.7, 108.8]</td>
<td>92.4</td>
<td>75.2</td>
</tr>
<tr>
<td>Remote</td>
<td>45</td>
<td>51.5</td>
<td>77.7</td>
<td>[67.1, 89.9]</td>
<td>96.8</td>
<td>135.4</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>152</td>
<td>71.9</td>
<td>101.0</td>
<td>[86.9, 117.3]</td>
<td>96.0</td>
<td>141.9</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>1,933</td>
<td>66.1</td>
<td>100.0</td>
<td></td>
<td>93.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>112</td>
<td>51.9</td>
<td>74.4</td>
<td>[64.0, 86.5]</td>
<td>92.2</td>
<td>70.1</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Female breast cancer

Incidence

BY HEALTH AREA

<table>
<thead>
<tr>
<th>Health Area</th>
<th>Incidence Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 20% lower</td>
<td></td>
</tr>
<tr>
<td>1 to 20% lower</td>
<td></td>
</tr>
<tr>
<td>No difference</td>
<td></td>
</tr>
<tr>
<td>1 to 30% higher</td>
<td></td>
</tr>
<tr>
<td>At least 30% higher</td>
<td></td>
</tr>
</tbody>
</table>

Total Queensland

BY REMOTELESS

<table>
<thead>
<tr>
<th>Remoteness</th>
<th>Incidence Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major City</td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td></td>
</tr>
<tr>
<td>Outer Regional</td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td></td>
</tr>
</tbody>
</table>

South-east Queensland

Survival benefit (5-years)

BY HEALTH AREA

<table>
<thead>
<tr>
<th>Health Area</th>
<th>5-yr Survival Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 30% lower</td>
<td></td>
</tr>
<tr>
<td>1 to 30% lower</td>
<td></td>
</tr>
<tr>
<td>No difference</td>
<td></td>
</tr>
<tr>
<td>1 to 20% higher</td>
<td></td>
</tr>
<tr>
<td>At least 20% higher</td>
<td></td>
</tr>
</tbody>
</table>

Total Queensland

BY REMOTELESS

<table>
<thead>
<tr>
<th>Remoteness</th>
<th>5-yr Survival Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major City</td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td></td>
</tr>
<tr>
<td>Outer Regional</td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td></td>
</tr>
</tbody>
</table>

South-east Queensland

BY SES

<table>
<thead>
<tr>
<th>SES Level</th>
<th>5-yr Survival Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affluent</td>
<td></td>
</tr>
<tr>
<td>Middle SES</td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference Category</th>
<th>5-yr Survival Benefit</th>
</tr>
</thead>
</table>
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year¹</td>
<td>Rate / 100,000²</td>
</tr>
<tr>
<td>Far North</td>
<td>84</td>
<td>91.7</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>96</td>
<td>100.9</td>
</tr>
<tr>
<td>Mackay</td>
<td>53</td>
<td>103.9</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>87</td>
<td>104.0</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>143</td>
<td>117.5</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>143</td>
<td>110.2</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>165</td>
<td>121.6</td>
</tr>
<tr>
<td>West Moreton</td>
<td>86</td>
<td>116.5</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>112</td>
<td>104.9</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>110</td>
<td>126.2</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>318</td>
<td>124.6</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>246</td>
<td>124.4</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>109</td>
<td>126.7</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>225</td>
<td>117.4</td>
</tr>
<tr>
<td><strong>Overall effect</strong>³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year¹</td>
<td>Rate / 100,000²</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>1,087</td>
<td>119.5</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>575</td>
<td>120.3</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>280</td>
<td>99.9</td>
</tr>
<tr>
<td>Remote</td>
<td>33</td>
<td>89.5</td>
</tr>
<tr>
<td><strong>Overall effect</strong>³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>143</td>
<td>129.4</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>1,716</td>
<td>115.5</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>115</td>
<td>106.2</td>
</tr>
<tr>
<td><strong>Overall effect</strong>³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis

2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.

3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).

4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.

5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).

6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).

7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).

8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Cervical cancer

Incidence

BY HEALTH AREA

BY REMOTEENESS [100 = Major City]

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTEENESS [100 = Major City]

BY SES [100 = Middle SES]
Cervical cancer (continued)

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year¹</td>
<td>Rate / 100,000²</td>
</tr>
<tr>
<td>Far North</td>
<td>15</td>
<td>14.4</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>11</td>
<td>10.1</td>
</tr>
<tr>
<td>Mackay</td>
<td>6</td>
<td>10.4</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>10</td>
<td>10.7</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>7</td>
<td>5.7</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>11</td>
<td>8.7</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
<td>West Moreton</td>
<td>7</td>
<td>9.2</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>14</td>
<td>11.8</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>7</td>
<td>8.7</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>25</td>
<td>9.7</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>19</td>
<td>9.6</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>8</td>
<td>8.9</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>18</td>
<td>9.7</td>
</tr>
<tr>
<td><strong>Overall effect</strong>³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year¹</td>
<td>Rate / 100,000²</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>91</td>
<td>9.7</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>35</td>
<td>7.7</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>33</td>
<td>11.0</td>
</tr>
<tr>
<td>Remote</td>
<td>6</td>
<td>14.2</td>
</tr>
<tr>
<td><strong>Overall effect</strong>³</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>8</td>
<td>7.1</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>141</td>
<td>9.3</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>16</td>
<td>14.3</td>
</tr>
<tr>
<td><strong>Overall effect</strong>³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Uterine cancer**

**Incidence**

**BY HEALTH AREA**

- Far North
- Northern/North West
- Mackay
- Fitzroy/Central West
- Darling Downs/South West
- Wide Bay/Burnett
- Sunshine Coast
- West Moreton
- Logan/Beaudesert
- Redcliffe-Caboolture
- Brisbane (North)
- Brisbane (South)
- Brisbane (Bayside)
- Gold Coast

