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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index of Australia
ARPHI	Australian Research Program on Health Inequalities
ASCO	Australian Standard Classification of Occupations
CCLO	Classification and Classified List of Occupations
CURF	Confidentialised Unit Record File
DHAC	Department of Health and Aged Care
DoHA	Department of Health and Ageing
FWEs	Fulltime Workload Equivalents
ICD-9	International Classification of Diseases: 9th revision
ICD-10	International Classification of Diseases: 10th revision
IRSD	Index of Relative Socioeconomic Disadvantage
NCCH	National Centre for Classification in Health
NHMRC	National Health and Medical Research Council
NHPA	National Health Priority Areas
PHERP	Public Health Education Research Program
PYLL	Potential Years of Life Lost
QUT	Queensland University of Technology
RRMA	Rural, Remote & Metropolitan Areas
SACC	Standard Australian Classification of Countries
SEIFA	Socio-Economic Indexes for Areas
SEP	Socioeconomic Position
SIDS	Sudden Infant Death Syndrome
SLA	Statistical Local Area
—	Nil, or rounded to zero
*	$p<0.05$
**	$p<0.01$
***	$p<0.001$

Summary of findings

The health of the Australian population improved markedly during the twentieth century. For example: the toll of infectious disease was reduced sharply, life expectancy at birth continued to increase, death rates from coronary heart disease and stroke have declined since the late 1960s and in more recent years, we have witnessed a downward trend in deaths from lung, colorectal and breast cancer. Despite this, health gains have not been equally shared across all sections of the population. At the end of the twentieth century, there were considerable mortality inequalities between population subgroups in Australia.

This report examines mortality inequalities by sex, geographic region, socioeconomic disadvantage, occupation, and country of birth among infants and children (0–14 years), young adults (15–24 years), working-aged adults (25–64 years), and older persons (65 years or more) for the period 1998–2000, and between 1985–1987 and 1998–2000. Mortality inequalities were examined on the basis of life expectancy, potential years of life lost, potentially avoidable deaths, age-standardised death rates, rate ratios, and a measure of excess mortality.

During 1998–2000, rates of death were substantially higher for males, those living in remote and very remote regions, those living in socioeconomically disadvantaged areas, blue-collar employees, and the Australian-born. While this publication does not focus in detail on Indigenous health, it is also well established that Indigenous peoples have a much poorer mortality profile than non-Indigenous Australians.

The mortality burden in the Australian population attributable to inequality based on sex, geographic region, socioeconomic disadvantage, occupation, and country of birth is large: much of this burden is potentially avoidable. Deaths attributable to inequality constitute a loss of economically productive members of society, and raise health care costs.

Throughout this report we make extensive use of the rate ratio, an internationally accepted measure of inequality that is widely used in health and epidemiological research. However, the reader needs to be aware that the rate ratio must be interpreted carefully when making comparisons between groups and over time: this issue is discussed more fully in Chapter 2 (Section 2.6).

Mortality differences by sex

In 1998–2000, life expectancy at birth for Australian males and females was 76.6 and 82.0 years respectively. Between 1990 and 2000, life expectancy increased by about 2.7 years for males at birth, and by 1.9 years for females. During the same period, the sex difference in life expectancy narrowed: in 1990 a new-born girl could expect to live 6.2 years longer than a new-born boy, and by 2000 this difference had reduced to 5.4 years.

Between 1985–1987 and 1998–2000, all-cause death rates declined for both males and females in each age group; at each period, however, death rates were significantly higher for males.

Across all ages, males experienced significantly higher all-cause death rates than females in 1998–2000 (Table S1). The relative difference was smallest among infants (25%) and largest among adolescents and young adults (163%). However, the sex difference in the absolute number of deaths per 100,000 was twice that among infants (118 more male deaths) compared with adolescents and young adults (59 more male deaths).

Table S1: Age-standardised mortality rates for all causes, by sex, 1998–2000

	Males	Females	% difference
Deaths per 100,000 persons			
Less than 1 year	587	469	25
0–14 years	58	46	27
15–24 years	96	37	163
25–64 years	308	170	81
Deaths per 1,000 persons			
65 years and over	49	32	54
65–74 years	25	13	85
75 years and over	86	60	44

Significant differences in death rates between males and females were evident for all major causes of death. Specific causes of death for which males had higher death rates included:

Less than 1 year	Accidents and injury (56% higher, 8 more male deaths per 100,000), Sudden Infant Death Syndrome (51% higher, 23 more male deaths per 100,000)
0–14 years	Accidents and injury (59% higher, 4 more male deaths per 100,000), potentially avoidable deaths (32% higher, 7 more male deaths per 100,000)
15–24 years	Suicide (293% higher, 17 more male deaths per 100,000), accidents and injury (227% higher, 49 more male deaths per 100,000)
25–64 years	Diseases of the circulatory system (160% higher, 47 more male deaths per 100,000), lung cancer (100% higher, 12 more male deaths per 100,000), potentially avoidable deaths (88% higher, 93 more male deaths per 100,000)
65 years and older	Diseases of the respiratory system (93% higher, 2 more male deaths per 1,000) diseases of the circulatory system (40% higher, 6 more male deaths per 1,000), lung cancer (190% higher, 2 more male deaths per 1,000)
65–74 years	Accidents and injury (112% higher, 0.35 more male deaths per 1,000), diabetes mellitus (60% higher, 0.25 more male deaths per 1,000), all cancers (82% higher, 5 more male deaths per 1,000)
75 years and older	All cancers (96% higher, 10 more male deaths per 1,000), diabetes mellitus (42% higher, 0.59 more male deaths per 1,000), diseases of the circulatory system (26% higher, 8 more male deaths per 1,000)

In 1998–2000, if males had experienced the same death rate as females, a large number of deaths could have been avoided, ranging from 553 among those aged less than 1 year to 20,693 among working-aged adults (Table S2).

Table S2: Number and percentage of deaths from all causes that would have been avoided in 1998–2000 if males had the same mortality rate as females

	Number[(a)]	Per cent[(b)]
Less than 1 year	553	11.4
0–14 years	725	12.1
15–24 years	2,456	45.4
25–64 years	20,693	28.3

(a) Total number of deaths that would have been avoided if males had the same mortality rate as females.

(b) Percentage of all deaths that would have been avoided if males had the same mortality rate as females.

Mortality differences by geographic region

In this report, geographic remoteness was ascertained using the Accessibility/Remoteness Index of Australia (ARIA). All Statistical Local Areas (SLAs) comprising each state and territory were grouped into four categories—Highly Accessible, Accessible, Moderately Accessible, Remote/Very Remote—with SLAs in each category having similar degrees of access to population centres containing basic services (e.g. health, education, and retail). This summary reports on mortality differences between areas classified as Highly Accessible and Remote/Very Remote; the mortality profile of all four ARIA categories is presented in the main text.

In 1998–2000, life expectancy at birth for males born in areas classified as Highly Accessible was 77.3 years, and 73.1 years for males born in areas classified as Remote/Very Remote. The corresponding figures for females were 82.7 and 79.7 years.

For both males and females in each age group, all-cause death rates were significantly higher for residents in Remote/Very Remote areas than for those in Highly Accessible areas (Table S3). For males, relative differences in death rates between the two ARIA categories were largest among adolescents and young adults (150%), which equates to 128 more deaths per 100,000 for males living in Remote/Very Remote areas; and smallest for those aged 65 years and over (2%), which equates to 1 more male death per 1,000 for those living in Remote/Very Remote areas. For females, the relative difference in death rates between the geographic regions was also largest among 15–24 year olds (162%), which equates to 53 more deaths per 100,000 for females living in Remote/Very Remote areas; and smallest among those 65 years or more (5%), which equates to 2 more deaths per 1,000 for females living in Remote/Very Remote areas.

It is now well established that Indigenous persons have considerably poorer health than the non-Indigenous population. Also, in Remote/Very Remote areas of Australia, Indigenous persons constitute a substantial proportion of the population. Given this, the report examined whether the higher mortality rate in Remote/Very Remote regions was partly due to the poorer health status of their Indigenous populations. This was done by comparing all-cause mortality rates for geographic regions that first included and then excluded Indigenous deaths. Differences in death rates across geographic regions were reduced substantially when based on only the non-Indigenous population (compared with all Australians) and the most marked reductions were observed in Remote/Very Remote areas. This evidence suggests that many of the mortality inequalities between geographic regions reported above were due in part to the disproportionate concentration of Indigenous peoples in non-metropolitan regions.

Table S3: Age-standardised mortality rates for all causes, for regions of Australia classified by their accessibility to, or remoteness from, basic services, 1998–2000

	Males			Females		
	Highly Accessible	Remote/ Very Remote	% difference	Highly Accessible	Remote/ Very Remote	% difference
Deaths per 100,000 persons						
Less than 1 year	539	968	80	430	1,091	154
0–14 years	54	101	89	42	97	129
15–24 years	85	213	150	33	86	162
25–64 years	288	521	81	162	323	99
Deaths per 1,000 persons						
65 years and over	49	50	2	31	33	5
65–74 years	24	32	34	13	19	43
75 years and over	86	76	11	60	55	8

It is worth noting that the use of the age group '65 years and over' obscures some important mortality inequalities between geographic regions for older age groups. Further, whilst mortality inequalities between geographic regions were observed among older persons, the magnitude of the inequalities was smaller than that found for those aged less than 65 years. A similar pattern is evident for a number of other sociodemographic indicators.

Differences in death rates between Highly Accessible and Remote/Very Remote regions were found for many specific causes of death. Mortality rates were significantly higher in Remote/Very Remote regions for:

Less than 1 year	Males	Certain conditions originating in the perinatal period (61% higher, 156 more male deaths per 100,000)
	Females	Congenital malformations, deformations, and chromosomal abnormalities (140% higher, 64 more female deaths per 100,000) and certain conditions originating in the perinatal period (120% higher, 243 more female deaths per 100,000)
0–14 years	Males	Accidents and injury (170% higher, 15 more male deaths per 100,000)
	Females	Accidents and injury (190% higher, 11 more female deaths per 100,000), potentially avoidable deaths (150% higher, 31 more female deaths per 100,000)
15–24 years	Males	Suicide (280% higher, 56 more male deaths per 100,000), accidents and injury (190% higher, 115 more male deaths per 100,000)
	Females	Potentially avoidable deaths (146% higher, 27 more female deaths per 100,000)
25–64 years	Males	Diseases of the circulatory system (111% higher, 77 more male deaths per 100,000), diseases of the respiratory system (231% higher, 22 more male deaths per 100,000), lung cancer (63% higher, 14 more male deaths per 100,000)
	Females	Diseases of the circulatory system (193% higher, 50 more female deaths per 100,000), diseases of the respiratory system (245% higher, 19 more female deaths per 100,000), potentially avoidable deaths (103% higher, 104 more female deaths per 100,000)

65 years and over	Males	None
	Females	Diabetes mellitus (112% higher, 0.85 more female deaths per 1,000), endocrine, nutritional and metabolic diseases (89% higher, 0.93 more female deaths per 1,000), heart failure (32% higher, 0.28 more female deaths per 1,000)
65–74 years	Males	All cancers (17% higher, 2 more male deaths per 1,000), diabetes mellitus (54% higher, 0.36 more male deaths per 1,000), accidents and injury (117% higher, 0.70 more male deaths per 1,000)
	Females	Diabetes mellitus (194% higher, 0.79 more female deaths per 1,000), diseases of the circulatory system (49% higher, 2 more female deaths per 1,000)
75 years and over	Males	None
	Females	Diabetes mellitus (73% higher, 0.96 more female deaths per 1,000)

In 1998–2000, if all geographic regions of Australia experienced the same death rate as Highly Accessible regions, substantial numbers of deaths could have been avoided (Table S4).

Table S4: Number and percentage of deaths from all causes that would have been avoided in 1998–2000 if all geographic regions of Australia had the same mortality rate as regions with the highest level of access to basic services

	Males		Females	
	Number[(a)]	Per cent[(b)]	Number	Per cent
Less than 1 year	174	6.3	130	6.3
0–14 years	227	6.7	172	6.7
15–24 years	373	9.6	104	7.4
25–64 years	2,411	5.2	1048	4.1

(a) Total number of deaths that would have been avoided if all ARIA categories experienced the same mortality rate as Highly Accessible areas.

(b) Percentage of deaths that would have been avoided if all ARIA categories experienced the same mortality rate as Highly Accessible areas.

Mortality differences by socioeconomic disadvantage

This report used an area-based measure of socioeconomic status known as the Index of Relative Socioeconomic Disadvantage (IRSD). The IRSD was developed by the Australian Bureau of Statistics using population census data, and it reflects the overall level of socioeconomic disadvantage of an area measured on the basis of attributes such as low income, low educational attainment, high levels of public sector housing, high unemployment, and jobs in relatively unskilled occupations. SLAs comprising each state and territory were categorised on the basis of their IRSD score into five groups (quintiles) so that each contained approximately 20% of the total Australian population. This summary reports on mortality differences between Quintiles 1 and 5. Quintile 1 contained the 20% least disadvantaged (i.e. the most advantaged) areas, and Quintile 5 the 20% most disadvantaged. The mortality profile of all IRSD quintiles is presented in the main text.

In 1998–2000, life expectancy at birth for males born in the least and most disadvantaged areas was 79.2 and 75.3 years respectively. The corresponding figures for females were 83.6 and 81.6 years.

For all age groups, males and females in the most disadvantaged areas had significantly higher all-cause death rates (Table S5). For males, relative differences between the least and most disadvantaged areas was largest among adolescents and young adults (89%), which equates to 57 more deaths per 100,000 for males living in the most disadvantaged areas; and smallest for those aged 75 years and over (10%), which equates to 8 more deaths per 1,000 for males living in the most disadvantaged areas. For females, the relative difference between the least and most disadvantaged areas was largest among children aged 0–14 years (62%), which equates to 22 more deaths per 100,000 for females living in the most disadvantaged areas; and smallest for those aged 75 years and over (4%), which equates to 3 more deaths per 1,000 for females living in the most disadvantaged areas.

Table S5: Age-standardised mortality rates for all causes, for the least and most socioeconomically disadvantaged areas of Australia, 1998–2000

	Males			Females		
	Least disadvantaged	Most disadvantaged	% difference	Least disadvantaged	Most disadvantaged	% difference
Deaths per 100,000 persons						
Less than 1 year	420	757	80	372	586	57
0–14 years	41	74	78	36	58	62
15–24 years	64	121	89	28	44	56
25–64 years	215	377	75	135	204	52
Deaths per 1,000 persons						
65 years and over	44	51	17	30	33	10
65–74 years	20	27	36	11	15	30
75 years and over	81	89	10	58	61	4

Differences in death rates between the least and most socioeconomically disadvantaged areas were found for many specific causes of death. Mortality rates were significantly higher in the most disadvantaged areas for:

Less than 1 year	Males	Sudden Infant Death Syndrome (204% higher, 66 more male deaths per 100,000), certain conditions originating in the perinatal period (59% higher, 131 more male deaths per 100,000), congenital malformations, deformations, and chromosomal abnormalities (61% higher, 71 more male deaths per 100,000)
	Females	Sudden Infant Death Syndrome (147% higher, 43 more female deaths per 100,000), congenital malformations, deformations, and chromosomal abnormalities (49% higher, 51 more female deaths per 100,000), certain conditions originating in the perinatal period (28% higher, 52 more female deaths per 100,000)
0–14 years	Males	Accidents and injury (235% higher, 11 more male deaths per 100,000), potentially avoidable deaths (82% higher, 17 more male deaths per 100,000)
	Females	Accidents and injury (156% higher, 6 more female deaths per 100,000), potentially avoidable deaths (76% higher, 12 more female deaths per 100,000)

15–24 years	Males	Suicide (103% higher, 15 more male deaths per 100,000), transport accidents (94% higher, 18 more male deaths per 100,000), potentially avoidable deaths (85% higher, 33 more male deaths per 100,000)
	Females	Accident and injuries (68% higher, 10 more female deaths per 100,000), potentially avoidable deaths (66% higher, 10 more female deaths per 100,000), suicide (59% higher, 3 more female deaths per 100,000)
25–64 years	Males	All cancers (45% higher, 35 more male deaths per 100,000), diseases of the circulatory system (112% higher, 53 more male deaths per 100,000), diseases of the respiratory system (181% higher, 10 more male deaths per 100,000), diseases of the digestive system (130% higher, 10 more male deaths per 100,000)
	Females	Lung cancer (73% higher, 6 more female deaths per 100,000), diseases of the circulatory system (127% higher, 23 more female deaths per 100,000), diseases of the digestive system (118% higher, 4 more female deaths per 100,000)
65 years and over	Males	All cancers (13% higher, 2 more male deaths per 1,000), diabetes mellitus (44% higher, 0.41 more male deaths per 1,000), diseases of the respiratory system (39% higher, 2 more male deaths per 1,000), diseases of the digestive system (30% higher, 0.35 more male deaths per 1,000)
	Females	Endocrine, nutritional, and metabolic diseases (64% higher, 0.51 more female deaths per 1,000), diabetes mellitus (84% higher, 0.45 more female deaths per 1,000), diseases of the digestive system (27% higher, 0.25 more female deaths per 1,000)
65–74 years	Males	All cancers (25% higher, 2 more male deaths per 1,000), diabetes mellitus (68% higher, 0.51 more male deaths per 1,000), diseases of the circulatory system (39% higher, 4 more male deaths per 1,000), accidents and injury (26% higher, 0.15 more male deaths per 1,000)
	Females	All cancers (9% higher, 0.45 more female deaths per 1,000), diabetes mellitus (116% higher, 0.29 more female deaths per 1,000), diseases of the circulatory system (46% higher, 2 more female deaths per 1,000)
75 years and over	Males	All cancers (6% higher, 1 more male deaths per 1,000), diabetes mellitus (32% higher, 0.51 more male deaths per 1,000), diseases of the circulatory system (8% higher, 3 more male deaths per 1,000)
	Females	Diabetes mellitus (72% higher, 0.71 more female deaths per 1,000), diseases of the circulatory system (5% higher, 1 more female death per 1,000)

If all SLAs in Australia experienced the same death rate as the least socioeconomically disadvantaged areas, more than 23,000 deaths could have been avoided in 1998–2000. This was especially so among persons aged 25–64, where socioeconomic inequality accounted for an estimated 13,749 male deaths, and 5,250 female deaths (Table S6).

Table S6: Number and percentage of deaths from all causes that would have been avoided in 1998–2000 if all areas of Australia had the same mortality rate as the least socioeconomically disadvantaged areas

	Males		Females	
	Number[a]	Per cent[b]	Number	Per cent
Less than 1 year	794	29.0	403	19.4
0–14 years	958	28.3	533	21.1
15–24 years	1,251	32.3	299	21.4
25–64 years	13,749	29.6	5,250	20.3

(a) Total number of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged area.

(b) Percentage of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged area.

Between 1985–1987 and 1998–2000, death rates fell across all IRSD quintiles for both males and females aged 25–64 (Table S7). For males, relative mortality inequalities over the two periods increased for all causes (from 68% to 75%), cancers (from 28% to 45%) and cardiovascular disease (from 65% to 110%). In terms of absolute death rates for all causes for males, differences between the most and least disadvantaged areas fell from 230 deaths per 100,000 in 1985–1987 (i.e. 568 minus 338) to 163 deaths in 1998–2000 (i.e. 382 minus 219), and from 82 to 54 deaths per 100,000 for cardiovascular disease; however, for cancers, absolute death rates widened slightly over the period from 33 to 36 deaths per 100,000. For females, relative and absolute mortality inequalities showed an identical patterning to that observed for males.

Table S7: Age-standardised mortality rates for the least and most socioeconomically disadvantaged areas of Australia, 1985–1987 and 1998–2000: males and females aged 25–64 years

	Males			Females		
	Least disadvantaged	Most disadvantaged	% difference	Least disadvantaged	Most disadvantaged	% difference
All causes[(a)(b)]						
1985–1987	338	568	68	190	285	50
1998–2000	219	382	75	137	207	51
Cancers						
1985–1987	118	151	28	103	113	10
1998–2000	79	115	45	79	92	31
Cardiovascular disease						
1985–1987	126	208	65	41	81	97
1998–2000	49	103	110	18	41	115

(a) Deaths per 100,000 persons.

(b) Age standardised to the total Australian population as at June 1988.

Mortality differences by occupation

Occupation is a widely used measure of an individual's socioeconomic status. This report compares the mortality profiles of different occupational categories using the Australian Standard Classification of Occupations (ASCO). ASCO is a skill-based measure that groups occupations requiring similar levels of education, knowledge, responsibility, on-the-job training and experience. These occupational groupings are ranked by their skill levels, with those occupations having the most extensive skill requirements ranked at the top. For this analysis, occupations were grouped into three categories: managers, administrators and professionals; white-collar employees (comprising clerks, salespersons, and personal service workers); and blue-collar employees (comprising tradespersons, plant and machine operators and drivers, and labourers and related workers). Persons not active in the labour force at the time of death were excluded (e.g. the unemployed or retired). To minimise the effects of possible misclassification bias of retired decedents, the analysis of mortality inequality by occupation was restricted to people aged 25 to 54 years. This summary reports on mortality differences between managers, administrators and professionals and blue-collar workers; the mortality profile of all three occupational categories is presented in the main text.

