

Background

This report is the second in a series of reports on the health status of Australians who live in regional and remote areas. The principal aim of the report is to answer the question 'do mortality rates increase with remoteness?'

A description of mortality is simply one measure of health. Other important aspects of health include how 'well' people feel, levels of fitness, the prevalence of risk factors such as smoking, measures of disability, disease rates, visits to medical practitioners, rates of surgical intervention and so on. These have not been described in this report but have been addressed, at least in part, in the development of a framework for rural health information by the Institute (AIHW 2003d) under the guidance of the Rural Health Information Advisory Committee (RHIAC).

Data quality and analytical methods

Previous descriptions of mortality, and other measures of health, have shown poorer outcomes in more remote areas (AIHW 1998), but it is possible that a lot of this difference is a result of poor Indigenous health. To assess whether the poorer health in more remote areas reflects the influence of remoteness or Indigenous health, ideally mortality for the Indigenous and non-Indigenous populations should be reported alongside mortality for the total population. However two issues affect the reporting of data for Indigenous people:

- Concerns about the inter-regional differences in the accuracy of the recording of Indigenous deaths prevent reporting on Indigenous mortality separately for the five regions used in this report. Reporting of differences between areas may reflect accuracy of the records rather than real differences in mortality. Consequently overall, rather than regional, mortality rates for Indigenous people are presented.
- Identification of Indigenous mortality was considered to be most reliable in the Northern Territory, South Australia, Western Australia and Queensland during the study period. Overall mortality rates for Indigenous people have been calculated using data from these jurisdictions only.

Because a 'non-Indigenous' person has been defined in this report as someone who is not identified as Indigenous, under-identification of Indigenous people will necessarily mean over-reporting of non-Indigenous people in the mortality data. However the effect on reporting by area will be much less than for Indigenous people (minimal in Major Cities and in regional areas), because non-Indigenous persons comprise the vast majority of the population.

Frequently, death rates for elderly non-Indigenous people from remote areas appear substantially lower than for their Major Cities counterparts, while rates for younger people from remote areas are higher than for those in Major Cities. It is possible that this effect is due to elderly people in poorer health migrating to less remote areas where they can access services, leaving the healthier individuals, who have lower death rates. To control for this apparent effect, death rates for some populations younger than 65 years have been presented alongside those for the total population.

Several analytical concepts have been used to compare mortality rates across the regions. There are two in particular that are crucial to understanding the discussion that follows. While these and other concepts are explained more fully in Chapter 2, they are, briefly:

- **standardised mortality ratio (SMR)** – the ratio of the actual number of deaths in an area to the number expected if Major Cities death rates for the relevant group (see Chapter 2) had applied in that area; and
- **‘excess’ deaths** – the difference between the actual number of deaths in an area and the number that would have occurred if Major Cities death rates had applied. The term does not imply in any way that these deaths are flippantly regarded, or that deaths in Major Cities are less important, or that death rates anywhere are not subject to reduction.

Indirect age standardisation involved the use of:

- age-specific death rates for people living in Major Cities as the standard for calculating the expected numbers of deaths in each area; and
- age-specific death rates for non-Indigenous people living in Major Cities as the standard for calculating the expected numbers of deaths of non-Indigenous people in each area and of Indigenous people in South Australia, Western Australia, the Northern Territory and Queensland.

‘Excess’ deaths have been reported because although SMRs provide a measure of inequity, they do not provide a measure of magnitude (that is, an understanding of the absolute size of disadvantage for particular causes of death in each region in terms of human lives lost).

Age-specific death rates have been reported throughout the report because summary measures like SMRs can sometimes mask important patterns.

Report structure

This report is structured as follows:

- The main findings are outlined in ‘Key points’ on page 5. They are grouped under six headings: Demography; Overall death rates; Life expectancy; Changes in death rates, 1992–1999; Broad causes of death; and Specific causes of death. These introduce and distil the main findings.
- ‘Comments on the findings’ (page 13) briefly describes areas for data development or improvement and the importance of Indigenous mortality data and of other data on health outcomes apart from death. It also suggests areas for further research.
- The characteristics of rural and remote populations are described in Chapter 1.
- Technical issues are discussed in Chapter 2.
- The body of the report begins at Chapter 3. Mortality is described for the total and for the non-Indigenous populations by region, and for the Indigenous population in South Australia, Western Australia, the Northern Territory and Queensland as a whole. Numbers of deaths, ratios of observed to expected deaths (SMRs), age-specific death rates and the difference between the observed and expected numbers of deaths (‘excess deaths’) are described for all deaths, for broad causes of death and for specific causes of death. Trends in death rate over time are described for all deaths and for broad causes of death. Variations in mortality within broad geographic regions are described for all deaths.