**Survival benefit (5-years)**

**BY HEALTH AREA**

**BY REMOTENESS**

- Major City
- Inner Regional
- Outer Regional
- Remote

**BY SES**

- Lower SES
- Middle SES
- Upper SES

---

Queensland Cancer Fund

Viertel Centre for Research in Cancer Control
## Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Far North</td>
<td>13</td>
<td>14.5</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>13</td>
<td>13.6</td>
</tr>
<tr>
<td>Mackay</td>
<td>7</td>
<td>14.0</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>14</td>
<td>17.3</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>21</td>
<td>17.1</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>22</td>
<td>16.5</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>19</td>
<td>13.8</td>
</tr>
<tr>
<td>West Moreton</td>
<td>12</td>
<td>17.3</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>14</td>
<td>13.5</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>15</td>
<td>16.6</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>44</td>
<td>17.6</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>32</td>
<td>16.3</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>13</td>
<td>15.4</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>24</td>
<td>12.1</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>141</td>
<td>15.5</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>79</td>
<td>16.2</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>38</td>
<td>13.8</td>
</tr>
<tr>
<td>Remote</td>
<td>5</td>
<td>15.7</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>18</td>
<td>17.2</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>227</td>
<td>15.2</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>18</td>
<td>16.9</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
OVARIAN CANCER

**Incidence**

BY HEALTH AREA

- Total Queensland
- South-east Queensland

BY REMOTENESS [100 = Major City]

- Major City
- Remote Regional
- Built-up Regional
- Rural

BY SES [100 = Middle SES]

- Above average
- Above average

Survival benefit (5-years)

BY HEALTH AREA [100 = QLD average]

- Total Queensland
- South-east Queensland

BY REMOTENESS [100 = Major City]

- Major City
- Remote Regional
- Built-up Regional
- Rural

BY SES [100 = Middle SES]

- Above average
- Above average
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Queensland Cancer Fund**

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Far North</td>
<td>10</td>
<td>11.2</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>13</td>
<td>13.6</td>
</tr>
<tr>
<td>Mackay</td>
<td>7</td>
<td>13.0</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>11</td>
<td>13.5</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>15</td>
<td>12.2</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>19</td>
<td>14.9</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>20</td>
<td>15.0</td>
</tr>
<tr>
<td>West Moreton</td>
<td>10</td>
<td>14.0</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>16</td>
<td>14.4</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>13</td>
<td>14.4</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>37</td>
<td>14.4</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>28</td>
<td>14.1</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>13</td>
<td>15.0</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>26</td>
<td>13.7</td>
</tr>
</tbody>
</table>

#### Overall effect

<table>
<thead>
<tr>
<th></th>
<th>Z=0.001, p=0.999</th>
</tr>
</thead>
</table>

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>130</td>
<td>14.1</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>69</td>
<td>14.5</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>35</td>
<td>12.4</td>
</tr>
<tr>
<td>Remote</td>
<td>5</td>
<td>13.8</td>
</tr>
</tbody>
</table>

#### Overall effect

|                      | Chi-sq=2.960, df=3, p=0.398 |

<table>
<thead>
<tr>
<th>Socio-economic status (SES)</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affluent</td>
<td>16</td>
<td>14.9</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>204</td>
<td>13.6</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>19</td>
<td>17.3</td>
</tr>
</tbody>
</table>

#### Overall effect

|                      | Chi-sq=9.139, df=2, p=0.010 |

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis.
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Prostate cancer

Incidences

BY HEALTH AREA

Total Queensland

South-east Queensland

BY REMOTENESS

[100 = Major City]

BY SES

[100 = Middle SES]

Survival benefit (5-years)

BY HEALTH AREA

Total Queensland

South-east Queensland

BY REMOTENESS

[100 = Major City]

BY SES

[100 = Middle SES]
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year¹</th>
<th>Rate / 100,000²</th>
<th>Relative risk³ 95% CI</th>
<th>Survival estimate⁴</th>
<th>Relative benefit⁵ 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>75</td>
<td>97.9</td>
<td>79.9 [74.2, 86.0]</td>
<td>79.0</td>
<td>88.8 [74.9, 109.1]</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>119</td>
<td>145.0</td>
<td>117.2 [110.2, 124.7]</td>
<td>79.1</td>
<td>82.0 [71.0, 97.1]</td>
</tr>
<tr>
<td>Mackay</td>
<td>50</td>
<td>119.5</td>
<td>97.7 [89.7, 106.3]</td>
<td>81.6</td>
<td>99.3 [81.7, 126.8]</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>88</td>
<td>127.8</td>
<td>100.4 [93.6, 107.6]</td>
<td>78.3</td>
<td>88.2 [75.0, 107.1]</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>123</td>
<td>113.3</td>
<td>92.6 [87.1, 98.4]</td>
<td>80.9</td>
<td>94.2 [81.5, 111.5]</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>160</td>
<td>124.0</td>
<td>100.6 [95.2, 106.2]</td>
<td>79.0</td>
<td>85.9 [75.4, 99.7]</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>168</td>
<td>130.5</td>
<td>107.1 [101.5, 112.9]</td>
<td>87.4</td>
<td>135.6 [117.2, 161.0]</td>
</tr>
<tr>
<td>West Moreton</td>
<td>88</td>
<td>145.6</td>
<td>116.0 [108.1, 124.3]</td>
<td>85.0</td>
<td>112.9 [94.2, 141.0]</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>75</td>
<td>103.6</td>
<td>85.9 [79.8, 92.5]</td>
<td>78.8</td>
<td>85.1 [71.7, 104.7]</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>102</td>
<td>126.1</td>
<td>102.9 [96.3, 109.9]</td>
<td>84.5</td>
<td>107.7 [91.0, 132.0]</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>257</td>
<td>129.5</td>
<td>106.0 [101.4, 110.8]</td>
<td>86.3</td>
<td>127.0 [112.1, 146.6]</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>177</td>
<td>112.7</td>
<td>92.3 [87.5, 97.2]</td>
<td>80.7</td>
<td>94.2 [83.3, 108.4]</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>87</td>
<td>122.6</td>
<td>101.2 [94.3, 108.5]</td>
<td>80.9</td>
<td>90.9 [77.3, 110.3]</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>208</td>
<td>116.1</td>
<td>95.9 [91.4, 100.7]</td>
<td>82.2</td>
<td>99.0 [87.6, 113.6]</td>
</tr>
<tr>
<td><strong>Overall effect⁶</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year¹</th>
<th>Rate / 100,000²</th>
<th>Relative risk³ 95% CI</th>
<th>Survival estimate⁴</th>
<th>Relative benefit⁵ 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>884</td>
<td>119.9</td>
<td>100.0</td>
<td>82.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>568</td>
<td>128.3</td>
<td>114.7 [104.6, 125.7]</td>
<td>84.4</td>
<td>108.8 [93.5, 126.7]</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>289</td>
<td>119.4</td>
<td>96.0 [87.4, 105.5]</td>
<td>79.6</td>
<td>84.6 [71.2, 100.5]</td>
</tr>
<tr>
<td>Remote</td>
<td>35</td>
<td>101.8</td>
<td>89.6 [81.3, 98.9]</td>
<td>67.1</td>
<td>44.6 [32.8, 60.6]</td>
</tr>
<tr>
<td><strong>Overall effect⁶</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Socio-economic status (SES)   |                      |                 |                       |                     |                          |
| Affluent                      | 107                  | 133.6           | 120.4 [94.3, 153.8]   | 88.6                | 149.3 [107.6, 207.2]     |
| Middle 80% SES                | 1,562                | 121.7           | 100.0                 | 82.3                | 100.0                    |
| Disadvantaged                 | 106                  | 112.3           | 81.8 [64.4, 104.0]    | 76.7                | 80.2 [62.4, 102.9]       |
| **Overall effect⁶**           |                      |                 |                       |                     |                          |