In 1998–2000, males and females in blue-collar occupations had significantly higher death rates for all causes combined, and for many specific causes (Table S8).

Table S8: Age-standardised mortality rates for managers, administrators and professionals, and blue-collar employees, 1998–2000: persons aged 25–54 years

	Males			Females		
	Managers, administrators & professionals	Blue-collar employees	% difference	Managers, administrators & professionals	Blue-collar employees	% difference
All causes[(a)]	115	234	104	81	90	12
Potentially avoidable deaths	72	154	113	51	56	9
Cardiovascular disease	21	45	116	8	14	74
Lung cancer	4	10	155	4	5	52
Diseases of the respiratory system	2	4	129	2	4	139
Diseases of the digestive system	3	9	212	2	4	102

(a) Deaths per 100,000 persons.

If male blue-collar employees aged 25–54 experienced the same death rate in 1998–2000 as their counterparts in managerial, administrative and professional occupations, an estimated 5,642 deaths could have been avoided. The corresponding figure for females was markedly lower at 100 deaths.

Mortality differences by country of birth

Using data from death information forms, the Australian Bureau of Statistics (ABS) codes country of birth to the Standard Australian Classification of Countries (SACC). This report is based on the following country-of-birth groupings, which enabled comparisons with earlier studies of mortality inequality, and ensured a sufficiently large number of deaths in each grouping to produce reliable estimates:

- Australia
- UK & Ireland — United Kingdom and Ireland
- Other Europe — Continental Europe, including Eastern Europe, the former USSR and Baltic states
- Asia — Includes the Northeast, Southeast, and Southern Asia, the Middle East, and Northern Africa

- Other — Includes New Zealand, Oceania, North and South America, and Southern Africa

As an illustration, this summary focuses on mortality differences between Australian residents born in Asia and the Australian-born; the mortality profile of all country-of-birth groupings is presented in the main text.

Table S9 compares all-cause death rates for Australian residents born in Asia and those born in Australia: for each age group, death rates were significantly lower among the Asian-born.

Table S9: Age-standardised mortality rates for all causes, Australian-born and Asian-born Australians, 1998–2000

	Males			Females		
	Australian-born	Asian-born	% difference	Australian-born	Asian-born	% difference
Deaths per 100,000 persons						
15–24 years	101	53	47	38	24	35
25–64 years	331	192	42	182	117	36
Deaths per 1,000 persons						
65 years and over	51	36	17	32	26	20
65–74 years	26	18	30	14	11	23
75 years and over	88	63	29	61	49	19

Significant differences in death rates between the Asian-born and Australian-born were also found for many specific causes of death. Mortality rates were significantly lower among Asian-born Australian residents for:

15–24 years	Males	Potentially avoidable deaths (47% lower, 47 fewer male deaths per 100,000), accidents and injury (43% lower, 32 fewer male deaths per 100,000)
	Females	Potentially avoidable deaths (36% lower, 8 fewer female deaths per 100,000), accidents and injuries (35% lower, 8 fewer female deaths per 100,000)
25–64 years	Males	All cancers (36% lower, 38 fewer male deaths per 100,000), diseases of the circulatory system (32% lower, 26 fewer male deaths per 100,000), diseases of the respiratory system (64% lower, 9 fewer male deaths per 100,000), suicide (69% lower, 22 fewer male deaths per 100,000)
	Females	All cancers (28% lower, 24 fewer female deaths per 100,000), diseases of the circulatory system (31% lower, 10 fewer female deaths per 100,000), diseases of the respiratory system (71% lower, 7 fewer female deaths per 100,000), accidents and injury (56% lower, 9 fewer female deaths per 100,000)
65 years and over	Males	All cancers (36% lower, 5 fewer male deaths per 1,000), diseases of the circulatory system (27% lower, 3 fewer male deaths per 1,000), diseases of the respiratory system (39% lower, 2 fewer male deaths per 1,000), diseases of the digestive system (29% lower, 0.42 fewer male deaths per 1,000)
	Females	All cancers (18% lower, 1 fewer female deaths per 1,000), diseases of the circulatory system (25% lower, 4 fewer female deaths per

		1,000), diseases of the respiratory system (39% higher, 1 fewer female death per 1,000)
65–74 years	Males	All cancers (39% lower, 4 fewer male deaths per 1,000), diseases of the circulatory system (21% lower, 2 fewer male deaths per 1,000), accidents and injury (35% lower, 0.23 fewer male deaths per 1,000)
	Females	All cancers (28% lower, 2 fewer female deaths per 1,000), diseases of the circulatory system (23% lower, 1 fewer female death per 1,000)
75 years and over	Males	All cancers (33% lower, 7 fewer male deaths per 1,000), diseases of the circulatory system (29% lower, 12 fewer male deaths per 1,000), accidents and injury (23% lower, 0.43 fewer male deaths per 1,000)
	Females	All cancers (10% lower, 1 fewer female death per 1,000), diseases of the circulatory system (26% lower, 8 fewer female deaths per 1,000)

It is worth noting that for both males and females aged 65 years or more, 65–74 years, and 75 years or more, death rates for diabetes mellitus were significantly higher among the Asian-born than among the Australian-born, which contrasts markedly with most other specific causes of death. For males in the three older age groups, death rates for diabetes mellitus were between 35% and 52% higher among Asian-born Australians. The corresponding figures for females were 62% and 88%.

1 Introduction

1.1 Background

Socioeconomic differences in health (Acheson 1998; Turrell et al. 1999), and other manifestations of health inequality, such as those between men and women (Hunt & Annandale 1999; Annandale & Hunt 2000), urban and rural areas (Strong et al. 1998a; Wilkinson & Blue 2002; AIHW 2003), Indigenous and non-Indigenous peoples (ABS & AIHW 2001, 2003) and ethnic groups (Rice 1999; Bryan & Batch 2002) are seen by many health authorities as some of the major public health challenges facing developed societies such as Australia. While there have been significant improvements in life expectancy and other health outcomes for the Australian population as a whole in recent years (AIHW 2002), these gains have not been equally distributed across all sections of the population.

Turrell et al. (1999) identified in the report—*Socioeconomic Determinants of Health: Towards a National Research Program and a Policy and Intervention Agenda*—a number of barriers to overcome if we are to improve our understanding of health inequalities and how they might be addressed in this country. One of the most significant barriers is Australia's fragmented, underdeveloped, and poorly coordinated monitoring and research infrastructure in relation to health inequalities. In 2001, the School of Public Health at Queensland University of Technology (QUT) established the Australian Research Program on Health Inequalities (ARPHI) to improve our understanding of such inequalities. This research program has five closely interrelated components:

(i) *Monitoring and surveillance of health inequalities in Australia*. This component examines temporal trends and quantifies the magnitude and direction of mortality and morbidity inequalities, and differences in risk factor prevalence and health-related behaviours between social groups and geographic areas.

(ii) *Methods and measurement*. This involves the development and application of new measures of inequality and the refinement and improvement of existing measures (at the individual, household, and area levels).

(iii) *Improving knowledge and understanding of health inequalities.* This aspect of the research program involves researching the processes and mechanisms that constitute the intermediate links between social and economic factors and health.

(iv) *Policies and interventions to reduce health inequalities.* This focuses on identifying and critically evaluating the range of actions available to tackle health inequalities.

(v) *Strengthening Australia's research capacity and infrastructure as these relate to health inequalities.* This component focuses on identifying the necessary 'building blocks', networks, and inter-sectoral linkages that need to form the basis of a nationally coordinated and strategic approach to researching and reducing health inequalities.

Research and monitoring projects undertaken as part of this research program draw on theories and concepts from a range of intersecting disciplines—sociology, psychology, anthropology, politics, and economics—and combine these with information on disease causation from biology and medicine, and the analytic methods of epidemiology and bio-statistics. Increasingly, it is being recognised that a multi-disciplinary approach is necessary if we are to better understand social variation in disease, and develop policies and strategies to address this issue (Lynch 2000; Berkman & Kawachi 2000). Further, part of the approach underpinning this research program is informed by a conceptual framework first developed for the report by Turrell et al. (1999). The framework delineates many of the main determinants of health inequalities, assists with identifying knowledge gaps, offers suggestions for future research, and helps identify possible entry points for policy and interventions. The framework has subsequently been published elsewhere (Turrell 2002c; Oldenburg et al. 2000a) and it is reproduced and discussed in more detail in Chapter 8.

This present report—*Health Inequalities in Australia: Mortality*—is published jointly by the Queensland University of Technology and the Australian Institute of Health and Welfare (AIHW), and is the first in a series. Subsequent reports will focus on health inequalities in morbidity, health-related behaviours, risk factor prevalence, and health service utilisation (Series Number 2), and on measuring socioeconomic position in population health monitoring and health research (Series Number 3).

Health Inequalities in Australia: Mortality represents the continuation of work that commenced nearly two decades ago. In 1987, the Australian Institute of Health published a report that documented the nature and extent of mortality inequalities among working-aged Australians during 1981 (Lee et al. 1987). This report was subsequently extended and updated by the AIHW in a series of publications that examined mortality inequalities among Australian children (0–14 years), young adults (15–24 years), working-aged adults (25–64 years) and older persons (aged 65 years or more) for the period 1985–1987 (Mathers 1994a, 1994b, 1995, 1996). The current report updates this series, and examines mortality inequalities in Australia for the period 1998–2000 by sex, geographic region, socioeconomic disadvantage, occupation, and country of birth. In keeping with the earlier work by the AIHW, this report examines mortality inequalities for males and females aged 0–14, 15–24, 25–64 and 65 years or older.

The current report however, extends the earlier AIHW analysis in a number of important respects:

- Mortality inequalities are documented for three additional age groups: those aged less than 1 year, 65–74 years, and 75 years or older.
- Occupation-based mortality inequalities among women aged 25–54 are reported. This was not possible in the earlier reports which, due to data limitations, only presented occupation findings for males.
- Where data collection and coding allow, this report also focuses on documenting changes in the size of mortality inequalities between the mid-1980s and the late 1990s.

1.2 Purpose

Health Inequalities in Australia: Mortality provides an important statistical reference source for mortality inequalities across the lifecourse, using as comprehensive an array of sociodemographic indicators as Australia's data allow. While comparisons of data published previously by the AIHW have been included, the report's primary purpose is to assess the nature and magnitude of mortality inequalities in Australia using data from 1998–2000. The report is intended to be a resource that focuses on describing patterns of association between each sociodemographic indicator and mortality. The report also includes the following:

- a brief overview of some of the main explanations for the observed patterns; and
- some discussion of public policy, health policy, health promotion, or other intervention strategies that might be relevant to reduce the identified health inequalities.

1.3 Indigenous mortality and inequality

It is now well established that Indigenous people experience much poorer health than the non-Indigenous population. As numerous reports have shown, Indigenous Australians have a substantially lower life expectancy (approximately 20 years lower than the non-Indigenous in 1998–2000), they are more likely to experience adverse birth outcomes such as low birth weight and premature birth, they have greater morbidity and disability, and they have higher rates of hospitalisation (ABS & AIHW 2003; AIHW 2002). Given that Indigenous health has been examined and discussed in detail elsewhere, we do not cover the topic directly in this report. We do, however, make use of data on Indigenous mortality when comparing the health profiles of different geographic areas (see the introduction of Chapter 4 for further details).

1.4 Structure of this report

The report is organised as follows:

Chapter 2 – Data issues and methods

Chapter 3 – Mortality differences by sex

Chapter 4 – Mortality differences by geographic region

Chapter 5 – Mortality differences by socioeconomic disadvantage

Chapter 6 – Mortality differences by occupation

Chapter 7 – Mortality differences by country of birth

Within each of these chapters, mortality inequalities for different age groups are examined using (where appropriate) up to six measures of mortality: life expectancy, potential years of life lost (PYLL), potentially avoidable deaths, sex-specific age-standardised death rates, mortality rate ratios, and excess mortality. In a final chapter (Chapter 8), we present a discussion of the findings of the report, propose some possible implications for policy and interventions, and suggest some directions for the future monitoring of mortality inequalities in Australia.

2 Data issues and methods

2.1 Data sources

Deaths registrations for the years 1998, 1999 and 2000 were the primary source of data used throughout this report. These datasets were provided by the ABS which compiles mortality statistics from information made available by the Registrars of Births, Deaths and Marriages in each state and territory. Information about the cause of death is recorded by medical practitioners and coroners, from which the ABS codes the underlying and multiple causes of death. Mortality statistics reported throughout this publication relate to year of registration, rather than the year of occurrence, and only the underlying cause of death is reported.

2.2 Causes of death examined

Only causes that provided a sufficient number of deaths to enable reliable comparisons between population subgroups were analysed. For each cause of death examined, we have reported the total number of deaths that occurred during the period 1998–2000 for males and females in each age group (Appendix A). For persons aged 25 years and over, and where the number of deaths was sufficient, we examined mortality inequalities by disease categories consistent with the National Health Priority Areas (NHPA). Further information on the NHPA can be obtained from the Department of Health and Ageing's web site at <http://www.health.gov.au/pq/nhpa/>.

2.3 Mortality classifications and coding issues

Deaths registered in Australia from 1 January 1999 were coded to the 10th revision of the International Classification of Diseases (ICD-10). Data for 1998 were recoded from ICD-9 to ICD-10 by the ABS and as such this report uses ICD-10 for all causes of death.

Where possible, we compare the results of this present report with that documented by Mathers (1994a, 1994b, 1995, 1996); this earlier work was based on deaths that occurred in 1985–1987. Changes in cause of death coding from ICD-9 to ICD-10, however, have precluded a comprehensive analysis of trends in mortality rates over time, and only those causes which are fully compatible between the two revisions are reported. Data examining temporal trends were age-standardised to the total Australian population as at 30 June 1988. All other data presented throughout this report are age-standardised to the total Australian population as at 30 June 1991.

2.4 Population estimates

Age-specific death rates for each sociodemographic indicator (see below) were calculated by dividing the number of deaths occurring within each population subgroup in the calendar years 1998, 1999, and 2000 by the estimated resident population for these years. When comparing mortality indicators across geographic regions and socioeconomic areas, we used ABS estimated resident populations for Statistical Local Areas (SLAs) in 1999.

The ABS Labour Force Surveys (ABS 1997a) were used to estimate populations for each of the major occupation groupings comprising the Australian Standard Classification of Occupations (ABS 1997b). Estimates of Indigenous populations for SLAs and categories of the Accessibility/

Remoteness Index of Australia (ARIA) were based on data from the 1996 Census (Department of Health and Aged Care 2001).

2.5 Sociodemographic indicators

This report examines mortality differences in Australia by the following sociodemographic indicators:

- Sex
- Geographic region
- Area socioeconomic disadvantage
- Occupation
- Country of birth

These indicators are consistent with those presented in a series of earlier reports published by the AIHW (Mathers 1994a, 1994b, 1995, 1996). For details about the methods used to categorise each of the sociodemographic indicators, see the introduction section at the beginning of each respective chapter.

2.6 Mortality indicators

Life expectancy

Life expectancy is one of the most widely used measures of population health, and its calculation is based solely on mortality and population data. It is defined as the average number of years a person is expected to live if the age-specific death rates of the given period continue throughout a person's lifetime, and is commonly reported as life expectancy at birth. For this report, abridged life tables based on 5-year age groups were constructed to calculate life expectancies for persons by sex, geographic region and area socioeconomic disadvantage. Life expectancy is reported for males and females aged less than 1 year, and those aged 15 years, 25 years, and 65 years.

Age-standardised death rates

Mortality within a given population is strongly related to age. Thus, a population with a large proportion of older persons would experience higher mortality rates than populations with a younger age profile. In order to facilitate comparisons between populations which may have different age structures, all mortality rates within this report have been directly age-standardised (see Armitage et al. 2002) to the total Australian population as at 30 June 1991 using 5-year age groups (unless otherwise stated). The following method was employed:

$$SR = \Sigma (R_1 * P_1) \; / \; \Sigma P_1$$

Where SR = the age-standardised mortality rate

R_1 = the age-specific death rate for age group 1

P_1 = the standard population in age group 1

Population data by occupation is published by the ABS in 10-year age groups. Consequently, mortality differences based on occupation were age-standardised using 10-year age groups.

Deaths among those aged 0–14, 15–24, and 25–64 years are expressed as rates per 100,000 persons. Deaths among those aged 65 years and over are expressed as rates per 1,000 persons.

Mortality rate ratios

Relative mortality differences between population groups are expressed in terms of rate ratios, with the age-standardised rate for each population subgroup being expressed as a proportion of the age-standardised rate of a reference group. The reference group within this report is generally the population group with the lowest mortality rate. The only exception being the analysis based on country of birth, where the country of birth with the highest mortality rates (Australia) was the reference group. Rate ratios reported in the figures are presented with their associated 95% confidence intervals.

The rate ratio is an internationally accepted measure of inequality, and is widely used in health and epidemiological research. However, the reader needs to be aware that the measure must be interpreted carefully when making comparisons between groups or when measuring change over time in the differences between groups. It is usefully complemented by consideration of the absolute differences in death rates. These issues are discussed below using hypothetical examples in the following table.

Hypothetical example showing the relation between mortality rates and rate ratios under different time periods and comparative scenarios

	Time 1 Scenario A		Time 2 Scenario B		Time 3 Scenario C		Time 4 Scenario D	
Groups being compared	Death rate	Rate ratio	Death rate	Rate ratio	Death rate	Rate ratio	Death rate	Rate ratio
Group 1	100		50		25		10	
Group 2	150	1.5	100	2.0	50	2.0	30	3.0
Absolute difference in death rates	50		50		25		20	

First, as a measure of *relative* inequality, rate ratios can change in magnitude even though the *absolute* difference between groups remains unchanged. In Scenario A for example, the difference in death rates between Group 1 and Group 2 is 50, and the rate ratio is 1.5. In Scenario B, although death rates for both groups declined by the same amount between the two periods (i.e. 50), and the absolute difference between the groups remained the same (i.e. 50), the rate ratio actually widened to 2.0.

Second, differences between two groups in terms of death rates can narrow over time, yet the relative inequality between them can remain the same. In Scenario B for example, the difference in death rates between Group 1 and Group 2 is 50 and the rate ratio is 2.0. In contrast, for Scenario C, death rates for the two groups decline, and the rate-difference between them reduces in magnitude to 25, however the rate ratio remains at 2.0.

Third, as the absolute magnitude of death rates for each group gets smaller, and especially when the rates approach zero, rate ratios can become large, and they also become sensitive to small differences in absolute rates. In Scenario C for example, the difference in death rates between Group 1 and Group 2 is 25, and the rate ratio is 2.0. In Scenario D however, absolute death rates for both groups declined, the difference between the groups in absolute terms narrowed to 20, yet the rate ratio increased to 3.0.

Potential Years of Life Lost (PYLL)

Potential Years of Life Lost (PYLL) is an indicator of premature mortality that gives more importance to deaths that occur at a younger age than those that occur at an older age. The method adopted here calculates the number of years that would have been lived had a person survived to age 75. For example, if a person were to die at age 20, he or she would contribute 55 years of potential life lost. This figure is generally expressed as PYLL per 1,000 persons.

Potentially avoidable deaths

Within this report, potentially avoidable deaths are conditions that are determined to be preventable through any of the following:

- individual behaviour change or population-level interventions;
- early intervention or detection;
- adequate management or medical intervention

Potentially avoidable deaths are recorded for persons aged less than 75 years of age. Deaths deemed avoidable were based on causes identified by Tobias and Jackson (2001) and are presented as the number of avoidable deaths per 100,000 persons. Importantly, deaths classified as potentially avoidable does not imply that these deaths could have been avoided; rather they have the potential to be prevented through the type of actions outlined above. A detailed list of potentially avoidable causes of death and their corresponding ICD codes can be found in Appendix B.

Excess mortality

In this report, we used a measure of 'excess mortality' to provide an indication of the burden of mortality in the Australian population that was attributable to inequality based on sex, geographic remoteness, area-based socioeconomic disadvantage, and occupation. We used an excess mortality measure that estimated the number and percentage of deaths that would have been saved if mortality across one or more population subgroups was the same as that of a reference population. The reference population is generally the sociodemographic category with the lowest mortality rate, and this convention is followed in this report. The methods used to calculate excess mortality are based on those described by McCracken (2002) and it is a measure that is widely employed in studies of health inequality (Turrell & Mathers 2001).