- Appendices start on page 288, describing standardised mortality ratios and their 95% confidence intervals, numbers of 'excess' deaths by age, sex, region, Indigenous status and cause, age-specific death rates for broad causes of death, ICD-10 codes used in analyses, and population tables.

Context

In comparing death rates in regional and remote areas with those in metropolitan areas, two questions are of interest:

- Are death rates amongst people who live outside Major Cities higher than for those who live in Major Cities?
- For any individual, whether old or young, rich or poor, more educated or less educated, male or female, Indigenous or non-Indigenous, smoker or non-smoker: is their chance of death higher if they live outside a Major City?

This report answers only the first question, and it is important that readers understand this.

Higher death rates in more remote areas may reflect higher prevalence of smoking, inactivity and poor diet as well as any impact of the rural environment (for example, different patterns of access to health services). For example, even though drinking undoubtedly increases the risk of fatal motor vehicle accidents, and people who live outside Major Cities are more likely to drink heavily, higher death rates outside Major Cities could also result from higher speeds, poorer road conditions, animals on the road and longer retrieval times for the injured.

A number of broad issues potentially affect death rates:

- the personal characteristics of the population;
- the risk imposed by the environment; and
- access to health services to reduce the chances of becoming ill, to sustain the patient while ill or to help the patient make a full recovery afterwards.

Health services are meant here to include services provided by the full range of health workers (for example, medical practitioners, Aboriginal health workers, allied health workers, and facilities or services such as hospitals and ambulance).

It is not possible for this report to differentiate between the contribution of each of these three factors to overall higher rates of death outside Major Cities.

Personal characteristics

Compared to those who live in Major Cities, individuals who live in regional and remote areas are more likely to be smokers, are more likely to drink alcohol in hazardous quantities, are more likely to be overweight or obese and are more likely to be physically inactive (AIHW 2002b). They are also more likely to have poorer access to work, particularly to work requiring skilled or professional labour. Household incomes and educational levels are also lower (Garnaut et al. 2001). All of these characteristics increase the risk of poor health and of death. On a positive note, people from rural areas are less likely to report unhappiness (AIHW: Mathers 1994) and women from rural and remote areas report lower levels of stress than women from metropolitan areas (Brown et al. 1999).

Also, people living outside Major Cities, particularly those living in remote areas, are more likely to be Indigenous.

Environment

The environment outside Major Cities is frequently stereotyped as 'outback', sparsely populated, hot, dry, populated by farmers, and isolated from population centres. In reality it is extremely diverse.

Non-metropolitan populations can live in coastal or inland areas, within commuting distance of Major Cities, in mixed farming or extensive grazing areas, or in areas dominated by forestry, fishing or mining. One in ten people in the non-metropolitan workforce is engaged in agriculture (BRS 1999). Many areas outside Major Cities, predominantly on the coast, attract older people in retirement.

Many of the occupations in regional and remote areas (for example mining, transport, forestry, commercial fishing and farming) entail higher levels of risk than other occupations (AIHW: 1998).

Health services

Those who live away from Major Cities and for whom access to health services is restricted may be disadvantaged because of different access to:

- preventive services such as immunisation and information allowing healthy life choices;
- health management and monitoring;
- specialist surgery and medical care;
- emergency care, for example ambulance;
- rehabilitation services after medical or surgical intervention;
- aged care services.

These could reflect different patterns of access to health workers and health facilities (for example, hospitals). The lower numbers of doctors in rural areas is frequently mentioned (AIHW 2003c), but supply of other workers such as nurses and allied health workers, pharmacists and dentists can also be, and frequently is, an issue (AIHW 2003e).