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Testicular cancer

Incidence

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Queensland Cancer Fund**

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;3&lt;/sup&gt; 95% CI</th>
<th>5-year relative survival&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;5&lt;/sup&gt; 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>5</td>
<td>4.1</td>
<td>87.6 [78.4, 99.4]</td>
<td>90.8</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Northern/North West</td>
<td>6</td>
<td>4.9</td>
<td>94.5 [84.1, 107.5]</td>
<td>98.2</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>3</td>
<td>4.7</td>
<td>94.7 [85.6, 106.9]</td>
<td>101.2</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>5</td>
<td>4.8</td>
<td>93.3 [83.6, 105.9]</td>
<td>95.6</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>7</td>
<td>5.8</td>
<td>99.4 [88.3, 113.0]</td>
<td>93.9</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>5</td>
<td>4.6</td>
<td>91.6 [82.0, 104.0]</td>
<td>92.1</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>8</td>
<td>7.8</td>
<td>113.5 [100.7, 129.1]</td>
<td>92.3</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>West Moreton</td>
<td>4</td>
<td>4.8</td>
<td>91.8 [82.7, 104.0]</td>
<td>81.2</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>9</td>
<td>6.6</td>
<td>104.3 [92.5, 118.6]</td>
<td>99.2</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>4</td>
<td>5.5</td>
<td>98.8 [88.8, 112.0]</td>
<td>91.9</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>19</td>
<td>6.7</td>
<td>110.8 [98.7, 124.6]</td>
<td>97.4</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>13</td>
<td>6.1</td>
<td>102.4 [90.8, 115.9]</td>
<td>97.1</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>7</td>
<td>8.1</td>
<td>112.9 [100.5, 128.5]</td>
<td>95.9</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td>Gold Coast</td>
<td>9</td>
<td>5.5</td>
<td>96.8 [85.8, 110.1]</td>
<td>95.5</td>
<td>100.0 [98.8, 101.2]</td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong>&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
<td></td>
<td><strong>Z=1.524, p=0.152</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;7&lt;/sup&gt; 95% CI</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;8&lt;/sup&gt; 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>59</td>
<td>6.2</td>
<td>100.0</td>
<td>96.3</td>
<td>100.0 [26.2, 318.6]</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>25</td>
<td>6.0</td>
<td>89.2 [71.3, 111.5]</td>
<td>93.8</td>
<td>111.8 [23.5, 531.5]</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>16</td>
<td>4.9</td>
<td>85.1 [67.4, 107.5]</td>
<td>95.2</td>
<td>30.6 [6.0, 156.3]</td>
</tr>
<tr>
<td>Remote</td>
<td>3</td>
<td>4.9</td>
<td>107.6 [80.4, 144.1]</td>
<td>90.5</td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong>&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
<td></td>
<td><strong>Chi-sq=3.512, df=3, p=0.319</strong></td>
<td></td>
<td><strong>Chi-sq=1.877, df=2, p=0.391</strong></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>9</td>
<td>7.3</td>
<td>120.1 [92.0, 156.9]</td>
<td>98.3</td>
<td>155.6 [17.8, 1362.2]</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>89</td>
<td>5.8</td>
<td>100.0</td>
<td>95.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>5</td>
<td>4.5</td>
<td>94.4 [71.0, 125.4]</td>
<td>86.7</td>
<td>29.8 [6.7, 132.3]</td>
</tr>
<tr>
<td><strong>Overall effect</strong>&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
<td></td>
<td><strong>Chi-sq=2.915, df=2, p=0.233</strong></td>
<td></td>
<td><strong>Chi-sq=1.877, df=2, p=0.391</strong></td>
</tr>
</tbody>
</table>

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis.
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Kidney cancer**

**Incidence**

**BY HEALTH AREA**

- Total Queensland
- South-east Queensland

**BY REMOTENESS** (100 = Major City)

- Far North
- Northern North West
- Mackay
- Fitzroy/Central West
- Darling Downs/South West
- Wide Bay Burnett
- Sunshine Coast
- West Moreton
- Logan-Bravo desert
- Redcliffe-Caboolture
- Brisbane (North)
- Brisbane (South)
- Brisbane (Bayside)

**Survival benefit (5-years)**

**BY HEALTH AREA**

- Total Queensland
- South-east Queensland

**BY REMOTENESS** (100 = Major City)

**BY SES** (100 = Middle SES)
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Far North</td>
<td>17</td>
<td>9.9</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>21</td>
<td>11.1</td>
</tr>
<tr>
<td>Mackay</td>
<td>13</td>
<td>13.3</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>20</td>
<td>12.5</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>34</td>
<td>14.2</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>34</td>
<td>12.9</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>34</td>
<td>12.6</td>
</tr>
<tr>
<td>West Moreton</td>
<td>22</td>
<td>16.0</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>27</td>
<td>14.7</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>26</td>
<td>15.2</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>63</td>
<td>13.3</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>50</td>
<td>13.6</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>24</td>
<td>14.8</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>50</td>
<td>13.3</td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>235</td>
<td>13.8</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>131</td>
<td>13.9</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>62</td>
<td>11.5</td>
</tr>
<tr>
<td>Remote</td>
<td>8</td>
<td>11.0</td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>22</td>
<td>11.7</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>383</td>
<td>13.4</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>30</td>
<td>14.2</td>
</tr>
<tr>
<td><strong>Overall effect&lt;sup&gt;6&lt;/sup&gt;</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Bladder cancer