2.7 Potential sources of error in the mortality analysis

There are numerous potential sources of error in the mortality analysis presented in this report. Details of those sources of error pertaining specifically to each sociodemographic indicator are provided in each of the chapters. Here we consider a more general source of error often known as numerator-denominator bias. The calculation of mortality rates (and other mortality outcomes) involves the use of two different data sources: data obtained from the mortality registration process (used for the numerator) and data collected as part of the Census or population surveys (used for the denominator). Each type of collection uses similar sociodemographic indicators (e.g. age, sex, occupation) to classify data; however, the indicators may not be exactly the same. Misclassification error occurs when a sociodemographic indicator used in one data source differs from that used in another and, generally, the size of the error is related to the discrepancy between indicators (i.e. large differences in how the numerator and denominator data are classified will tend to produce larger errors). Quantifying the magnitude of bias resulting from misclassification error is difficult, but is assumed to be small for sex, place of residence and birthplace, but larger for occupation.

2.8 Standard errors and statistical tests

Standard Errors (SE) and Confidence Intervals (CI) were calculated for all rates and rate ratios using the following formulas:

Mortality rates

SE = Age-standardised Mortality Rate/(sqrt total deaths)

CI = Age-standardised Mortality Rate $\pm$ (1.96*SE)

Rate ratios

SE = sqrt($1/p_1+1/p_2$)

Where p_1 = total deaths within sub-population

p_2 = total deaths within reference group

CI = exp(lnRR $\pm$ 1.96 *SE(lnRR))

Significance levels for rate ratios were calculated using the following test statistic (assumed normally distributed around zero, under the null hypothesis that the rate ratio is 1.0) (Mathers 1994a):

$$z = \frac{\log 10(r_1 / r_2) * \ln(10)}{sqrt[se(r_1)^2 / r_1^2 + se(r_2)^2 / r_2^2)]}$$ (Where r_1 and r_2 are age-standardised rates)

A two-tailed p value was calculated from the z score. Significance levels for rate ratios are indicated as follows: *p<0.05, **p<0.01, ***p<0.001

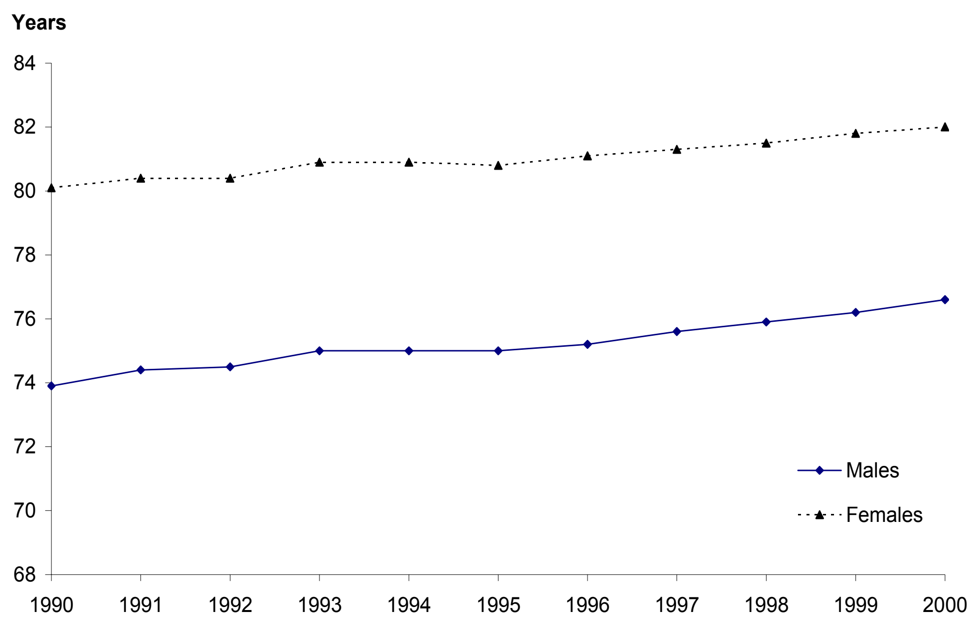
3 Mortality differences by sex

Males and females have very different mortality profiles (Hart 1989; Ory & Warner 1990; Kane 1994; Mathers 1994a, 1994b, 1995, 1996; Waldron 1995; Cameron & Bernades 1998; Annandale & Hunt 2000; Lawlor et al. 2001; Pampel 2003). Females live longer than males, and they experience lower mortality rates for almost all non-sex-specific causes of death, and this sex discrepancy is evident at every age.

This chapter examines the mortality experience of Australian males and females in 1998–2000. In addition, where data collection and coding permit, we compare the magnitude of sex differences in mortality for the years 1985–1987 and 1998–2000. As with all other chapters in this report, we examine the nature and extent of mortality inequalities at different stages of the lifecourse, from infancy and childhood, through to adolescence and adulthood, and among the elderly. In the final section of this chapter, we briefly discuss some of the suggested reasons for sex differences in mortality.

3.1 Persons aged 0–14 years

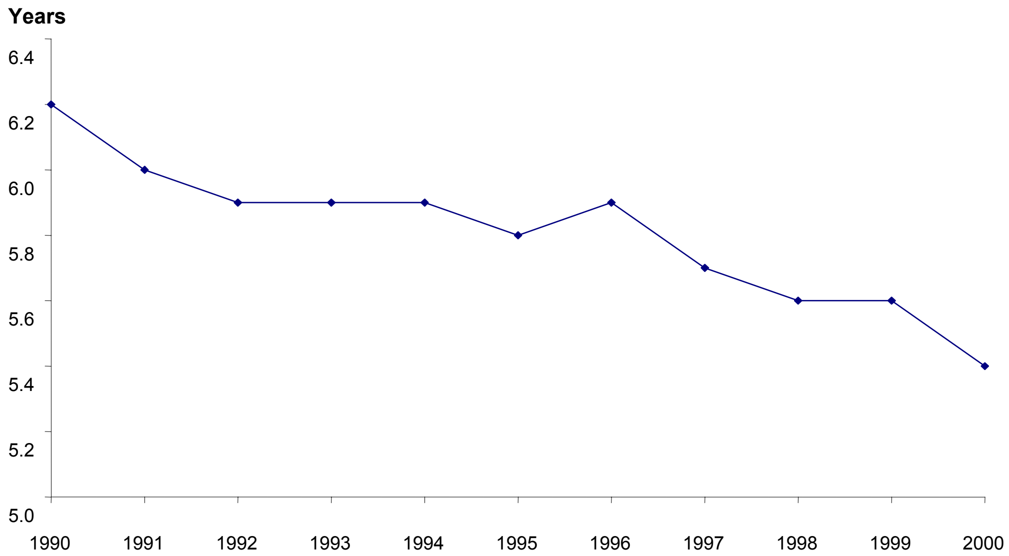
In 1998–2000, male life expectancy at birth was, on average, 76.8 years, while females could expect to live 82.4 years. Life expectancies for both males and females improved throughout the 1990s, increasing by around 2.7 years for males and 1.9 years for females (ABS 2002) (Figure 3.1.1).



Source: ABS 2002.

Figure 3.1.1: Trends in life expectancy at birth by sex, 1990–2000

In 1990, a new-born girl had a life expectancy 6.2 years greater than a new–born boy (Figure 3.1.2). In the early part of the 20th century, this gap was around 4 years, increasing to over 7 years by the beginning of the 1980s. Throughout the 1990s, the gap in life expectancy between males and females narrowed, reaching 5.4 years by 2000 (de Looper & Bhatia 2001; ABS 2002). Declining differences in life expectancy for males and females have also been observed in many other countries (Trovato & Lalu 1996).



Source: ABS 2002.

Figure 3.1.2: Difference between male and female life expectancy at birth, 1990–2000

Infants aged less than 1 year

Boys aged less than 1 year experienced significantly higher mortality rates than girls in 1998–2000. For all causes of death, boys recorded a mortality rate 25% higher than girls at 586 and 468 deaths per 100,000 persons respectively (Table 3.1.1). Similar results were recorded for a number of specific causes, with boys experiencing significantly higher mortality rates for:

- certain conditions originating in the perinatal period (26% higher, 58 more male deaths per 100,000)
- congenital malformations, deformations and chromosomal abnormalities (16% higher, 21 more male deaths per 100,000)
- Sudden Infant Death Syndrome (51% higher, 23 more male deaths per 100,000)
- accidents and injury (56% higher, 8 more male deaths per 100,000)

Table 3.1.1: Age-standardised mortality rates and rate ratios, children aged less than 1 year by sex, 1998–2000

Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
All causes		
Boys	586.5	1.25***
Girls	468.6	1.00
Certain conditions originating in the perinatal period (P00–P96)		
Boys	276.6	1.26***
Girls	218.8	1.00
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)		
Boys	153.0	1.16*
Girls	131.8	1.00
Sudden Infant Death Syndrome (R95)		
Boys	67.2	1.51***
Girls	44.5	1.00
Accidents and injury (V01–Y98)		
Boys	22.8	1.56**
Girls	14.6	1.00

(a) Deaths per 100,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Table 3.1.2 indicates that around 553 deaths could have been avoided in 1998–2000 if boys aged less than 1 year experienced the same mortality rate as girls; this corresponds to approximately 11.4% of all deaths within this age group.

Table 3.1.2: Excess mortality by sex, children aged less than 1 year, 1998–2000

Cause of death and ICD-10 codes	Number[(a)]	Per cent[(b)]
All causes	553	11.4
Certain conditions originating in the perinatal period (P00–P96)	224	12.0
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	95	8.1
Accidents and injury (V01–Y98)	102	19.8

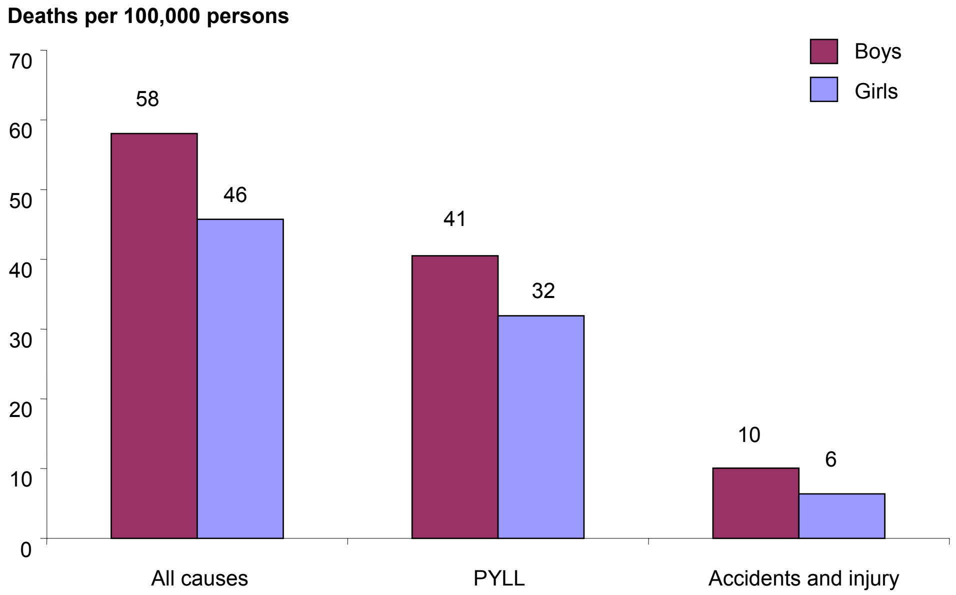
(a) Total number of deaths that would have been avoided if boys experienced the same mortality rates as girls.

(b) Percentage of deaths that would have been avoided if boys experienced the same mortality rates as girls.

Source: ABS mortality data.

Children aged 0–14 years

In 1998–2000, boys aged 0–14 years recorded significantly higher mortality rates than girls for a number of causes of death. For all-cause mortality, boys had an age-standardised mortality rate of 58 deaths per 100,000 persons, compared with around 46 deaths per 100,000 persons for girls (Figure 3.1.3; Table 3.1.3). Significant sex differences were also found for Potential Years of Life Lost (PYLL), potentially avoidable deaths, and accidents and injury.



Note: PYLL = PYLL per 1,000 persons.

Source: ABS mortality data.

Figure 3.1.3: Age-standardised mortality rates and PYLL by sex, selected causes, children aged 0–14 years, 1998–2000

In 1998–2000, mortality rate ratios for boys and girls aged 0–14 years were significantly different for each cause of death examined (Table 3.1.3; Figure 3.1.4). Overall, boys experienced mortality rates that were:

- 27% higher for all-cause mortality (12 more male deaths per 100,000); and
- 59% higher for accidents and injury (4 more male deaths per 100,000).

Table 3.1.3: Age-standardised mortality rates and rate ratios by sex, children aged 0–14 years, 1998–2000

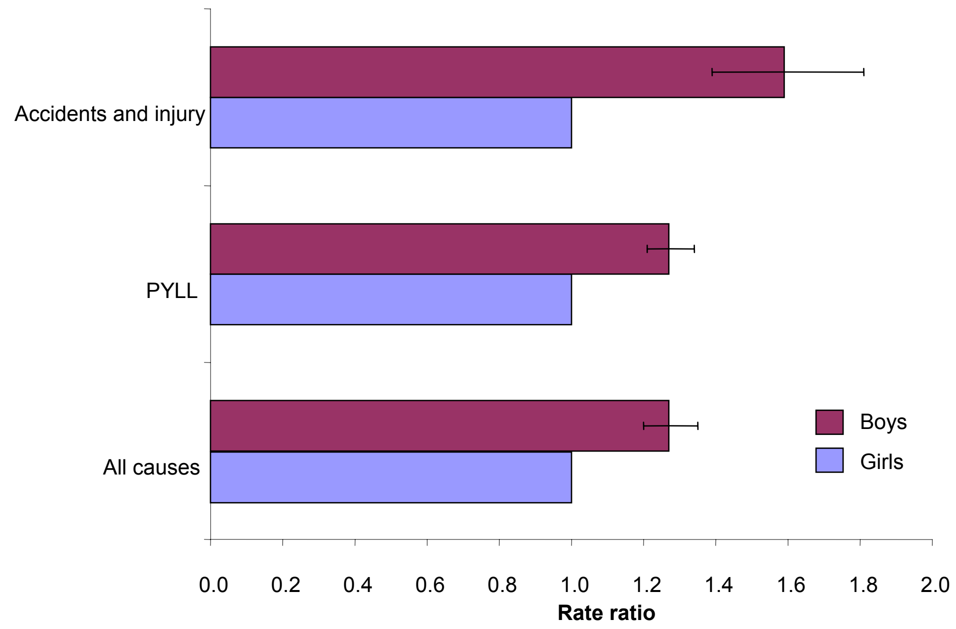
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
All causes		
Boys	58.0	1.27***
Girls	45.8	1.00
PYLL[(b)]		
Boys	40.5	1.27***
Girls	31.9	1.00
Potentially avoidable deaths		
Boys	29.3	1.32***
Girls	22.2	1.00
Accidents and injury (V01–Y98)		
Boys	10.1	1.59***
Girls	6.4	1.00

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001



Source: ABS mortality data.

Figure 3.1.4: Age-standardised mortality rate ratios by sex, selected causes, children aged 0–14 years, 1998–2000

Table 3.1.4 presents the excess mortality associated with differences in mortality between boys and girls aged 0–14 years. In 1998–2000, around 725 deaths could have been avoided if boys experienced the same mortality rate as girls. A substantial number of deaths could also have been avoided for accidents and injury (223 deaths).

Table 3.1.4: Excess mortality by sex, children aged 0–14 years, 1998–2000

Cause of death and ICD-10 codes	Number[(a)]	Per cent[(b)]
All causes	725	12.1
Accidents and injury (V01–Y98)	223	23.2

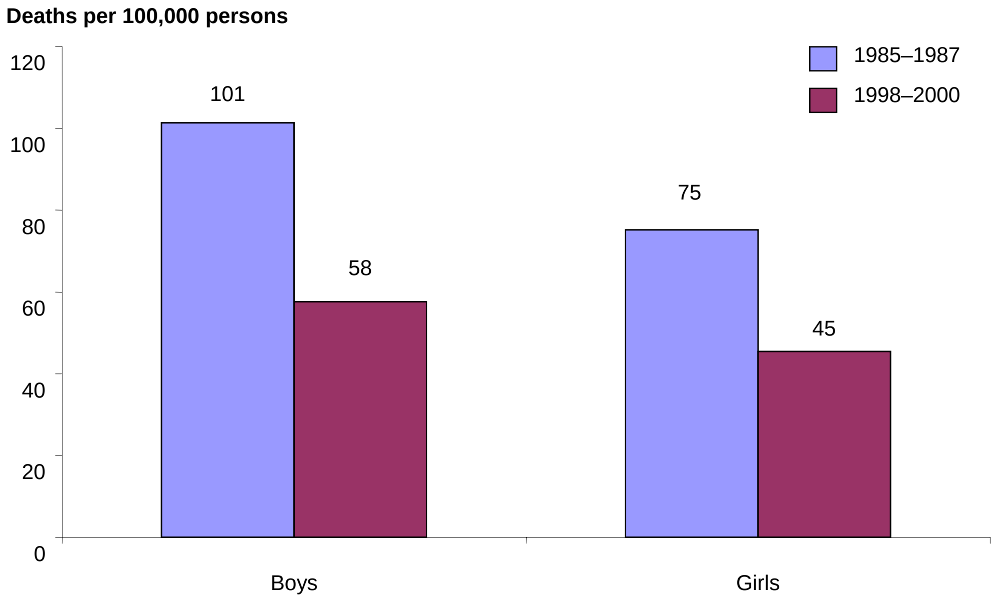
(a) Total number of deaths that would have been avoided if boys experienced the same mortality rates as girls.

(b) Percentage of deaths that would have been avoided if boys experienced the same mortality rates as girls.

Source: ABS mortality data.

Trends in mortality rates and mortality inequality

Substantial declines in total mortality were recorded for both boys and girls aged 0–14 years between 1985–1987 and 1998–2000, with boys recording a larger decline than girls. Over this period, age-standardised mortality rates for girls fell by around 30% from 75 to 45 deaths per 100,000 persons, whereas mortality rates for boys fell by about 42%, from 101 to 58 deaths per 100,000 persons (Figure 3.1.5). Overall, the sex difference in mortality for boys and girls declined from 35% in the mid-1980s to 27% by the end of the 1990s.



Note: Age-standardised to the total Australian population as of 30 June 1988.

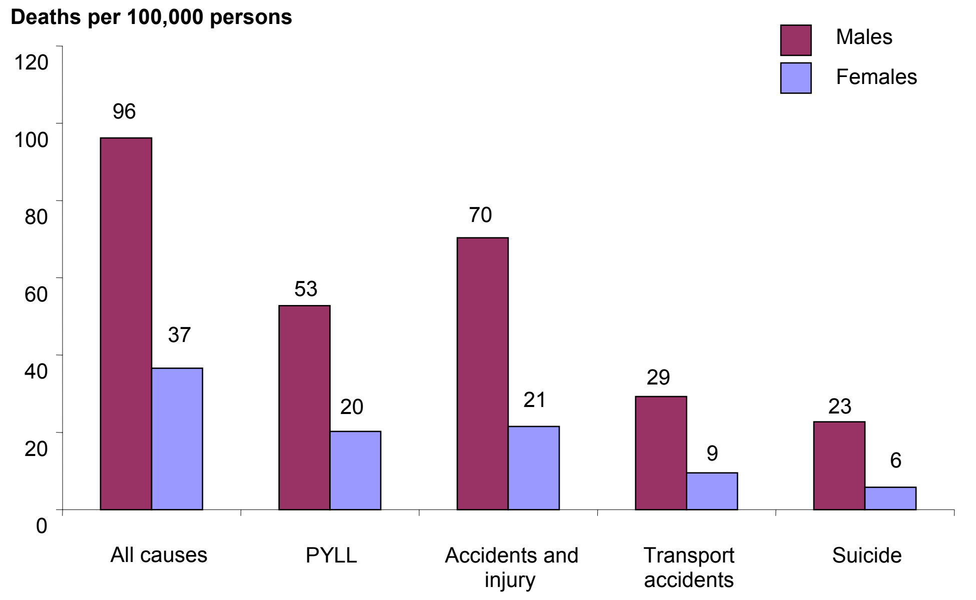
Source: ABS mortality data; Mathers 1995.

Figure 3.1.5: Age-standardised all-cause mortality rates by sex, children aged 0–14 years, 1985–1987 and 1998–2000

3.2 Persons aged 15–24 years

In 1998–2000, males aged 15 years recorded a life expectancy of 62.5 years. This was around 5.5 years less than for females of the same age, who recorded a life expectancy of 68.0 years. Males aged 15–24 years also experienced significantly higher mortality rates. For all-cause mortality, males and females recorded age-standardised rates of around 96 and 37 deaths per 100,000 persons respectively (Figure 3.2.1; Table 3.2.1). When expressed as rate ratios, male mortality rates were:

- 163% higher for all causes (60 more male deaths per 100,000);
- 227% higher for accidents and injury (49 more male deaths per 100,000);
- 208% higher for transport accidents (20 more male deaths per 100,000); and
- 293% higher for suicide (17 more male deaths per 100,000).