A substantial challenge in providing equitable access to people living in regional and remote areas is that, unlike Major Cities, non-metropolitan populations are dispersed and clustered. Towns exactly the right size to support one, two or three doctors, nurses or allied health workers are very rare – more usually they would support a fraction of a health worker, or, for example, more than one but less than two. In these situations, a single worker may practise in one town and also service one or more others. Either way, someone has to travel, with routine and emergency access potentially compromised and/or the health worker spending substantial amounts of time travelling rather than consulting with patients.

Key points

Demography

- Two-thirds (66%) of the population lives in Major Cities, with 21%, 11%, 2% and 1% living in Inner Regional, Outer Regional, Remote and Very Remote areas respectively.
- Whereas only 1% of the population of Major Cities are Indigenous, this increases to 2% and 5% in Inner and Outer Regional areas, 12% in Remote areas and 45% in Very Remote areas.
- Males outnumber females in almost all age groups in the more remote areas. This is largely influenced by the non-Indigenous population; the number of Indigenous males in each area is similar to the number of females.
- Remote area populations tend to have proportionally more children and working age males, and fewer elderly people than other areas.
- Regional areas have proportionally lower numbers of people aged 25–44 years, higher numbers of people aged 45–74 years and similar or slightly lower numbers of people older than 75 years than other areas. In regional areas, children make up a higher proportion than in Major Cities, but lower than in remote areas.

Overall death rates

- There was an annual average of 128,200 deaths between 1997 and 1999. Of these, 64% were in Major Cities, and 22%, 11%, 1% and 1% were in Inner and Outer Regional, Remote and Very Remote areas, respectively.
- Death rates increased with remoteness, and were 10% (1.1 times) higher in regional and Remote areas compared with Major Cities, and 50% (1.5 times) higher in Very Remote areas.
- Outside Major Cities, there were 3,303 more deaths each year than would have been expected ('excess' deaths) if Major Cities death rates had applied in these areas. Of these, 46%, 37%, 6%, and 10% were in Inner and Outer Regional, Remote and Very Remote areas, respectively.
- On average there were 1,459 deaths each year of Indigenous people in the four jurisdictions (South Australia, Western Australia, the Northern Territory and Queensland) for which identification is considered more reliable. This was 993 more than would be expected if age-specific death rates for non-Indigenous people from Major Cities had applied for Indigenous people in those jurisdictions.
- Death rates for Indigenous people across South Australia, Western Australia, the Northern Territory and Queensland (jurisdictions in which identification is considered more reliable in 1997–1999) were 3.1 times those for non-Indigenous people who lived in Major Cities of Australia. Indigenous deaths are thought to be more under-reported than census counts of the Indigenous population. Consequently, it is likely that the overall Indigenous death rates reported here are lower than actual death rates.

- The high death rate for the total population in Very Remote areas is likely to reflect the high proportion of the population in these areas who are Indigenous and the higher rate of mortality for Indigenous people overall in Australia.
- Inter-regional comparisons of the death rate for Indigenous people cannot be presented because of the strong likelihood of differences by remoteness in the accuracy of identification of deaths of Indigenous people. This means that calculated differences in death rates between regions could be an artefact of variations in identification, rather than a portrayal of real differences.
- Annually, there were 2,414 more deaths of non-Indigenous people outside Major Cities than expected if death rates for non-Indigenous people from Major Cities had applied in those areas. Of these, 57%, 42% and 2% were in Inner and Outer Regional and Remote areas, respectively, but there were 23 fewer deaths than expected annually in Very Remote areas.
- Death rates for the non-Indigenous population were up to 10% higher in areas outside Major Cities (but not clearly higher in Very Remote areas).
 - Some degree of over-estimation of non-Indigenous death rates is a consequence of the under-identification of Indigenous deaths (with some Indigenous deaths being counted amongst the non-Indigenous). Reported death rates for non-Indigenous people are likely to be affected by between minus 2% and plus 2% for Major Cities and regional areas, but may be inflated in remote areas by up to 10% (AIHW 2003a). The exact magnitude of the effect within this range is unclear.
- Death rates for non-Indigenous people who were younger than 65 years were about 10% higher in regional and Remote areas, and about 20% higher in Very Remote areas than they were in Major Cities. For males, rates were 10% higher in Inner Regional areas and 20% higher in the other areas. For females, rates were 10% higher in regional areas, but not significantly higher in remote areas.
 - Conversely, death rates for those over 65 years were frequently lower than in Major Cities. It is possible that in order to access health and other services (including aged care), the frail-aged migrate to larger, less remote centres leaving behind the healthier individuals, who live longer.
- Within the broad geographic zones utilised in this report, there is substantial variation in mortality from community to community.
 - The average death rate in Very Remote areas was substantially elevated by a relatively small number of Statistical Local Areas (SLAs) with very high death rates – some SLAs had relatively low death rates. This was also true to a lesser extent in Remote areas, but not for Major Cities and regional areas, where death rates were more likely to cluster around an average value.
- Poor identification of Indigenous people in data collections generally, and specifically in the mortality data collection, hampers the ability to report on health not only of Indigenous people overall, but also of both Indigenous and non-Indigenous people who live in regional and remote Australia.
- This report shows higher death rates in regional and remote areas. These higher rates are evident after taking inter-regional differences in age, sex, Indigenous status, and to some extent the possible migration of the frail elderly into account. The remaining differences in mortality could be due to a range of different influences including lower socioeconomic status and poorer risk factors (for example, higher smoking rates), different access to services, and other aspects of living outside Major Cities (for example,