Incidence

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Queensland Cancer Fund**

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year¹</th>
<th>Rate / 100,000²</th>
<th>Relative risk³ 95% CI</th>
<th>Survival estimate⁴ 95% CI</th>
<th>Relative benefit⁵ 95% CI</th>
<th>Survival</th>
<th>Relative benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>28</td>
<td>17.3</td>
<td>89.6 [81.3, 98.8]</td>
<td>76.3 [83.1, 124.6]</td>
<td>99.7 [83.1, 124.6]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern/North West</td>
<td>29</td>
<td>16.7</td>
<td>87.2 [79.2, 96.1]</td>
<td>80.4 [92.2, 140.0]</td>
<td>111.2 [92.2, 140.0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>16</td>
<td>17.9</td>
<td>94.7 [85.5, 105.4]</td>
<td>66.4 [72.8, 110.1]</td>
<td>87.6 [72.8, 110.1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>31</td>
<td>20.2</td>
<td>100.2 [91.1, 110.2]</td>
<td>75.8 [93.1, 124.3]</td>
<td>99.6 [93.1, 124.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>42</td>
<td>17.5</td>
<td>89.4 [81.8, 97.7]</td>
<td>71.4 [77.6, 109.8]</td>
<td>90.9 [77.6, 109.8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>44</td>
<td>16.6</td>
<td>85.7 [78.5, 93.5]</td>
<td>68.6 [75.0, 105.8]</td>
<td>87.8 [75.0, 105.8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>60</td>
<td>22.2</td>
<td>107.8 [99.6, 116.8]</td>
<td>78.7 [97.5, 139.3]</td>
<td>114.7 [97.5, 139.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Moreton</td>
<td>29</td>
<td>21.7</td>
<td>105.5 [95.6, 116.3]</td>
<td>77.2 [84.7, 128.2]</td>
<td>102.0 [84.7, 128.2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>38</td>
<td>22.0</td>
<td>111.6 [101.9, 122.3]</td>
<td>81.0 [85.5, 128.4]</td>
<td>102.6 [85.5, 128.4]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>40</td>
<td>22.8</td>
<td>110.1 [100.6, 120.4]</td>
<td>75.1 [84.8, 123.4]</td>
<td>100.5 [84.8, 123.4]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>97</td>
<td>20.5</td>
<td>101.3 [94.7, 108.3]</td>
<td>80.1 [99.4, 135.5]</td>
<td>114.7 [99.4, 135.5]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>75</td>
<td>20.0</td>
<td>99.4 [92.3, 107.0]</td>
<td>71.3 [78.8, 105.7]</td>
<td>90.3 [78.8, 105.7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>38</td>
<td>24.3</td>
<td>114.5 [104.5, 125.4]</td>
<td>76.8 [86.0, 126.9]</td>
<td>102.5 [86.0, 126.9]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold Coast</td>
<td>80</td>
<td>20.8</td>
<td>102.5 [95.3, 110.1]</td>
<td>74.9 [87.9, 119.3]</td>
<td>101.3 [87.9, 119.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Z=2.694</td>
<td>p=0.018</td>
</tr>
</tbody>
</table>

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year¹</th>
<th>Rate / 100,000²</th>
<th>Relative risk³ 95% CI</th>
<th>Survival estimate⁴ 95% CI</th>
<th>Relative benefit⁵ 95% CI</th>
<th>Survival</th>
<th>Relative benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>357</td>
<td>21.1</td>
<td>100.0</td>
<td>75.7 [88.1, 128.5]</td>
<td>100.0 [88.1, 128.5]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td>194</td>
<td>20.5</td>
<td>99.7 [80.8, 123.0]</td>
<td>76.9 [100.6, 120.4]</td>
<td>106.4 [78.8, 123.4]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer Regional</td>
<td>89</td>
<td>17.3</td>
<td>88.7 [71.5, 110.0]</td>
<td>74.0 [92.2, 116.7]</td>
<td>92.2 [92.2, 116.7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>9</td>
<td>13.1</td>
<td>92.4 [71.7, 119.1]</td>
<td>62.7 [30.7, 89.3]</td>
<td>52.4 [30.7, 89.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chi-sq=1.625, df=3, p=0.654</td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chi-sq=5.476, df=3, p=0.140</td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>33</td>
<td>17.9</td>
<td>100.7 [79.4, 127.8]</td>
<td>81.1 [77.5, 165.7]</td>
<td>113.3 [77.5, 165.7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>567</td>
<td>20.0</td>
<td>100.0</td>
<td>75.2 [100.0]</td>
<td>100.0 [100.0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>48</td>
<td>23.5</td>
<td>133.2 [105.5, 168.2]</td>
<td>77.2 [77.1, 161.1]</td>
<td>111.4 [77.1, 161.1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Chi-sq=0.748, df=2, p=0.688</td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).

**Bladder cancer (continued)**
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Queensland Cancer Fund

Viertel Centre for Research in Cancer Control

Brain cancer

Incidence

BY HEALTH AREA

BY REMOTENESS (100 = Major City)

BY SES (100 = Middle SES)

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS (100 = Major City)