Note: PYLL = PYLL per 1,000 persons.

Source: ABS mortality data.

Figure 3.2.1: Age-standardised mortality rates and PYLL, selected causes of death by sex, persons aged 15–24 years, 1998–2000

Table 3.2.1: Age-standardised mortality rates and rate ratios by sex, persons aged 15–24 years, 1998–2000

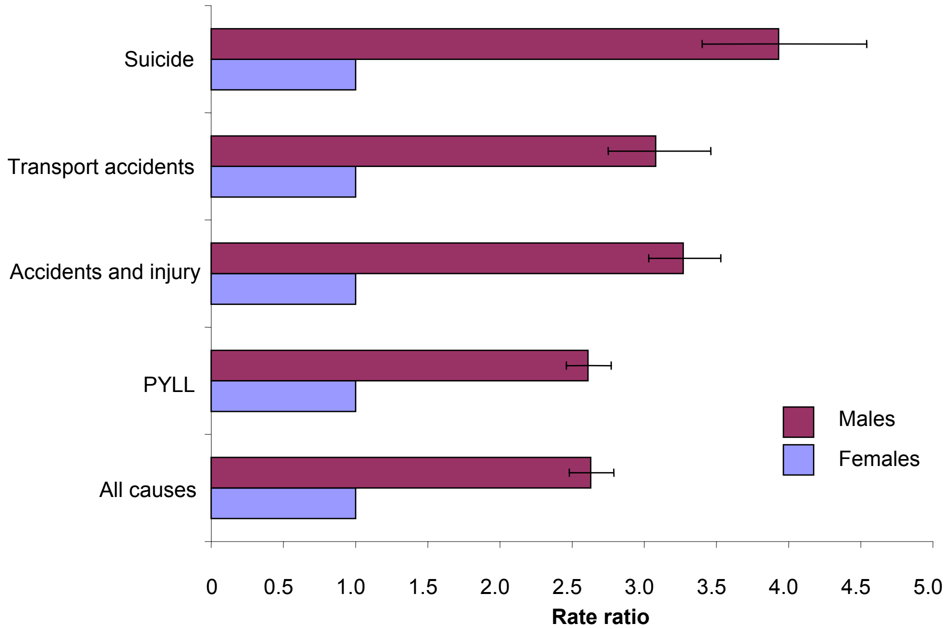
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
All causes		
Males	96.2	2.63***
Females	36.6	1.00
PYLL[(b)]		
Males	52.8	2.61***
Females	20.2	1.00
Potentially avoidable deaths		
Males	58.8	2.85***
Females	20.6	1.00
Accidents and injury (V01–Y98)		
Males	70.3	3.27***
Females	21.5	1.00
Transport accidents (V01–V99)		
Males	29.3	3.08***
Females	9.5	1.00
Suicide (X60–X84)		
Males	22.7	3.93***
Females	5.8	1.00

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001



Source: ABS mortality data.

Figure 3.2.2: Age-standardised mortality rate ratios, selected causes of death by sex, persons aged 15–24 years, 1998–2000

For males aged 15–24 years in 1998–2000, around 2,456 deaths could have been avoided if they had experienced the same all-cause mortality rate as females (Table 3.2.2). If cause-specific death rates for males in this age group were equivalent to those of females, a substantial number of male deaths could also have been avoided for:

- accidents and injury: 2,011 deaths (53.7% of total);
- transport accidents: 815 deaths (51.6% of total); and
- suicide: 697 deaths (59.9% of total).

Table 3.2.2: Excess mortality, selected causes of death by sex, persons aged 15–24 years, 1998–2000

Cause of death and ICD-10 codes	Number[(a)]	Per cent[(b)]
All causes	2,456	45.4
Accidents and injury (V01–Y98)	2,011	53.7
Transport accidents (V01–V99)	815	51.6
Suicide (X60–X84)	697	59.9

(a) Total number of deaths that would have been avoided if males had the same mortality rate as females.

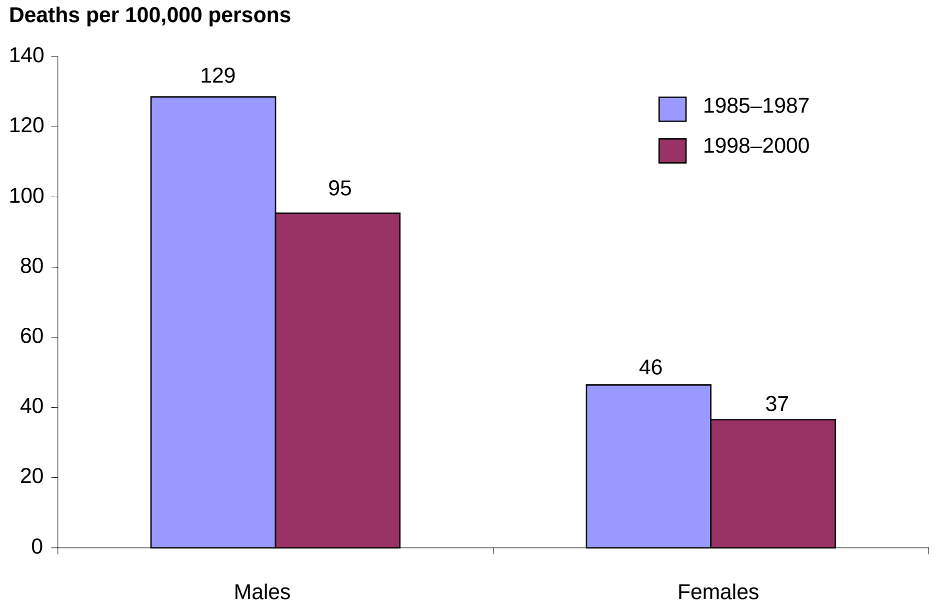
(b) Per cent of deaths that would have been avoided if males had the same mortality rate as females.

Source: ABS mortality data.

Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, all-cause mortality rates fell for both males and females aged 15–24 years. Male rates fell by around 26% from 129 to 95 deaths per 100,000 persons, whereas female mortality fell by 21%, from 46 to 37 deaths per 100,000 persons (Figure 3.2.3).

The size of the mortality inequality between males and females aged 15–24 years also declined during the period 1985–1987 and 1998–2000. In the mid-1980s, male all-cause mortality rates were 177% higher than females (83 more male deaths per 100,000); by 1998–2000 the difference was 161% (58 more male deaths per 100,000).



Note: Age-standardised to the total Australian population as of 30 June 1988.

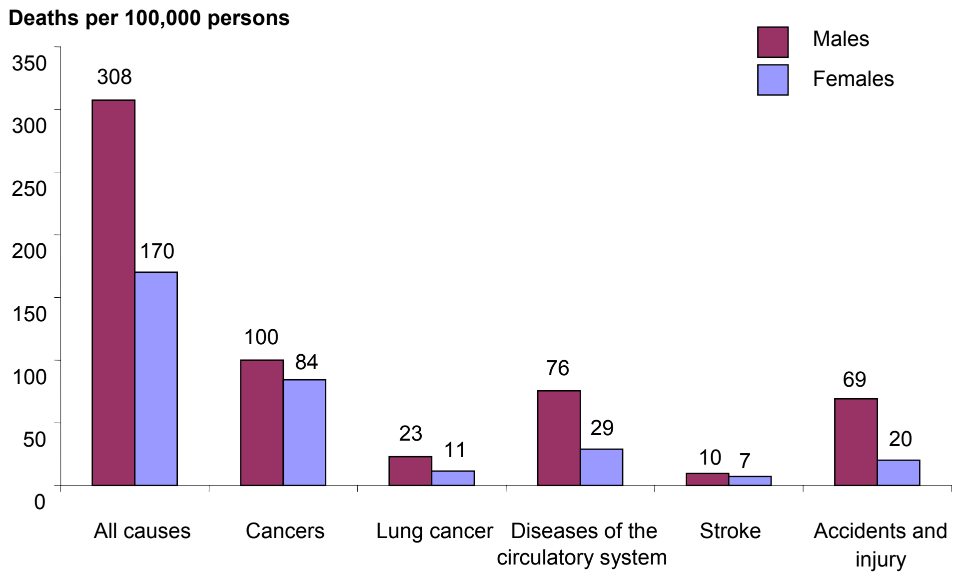
Source: ABS mortality data; Mathers 1995.

Figure 3.2.3: Age-standardised mortality rates, all-cause mortality by sex, persons aged 15–24 years, 1985–1987 and 1998–2000

3.3 Persons aged 25–64 years

In 1998–2000, males aged 25–64 experienced significantly higher mortality rates than females for each cause of death examined. All-cause mortality for males was 308 deaths per 100,000 persons, compared with 170 deaths per 100,000 persons for females (Figure 3.3.1; Table 3.3.1). Males also experienced higher mortality rates for a number of specific causes, including:

- all cancers: males, 100 deaths per 100,000 persons; females, 84 deaths per 100,000;
- lung cancer: males, 23 deaths per 100,000 persons; females, 11 deaths per 100,000; and
- accidents and injury: males, 69 deaths per 100,000 persons; females, 20 deaths per 100,000.

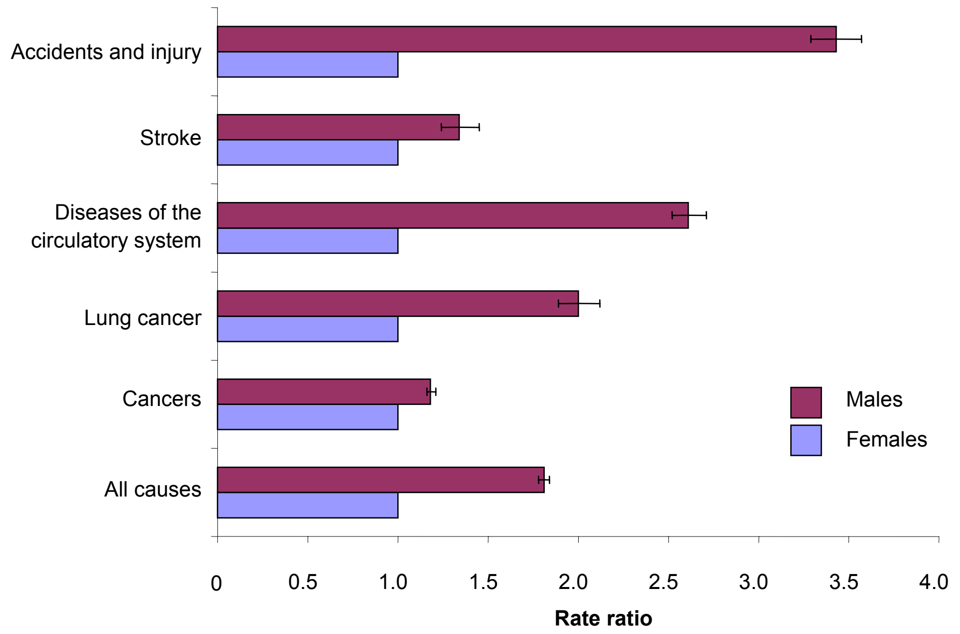


Source: ABS mortality data.

Figure 3.3.1: Age-standardised mortality rates by sex, selected causes of death, persons aged 25–64 years, 1998–2000

When expressed as rate ratios (Figure 3.3.2; Table 3.3.1), male mortality rates were higher by:

- 81% for all causes (138 more male deaths per 100,000);
- 18% for all cancers (16 more male deaths per 100,000);
- 161% for diseases of the circulatory system (47 more male deaths per 100,000);
- 122% for diseases of the digestive system (7 more male deaths per 100,000);
- 243% for accidents and injury (49 more male deaths per 100,000); and
- 300% for suicide (22 more male deaths per 100,000).



Source: ABS mortality data.

Figure 3.3.2: Age-standardised mortality rate ratios by sex, selected causes of death, persons aged 25–64 years, 1998–2000

Table 3.3.1: Age-standardised mortality rates and rate ratios by sex, persons aged 25–64 years, 1998–2000

Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
All causes		
Males	307.6	1.81***
Females	170.1	1.00
PYLL[(b)]		
Males	76.8	1.88***
Females	40.9	1.00
Potentially avoidable deaths		
Males	199.2	1.88***
Females	106.2	1.00
Cancers (C00–C97)		
Males	99.9	1.18***
Females	84.3	1.00
Cancer of the digestive organs (C15–C26)		
Males	30.9	1.72***
Females	18.0	1.00
Colon cancer (C18)		
Males	9.5	1.35***
Females	7.0	1.00
Melanoma of skin (C43)		
Males	4.8	1.71***
Females	2.8	1.00
Lung cancer (C33, C34)		
Males	23.0	2.00***
Females	11.5	1.00
Brain cancer (C71)		
Males	5.9	1.63***
Females	3.6	1.00
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)		
Males	10.6	1.42***
Females	7.4	1.00
Mental and behavioural disorders due to psychoactive substance use (F10–F19)		
Males	9.0	3.88***
Females	2.3	1.00
Diseases of the circulatory system (I00–I99)		
Males	75.5	2.61***
Females	28.9	1.00
Ischaemic heart disease (I20–I25)		
Males	52.1	3.83***
Females	13.6	1.00
Acute myocardial infarction (I21)		
Males	26.1	3.55***
Females	7.3	1.00
Stroke (I60–I69)		
Males	9.6	1.34***
Females	7.2	1.00
Diseases of the respiratory system (J00–99)		
Males	11.2	1.31***
Females	8.6	1.00

(continued)

Table 3.3.1 (continued): Age-standardised mortality rates and rate ratios by sex, persons aged 25–64 years, 1998–2000

Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
Chronic lower respiratory disease (J40–J47)		
Males	7.6	1.22***
Females	6.2	1.00
Diseases of the digestive system (K00–K93)		
Males	12.7	2.22***
Females	5.7	1.00
Diseases of the liver (K70–K77)		
Males	9.4	2.76***
Females	3.4	1.00
Accidents and injury (V01–Y98)		
Males	69.1	3.43***
Females	20.2	1.00
Transport accidents (V01–V99)		
Males	16.6	3.11***
Females	5.0	1.00
Suicide (X60–X84)		
Males	29.2	4.00***
Females	7.3	1.00

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

In 1998–2000, an estimated 20,700 male deaths could have been avoided if males aged 25–64 years experienced the same mortality rate as females (Table 3.3.2); this represented 28.3% of all deaths for persons within this age group. If cause-specific death rates for males in this age group were equivalent to those of females, a substantial number of male deaths could also have been avoided for:

- all cancers: 2,255 deaths;
- diseases of the circulatory system: 7,282 deaths;
- diseases of the digestive system:1,097 deaths; and
- accidents and injury: 7,184 deaths.

Table 3.3.2: Excess mortality by sex, persons aged 25–64 years, 1998–2000

Cause of death and ICD-10 codes	Number[(a)]	Per cent[(b)]
All causes	20,693	28.3
Cancers (C00–C97)	2,255	7.9
Lung cancer (C33, C34)	1,742	32.7
Diseases of the circulatory system (I00–I99)	7,282	45.2
Stroke (I60–I69)	369	14.3
Diseases of the digestive system (K00–K93)	1,097	38.1
Accidents and injury (V01–Y98)	7,184	54.4

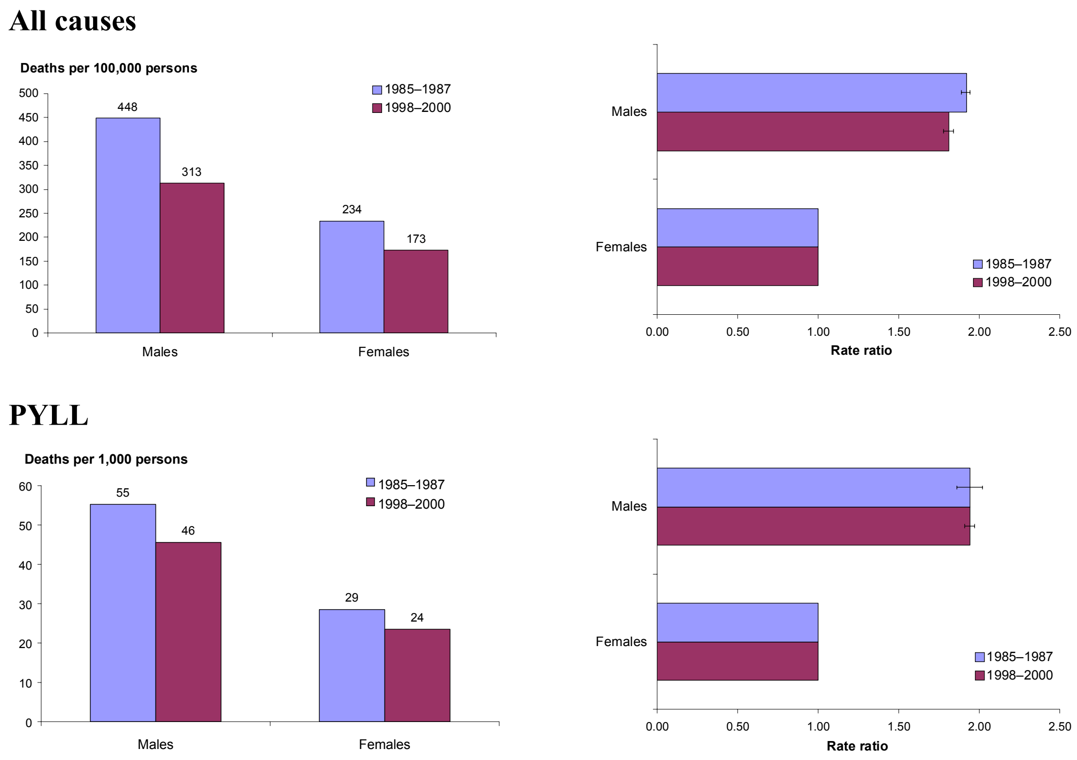
(a) Total number of deaths that would have been avoided if males had the same mortality rates as females.

(b) Percentage of deaths that would have been avoided if males had the same mortality rate as females.

Source: ABS mortality data.

Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, all-cause mortality for males aged 25–64 fell by approximately 30%, from 448 to 313 deaths per 100,000 persons. The corresponding decline for females was 26%, from 234 to 173 deaths per 100,000 persons (Figure 3.3.3). The number of Potential Years of Life Lost (PYLL) also declined for males and females between the mid 1980s and the late 1990s.



Note: Age-standardised to the total Australian population as of 30 June 1988.

Source: ABS mortality data; Mathers 1994a.

Figure 3.3.3: Age-standardised mortality rates and rate ratios by sex, all causes and PYLL, persons aged 25–64 years, 1985–1987 and 1998–2000

While males aged 25–64 years continued to experience significantly higher mortality rates than females in 1998–2000, the sex difference was smaller than that observed in 1985–1987 (Table 3.3.3). Between the two periods, mortality inequality between males and females declined by approximately 6% for all causes, 5% for all cancers, and 3% for diseases of the circulatory system. Table 3.3.3 also shows that death rates for cancer among females aged 25–64 years declined from 106.4 deaths per 100,000 in 1985–1987 to 85.5 per 100,000 in 1998–2000.

Table 3.3.3: Age-standardised mortality rate ratios, selected causes of death by sex, persons aged 25–64, 1985–1987 and 1998–2000

	1985–1987		1998–2000	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Males	448.5	1.92***	312.6	1.81***
Females	234.0	1.00	172.5	1.00
Cancers (C00–C97)				
Males	134.5	1.26***	102.4	1.20***
Females	106.4	1.00	85.5	1.00
Disease of the circulatory system (I00–I99)				
Males	167.1	2.70***	77.1	2.61***
Females	61.9	1.00	29.5	1.00

Note: Age-standardised to the total Australian population as of 30 June 1988.

(a) Deaths per 100,000 persons.