possible greater hazards associated with occupations such as farming and with driving in rural areas). It is not within the scope of this report to explain why these remaining differences occur.

Life expectancy

- Life expectancy generally declined with increasing remoteness, but was lower for males in each area than for females. Life expectancy for males was 77.9, 76.7, 76.0, 75.3 and 72.2 years in Major Cities, Inner and Outer Regional, Remote and Very Remote areas, respectively, and for females was 83.9, 83.3, 82.6, 82.7 and 78.5 years.
- These figures may be strongly affected by two factors: Indigenous mortality and potential migration of the frail aged:
 - Life expectancy for Indigenous people has been reported as 56 years for males and 63 years for females, compared to 76 and 82 years for Australian males and females generally (ABS 2001c). A relatively large proportion of the remote area population is Indigenous, acting to lower average life expectancy there.
 - Possible migration of the frail aged towards less remote areas is likely to increase calculated average life expectancy in remote areas.
- The effect of remoteness on life expectancy is best illustrated as the probability of non-Indigenous people reaching 65 years of age in each area.
- The probability of non-Indigenous males and females living to 65 years of age is highest in Major Cities (85% and 91%), decreasing gradually with remoteness (to 82% and 89% in Very Remote areas respectively).

Changes in death rates, 1992–1999

- Since 1992, death rates in all except Very Remote areas have decreased by about 3% per year for males and by about 2% for females. In Very Remote areas, death rates have decreased more rapidly – by about 10% for males and females per year over the same period.
- The major contributor to the overall decrease in all areas was a reduction in circulatory disease mortality. While responsible for between 67% and 80% of the overall reduction in most areas, decreases in circulatory disease mortality was responsible for a smaller proportion (45%) of the substantial overall reduction in Very Remote areas.
- Reductions in respiratory disease mortality were responsible for 9% of the overall mortality decrease in Major Cities, increasing with remoteness to 25% of the overall decrease in Very Remote areas.
- Reductions in cancer death rates were generally responsible for about 15% of the overall decline in each of the areas.
- Injury death rates changed very little, and in some areas increased over the study period.
- ‘Other’ causes (see page 42) contributed little to the decline in most areas, but to 13% of the decrease in Very Remote areas.