BY SES (100 = Middle SES)
### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;3&lt;/sup&gt;</th>
<th>95% CI</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;5&lt;/sup&gt;</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>14</td>
<td>7.3</td>
<td>99.6 [96.1, 103.6]</td>
<td>25.3</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern/North West</td>
<td>16</td>
<td>7.5</td>
<td>100.4 [96.8, 104.6]</td>
<td>27.3</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mackay</td>
<td>7</td>
<td>6.4</td>
<td>98.9 [96.2, 102.2]</td>
<td>35.2</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>9</td>
<td>4.8</td>
<td>94.0 [91.3, 97.3]</td>
<td>21.7</td>
<td>100.0 [98.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>16</td>
<td>6.4</td>
<td>96.7 [93.3, 100.6]</td>
<td>24.6</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>20</td>
<td>8.0</td>
<td>101.7 [97.8, 106.3]</td>
<td>16.3</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>21</td>
<td>8.1</td>
<td>101.9 [97.9, 106.4]</td>
<td>25.4</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Moreton</td>
<td>12</td>
<td>7.6</td>
<td>100.4 [97.1, 104.3]</td>
<td>27.1</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>15</td>
<td>6.9</td>
<td>98.0 [94.5, 102.0]</td>
<td>28.7</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>13</td>
<td>7.7</td>
<td>100.3 [96.9, 104.3]</td>
<td>27.2</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>39</td>
<td>7.9</td>
<td>101.9 [97.4, 106.9]</td>
<td>26.3</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>30</td>
<td>7.8</td>
<td>101.1 [96.8, 105.9]</td>
<td>21.6</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>13</td>
<td>8.0</td>
<td>100.9 [97.5, 104.9]</td>
<td>24.4</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold Coast</td>
<td>29</td>
<td>7.9</td>
<td>102.1 [97.7, 106.9]</td>
<td>24.1</td>
<td>100.0 [99.7, 100.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td><strong>6</strong></td>
<td><strong>Z=1.616, p=0.130</strong></td>
<td><strong>Z=0.001, p=0.999</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Rate / 100,000&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Relative risk&lt;sup&gt;7&lt;/sup&gt;</th>
<th>95% CI</th>
<th>Survival estimate&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Relative benefit&lt;sup&gt;8&lt;/sup&gt;</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remote</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>136</td>
<td>7.7</td>
<td>100.0</td>
<td>25.2</td>
<td>100.0 [75.5, 101.1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td>68</td>
<td>7.3</td>
<td>91.3 [77.1, 108.1]</td>
<td>21.2</td>
<td>97.4 [83.1, 119.2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer Regional</td>
<td>42</td>
<td>7.1</td>
<td>95.5 [80.5, 113.4]</td>
<td>28.5</td>
<td>99.5 [81.9, 112.9]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote</td>
<td>6</td>
<td>5.5</td>
<td>124.7 [102.0, 152.4]</td>
<td>25.3</td>
<td>62.5 [41.8, 93.3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td><strong>6</strong></td>
<td><strong>Chi-sq=10.114, df=3, p=0.018</strong></td>
<td><strong>Z=7.421, df=3, p=0.060</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Socio-economic status (SES)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Affluent</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>9.0</td>
<td>121.7 [102.4, 144.7]</td>
<td>31.6</td>
<td>141.1</td>
<td>[108.1, 184.2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Middle 80% SES</strong></td>
<td>215</td>
<td>7.3</td>
<td>100.0</td>
<td>24.5</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantaged</strong></td>
<td>18</td>
<td>8.2</td>
<td>119.0 [100.3, 141.2]</td>
<td>21.0</td>
<td>79.0 [61.9, 100.8]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td><strong>6</strong></td>
<td><strong>Chi-sq=5.878, df=2, p=0.053</strong></td>
<td><strong>Chi-sq=11.266, df=2, p=0.004</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Non-hodgkin lymphoma

Incidence

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS [100 = Major City]

BY SES [100 = Middle SES]
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>24</td>
<td>13.9</td>
<td>89.4</td>
<td>[82.8, 96.9]</td>
<td>47.6</td>
<td>77.3</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>25</td>
<td>13.5</td>
<td>89.0</td>
<td>[82.4, 96.4]</td>
<td>58.1</td>
<td>94.4</td>
</tr>
<tr>
<td>Mackay</td>
<td>14</td>
<td>14.6</td>
<td>94.0</td>
<td>[87.3, 101.8]</td>
<td>43.2</td>
<td>80.4</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>25</td>
<td>15.1</td>
<td>94.3</td>
<td>[87.3, 102.1]</td>
<td>56.0</td>
<td>95.3</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>38</td>
<td>15.7</td>
<td>95.5</td>
<td>[88.6, 103.1]</td>
<td>55.1</td>
<td>87.8</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>44</td>
<td>17.0</td>
<td>100.5</td>
<td>[93.3, 108.3]</td>
<td>55.3</td>
<td>93.6</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>46</td>
<td>17.6</td>
<td>102.4</td>
<td>[95.1, 110.2]</td>
<td>62.8</td>
<td>115.6</td>
</tr>
<tr>
<td>West Moreton</td>
<td>27</td>
<td>18.9</td>
<td>106.2</td>
<td>[98.3, 115.0]</td>
<td>56.6</td>
<td>95.8</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>30</td>
<td>15.7</td>
<td>97.1</td>
<td>[89.9, 105.0]</td>
<td>60.1</td>
<td>95.0</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>31</td>
<td>17.9</td>
<td>103.4</td>
<td>[95.7, 111.8]</td>
<td>57.8</td>
<td>99.0</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>90</td>
<td>18.7</td>
<td>108.3</td>
<td>[101.7, 115.3]</td>
<td>63.7</td>
<td>115.2</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>69</td>
<td>18.3</td>
<td>106.1</td>
<td>[99.2, 113.6]</td>
<td>64.5</td>
<td>122.7</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>29</td>
<td>17.9</td>
<td>102.9</td>
<td>[95.3, 111.4]</td>
<td>52.7</td>
<td>86.9</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>62</td>
<td>16.3</td>
<td>97.9</td>
<td>[91.3, 105.0]</td>
<td>58.6</td>
<td>104.4</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Z=2.542, p=0.025</strong></td>
<td></td>
</tr>
</tbody>
</table>

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year</th>
<th>Rate / 100,000</th>
<th>Relative risk</th>
<th>95% CI</th>
<th>Survival estimate</th>
<th>Relative benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>304</td>
<td>17.7</td>
<td>100.0</td>
<td></td>
<td>61.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>163</td>
<td>17.5</td>
<td>99.1</td>
<td>[83.8, 117.1]</td>
<td>57.0</td>
<td>86.6</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>76</td>
<td>13.8</td>
<td>79.4</td>
<td>[66.9, 94.3]</td>
<td>51.8</td>
<td>70.1</td>
</tr>
<tr>
<td>Remote</td>
<td>10</td>
<td>12.0</td>
<td>105.8</td>
<td>[87.3, 128.3]</td>
<td>59.0</td>
<td>72.9</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Chi-sq=10.395, df=3, p=0.016</strong></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Chi-sq=17.375, df=3, p&lt;0.001</strong></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>38</td>
<td>19.2</td>
<td>126.9</td>
<td>[106.4, 151.4]</td>
<td>64.4</td>
<td>117.3</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>481</td>
<td>16.7</td>
<td>100.0</td>
<td></td>
<td>58.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>34</td>
<td>16.0</td>
<td>107.9</td>
<td>[90.3, 128.9]</td>
<td>55.7</td>
<td>88.1</td>
</tr>
<tr>
<td><strong>Overall effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Chi-sq=7.027, df=2, p=0.030</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).