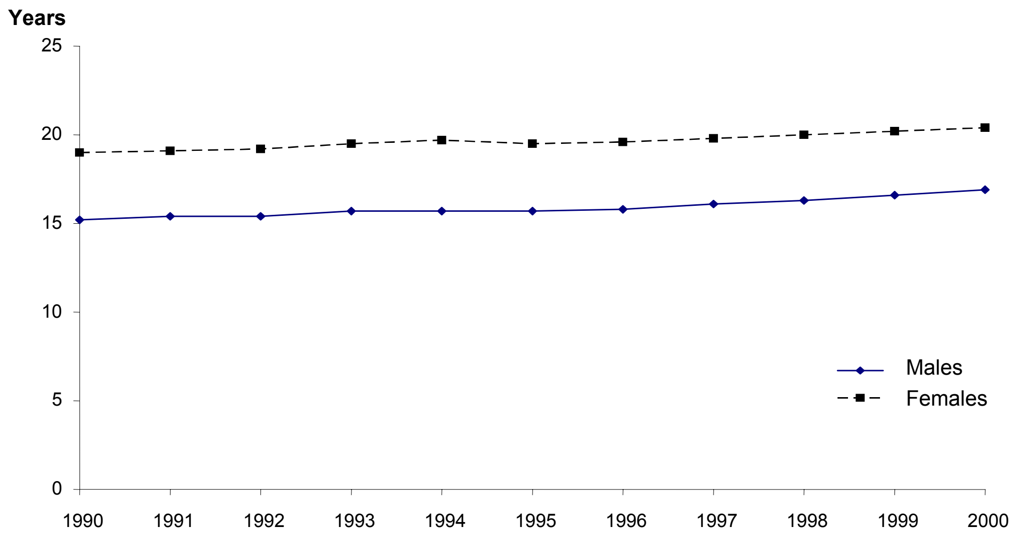
Source: ABS mortality data; Mathers 1994a.

*p<0.05, ** p<0.01, ***p<0.001

3.4 Persons aged 65 years and over

In this report, deaths among those aged 65 years and over are expressed as rates per 1,000 persons, which is consistent with the earlier (benchmark) work of Mathers (1994b).

Over the 10-year period from 1990 to 2000, life expectancy for persons at 65 years of age steadily improved. In 1990, life expectancy for a male at age 65 was around 15.2 years, and by the year 2000, this had increased to 16.9 years. Females experienced a similar change, with life expectancy at 65 increasing from 19.0 years in 1990 to 20.4 years in 2000 (Figure 3.4.1).



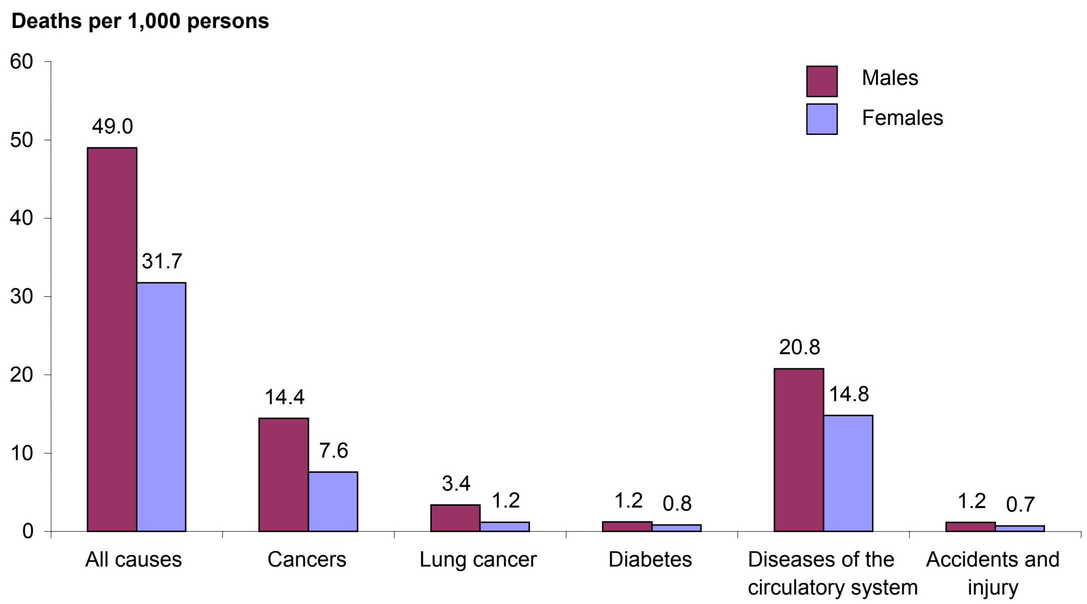
Source: ABS 2002.

Figure 3.4.1: Life expectancy at 65 years of age by sex, 1990–2000

In 1998–2000, males aged 65 years and over experienced higher mortality rates than females for a number of causes of death (Figure 3.4.2; Table 3.4.1). All-cause mortality among males was 49 deaths per 1,000 persons, and among females, 32 deaths per 1,000 persons: a difference of approximately 54%.

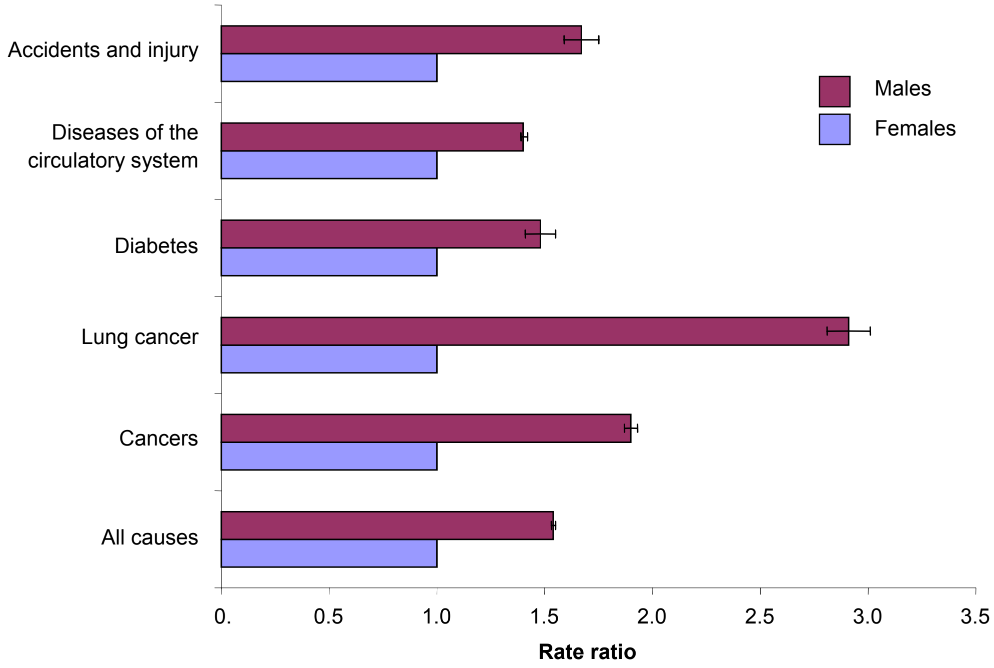
Sex differences in mortality among persons aged 65 years and older were also evident for many specific causes. When expressed as rate ratios (Figure 3.4.3; Table 3.4.1), male mortality rates were:

- 90% higher for all cancers (17 more male deaths per 1,000);
- 45% higher for diabetes mellitus (0.39 more male deaths per 1,000);
- 40% higher for diseases of the circulatory system (6 more male deaths per 1,000);
- 93% higher for diseases of the respiratory system ((2 more male deaths per 1,000); and
- 67% higher for accidents and injury (0.46 more male deaths per 1,000)



Source: ABS mortality data.

Figure 3.4.2: Age-standardised mortality rates by sex, selected causes of death, persons aged 65 years and over, 1998–2000



Source: ABS mortality data.

Figure 3.4.3: Age-standardised mortality rate ratios by sex, selected causes of death, persons aged 65 years and over, 1998–2000

Table 3.4.1: Age-standardised mortality rates and rate ratios by sex, persons aged 65 years and over, 1998–2000

Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
All causes		
Males	48.97	1.54***
Females	31.74	1.00
Cancers (C00–C97)		
Males	14.44	1.90***
Females	7.59	1.00
Cancer of the digestive organs (C15–C26)		
Males	3.90	1.66***
Females	2.35	1.00
Colon cancer (C18)		
Males	1.25	1.43***
Females	0.87	1.00
Cancer of the pancreas (C25)		
Males	0.59	1.23***
Females	0.48	1.00
Lung cancer (C33, C34)		
Males	3.39	2.91***
Females	1.17	1.00
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)		
Males	1.34	1.60***
Females	0.84	1.00
Endocrine, nutritional and metabolic diseases (E00–E90)		
Males	1.52	1.38***
Females	1.10	1.00
Diabetes mellitus (E10–E14)		
Males	1.20	1.48***
Females	0.81	1.00
Diseases of the nervous system (G00–G99)		
Males	1.35	1.25***
Females	1.08	1.00
Alzheimer's disease (G30)		
Males	0.48	0.83***
Females	0.58	1.00
Diseases of the circulatory system (I00–I99)		
Males	20.78	1.40***
Females	14.80	1.00
Ischaemic heart disease (I20–I25)		
Males	12.05	1.65***
Females	7.29	1.00
Acute myocardial infarction (I21)		
Males	6.71	1.61***
Females	4.16	1.00
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)		
Males	2.46	1.20***
Females	2.05	1.00

(continued)

Table 3.4.1 (continued): Age-standardised mortality rates and rate ratios by sex, persons aged 65 years and over, 1998–2000

Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio
Heart failure (I50)		
Males	1.01	1.09***
Females	0.93	1.00
Stroke (I60–I69)		
Males	4.47	1.09***
Females	4.11	1.00
Diseases of arteries, arterioles and capillaries (I70–I79)		
Males	1.27	1.68***
Females	0.75	1.00
Diseases of the respiratory system (J00–J99)		
Males	4.93	1.93***
Females	2.56	1.00
Influenza and pneumonia (J10–J18)		
Males	0.91	1.31***
Females	0.69	1.00
Chronic lower respiratory disease (J40–J47)		
Males	3.18	2.19***
Females	1.45	1.00
Diseases of the digestive system (K00–K93)		
Males	1.39	1.29***
Females	1.08	1.00
Diseases of the genitourinary system (N00–N99)		
Males	1.16	1.36***
Females	0.85	1.00
Renal failure (N17–N19)		
Males	0.80	1.56***
Females	0.51	1.00
Accidents and injury (V01–Y98)		
Males	1.15	1.67***
Females	0.69	1.00
Falls (W00–W19)		
Males	0.17	1.46***
Females	0.12	1.00

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Persons aged 65–74 years, and 75 years and over

In 1998–2000, mortality inequalities between males and females were found for those aged 65–74 years and 75 years and older. For the 'younger' of these age groups, all-cause mortality rates were 85% higher among males (11 more male deaths per 1,000), and for the oldest age group, male death rates were 44% higher (26 more male deaths per 1,000) (Table 3.4.2). For both age groups, males also experienced significantly higher death rates for diabetes mellitus, diseases of the circulatory system, and accidents and injury.

Table 3.4.2: Age-standardised mortality rates and rate ratios by sex, persons aged 65–74 years, and 75 years and over, 1998–2000

Cause of death and ICD-10 codes	65–74 years		75 years and older	
	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Males	24.73	1.85***	86.14	1.44***
Females	13.38	1.00	59.99	1.00
Cancers (C00–C97)				
Males	10.00	1.82***	21.26	1.96***
Females	5.49	1.00	10.83	1.00
Diabetes mellitus (E10–E14)				
Males	0.68	1.60***	1.99	1.42***
Females	0.43	1.00	1.40	1.00
Disease of the circulatory system (I00–I99)				
Males	8.81	2.07***	39.20	1.26***
Females	4.26	1.00	31.01	1.00
Accidents and injury (V01–Y98)				
Males	0.65	2.12***	1.92	1.51***
Females	0.30	1.00	1.28	1.00

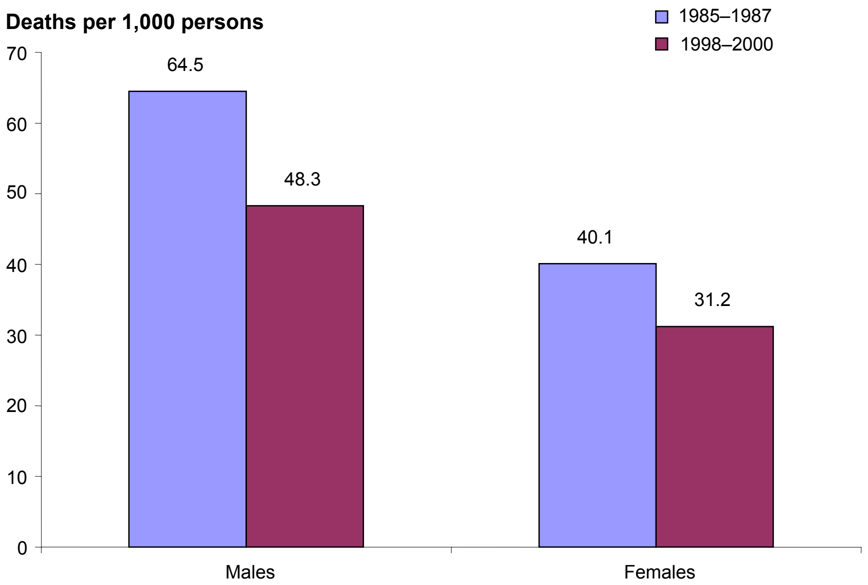
(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, ** p<0.01, ***p<0.001

Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, mortality rates fell for both males and females aged 65 years and over. Male all-cause mortality declined by around 25%, from 65 to 48 deaths per 1,000 persons, and female mortality fell by approximately 22%, from 40 to 31 deaths per 1,000 persons (Figure 3.4.4).



Note: Age-standardised to the total Australia population as of 30 June 1988.

Source: ABS mortality data.

Figure 3.4.4: Age-standardised mortality rates, all causes by sex, persons aged 65 years and over, 1985–1987 and 1998–2000

Between the mid-1980s and late 1990s, mortality inequality between males and females aged 65 years or more narrowed slightly: the sex difference in all-cause mortality was 61% in 1985–1987 (24 more male deaths per 1,000) and 55% in 1998–2000 (17 more males deaths per 1,000)(Table 3.4.3). Small declines in mortality inequality were also observed between males and females for all cancers, and diseases of the circulatory system.

Table 3.4.3: Age-standardised mortality rate ratios, by sex, persons aged 65 years and over, 1985–1987 and 1998–2000

	1985–1987		1998–2000	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Males	64.5	1.61***	48.3	1.55***
Females	40.1	1.00	31.3	1.00
Cancers (C00–C97)				
Males	15.3	1.96***	14.3	1.90***
Females	7.8	1.00	7.5	1.00
Disease of the circulatory system (I00–I99)				
Males	33.7	1.43***	20.5	1.41***
Females	23.6	1.00	14.5	1.00

Note: Age-standardised to the total Australian population as of 30 June 1988.

(a) Deaths per 1,000 persons.

Source: ABS mortality data; Mathers 1994b.

*p<0.05, ** p<0.01, ***p<0.001

3.5 Summary and discussion

Consistent with previous Australian and overseas research, this report has shown that males and females have very different mortality profiles. Girls born in 1998–2000 were expected to live an average of 5.6 years longer than boys born in the same period. From infancy to old age, females experienced lower rates of death for all causes combined, and for most of the specific causes that were examined. The largest all-cause mortality inequality between the sexes was observed among 15–24 year olds (163%, 59 more male deaths) and the smallest was found for those aged less than 1 year (25%, 118 more male deaths). During 1998–2000, an estimated 23,874 deaths among males aged 0–64 years could have been avoided if they had experienced the same mortality rate as females. Further, despite reductions in all-cause mortality for both males and females between 1985–1987 and 1998–2000, death rates remained relatively higher among males at each period, although for all age groups, the size of the sex difference in mortality narrowed.

What factors might account for sex differences in mortality? How, for example, might we explain greater longevity among females, or higher death rates among male infants for seemingly very different causes of death such as congenital malformations, deformations and chromosomal abnormalities, and accidents and injury (see Table 3.1.1)? Further, what factors might underpin higher male death rates for suicide among those aged 15–24 (see Table 3.2.1), or higher death rates for cardiovascular disease and diseases of the digestive system among working-aged males (see Table 3.3.1)? There is a long history of attempts to explain these (and other) types of sex differences in mortality, and over the years many varied reasons have been proffered. Given the complexity and volume of this work, only a brief overview is provided here.

The suggested reasons for mortality differences between males and females reduce to two broad categories of explanation: those that relate to the biological determinants of sex differentiation (genes, hormones, and physiology), and differentiation that is a product of historical, social, economic, and cultural factors. Importantly, interactions and interdependencies among biological and social factors (e.g. gene–environment interactions) are also likely to contribute to sex differences in mortality.

The mortality profile of males at the beginning of life provides some of the strongest evidence that females have an inherent biologic advantage that results in lower rates of death. Although more boys than girls are born (an average of 105 boys for every 100 girls), their death rate in the first year of life is significantly higher (25% higher in 1998–2000: see Table 3.1.1). Moreover, boys have a higher rate of early death for conditions that seemingly have a clear biological basis, such as conditions specific to the perinatal period (e.g. congenital infections, haemorrhagic and haematological disorders of the foetus) and congenital malformations and chromosomal abnormalities. Biologic factors are also believed to contribute to higher rates of male mortality for some conditions experienced in adulthood, particularly coronary heart disease (Waldron 1995; Weidner 2000).

While the role of biologic factors in explaining some of the sex differences in mortality is widely acknowledged, many researchers see the difference as being due primarily to social and environmental influences (Waldron 2000; Kane 1994; Lawlor et al. 2001; Pampel 2003). This conclusion is underscored by studies which show that sex differences in mortality vary in magnitude across different time-points within the same country and between different countries at any single time-point (Trovato and Lalu 1996, 1998; de Looper and Bhatia 2001). These temporal and cross-national variations make a strong case for the primacy of non-biologic factors in shaping and circumscribing mortality differences between the sexes.

The now extensive literature on sex differences in mortality, and health more generally (e.g. Kane 1994; Hart 1989; Verbrugge 1989; Waldron 1995; Annandale & Hunt 2000; Cameron & Bernardes 1998; Macintyre et al. 1996), suggests that the poorer mortality profile of males is due to a complex array of interacting social and environmental factors, including (but not limited to):

(i) *Health-related behaviours*: males are more likely than females to smoke cigarettes (Waldron 1986, 1991; Turrell et al. 2002b), consume alcohol at higher levels of risk (Ely et al. 1999; Green et al 2003; Persson et al. 1998), and have food and nutrient intakes that are less consistent with dietary guideline recommendations (Turrell 1997). These factors probably contribute to the significantly higher death rates among males for cardiovascular disease, lung cancer, diabetes, diseases of the digestive system, and diseases of the liver.

(ii) *Psychosocial response to illness*: males and females differ in terms of how they perceive symptoms and illness, how they define and monitor their psychobiological functioning, and their general attentiveness to changes in bodily states (Saltonstall 1993; Scott & Morgan 1993; Sabo & Gordon 1995).

(iii) *Help-seeking and health service use*: males are less likely to seek help in response to symptoms and illness and are more likely to delay help-seeking, thus reducing the probability that potentially fatal conditions are prevented or detected at an asymptomatic stage. Males are also less likely to engage in continued care: that is, show persistence in caring for their health problems by such things as attending follow-up appointments and compliance with medical advice.

(iv) *Exposure to environmental risks:* irrespective of age, males experience much higher death rates for accidents and injury. This presumably reflects men's greater exposure to employment-related hazards, their propensity to engage in leisure activities with higher levels of associated risk, and their greater risk-taking behaviour more generally (e.g. driving cars fast). Higher levels of mortality for accidents and injury among male children aged less than 1 year (see Table 3.1.1) also suggests that male and female infants are exposed to different types and levels of social and environmental risk.

(v) *Social relations:* males tend to have fewer intimate social networks and ties than females, and are less likely to have a close personal confidant other than their partner (Fuhrer et al. 1999). Males are also less likely to be active civic participants, as reflected in their lower levels of involvement in community organisations and rates of volunteerism. Arguably, the higher death rate for suicide among males (especially in adolescence and young adulthood) is partly due to their having fewer close ties and being less socially integrated. Also, dealing with such things as stress, anxiety, and feelings of hopelessness and low self-esteem is likely to be more difficult in the absence of social and personal supports, and this may partly underpin males' higher use of cigarettes and alcohol, and in turn, their poorer mortality profile for chronic degenerative conditions such as cardiovascular disease.

Importantly, it is also necessary to acknowledge that some of these social and environmental factors influencing health differences between males and females may themselves be the product of inherent (e.g. genetic) differences between the sexes.

In sum, this chapter has shown that irrespective of age, males and females exhibit a very different mortality pattern, and previous research suggests that this is due to both biologic and environmental factors. Moreover, sex differences in mortality are not constant, but rather change (widen and narrow) in response to concomitant social, economic, and cultural changes that occur in the wider society. This suggests that large sex inequalities in mortality are not inevitable (Lawlor et al. 2001), and that the inequalities are likely to be responsive to policies and interventions that encapsulate the social origins of sex differences in death.