Broad causes of death

- The major causes of death for the Australian population are circulatory diseases (41%), neoplasms (28% – mainly cancers), respiratory diseases (8%) and injury (6%). This pattern holds across most areas, but in Very Remote areas neoplasms are relatively less important causes of death, and injury and ‘other’ causes are relatively more important.
- Those major causes most responsible for the 3,303 ‘excess’ deaths outside Major Cities were circulatory diseases (42%), injury (24%), ‘other’ causes (13%), neoplasms (11%) and respiratory diseases (10%). This pattern changed with remoteness, circulatory diseases and neoplasms becoming relatively less important, and ‘other’ causes becoming relatively more important.
- In regional areas, most ‘excess’ deaths occurred in people (mainly males) older than 50 years, although there were also appreciable numbers of extra deaths of males from younger age groups. In remote areas, the ‘excess’ deaths were mainly of males from a broad range of age groups.
- For Indigenous people, 60–70% of the ‘excess’ deaths occurred in those aged 25–64 years. Circulatory diseases (30%), injury (17%) and ‘other’ causes (36%) were responsible for most of this excess (while respiratory diseases accounted for 9% and neoplasms for 7%).
- For non-Indigenous people in regional areas, the ‘excess’ deaths were mainly in the older age groups, and were mainly male. For non-Indigenous people from remote areas, there were small numbers of ‘excess’ deaths in each age group up to age 70, but fewer than expected for people older than this.
- For non-Indigenous people, injury was either the only, or by far the major, cause of the ‘excess’ deaths outside Major Cities for people aged less than 45 years. For those older than this, circulatory disease and neoplasms (and to an extent respiratory disease) contributed the great majority of extra deaths. In remote areas, while circulatory diseases and neoplasms were important for those aged over 45 years, injury was also important as a cause of extra deaths for older age groups.

Specific causes of death

Outlined below are the ten major specific causes of death, which together were responsible for 88% of the ‘excess’ deaths outside Major Cities (that is, those in excess of what would be expected if Major Cities rates had applied in each area). With a few exceptions, death rates were higher outside the Major Cities and increased with increasing remoteness.

- **Ischaemic heart disease** was responsible for 755 ‘excess’ deaths each year outside Major Cities. Rates were 10% higher in all areas outside Major Cities except Very Remote areas, where they were 30% higher. There were 3.3 times as many deaths of Indigenous people as expected (9.3 times as many for 0–64-year-olds). For younger non-Indigenous people (aged 0–64 years), rates were 10%, 20%, 20% and 30% higher in Inner Regional, Outer Regional, Remote and Very Remote areas.
- **‘Other’ circulatory diseases** (circulatory disease excluding ischaemic heart disease, stroke and rheumatic heart disease) were responsible for 518 ‘excess’ deaths each year outside Major Cities. Rates ranged from 10% higher than in Major Cities in Inner Regional areas, to 30% higher in Very Remote areas. There were 3.0 times as many deaths of Indigenous people as expected (6.6 times as many for 0–64-year-olds). For non-

Indigenous people aged 0–64 years, rates were 10% and 30% higher in Inner and Outer Regional areas (with rates elevated, but not significantly higher, in remote areas).

- There were about 374 ‘excess’ deaths (mainly male) due to **chronic obstructive pulmonary disease** each year; overall rates in Inner Regional, Outer Regional, Remote and Very Remote areas were 1.2, 1.3, 1.3 and 1.9 times those in Major Cities. Rates for Indigenous people were 3.4 times higher than expected (and 8.8 times higher for 0–64-year-olds). Death rates for non-Indigenous people aged 0–64 years were 1.3, 1.6, 1.8 and 2.8 times higher in the four areas outside Major Cities.
- There were 368 ‘excess’ deaths due to **motor vehicle accidents** annually, of which 70% were male. Rates were substantially elevated outside Major Cities for all groups examined. Indigenous death rates due to this cause were 4.1 times higher than expected. Rates for non-Indigenous people aged 0–64 years were 1.8, 2.0, 2.1 and 2.4 times higher in the four areas outside the Major Cities.
- **Diabetes** was responsible for 191 ‘excess’ deaths outside Major Cities annually where it was reported as the underlying cause of death¹. However, there were another 169 ‘excess’ deaths of people outside Major Cities where diabetes was mentioned on the death certificate as an associated cause of death (making up 360 altogether). Although most of the 191 deaths were of people older than 75 years, about one-third were aged between 35 and 74 years, and about 60–70% were females. Death rates in the four areas were 1.1, 1.3, 1.7 and 3.8 times higher than in Major Cities. There were 13.3 times as many deaths of Indigenous people as expected (and 28.2 times as many for 0–64-year-olds). For non-Indigenous people, there were 1.05, 1.2 and 1.2 times as many deaths as expected in Inner Regional, Outer Regional and Remote areas, while rates in Very Remote areas were not significantly different from those in Major Cities. For non-Indigenous people aged 0–64 years, rates were lower (in Inner Regional areas), or not significantly higher (in the other areas).
- There were 184 ‘excess’ deaths due to **suicide** annually, and practically all were male. Rates in the four areas were 1.2, 1.2, 1.4 and 1.6 times the rate in Major Cities. Indigenous death rates due to this cause were 2.9 times higher than expected. Rates for non-Indigenous people were 1.2 times higher in Inner Regional, Outer Regional and Remote areas than in Major Cities, with all age groups between 15 and 64 years contributing, but similar in Very Remote areas to those in Major Cities. Rates for non-Indigenous people aged 0–64 years from Inner and Outer Regional areas were 1.3 and 1.2 times higher than in Major Cities.
- There were 214 ‘excess’ deaths annually due to ‘other’ injuries. This is a broad group of causes including **non-traffic motor vehicle accidents, drownings and falls**. The main population groups affected were young children, men in age groups between 15 and 64 years and elderly women, but 70% of this group were male. Rates increased with remoteness: in the four areas, rates were 1.1, 1.3, 1.6 and 2.1 times those in Major Cities. There were 3.3 times as many deaths of Indigenous people as expected. Rates for non-Indigenous people (including those aged 0–64 years) also increased with remoteness.