Non-hodgkin lymphoma (continued)
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Queensland Cancer Fund

**Leukaemia**

**Incidence**

- **BY HEALTH AREA**
  - At least 20% lower
  - 1 to 20% lower
  - No difference
  - 1 to 30% higher
  - At least 30% higher

- **BY REMOTENESS** [100 = Major City]

- **BY SES** [100 = Middle SES]

**Survival benefit (5-years)**

- **BY HEALTH AREA**

- **BY REMOTENESS** [100 = Major City]

- **BY SES** [100 = Middle SES]
### Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

**Queensland Cancer Fund**

#### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year¹</th>
<th>Rate / 100,000²</th>
<th>Relative risk³</th>
<th>95% CI</th>
<th>Survival estimate⁴</th>
<th>Relative benefit⁵</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far North</td>
<td>21</td>
<td>11.4</td>
<td>89.3</td>
<td>[82.4, 97.1]</td>
<td>53.5</td>
<td>93.8</td>
<td>[77.8, 118.2]</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>27</td>
<td>14.3</td>
<td>99.0</td>
<td>[91.4, 107.5]</td>
<td>45.7</td>
<td>87.1</td>
<td>[73.8, 106.4]</td>
</tr>
<tr>
<td>Mackay</td>
<td>14</td>
<td>14.1</td>
<td>99.3</td>
<td>[91.9, 107.9]</td>
<td>53.5</td>
<td>99.5</td>
<td>[81.7, 127.4]</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>25</td>
<td>15.4</td>
<td>103.0</td>
<td>[95.0, 111.8]</td>
<td>58.6</td>
<td>110.1</td>
<td>[91.9, 137.3]</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>37</td>
<td>15.4</td>
<td>103.4</td>
<td>[95.6, 111.9]</td>
<td>52.1</td>
<td>97.2</td>
<td>[83.3, 116.8]</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>36</td>
<td>13.9</td>
<td>97.2</td>
<td>[89.9, 105.3]</td>
<td>41.6</td>
<td>79.6</td>
<td>[68.5, 95.0]</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>34</td>
<td>13.0</td>
<td>92.6</td>
<td>[85.6, 100.3]</td>
<td>56.9</td>
<td>105.9</td>
<td>[89.6, 129.3]</td>
</tr>
<tr>
<td>West Moreton</td>
<td>21</td>
<td>15.1</td>
<td>101.1</td>
<td>[93.3, 109.9]</td>
<td>56.6</td>
<td>103.5</td>
<td>[86.0, 130.1]</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>27</td>
<td>14.0</td>
<td>97.7</td>
<td>[90.2, 106.1]</td>
<td>58.0</td>
<td>103.6</td>
<td>[88.7, 128.7]</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>25</td>
<td>14.8</td>
<td>99.9</td>
<td>[92.2, 108.6]</td>
<td>54.9</td>
<td>107.7</td>
<td>[90.4, 133.3]</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>75</td>
<td>15.5</td>
<td>104.6</td>
<td>[97.8, 111.9]</td>
<td>56.7</td>
<td>108.8</td>
<td>[95.8, 126.0]</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>60</td>
<td>15.9</td>
<td>106.2</td>
<td>[98.9, 114.1]</td>
<td>56.9</td>
<td>111.5</td>
<td>[97.3, 130.5]</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>28</td>
<td>17.6</td>
<td>110.5</td>
<td>[102.0, 120.0]</td>
<td>63.5</td>
<td>125.0</td>
<td>[103.7, 157.3]</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>45</td>
<td>12.1</td>
<td>87.2</td>
<td>[80.9, 94.2]</td>
<td>42.4</td>
<td>81.2</td>
<td>[70.9, 95.0]</td>
</tr>
<tr>
<td><strong>Overall effect⁶</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Z=2.978, p=0.011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

#### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Avg. cases per year¹</th>
<th>Rate / 100,000²</th>
<th>Relative risk³</th>
<th>95% CI</th>
<th>Survival estimate⁴</th>
<th>Relative benefit⁵</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>254</td>
<td>14.7</td>
<td>100.0</td>
<td></td>
<td>54.6</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Inner Regional</td>
<td>135</td>
<td>14.4</td>
<td>100.2</td>
<td>[87.1, 115.2]</td>
<td>52.5</td>
<td>89.8</td>
<td>[78.1, 103.3]</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>77</td>
<td>13.9</td>
<td>94.3</td>
<td>[81.9, 108.5]</td>
<td>52.4</td>
<td>90.9</td>
<td>[78.5, 108.0]</td>
</tr>
<tr>
<td>Remote</td>
<td>10</td>
<td>13.1</td>
<td>109.7</td>
<td>[94.0, 127.9]</td>
<td>48.6</td>
<td>82.0</td>
<td>[55.8, 120.4]</td>
</tr>
<tr>
<td><strong>Overall effect⁶</strong></td>
<td></td>
<td></td>
<td>Chi-sq=3.656, df=3, p=0.301</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affluent</td>
<td>34</td>
<td>17.4</td>
<td>124.3</td>
<td>[108.2, 142.9]</td>
<td>62.4</td>
<td>126.3</td>
<td>[97.1, 164.3]</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>413</td>
<td>14.3</td>
<td>100.0</td>
<td></td>
<td>53.3</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>29</td>
<td>13.7</td>
<td>90.7</td>
<td>[78.2, 105.3]</td>
<td>46.6</td>
<td>84.0</td>
<td>[65.4, 107.7]</td>
</tr>
<tr>
<td><strong>Overall effect⁶</strong></td>
<td></td>
<td></td>
<td>Chi-sq=5.417, df=2, p=0.067</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 6).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

Queensland Cancer Fund

Myeloma

Incidence

BY HEALTH AREA

BY REMOTENESS (100 = Major City)

BY SES (100 = Middle SES)

Survival benefit (5-years)

BY HEALTH AREA

BY REMOTENESS (100 = Major City)

BY SES (100 = Middle SES)
## Geographical differentials in cancer incidence and survival in Queensland, 1996 to 2002

### BY HEALTH AREA

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Far North</td>
<td>10</td>
<td>6.0</td>
</tr>
<tr>
<td>Northern/North West</td>
<td>9</td>
<td>5.1</td>
</tr>
<tr>
<td>Mackay</td>
<td>6</td>
<td>6.4</td>
</tr>
<tr>
<td>Fitzroy/Central West</td>
<td>8</td>
<td>5.4</td>
</tr>
<tr>
<td>Darling Downs/South West</td>
<td>14</td>
<td>6.0</td>
</tr>
<tr>
<td>Wide Bay-Burnett</td>
<td>14</td>
<td>5.3</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>15</td>
<td>5.6</td>
</tr>
<tr>
<td>West Moreton</td>
<td>7</td>
<td>5.5</td>
</tr>
<tr>
<td>Logan-Beaudesert</td>
<td>10</td>
<td>5.6</td>
</tr>
<tr>
<td>Redcliffe-Caboolture</td>
<td>9</td>
<td>5.4</td>
</tr>
<tr>
<td>Brisbane (North)</td>
<td>34</td>
<td>7.1</td>
</tr>
<tr>
<td>Brisbane (South)</td>
<td>22</td>
<td>6.0</td>
</tr>
<tr>
<td>Brisbane (Bayside)</td>
<td>10</td>
<td>6.5</td>
</tr>
<tr>
<td>Gold Coast</td>
<td>18</td>
<td>4.8</td>
</tr>
</tbody>
</table>