4 Mortality differences by geographic region

A number of Australian studies have examined the relationship between geographic region and mortality (Mathers 1994a, 1994b, 1995, 1996; Strong et al. 1998a; Glover et al. 1999; AIHW 2002, 2003; ABS 2002). The findings of these works generally indicate that death rates are lowest in capital cities and major metropolitan regions, and highest in rural and remote areas. Summarising the relationship between geographic region and mortality beyond this overall finding, however, is difficult. Much of the extant research has used different geographic classifications, or a differently sized area-based unit of analysis, and the nature and extent of mortality inequalities by geographic region seem to be contingent on the cause of death, the age group examined, and sex.

The assessment of geographic mortality inequalities is further complicated by the variable concentration of Indigenous peoples in rural and remote areas. Specifically: to what extent are higher death rates in non-metropolitan regions of Australia due to the higher mortality experience of the Indigenous populations who reside in these areas? Previous research suggests that Indigenous mortality contributes moderately to higher death rates among people in rural regions, and substantially in remote and very remote areas (Coory 2003; Glover et al. 1999; AIHW 2002).

In this chapter we examine the mortality profile of different geographic regions for the period 1998–2000, for males and females aged 0–14, 15–24, 25–64 and 65 years or more. The analysis is based on the remoteness characteristics of Statistical Local Areas (SLAs). In most cases, SLAs correspond to council boundaries defined by Local Government Areas, and, in aggregate, SLAs cover the whole of Australia without gaps or overlaps (ABS 2001).

The geographic remoteness of each SLA was ascertained using the Accessibility/Remoteness Index of Australia (ARIA) (Department of Health and Aged Care 2001). Released in 1999, ARIA is an alternative measure to the Rural, Remote and Metropolitan Area (RRMA) classification, which was limited as an indicator of people's access to services by its use of straight-line distance measurements between places, which did not capture the reality of road travel (Bamford et al. 1999; Hays et al. 1998). ARIA, by contrast, was developed using Geographic Information Systems network analysis to calculate actual distance travelled by road from 11,340 populated localities to four categories of ABS-defined urban centres: Category A = >250,000 persons; B = 48,000–249,999; C = 18,000–47,999; D = 5,000–17,999 persons. ARIA is based on the minimum distance that people have to travel to reach an urban centre containing basic services (e.g. health, education, and retail). The ARIA methodology produces a continuous variable that ranges from 0 (areas of highest accessibility) to 12 (areas of highest remoteness). Using an interpolation process, ARIA remoteness values can be assigned to all places and points in Australia. ARIA scores for each SLA are calculated by taking the average remoteness value for each 1-km grid-segment forming the SLA. The developers of ARIA have produced a categorical measure that allows SLAs with similar degrees of access and remoteness to services to be grouped together as follows:

1. Highly Accessible SLAs – areas with relatively unrestricted access to a wide range of goods and services and opportunities for social interaction.
2. Accessible SLAs – areas with some restrictions in accessibility to some goods, services and opportunities for social interaction.
3. Moderately Accessible SLAs – areas with significantly restricted accessibility to goods, services and opportunities for social interaction.

4. Remote SLAs – areas with very restricted accessibility to goods, services and opportunities for social interaction.
5. Very Remote SLAs – areas with very little accessibility to goods, services and opportunities for social interaction.

Due to the relatively small populations and number of deaths within areas classified as Remote or Very Remote, these two categories were combined.

As part of this chapter, we also investigate whether the higher death rates of Indigenous peoples contribute to geographic differences in mortality. Examining the mortality status of Indigenous Australians is complicated by variations in the extent to which Indigenous persons are included in national data collections, and the accuracy with which they are identified in administrative datasets. At present, it is considered that only Queensland, South Australia, Western Australia, and the Northern Territory reliably report Indigenous status on death certificates (ABS & AIHW 2001, 2003). As such, only these states and territories are included in the Indigenous mortality analysis undertaken in this report.

4.1 Persons aged 0–14 years

In 1998–2000, life expectancy at birth for males born in Highly Accessible areas of Australia was approximately 77.3 years, whereas life expectancy for males born in Remote/Very Remote areas was 73.1 years (Table 4.1.1). The corresponding figures for females were 82.7 and 79.6 years respectively.

Table 4.1.1: Life expectancy by ARIA category and sex, children born 1998–2000

ARIA category	Boys	Girls
Highly accessible	77.3	82.7
Accessible	75.8	81.8
Moderately accessible	75.8	82.0
Remote/very remote	73.1	79.6
All persons	**76.8**	**82.4**

Source: ABS mortality data.

Infants aged less than 1 year

Children aged less than 1 year from Remote/Very Remote areas experienced significantly higher all-cause mortality in 1998–2000 than their counterparts from Highly Accessible areas (Table 4.1.2).

For male infants, all-cause death rates were 80% higher in Remote/Very Remote areas (429 more male deaths per 100,000), and for females, 154% higher (661 more female deaths per 100,000). Death rates among infants were also significantly higher in Remote/Very Remote areas for certain conditions originating in the perinatal period, and for congenital malformations, deformations and chromosomal abnormalities (females only).

Table 4.1.2: Age-standardised mortality rates and rate ratios, children aged less than 1 year by ARIA category and sex, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Rate[a]**	**Rate ratio**	**Rate[a]**	**Rate ratio**
All causes				
Highly accessible	539.0	1.00	430.0	1.00
Accessible	703.3	1.30***	518.8	1.21**
Moderately accessible	773.2	1.43***	491.4	1.14
Remote/very remote	967.8	1.80***	1,090.7	2.54***
Certain conditions originating in the perinatal period (P00–P96)				
Highly accessible	257.0	1.00	202.9	1.00
Accessible	317.0	1.23*	246.6	1.22
Moderately accessible	346.4	1.35*	213.4	1.05
Remote/very remote	412.6	1.61***	445.8	2.20***
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)				
Highly accessible	146.3	1.00	123.1	1.00
Accessible	171.9	1.17	130.3	1.06
Moderately accessible	179.4	1.23	135.8	1.10
Remote/very remote	210.1	1.44	294.6	2.39***

(a) Deaths per 100,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

In 1998–2000, approximately 174 male deaths, and 130 female deaths, could have been avoided if infants in Accessible, Moderately Accessible, and Remote/Very Remote areas experienced the same mortality rate as male and female infants in Highly Accessible areas (Table 4.1.3).

Table 4.1.3: Excess mortality by ARIA category and sex, children aged less than 1 year, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Number[a]**	**Per cent[b]**	**Number[a]**	**Per cent[b]**
All causes	174	6.3	130	6.3
Certain conditions originating in the perinatal period (P00–P96)	60	5.7	46	5.8
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	23	3.6	26	5.0
Accidents and injury (V01–Y98)	33	10.6	19	9.6

(a) Total number of deaths that would have been avoided if all ARIA categories experienced the same mortality rate as highly accessible areas.

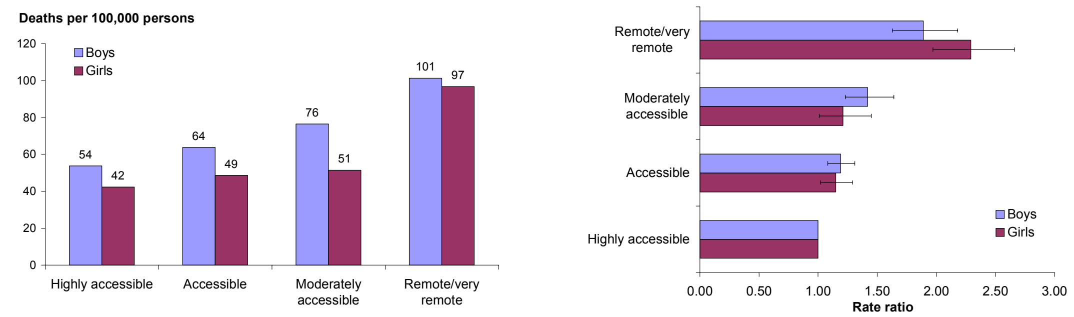
(b) Percentage of deaths that would have been avoided if all ARIA categories had the same mortality rate as highly accessible areas.

Source: ABS mortality data.

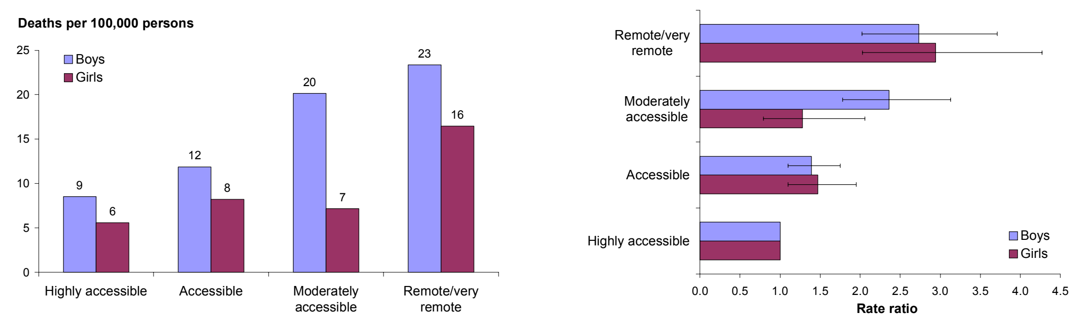
Children aged 0–14 years

Boys and girls aged 0–14 who lived in Remote/Very Remote areas experienced the greatest number of potential years of life lost, and the highest mortality rates for all causes, for potentially avoidable deaths, and for accidents and injury (Figure 4.1.1; Table 4.1.4).

All causes



Accidents and injury



Source: ABS mortality data.

Figure 4.1.1: Age-standardised mortality rates and rate ratios, selected causes of death by ARIA category and sex, children aged 0–14 years, 1998–2000

Table 4.1.4: Age-standardised mortality rates and rate ratios, children aged 0–14 years by ARIA category and sex, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Highly accessible	53.7	1.00	42.4	1.00
Accessible	63.8	1.19***	48.7	1.15*
Moderately accessible	76.4	1.42***	51.4	1.21*
Remote/very remote	101.3	1.89***	96.8	2.29***
PYLL[(b)]				
Highly accessible	37.7	1.00	29.7	1.00
Accessible	43.1	1.14**	33.0	1.11
Moderately accessible	52.4	1.39***	35.5	1.20
Remote/very remote	72.9	1.93***	70.9	2.39***
Potentially avoidable deaths				
Highly accessible	26.1	1.00	20.2	1.00
Accessible	36.6	1.40***	23.4	1.16
Moderately accessible	41.5	1.59***	27.6	1.37*
Remote/very remote	51.2	1.96***	50.8	2.52***
Accidents and injury (V01–Y98)				
Highly accessible	8.5	1.00	5.6	1.00
Accessible	11.9	1.39**	8.2	1.47**
Moderately accessible	20.1	2.36***	7.2	1.28
Remote/very remote	23.4	2.73***	16.5	2.94***

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

In 1998–2000, if all geographic regions in Australia experienced the same mortality rate as Highly Accessible regions, approximately 399 deaths among 0–14 year olds could have been avoided, which represented 6.7% of all deaths in this age group (Table 4.1.5).

Table 4.1.5: Excess mortality by ARIA category and sex, children aged 0–14 years, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Number[(a)]**	**Per cent[(b)]**	**Number[(a)]**	**Per cent[(b)]**
All causes	227	6.7	172	6.7
Accidents and injury (V01–Y98)	85	14.4	43	11.9

(a) Total number of deaths that would have been avoided if all ARIA categories experienced the same mortality rate as highly accessible areas.

(b) Percentage of deaths that would have been avoided if all ARIA categories had the same mortality rate as highly accessible areas.

Source: ABS mortality data.

Indigenous deaths among 0–14 year olds, and their impact on geographic mortality inequalities

In 1998–2000, babies born to Indigenous mothers were more than twice as likely to die during the perinatal period than babies born to non-Indigenous mothers (Table 4.1.6). Foetal deaths (stillbirths) were around 48% higher amongst babies born to Indigenous mothers, while neonatal deaths (death of an infant within 28 days of birth) were around 61% higher.

Table 4.1.6: Perinatal mortality by mother's Indigenous status, 1998–2000

	Foetal deaths		Neonatal deaths[a]		Perinatal deaths[b]	
Indigenous status	**Number**	**Rate[c]**	**Number**	**Rate[d]**	**Number**	**Rate[c]**
Babies of Indigenous mothers	337	12.8	193	7.4	530	20.1
Babies of non-Indigenous mothers	5,004	6.7	2,171	2.9	7,175	9.6

(a) Based on live births only. May exclude neonatal deaths within 28 days of birth for babies transferred or readmitted to hospital and those dying at home, for selected states and territories.

(b) Perinatal deaths include fetal deaths and neonatal deaths.

(c) Deaths per 1,000 total births.

(d) Deaths per 1,000 live births.

Source: ABS & AIHW 2003.

In Queensland, South Australia, Western Australia, and the Northern Territory in 1999–2000, Indigenous infants and children comprised a relatively small proportion of all children aged 0–14 years. As Table 4.1.7 shows, however, deaths among Indigenous infants and children accounted for a disproportionately high number of all deaths among young people in the population.

Table 4.1.7: Deaths identified as Indigenous,[a] persons aged 0–14 years, 1999–2001 (per cent)

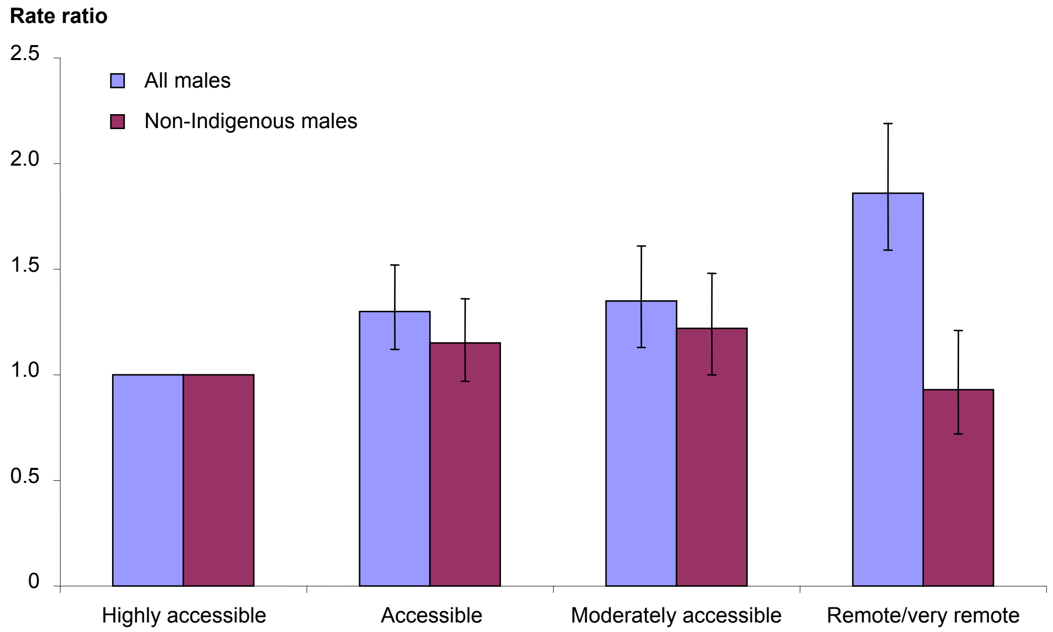
Age group	Indigenous deaths as a proportion of all deaths	Indigenous population as a proportion of total population
Less than 1	19.1	7.4
1–4	16.6	7.1
5–14	14.5	6.4

(a) Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS & AIHW 2003.

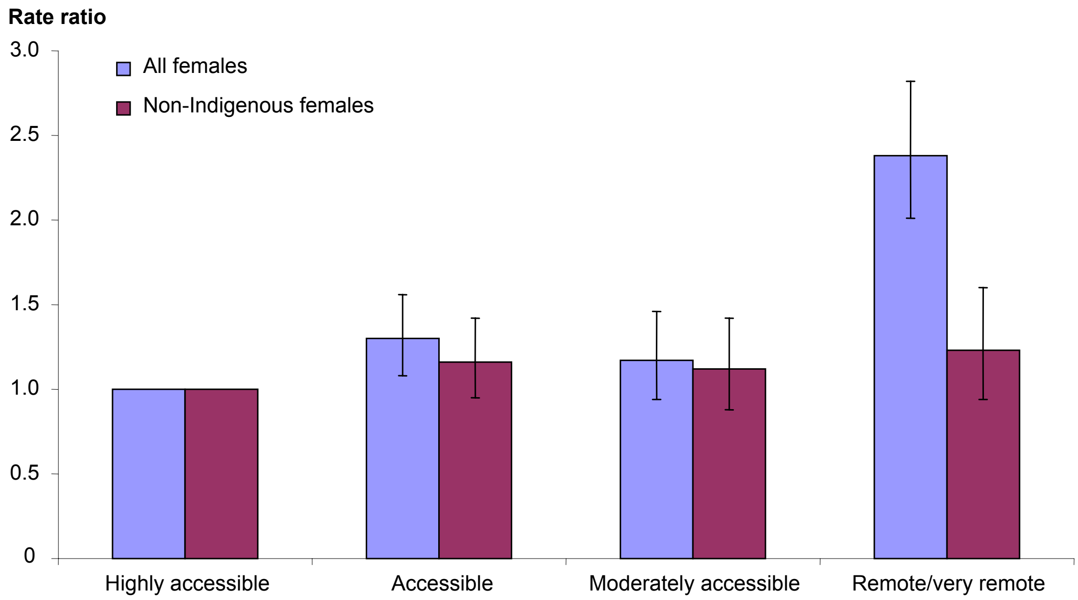
Figures 4.1.2 and 4.1.3 compare all-cause mortality rates across the ARIA categories for males and females aged 0–14 years, using death data for all persons, and then based on data that excluded Indigenous deaths.

Compared with Highly Accessible areas, mortality rates among all boys were 30% higher in Accessible areas, 35% higher in Moderately Accessible areas, and 86% higher in Remote/Very Remote areas (Figure 4.1.2). When Indigenous deaths were removed from the analysis, the corresponding differences across the ARIA categories were 15%, 22% and 7% (with this latter difference indicating a lower all-cause mortality rate in Remote/Very Remote regions compared with Highly Accessible areas). A similar patterning is found for girls (Figure 4.1.3). Prior to the removal of Indigenous deaths, all-cause mortality rates were 30% higher in Accessible areas, 17% higher in Moderately Accessible areas, and 138% higher in Remote/Very Remote areas. These differences reduced to 16%, 12% and 23% respectively when the analysis was based on deaths among only non-Indigenous girls.



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Figure 4.1.2: All-cause age-standardised mortality rate ratios by ARIA category, total male population and male non-Indigenous population aged 0–14 years, 1998–2000



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Figure 4.1.3: All-cause age-standardised mortality rate ratios by ARIA category, total female population and female non-Indigenous population aged 0–14 years, 1998–2000

4.2 Persons aged 15–24 years

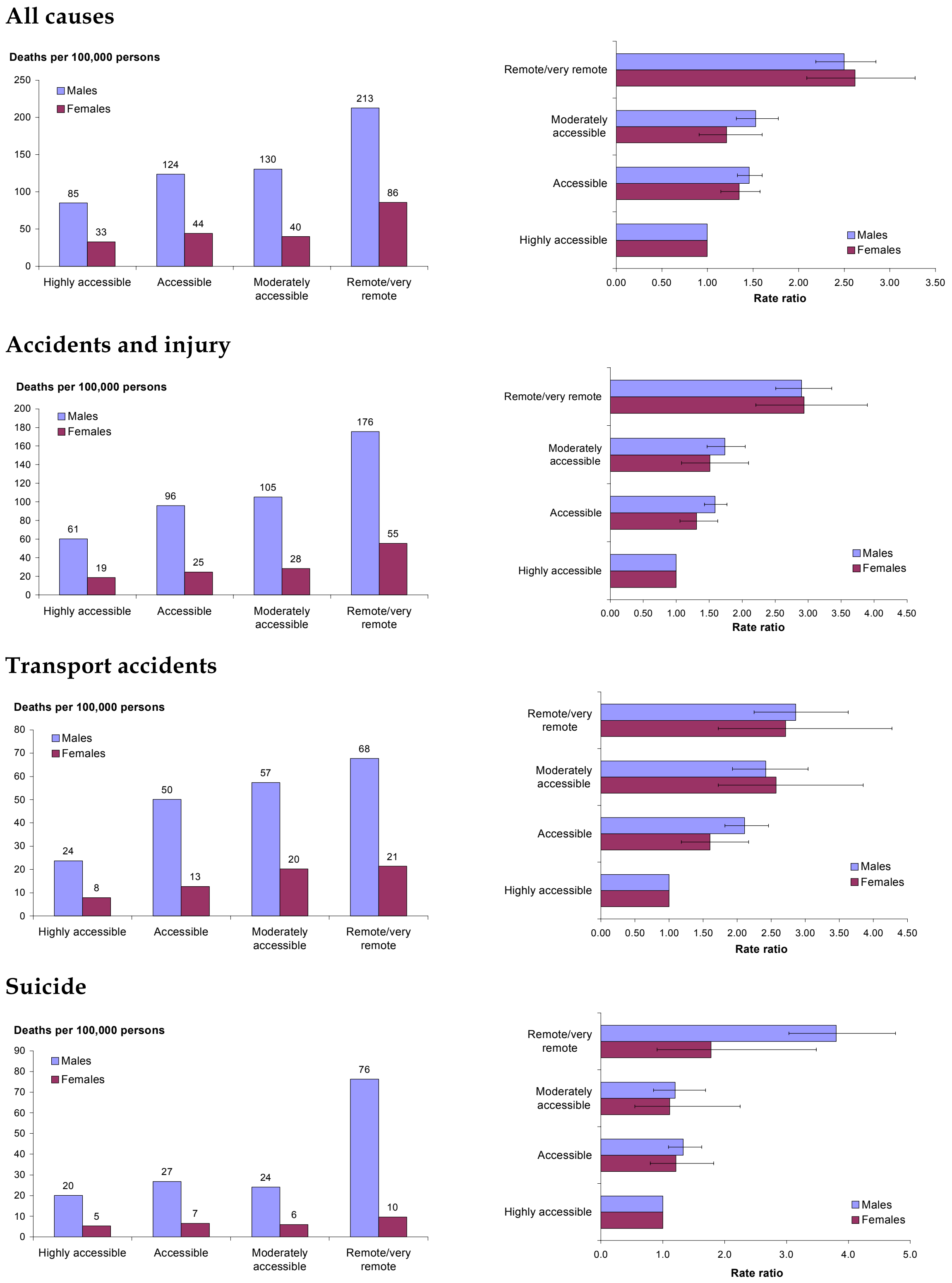
In 1998–2000, males aged 15 years living in Remote/Very Remote areas, had a life expectancy of 59.2 years: this was approximately 3.7 years less than males of the same age from Highly Accessible areas (Table 4.2.1). The corresponding difference in life expectancy between Remote/Very Remote and Highly Accessible areas for 15 year old females was 2.5 years.