¹ The underlying cause of death is the main disease or injury initiating the sequence of events leading directly to death. Associated causes of death are the other diseases or injuries recorded on the death certificate that contributed to the death. Details of deaths where diabetes was recorded as an associated cause of death are included in Appendix A.

- There were 131 'excess' deaths annually due to **prostate cancer**. There were about as many deaths of Indigenous men as expected due to this cause. Rates for non-Indigenous men were 10% and 20% higher in Inner and Outer Regional areas, and 40% higher for men aged 0–64 years in these areas.
- **Colorectal cancer** was responsible for 117 'excess' deaths annually. Rates were 10% higher in regional areas, but lower in remote areas than in Major Cities. There were about half as many deaths of Indigenous people as expected. There were about 20% more deaths of non-Indigenous people aged 0–64 years as expected in regional areas.
- **Lung cancer** was responsible for 52 'excess' deaths annually outside Major Cities (60 fewer deaths than expected for those older than 70 years, but 112 more than expected for those younger than 70 years). Rates were 10% and 30% higher in Remote and Very Remote areas than in Major Cities, and there were 2.1 times as many deaths of Indigenous people as expected (3.2 times as many for 0–64-year-olds). Rates for non-Indigenous people aged 0–64 years were 10% higher in regional areas and 80% higher in Very Remote areas than in Major Cities.

Specific causes of death responsible for the higher death rates outside Major Cities are described in Table 1.

Table 1: Leading specific causes of 'excess' deaths, 1997–1999

Specific cause of death	Annual 'excess' deaths	Per cent of total 'excess'
Ischaemic heart disease (IHD)	755	23
'Other' circulatory diseases (but not stroke or RHD)	518	16
Chronic obstructive pulmonary disease (COPD)	374	11
Motor vehicle accidents (MVA)	368	11
Diabetes	191 (360 ^(a))	6 (11 ^(a))
Suicide	184	6
'Other' injuries ^(b)	214	6
Prostate cancer	131	4
Colorectal cancer	117	4
Lung cancer	52 (112 ^(c))	2 (6 ^(c))
All other causes	399	12
All causes	3,303	100

(a) There were 360 'excess' deaths for which diabetes was a contributing factor (associated cause). In 191 of these, diabetes was recorded as the principal cause of death. The principal causes of the remaining 169 are distributed among the remaining categories in the table. In 11% of all 'excess' deaths, diabetes was implicated as an associated cause of death.

(b) 'Other' injuries include all injuries except motor vehicle accidents, suicide, homicide and accidental shooting.

(c) There were 52 excess deaths due to lung cancer overall (this was made up of 112 'excess' deaths of those younger than 70 years outside Major Cities and 60 fewer than expected for those who were 70 years and older). While it accounted for 2% of all 'excess' deaths, lung cancer accounted for 6% of 'excess' deaths of people younger than 65 years.

Source: AIHW National Mortality Database.

Other specific causes

Details of the other causes of death described in this report are included below. These causes are listed in no particular order.