### Overall effect

- Z=1.837, p=0.089
- Z=3.771, p=0.002

### BY REMOTENESS AND SES

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major city</td>
<td>100</td>
<td>5.9</td>
</tr>
<tr>
<td>Inner Regional</td>
<td>56</td>
<td>5.9</td>
</tr>
<tr>
<td>Outer Regional</td>
<td>29</td>
<td>5.5</td>
</tr>
<tr>
<td>Remote</td>
<td>3</td>
<td>3.7</td>
</tr>
</tbody>
</table>

### Overall effect

- Chi-sq=0.487, df=3, p=0.922
- Chi-sq=4.510, df=3, p=0.211

<table>
<thead>
<tr>
<th>Socio-economic status (SES)</th>
<th>Incidence</th>
<th>5-year relative survival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg. cases per year</td>
<td>Rate / 100,000</td>
</tr>
<tr>
<td>Affluent</td>
<td>16</td>
<td>8.3</td>
</tr>
<tr>
<td>Middle 80% SES</td>
<td>162</td>
<td>5.7</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>10</td>
<td>4.7</td>
</tr>
</tbody>
</table>

### Overall effect

- Chi-sq=23.603, df=2, p<0.001
- Chi-sq=0.006, df=2, p=0.997

---

1. Average number of cancers diagnosed per year between 1996 and 2002, based on place of usual residence at time of diagnosis
2. Age-standardised incidence rate per 100,000 population, standardised to the 2001 Australian population.
3. Relative risk of being diagnosed with the specific cancer in comparison with the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased risk of cancer diagnosis. Values less than 100 suggest a reduced risk of cancer diagnosis. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 5).
4. 5-year relative survival estimate for people “at risk of dying” between 1996 and 2002. Ratio of observed mortality among cancer patients to the expected mortality in the general population.
5. Relative likelihood of being alive 5 years after being diagnosed in comparison to the Queensland average (set to 100). Risk estimates have been “shrunk” to adjust for the variation in each region (see methods). Values greater than 100 indicate an increased likelihood of surviving for five years after a cancer diagnosis. Values less than 100 suggest a reduced likelihood of surviving 5 years. 95% confidence intervals are in brackets. If this figure includes 100 then the estimate is not statistically significantly different to the Queensland average (see note 4).
6. Overall geographical effect. If the p-value for this statistical test is ≥0.05, then there is no evidence of overall geographical variation (even if individual estimates are significant).
7. As for 3 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
8. As for 5 above except the reference categories are Major city (remoteness) and Middle SES (SES). These risk estimates have not been “shrunk” (see methods).
Appendix: Statistical methodology

Data source

The data reported in this publication was obtained from the Queensland Cancer Registry (QCR) after getting Government Gazettal approval according to the Health Act 1937. Data was obtained in aggregated de-identified format so that no individuals could be identified from the data provided. Cancer incidence data is based on cancer diagnosed in Queensland between January 1st 1996 and December 31st 2002. Cancer survival results are based on those cancer patients considered “at risk” between the same period.

The QCR is a population-based cancer registry and since 1982 has maintained a register of all cases of cancer diagnosed in usual residents of Queensland. The State Health Act legally required details of all cancers diagnosed in Queensland to be included in the registry. Notifications are received for all persons with cancer admitted to public and private hospitals and nursing homes. Queensland pathology laboratories provide copies of pathology report for cancer specimens. Non-melanoma skin cancers are not registered by the QCR (nor most other cancer registries), since many are treated in doctor’s surgeries using destructive techniques that preclude histological confirmation. As such they are not included in the comparisons of cancer types throughout this report.

Since October 2000 the Queensland Cancer Fund has managed the processing operations of the Registry for Queensland Health. Further details of the QCR can be found in their annual report. Throughout this report the definitions of cancer type are the same as that reported in the Queensland Cancer Registry annual report.

This report does not include any adjustment for stage or seriousness of cancer when it was diagnosed. As is the case for all cancer registries in Australia, complete staging data is not routinely collected by the Queensland Cancer Registry (although New South Wales collects a measure of degree of spread). The major implications of the absence of stage information are that we cannot differentiate between early/late diagnosis and better/worse management of the cancer as possible reasons for the observed patterns.

Deaths among people with cancer are identified by routinely matching QCR data against records from the Office of the Queensland Registrar of Births, Deaths and Marriages. This identifies deaths of people diagnosed with cancer in Queensland, who died in Queensland. People who were diagnosed with cancer in Queensland, but who died in another state or territory, are identified by matching data from the QCR to the National Death Index at the Australian Institute of Health and Welfare. Cancer registries in other states and territories also provide information on interstate deaths. People who were not known to have died were assumed to be still alive.

Incidence

Incidence is the number of new cancers diagnosed in a specified time period, which for this report was all those cancers diagnosed between 1st January 1996 and 31st December 2002 (inclusive) for residents of Queensland. Incidence reflects the number of primary tumours rather than the number of individuals with cancer. Although multiple primary tumours are possible for the same person, only the first primary tumour of a specific cancer site is reported. Incidence is based on the place of usual residence when diagnosed.

Incidence is expressed in two forms: average counts per year, and the incidence rate. Incidence rates are expressed as the number of cancers per 100,000 people. Since the risk of cancer varies with age, it is common practice to age-standardise rates to allow for more valid comparisons between populations. Incidence rates in this report have been age-standardised to the Australian Standard Population (2001).
Relative survival

In population-based survival analyses, survival time is taken to be the date of diagnosis to the date of death. However, since the eventual survival time of everyone diagnosed with a cancer is not known (for example they may still be alive), statistical adjustments are required to take into account those unknown or “censored” survival times. Survival is based on the place of usual residence when diagnosed.