Table 4.2.1: Life expectancy, persons at 15 years by ARIA category and sex, 1998–2000

ARIA category	Males	Females
Highly accessible	62.9	68.2
Accessible	61.6	67.4
Moderately accessible	61.7	67.6
Remote/very remote	59.2	65.7
Total persons	**62.5**	**68.0**

Source: ABS mortality data.

Persons aged 15–24 from Remote/Very Remote areas experienced significantly higher mortality rates for all causes of death, and for a range of specific causes including accidents and injuries, and suicide (males only) (Figure 4.2.1; Table 4.2.2).



Source: ABS mortality data.

Figure 4.2.1: Age-standardised mortality rates and rate ratios, selected causes of death by ARIA category, persons aged 15–24 years, 1998–2000

Table 4.2.2: Age-standardised mortality rates and rate ratios, persons aged 15–24 years by ARIA category and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Highly accessible	85.1	1.00	32.9	1.00
Accessible	123.9	1.46***	44.4	1.35***
Moderately accessible	130.5	1.53***	39.9	1.21
Remote/very remote	212.5	2.50***	86.1	2.62***
PYLL[(b)]				
Highly accessible	46.8	1.00	18.2	1.00
Accessible	67.3	1.44***	24.3	1.33***
Moderately accessible	70.8	1.51***	22.6	1.24
Remote/very remote	117.8	2.51***	47.6	2.62***
Potentially avoidable deaths				
Highly accessible	51.6	1.00	18.2	1.00
Accessible	73.9	1.43***	25.9	1.42***
Moderately accessible	85.3	1.65***	26.9	1.48*
Remote/very remote	145.2	2.81***	44.8	2.46***
Accidents and injury (V01–Y98)				
Highly accessible	60.5	1.00	18.9	1.00
Accessible	96.1	1.59***	24.8	1.31*
Moderately accessible	105.2	1.74***	28.4	1.51*
Remote/very remote	175.6	2.90***	55.4	2.94***
Transport accidents (V01–V99)				
Highly accessible	23.7	1.00	7.9	1.00
Accessible	50.1	2.11***	12.6	1.60**
Moderately accessible	57.3	2.42***	20.3	2.57***
Remote/very remote	67.7	2.86***	21.4	2.71***
Suicide (X60–X84)				
Highly accessible	20.1	1.00	5.4	1.00
Accessible	26.8	1.33**	6.6	1.21
Moderately accessible	24.1	1.20	6.0	1.11
Remote/very remote	76.3	3.80***	9.7	1.78

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Around 477 deaths among 15–24 year olds (males n=373, females n=104) could have been avoided in 1998–2000 if the mortality rate in Accessible, Moderately Accessible, and Remote/Very Remote areas was the same as in Highly Accessible areas (Table 4.2.3).

Table 4.2.3: Excess mortality, selected causes of death by ARIA category and sex, persons aged 15–24 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Number[(a)]	Per cent[(b)]	Number[(a)]	Per cent[(b)]
All causes	373	9.6	104	7.4
Accidents and injury (V01–Y98)	342	12.1	71	8.7
Transport accidents (V01–V99)	207	17.5	47	13.1
Suicide (X60–X84)	97	10.5	10	4.4

(a) Total number of deaths that would have been avoided if all ARIA categories had the same mortality rate as highly accessible areas.

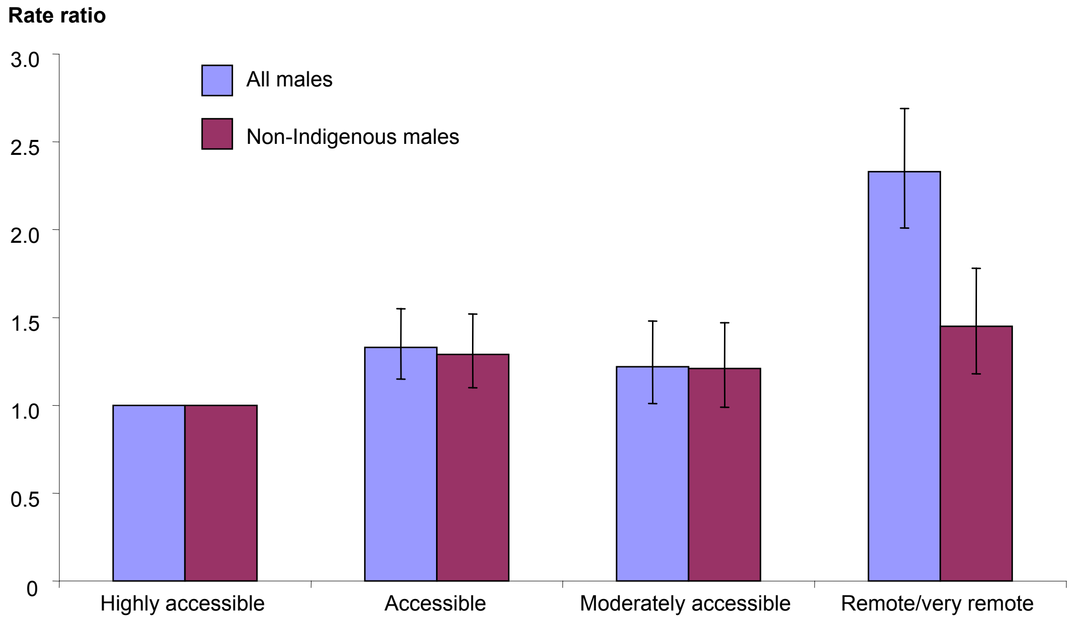
(b) Percentage of deaths that would have been avoided if all ARIA categories had the same mortality rate as highly accessible areas.

Source: ABS mortality data.

Indigenous deaths among 15–24 year olds, and their impact on geographic mortality inequalities

In 1997–1999, Indigenous Australians aged 15–24 years represented about 4.7% of the Queensland, South Australian, Western Australian and Northern Territory populations: among this age group; however, Indigenous persons accounted for around 12.4% of all deaths (ABS & AIHW 2001).

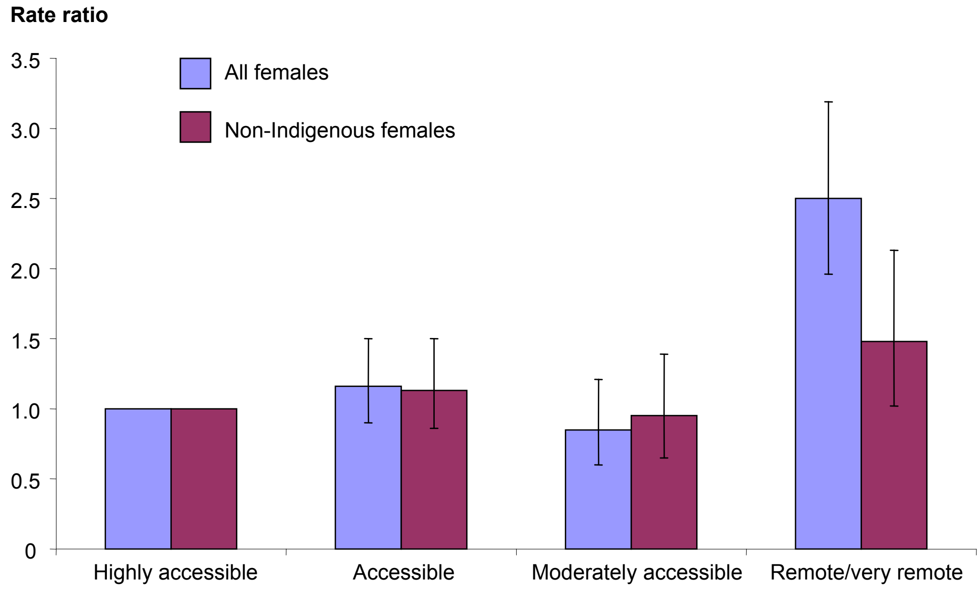
Figure 4.2.2 compares death rates across the ARIA categories for males aged 15–24 using data that first includes and then excludes Indigenous deaths. Death rates for all males were 133% higher in Remote/Very Remote areas than in Highly Accessible areas: this difference reduces to 45% when based on deaths among non-Indigenous males. A similar pattern was observed among females: death rates were 150% higher in Remote/Very Remote areas when based on all deaths, reducing to 48% when deaths among Indigenous females were excluded (Figure 4.2.3).



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS mortality data.

Figure 4.2.2: Age-standardised all-cause mortality rate ratios by ARIA category, total male population and male non-Indigenous population, persons aged 15–24 years, 1998–2000



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS mortality data.

Figure 4.2.3: Age-standardised all-cause mortality rate ratios by ARIA category, total female population and female non-Indigenous population, persons aged 15–24 years, 1998–2000

4.3 Persons aged 25–64 years

In 1998–2000, males aged 25 years and resident in Remote/Very Remote areas had a life expectancy of 50.4 years: this was 3 years less than 25 year old males from Highly Accessible areas (Table 4.3.1). The corresponding difference in life expectancy among 25 year old females from Remote/Very Remote and Highly Accessible areas was 2.1 years.

Table 4.3.1: Life expectancy by ARIA category and sex, persons aged 25 years, 1998–2000

ARIA category	Males	Females
Highly accessible	53.4	58.4
Accessible	52.3	57.7
Moderately accessible	52.4	57.9
Remote/very remote	50.4	56.3
Total population	**53.1**	**58.2**

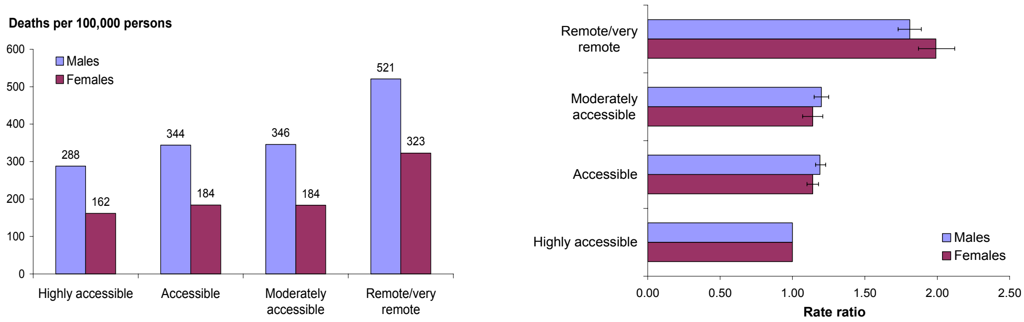
Source: ABS mortality data.

Persons aged 25–64 who resided in Remote/Very Remote areas in 1998–2000 experienced a significantly higher mortality rate for all causes, and for many specific causes (Figure 4.3.1; Table 4.3.2). For males and females, all-cause death rates were 81% and 99% higher respectively among those living in Remote/Very Remote areas compared with those from Highly Accessible areas.

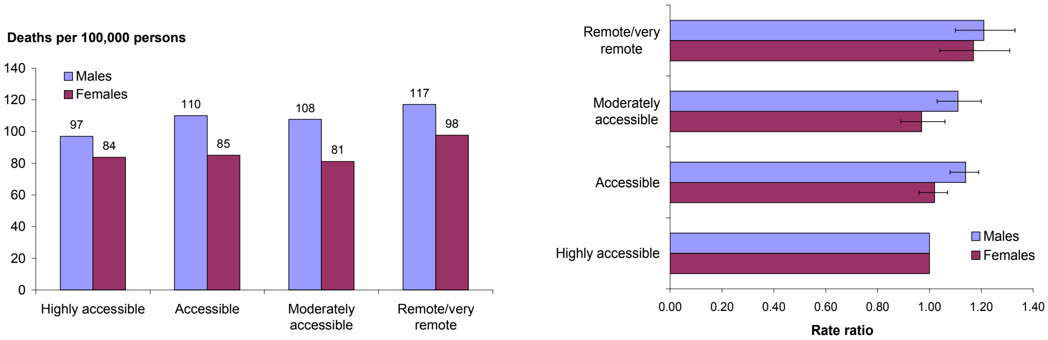
For specific causes, death rates for males and females aged 25–64 from Remote/Very Remote areas were significantly higher for:

- all cancers: 21% higher for males (20 more deaths per 100,000), 17% higher for females (14 more deaths per 100,000);
- lung cancer: 63% higher for males (14 more deaths per 100,000), 43% higher for females (5 more deaths per 100,000);
- diseases of the circulatory system: 111% higher for males (77 more deaths per 100,000), 193% higher for females (50 more deaths per 100,000);
- diseases of the respiratory system: 231% higher for males (22 more deaths per 100,000), 245% higher for females (19 more deaths per 100,000); and
- accidents and injury: 100% higher for males (63 more deaths per 100,000), 83% higher for females (16 more deaths per 100,000).

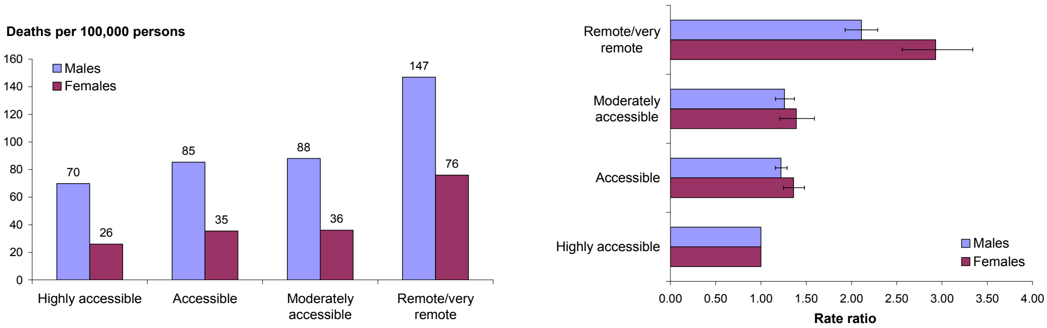
All causes



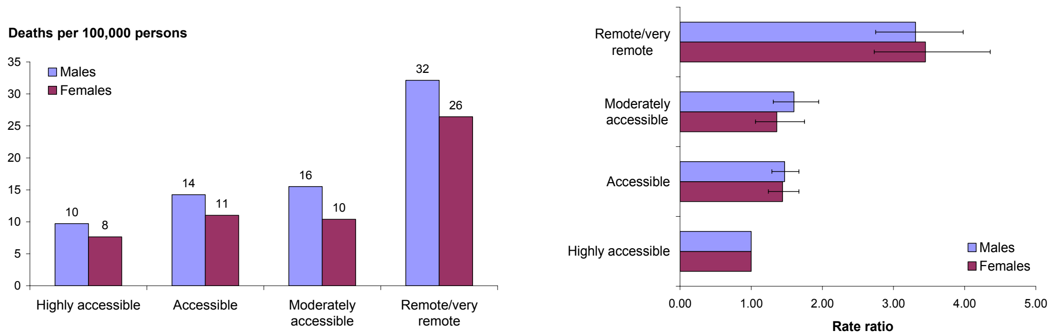
Cancers



Diseases of the circulatory system



Respiratory diseases



Source: ABS mortality data.

Figure 4.3.1: Age-standardised mortality rates and rate ratios, selected causes of death by ARIA category, persons aged 25–64 years, 1998–2000

Table 4.3.2: Age-standardised mortality rates and rate ratios by ARIA category and sex, persons aged 25–64 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Highly accessible	288.1	1.00	161.9	1.00
Accessible	344.1	1.19***	184.0	1.14***
Moderately accessible	346.1	1.20***	183.8	1.14***
Remote/very remote	520.7	1.81***	322.9	1.99***
PYLL[(b)]				
Highly accessible	71.2	1.00	38.6	1.00
Accessible	88.9	1.25***	45.7	1.18***
Moderately accessible	87.5	1.23***	46.4	1.20***
Remote/very remote	133.2	1.87***	74.0	1.92***
Potentially avoidable deaths				
Highly accessible	186.1	1.00	101.0	1.00
Accessible	220.4	1.18***	114.2	1.13***
Moderately accessible	232.5	1.25***	118.1	1.17***
Remote/very remote	348.8	1.87***	205.2	2.03***
Cancers (C00–C97)				
Highly accessible	97.0	1.00	83.8	1.00
Accessible	110.1	1.14***	85.1	1.02
Moderately accessible	107.7	1.11**	81.1	0.97
Remote/very remote	117.1	1.21***	97.7	1.17**
Cancer of the digestive organs (C15–C26)				
Highly accessible	30.5	1.00	17.8	1.00
Accessible	31.5	1.03	18.2	1.02
Moderately accessible	31.8	1.04	17.6	0.99
Remote/very remote	35.1	1.15	21.8	1.22
Colon cancer (C18)				
Highly accessible	9.4	1.00	7.0	1.00
Accessible	10.3	1.10	8.3	1.18
Moderately accessible	8.9	0.95	5.3	0.77
Remote/very remote	9.1	0.97	6.4	0.92
Melanoma of skin (C43)				
Highly accessible	4.7	1.00	2.8	1.00
Accessible	5.6	1.19	3.1	1.13
Moderately accessible	5.2	1.12	3.0	1.08
Remote/very remote	4.2	0.90	2.9	1.07
Lung cancer (C33, C34)				
Highly accessible	21.7	1.00	11.6	1.00
Accessible	27.0	1.24***	10.8	0.94
Moderately accessible	27.4	1.26**	9.5	0.82
Remote/very remote	35.4	1.63***	16.5	1.43*
Breast cancer (C50)				
Highly accessible	—	—	22.4	1.00
Accessible	—	—	23.7	1.06
Moderately accessible	—	—	19.3	0.86
Remote/very remote	—	—	23.2	1.04

(continued)