- **Stroke and rheumatic heart disease (RHD)** were responsible for 85 and 18 extra deaths annually, on average, outside Major Cities. Death rates due to stroke were broadly similar in all areas, while rates for RHD were much higher (to 7 times Major Cities rates) in remote areas, reflecting large numbers of Indigenous people in these areas, and high rates in the overall Indigenous population (24 times as many deaths as expected). There were 2.6 times as many deaths of Indigenous people due to stroke; while for 0–64-year-old Indigenous people, there were 6.5 and 50.2 times as many deaths as expected due to stroke and RHD respectively.
- Outside Major Cities, there were about as many deaths as expected due to **breast cancer**, and slightly more deaths than expected due to **cervical cancer**. For Indigenous women, there were about as many deaths due to breast cancer as expected, but 6.5 times as many deaths as expected due to cervical cancer. There was no clear difference in rates of breast and cervical cancer in non-Indigenous women in each of the areas.
- There were 36 extra deaths annually outside Major Cities due to **melanoma**. Rates for Indigenous people were relatively low. Rates for non-Indigenous people were 20–30% higher in regional areas.
- There were about as many deaths as expected due to **‘other’ neoplasms**, but 1.7 times as many for Indigenous people generally. Rates for non-Indigenous people were lower in remote areas largely because of relatively low rates in those older than 70 years. In Inner Regional areas, there were about 10% more deaths of young (0–64 years) non-Indigenous people than expected due to ‘other’ neoplasms.
- There were fewer deaths overall than expected due to **pneumonia**, although remote area rates were 1.3 and 2.3 times as high as in Major Cities. There were 7.2 times as many deaths of Indigenous people than expected (23.7 times as many for 0–64-year-olds). There were fewer than, or about as many, deaths of non-Indigenous people as expected in the areas outside Major Cities.
- There were 21 more deaths than expected due to **asthma** annually outside Major Cities, with 1.2 and 1.5 times as many deaths as expected in Outer Regional and Remote areas. Rates for Indigenous people were 3.0 times as high as expected (3.8 times as high for 0–64-year-olds). Asthma death rates were not significantly higher for non-Indigenous people (although the numbers of deaths were elevated), while the asthma death rate for young (0–64 years) non-Indigenous people was 30% higher in Outer Regional areas and not significantly higher in the other areas.
- There were 27 extra deaths due to **influenza** annually outside Major Cities. Death rates were 1.6, 1.9 and 3.2 times as high in Inner Regional, Outer Regional and Remote areas, with rates similarly elevated for non-Indigenous people. There were relatively few deaths of Indigenous people due to influenza.
- There were 78 fewer deaths than expected due to **‘other’ respiratory** diseases, largely as a consequence of low death rates for elderly non-Indigenous people in regional areas. Rates for Indigenous people were 5.2 times as high as expected (12.5 times as high for 0–64-year-olds). There were about as many deaths of younger (0–64 years) non-

Indigenous people as expected due to this cause in each of the areas outside Major Cities.

- There were nine extra deaths on average due to **interpersonal violence** outside Major Cities annually (mainly female); rates were 0.8 times the Major Cities rate in Inner Regional areas, similar in Outer Regional areas and 2.0 and 5.4 times as high in Remote and Very Remote areas. There were 7.4 times as many deaths of Indigenous people as expected (7.6 times as many for 0–64-year-olds), and it is these deaths that are mainly responsible for the higher rate in remote areas. For non-Indigenous people, rates were lower in Inner Regional areas, not significantly different in Outer Regional and Remote areas, and 2.3 times as high in Very Remote areas (although based on small numbers).
- There was an average of 16 deaths annually due to **accidental shooting** in areas outside Major Cities (almost all male), 12 of these were in excess of the number expected; rates in Inner Regional, Outer Regional, Remote and Very Remote areas were 3.7, 4.6, 7.7 and 15.5 times those in Major Cities. There were essentially no deaths of Indigenous people from this cause in the study period.
- There were 33 extra deaths annually due to **renal diseases**, and 70% were female. Rates were similar in all areas, or at least were not significantly different from those in Major Cities. However, in Very Remote areas, there were 2.6 times as many deaths as expected due to this cause. There were 7.1 times as many deaths of Indigenous people as expected, and 25.1 times as many deaths as expected for 0–64-year-old Indigenous people. Rates for non-Indigenous people were not significantly different in any area from those in Major Cities.
- **Other causes 'not elsewhere described'** is a group that excludes cardiovascular and respiratory diseases, neoplasms, injuries, diabetes and renal disease, but includes diverse causes, ranging from pregnancy related, through infectious diseases, conditions originating in the perinatal period, diseases of the digestive system (including liver), and others. There were 210 more deaths than expected due to these causes annually (practically all female, one-third younger than 5 years, the rest older than 50 years). Rates were similar to those in Major Cities in regional areas, but 1.1 and 1.7 times as high in remote areas. Indigenous death rates due to this cause were 3.5 times as high as expected (4.1 times as high for 0–64-year-olds). Rates for non-Indigenous people in Inner Regional, Outer Regional, Remote and Very Remote areas were similar in regional areas, but in remote areas were lower than (0.9 and 0.8 times) those in Major Cities.