Relative survival compares the survival of people who have a particular cancer with the expected survival of a comparable group from the general population, taking into account age, sex and year of diagnosis. The method does not require knowledge of the specific cause of death, only knowledge of whether the patient has died. Only those patients who are still alive are considered censored.

The other type of survival is cause-specific survival, which considers the time from diagnosis of a cancer to death from that specific cancer. All other events (i.e. still alive or dying from another condition (including other cancers)) are considered censored. The main limitation of cause-specific survival is obtaining accurate cause of death information. However this is less of a problem in Australia than in less developed countries.

Cancer registries have traditionally used relative survival in preference to cause-specific survival when presenting population-based survival estimates. It is primarily for this reason that we have used relative survival in this publication. Relative survival estimates were generated based on a suite of SAS® programs. The programs use a life table (or actuarial) method for calculating observed survival. This approach involves dividing the total period of “observation” into a series of discrete time intervals. The survival proportion was then calculated for each of these intervals, and these were multiplied together to get the observed survival estimate. Expected survival (based on the total mortality for respective geographical area) was calculated using the Ederer II method. Relative survival is then obtained from the ratio of observed survival to expected survival, and presented with the corresponding 95% confidence intervals.

Cohort versus period approach for calculating survival

In this report, relative survival estimates have been calculated using the period approach. Although this method is not consistent with a recently released Queensland publication on cancer survival (which used the cohort approach), no estimates for Total Queensland are produced in this report. Therefore estimates were not directly comparable. However the period approach is being progressively implemented by some cancer registries, and we thought it useful to be consistent with the recent geographical analyses by New South Wales. Evaluations of the two approaches suggest that the differences between the two methods are fairly minor when considering five-year survival.

In the cohort approach, the survival is estimated based on cases diagnosed during a specific time period (for example 1st January 1996 to 31st December 2000). They are then followed up until 31st December 2002. This however means that five-year survival is only relevant for patients diagnosed in 1996 and 1997. Period survival focuses instead on the period at which the cancer patients are at risk.

For this analysis we set the period at risk as “1st January 1996 to 31st December 2002”. Therefore when calculating two-year survival, all those patients diagnosed in 1994 to 2000 would contribute to the estimates. When calculating five-year survival, those patients diagnosed between 1991 and 1997 would contribute to the calculations. To obtain the period estimates we applied the SAS macros developed by Paul Dickman. As is standard procedure for relative survival analyses, we excluded death certificate only cases.
Adjustment for small numbers

Although the rationale of splitting Queensland into only 14 Health Areas and combining 7 years of data was to increase the counts in each area, numbers were still small in some areas, particularly for the less common cancers in the more rural Health Areas. These small numbers can make the estimates unstable and the resulting interpretation very difficult.

For this reason we used a mathematical method to make allowance for these small numbers when looking at the variation across Health Areas. This method meant that if the numbers of a specific cancer in a specific Health Area was small, then it was “shrunk” towards the Queensland average. The degree of “shrinkage” generally increased as the area-specific count became smaller.

This method, known as the Empirical Bayes (EB) method, was the same used by The Cancer Council New South Wales in their recent report, and they have provided a detailed description of this methodology in the report and a related research paper.

Briefly, observed and expected counts were calculated based on standard procedures. The unadjusted ratio would then be \( \frac{\text{Observed}}{\text{Expected}} \times 100 \). It was then assumed that the ratio followed a Gamma distribution with mean \( \mu \) and standard deviation \( \sigma \), and so an EB estimator for each cancer site was calculated using \( \frac{O + \mu}{E + \frac{\mu^2}{\sigma^2}} \) where \( O \) is the observed difference in deaths after a diagnosis of cancer in a Health Area and \( E \) is the expected difference in deaths based on the state average. The mean \( \mu \) was set to be 1 and \( \sigma \) was estimated using the SAS procedure PROC NLIN. Convergence was only achieved using the secant method, which is only available in SAS V8.2 and earlier. A formal test for significant geographical variation was carried out by comparing the estimate of \( \sigma \) divided by its standard error \( Z = \frac{\sigma}{\text{se}(\sigma)} \) with the standard normal distribution.

There were fewer categories for Remoteness (4) and SES (3), and so the EB method was not able to be applied. Therefore we used standard regression techniques (described below) to look at these geographical differentials. The largest category in each grouping (ie. Major City for Remoteness and Middle 80% for SES) had populations well over half of the Queensland total, so they were used as the reference populations (rather than the Queensland average).

Incidence ratio

The incidence ratio is the ratio of the incidence rate in one geographical area and the incidence rate in a reference population (multiplied by 100). The reference populations (in brackets) vary for each geographical type: Health Areas (Queensland average), Remoteness (Major city) and SES (Middle SES).

Modelling of the incidence estimates for the Health Areas used the shrinking process described above. Geographical differences in incidence for Remoteness and SES were assessed by age-adjusted generalised linear models. Since there was very strong evidence of overdispersion using the Poisson distribution, and problems with convergence with the negative binomial distribution, we used the gamma distribution in the final models. In each model the age-specific incidence counts were regressed against age group and geographical area (both as categorical variables). A log-link function was used with the offset variable being the log of the age-specific population. Relative incidence risks were calculated by taking the exponential of the regression parameter estimate for the geographical categories, and 95% confidence intervals utilised the standard error of this estimate. The significance of the geographical effect was obtained by the Type III estimates from the generalised linear model.
Survival ratio

The survival ratio can be interpreted as the ratio of the relative survival in one geographical area and the relative survival in a reference population (multiplied by 100). The reference populations (in brackets) vary for each geographical type: Health Areas (Queensland average), Remoteness (Major city) and SES (Middle SES).

Other publications have reported the results of this modelling as “Excess mortality”, which is the inverse of the “Survival ratio”. We decided to look at the survival ratio because it was more internally consistent with the reported survival estimates. For example, it might be confusing if, in the same table, the relative survival estimate was high in a geographical area, but the excess mortality estimate was low. By making these two terms consistent, ie. relative survival and survival ratio, an area with high relative survival would generally have a higher survival ratio.

Modelling of the survival estimates for the Health Areas used the shrinking process described above. Modelling of the relative survival estimates for the Remoteness and SES Areas used a generalised linear model in SAS9 using exact survival times and a Poisson assumption (with logarithmic link and offset)33, including adjustments for age and sex where applicable. Differences in survival were expressed in terms of a “survival ratio” (along with 95% confidence intervals). The survival ratio was based on survival estimates up to (and including) 5-year survival. The significance of the geographical effect was obtained by the Type III estimates from the generalised linear model.
References