Comments on the findings

- Improvements in the identification of Indigenous people in the mortality data collection are crucial to being able to describe differences in mortality across remoteness in the future.
- Estimates of the accuracy of Indigenous identification in each area are critical for the utilisation of current and historical mortality data to assess differences in mortality for Indigenous people in each area.
- Descriptions of regional mortality rely on relatively clumsy allocation of regional category on the basis of Statistical Local Area (SLA), because the boundaries of SLAs and Remoteness categories seldom coincide exactly. Geocoding of residential location would allow more precise allocation, and would also facilitate more powerful epidemiological work (for example, identification of disease clusters), however a move to geocoding would need to incorporate substantial confidentiality safeguards.
- While all of the causes of death described in this report are significant, two broad causes stand out as being of particular importance: circulatory disease and injury. Circulatory disease is important because of the large number of deaths involved, while injury is important because of the large number of 'excess' deaths outside Major Cities, the young age of many of the people affected and the trend for rates to remain unchanged or to increase over time. These two broad causes are responsible for 66% of all the 'excess' deaths that occur outside Major Cities.
- For many of the causes of death examined, rates for Indigenous people are much higher than for non-Indigenous people from any area. Elevated death rates in remote areas may be a consequence of the proportionally large number of Indigenous people in those areas, and high overall Indigenous mortality. Because of the proportionally lower numbers of Indigenous people in regional areas, the impact of high overall Indigenous mortality on death rates in these areas is probably relatively small.
- While access to health services, the higher risks associated with some occupations and with country driving likely to contribute to higher death rates outside Major Cities, other issues are also likely to be relevant. Strong influences on health outcomes are also likely to result from higher rates of smoking, physical inactivity, risky alcohol consumption and poorer nutrition, and lower rates of employment, income and education. At least for Indigenous people, disadvantages with regard to these issues, and issues around the social environment, lack of control over aspects of one's life, potentially leading to a sense of hopelessness, have been cited as possible reasons for poorer health outcomes (ABS 2001c).

- Although comparison of death rates tells us something about gross health conditions, it tells little about other important issues. There may be substantial differences between areas, for example:
 - accessing speech therapy services for a young child;
 - getting an elderly person to rehabilitation services on a regular basis;
 - logistic and financial difficulties when a family member needs specialist care in a Major Cities hospital; and
 - whether people are living happy and fulfilling lives.
- The lower death rates of the aged in remote areas is assumed, in this report, to be due to the migration of the frail aged to less remote areas where they can access services. There is much anecdote, but little that has been published to support this hypothesis.
- This report does not include information on deaths due to occupational accidents. This is an important issue that requires further investigation.
- This report touches briefly on intra-regional variation in rates of death, that is, differences in mortality between areas within broad geographic zones. Further investigation of small area mortality patterns may be useful in better targeting interventions.
- The effect of income and education on regional differences in mortality has not been explored in this report. It is possible that these factors would explain some of the regional differences in mortality.
- Although this report describes, amongst others, high death rates due to ischaemic heart disease, 'other' circulatory disease, and motor vehicle accidents, it is not clear whether these differences are due to higher overall risk, or due to lower levels of access to health services or both. Further work to identify the contribution of risk and access would be useful.