Table 4.3.2 (continued): Age-standardised mortality rates and rate ratios by ARIA category and sex, persons aged 25–64 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Cancer of the female genital organs (C51–C58)				
Highly accessible	—	—	4.5	1.00
Accessible	—	—	8.5	1.00
Moderately accessible	—	—	11.1	1.32*
Remote/very remote	—	—	9.8	1.16
Brain cancer (C71)				
Highly accessible	5.8	1.00	3.6	1.00
Accessible	6.5	1.13	3.5	0.97
Moderately accessible	7.5	1.30	3.9	1.08
Remote/very remote	3.5	0.61	4.1	1.14
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)				
Highly accessible	6.6	1.00	4.7	1.00
Accessible	7.6	1.15	5.0	1.07
Moderately accessible	5.6	0.84	4.3	0.90
Remote/very remote	6.0	0.91	6.1	1.28
Mental and behavioural disorders due to psychoactive substance use (F10–F19)				
Highly accessible	8.9	1.00	2.3	1.00
Accessible	7.3	0.82*	1.7	0.74
Moderately accessible	3.9	0.44***	0.5	0.23*
Remote/very remote	11.1	1.24	4.5	1.91*
Diseases of the circulatory system (I00–I99)				
Highly accessible	69.8	1.00	26.0	1.00
Accessible	85.4	1.22***	35.4	1.36***
Moderately accessible	88.0	1.26***	36.1	1.39***
Remote/very remote	147.0	2.11***	76.0	2.93***
Ischaemic heart disease (I20–I25)				
Highly accessible	48.4	1.00	12.1	1.00
Accessible	57.6	1.19***	17.1	1.41***
Moderately accessible	61.2	1.26***	18.2	1.50***
Remote/very remote	100.1	2.07***	36.6	3.02***
Acute myocardial infarction (I21)				
Highly accessible	23.1	1.00	6.3	1.00
Accessible	33.7	1.46***	10.7	1.68***
Moderately accessible	37.8	1.64***	10.5	1.66***
Remote/very remote	53.2	2.31***	17.8	2.80***
Stroke (I60–I69)				
Highly accessible	9.2	1.00	6.6	1.00
Accessible	6.5	0.70***	8.4	1.26**
Moderately accessible	9.7	1.05	8.1	1.23
Remote/very remote	18.4	1.99***	15.5	2.34***
Diseases of the respiratory system (J00–J99)				
Highly accessible	9.7	1.00	7.7	1.00
Accessible	14.2	1.47***	11.0	1.44***
Moderately accessible	15.5	1.60***	10.4	1.36*
Remote/very remote	32.1	3.31***	26.4	3.45***

(continued)

Table 4.3.2 (continued): Age-standardised mortality rates and rate ratios by ARIA category and sex, persons aged 25–64 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Chronic lower respiratory disease (J40–J47)				
Highly accessible	6.4	1.00	5.6	1.00
Accessible	10.3	1.61***	8.1	1.45***
Moderately accessible	1.5	1.81***	8.3	1.48**
Remote/very remote	22.5	3.53***	18.1	3.25***
Diseases of the digestive system (K00–K93)				
Highly accessible	11.7	1.00	5.1	1.00
Accessible	14.8	1.27***	7.4	1.45***
Moderately accessible	13.8	1.18	6.6	1.29
Remote/very remote	23.7	2.03***	14.9	2.91***
Diseases of the liver (K70–K77)				
Highly accessible	8.6	1.00	3.0	1.00
Accessible	11.3	1.32***	4.0	1.32*
Moderately accessible	10.9	1.28*	5.1	1.69**
Remote/very remote	17.7	2.07***	10.1	3.35***
Accidents and injury (V01–Y98)				
Highly accessible	62.6	1.00	18.8	1.00
Accessible	81.6	1.30***	20.6	1.10
Moderately accessible	84.7	1.35***	26.2	1.39***
Remote/very remote	125.4	2.00***	34.4	1.83***
Transport accidents (V01–V99)				
Highly accessible	12.7	1.00	4.1	1.00
Accessible	23.0	1.81***	7.1	1.74***
Moderately accessible	25.8	2.03***	10.6	2.61***
Remote/very remote	38.1	3.01***	11.3	2.76***
Suicide (X60–X84)				
Highly accessible	27.6	1.00	7.4	1.00
Accessible	33.8	1.22***	6.5	0.88
Moderately accessible	33.2	1.20*	7.0	0.95
Remote/very remote	38.2	1.38***	6.8	0.92

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

In 1998–2000, an estimated 2,411 male deaths and 1,048 female deaths could have been avoided among persons aged 25–64 years if all geographic areas of Australia had experienced the same all-cause mortality rate as that exhibited by Highly Accessible areas (Table 4.3.3). Substantial numbers of deaths could also have been avoided for cancers (n=465), diseases of the circulatory system (n=1,134) and accidents and injury (n=869).

Table 4.3.3: Excess mortality by ARIA category, persons aged 25–64 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Number[(a)]	Per cent[(b)]	Number[(a)]	Per cent[(b)]
All causes	2,411	5.2	1,048	4.1
Cancers (C00–C97)	417	2.7	48	0.4
Lung cancer (C33, C34)	195	5.2	–13	–0.7
Diseases of the circulatory system (I00–I99)	746	6.5	388	9.0
Stroke (I60–I69)	–10	–0.7	65	6.1
Diseases of the digestive system (K00–K93)	129	6.6	83	9.5
Accidents and injury (V01–Y98)	733	7.4	136	4.6

(a) Total number of deaths that would have been avoided if all ARIA categories had the same mortality rate as highly accessible areas.

(b) Percentage of deaths that would have been avoided if all ARIA categories had the same mortality rate as highly accessible areas.

Source: ABS mortality data.

Indigenous deaths among 25–64 year olds, and their impact on geographic mortality inequalities

In 1997–1999, Indigenous Australians aged 25–64 years represented less than 4% of the Queensland, South Australian, Western Australian and Northern Territory populations; however, they accounted for approximately 14% of all deaths among this age group (ABS & AIHW 2001) (Table 4.3.4).

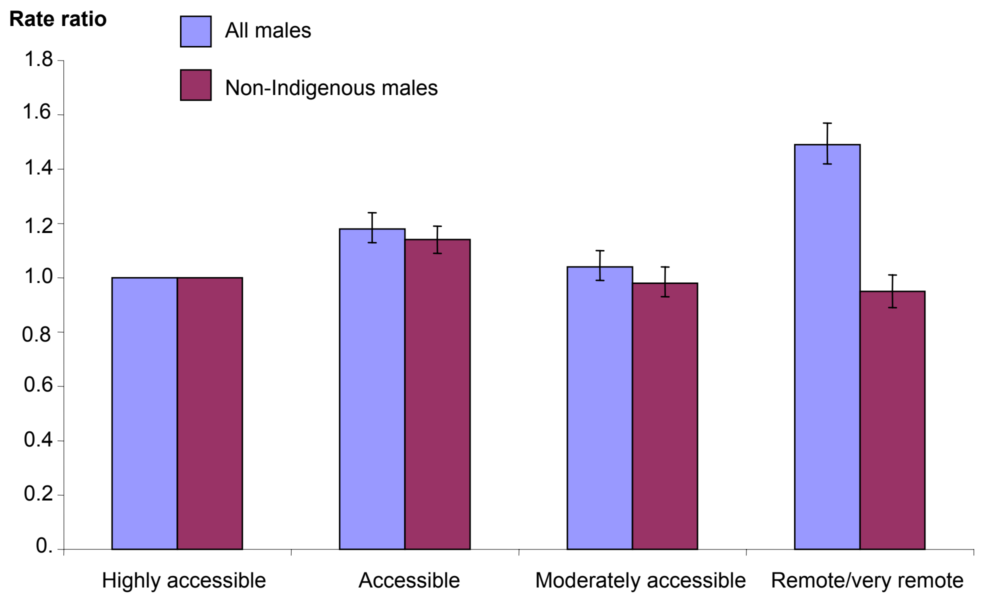
Table 4.3.4: Deaths identified as Indigenous,[(a)] persons aged 25–64 years, 1997–1999 (per cent)

Age group	Indigenous deaths as a proportion of all deaths	Indigenous population as a proportion of total population
25–34	13.7	3.8
35–44	13.9	2.6
45–54	9.0	1.8
55–64	5.3	1.5

(a) Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS & AIHW 2001.

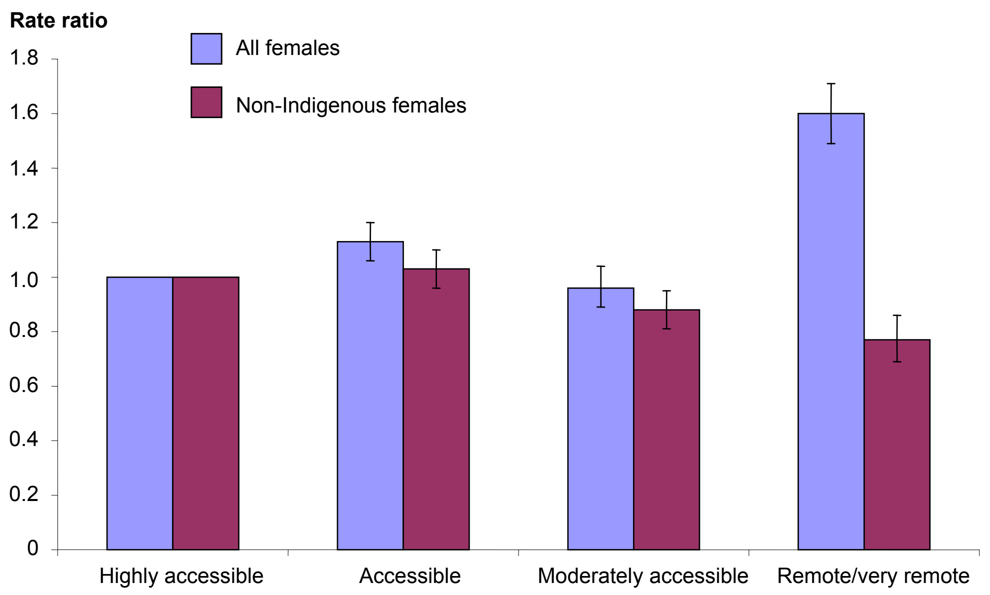
Figure 4.3.2 compares death rates across the ARIA categories for males aged 25–64 using data that first includes and then excludes Indigenous deaths. The total death rate for all males was 49% higher in Remote/Very Remote areas than in Highly Accessible areas: this difference was only 5% when based on deaths among non-Indigenous males. Indeed, as the figure shows, the all-cause death rate was actually lower in Remote/Very Remote areas than in Highly Accessible areas when calculated using non-Indigenous deaths. A similar pattern was observed among females: death rates were 60% higher in Remote/Very Remote areas when based on all deaths; but when deaths among Indigenous females were excluded, rates were 23% lower in Remote/Very Remote areas than in Highly Accessible areas (Figure 4.3.3).



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS mortality data.

Figure 4.3.2: Age-standardised all-cause mortality rates ratios by ARIA category, total male population and male non-Indigenous population aged 25–64 years, 1998–2000



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS mortality data.

Figure 4.3.3: Age-standardised all-cause mortality rate ratios by ARIA category, total female population and female non-Indigenous population aged 25–64 years, 1998–2000

4.4 Persons aged 65 years and over

In this report, deaths among those aged 65 years and over are expressed as rates per 1,000 persons, which is consistent with the earlier (benchmark) work of Mathers (1994b).

In 1998–2000, there was little difference in life expectancy across the ARIA categories for persons aged 65 years (Table 4.4.1). This contrasts with the younger age groups, where as much as 4 years separated the life expectancy of those from Highly Accessible and Remote/Very Remote areas.

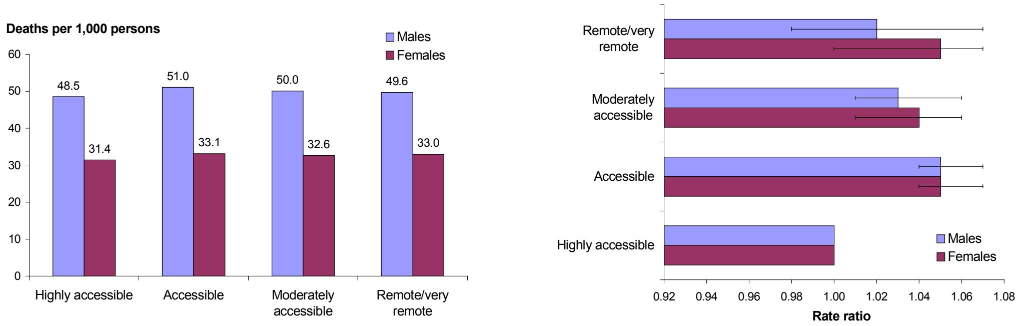
Table 4.4.1: Life expectancy, persons aged 65 years and over by ARIA category and sex, 1998–2000

ARIA category	Males	Females
Highly accessible	17.20	20.90
Accessible	16.76	20.47
Moderately accessible	16.88	20.64
Remote/very remote	17.03	21.05
Total population	**17.10**	**20.82**

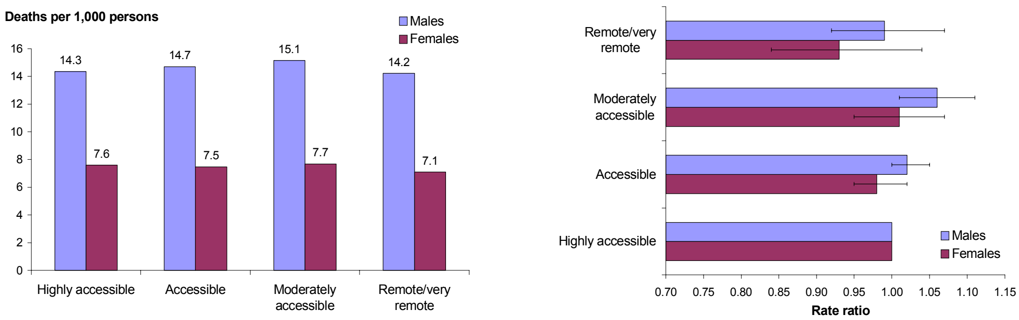
Source: ABS mortality data.

Among persons aged 65 years and older, all-cause and specific-cause mortality rates showed a mixed patterning across the ARIA categories (Figure 4.4.1; Table 4.4.2). The first thing to note about these data is that seemingly very small differences in death rates between the Highly Accessible and other categories were sometimes (statistically) significantly different. Second, for many conditions, it was the Remote/Very Remote category that had the lowest mortality rate. Third, and related, there was no clear evidence of a mortality gradient across the ARIA categories associated with the degree of remoteness. This contrasts with that found among the younger age groups where, more often than not, death rates increased in magnitude in a linear step-wise manner from Highly Accessible to Remote/Very Remote areas.

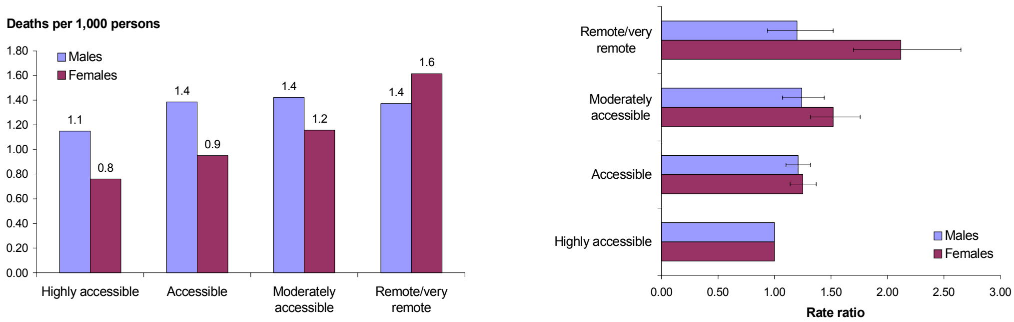
All causes



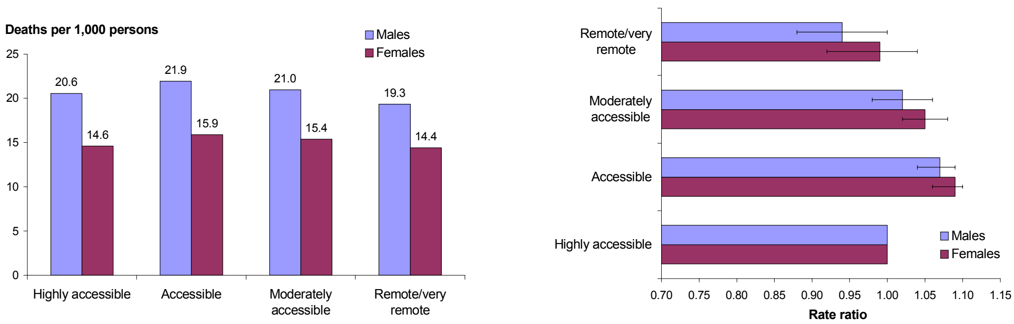
Cancers



Diabetes



Diseases of the circulatory system



Source: ABS mortality data.

Figure 4.4.1: Age-standardised mortality rates and rate ratios, selected causes of death by ARIA category and sex, persons aged 65 years and over, 1998–2000

Table 4.4.2: Age-standardised mortality rates and rate ratios byARIA category and sex, persons aged 65 years and over, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Highly accessible	48.48	1.00	31.43	1.00
Accessible	51.01	1.05***	33.09	1.05***
Moderately accessible	50.03	1.03*	32.62	1.04**
Remote/very remote	49.65	1.02	32.96	1.05*
Cancers (C00–C97)				
Highly accessible	14.34	1.00	7.60	1.00
Accessible	14.70	1.02	7.47	0.98
Moderately accessible	15.15	1.06*	7.69	1.01
Remote/very remote	14.21	0.99	7.11	0.93
Cancer of the digestive organs (C15–C26)				
Highly accessible	3.89	1.00	2.35	1.00
Accessible	3.95	1.02	2.37	1.01
Moderately accessible	3.91	1.01	2.43	1.03
Remote/very remote	4.07	1.05	2.01	0.86
Colon cancer (C18)				
Highly accessible	1.25	1.00	0.85	1.00
Accessible	1.28	1.03	0.97	1.14**
Moderately accessible	1.17	0.94	0.98	1.15
Remote/very remote	1.07	0.85	0.68	0.79
Cancer of the pancreas (C25)				
Highly accessible	0.59	1.00	0.49	1.00
Accessible	0.60	1.01	0.45	0.92
Moderately accessible	0.62	1.04	0.42	0.85
Remote/very remote	0.56	0.95	0.37	0.75
Lung cancer (C33, C34)				
Highly accessible	3.37	1.00	1.18	1.00
Accessible	3.41	1.01	1.11	0.95
Moderately accessible	3.64	1.08	1.11	0.95
Remote/very remote	3.59	1.07	1.22	1.03
Breast cancer (C50)				
Highly accessible	—	—	0.95	1.00
Accessible	—	—	0.97	1.02
Moderately accessible	—	—	0.87	0.91
Remote/very remote	—	—	0.87	0.92
Cancer of the male genital organs (C60–C63)				
Highly accessible	2.34	1.00	—	—
Accessible	2.68	1.14***	—	—
Moderately accessible	2.78	1.19**	—	—
Remote/very remote	2.35	1.00	—	—
Prostate cancer (C61)				
Highly accessible	2.33	1.00	—	—
Accessible	2.67	1.15***	—	—
Moderately accessible	2.75	1.18**	—	—
Remote/very remote	2.31	0.99	—	—

(continued)

Table 4.4.2 (continued): Age-standardised mortality rates and rate ratios by ARIA category and sex, persons aged 65 years and over, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)				
Highly accessible	1.36	1.00	0.85	1.00
Accessible	1.27	0.93	0.80	0.95
Moderately accessible	1.24	0.91	0.83	0.98
Remote/very remote	0.87	0.64**	0.54	0.64*
Endocrine, nutritional and metabolic diseases (E00–E90)				
Highly accessible	1.48	1.00	1.06	1.00
Accessible	1.71	1.16***	1.22	1.15***
Moderately accessible	1.68	1.14	1.51	1.43***
Remote/very remote	1.65	1.12	1.99	1.89***
Diabetes mellitus (E10–E14)				
Highly accessible	1.15	1.00	0.76	1.00
Accessible	1.38	1.21***	0.95	1.25***
Moderately accessible	1.42	1.24**	1.16	1.52***
Remote/very remote	1.37	1.20	1.61	2.12***
Diseases of the nervous system (G00–G99)				
Highly accessible	1.38	1.00	1.08	1.00
Accessible	1.28	0.93	1.14	1.05
Moderately accessible	1.17	0.85*	0.89	0.82*
Remote/very remote	0.85	0.62**	0.91	0.85
Alzheimer's disease (G30)				
Highly accessible	0.49	1.00	0.57	1.00
Accessible	0.46	0.94	0.67	1.18**
Moderately accessible	0.34	0.70*	0.37	0.66***
Remote/very remote	0.28	0.56*	0.53	0.93
Diseases of the circulatory system (I00–I99)				
Highly accessible	20.56	1.00	14.60	1.00
Accessible	21.94	1.07***	15.88	1.09***
Moderately accessible	20.95	1.02	15.40	1.05**
Remote/very remote	19.35	0.94	14.40	0.99
Ischaemic heart disease (I20–I25)				
Highly accessible	11.95	1.00	7.20	1.00
Accessible	12.58	1.05***	7.72	1.07**
Moderately accessible	11.91	1.00	7.57	1.05
Remote/very remote	10.86	0.91*	6.86	0.95
Acute myocardial infarction (I21)				
Highly accessible	6.65	1.00	4.12	1.00
Accessible	7.07	1.06**	4.40	1.07**
Moderately accessible	6.72	1.01	4.05	0.98
Remote/very remote	5.99	0.90	3.79	0.92
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)				
Highly accessible	2.39	1.00	1.97	1.00
Accessible	2.82	1.18***	2.49	1.26***
Moderately accessible	2.63	1.10	2.25	1.14**
Remote/very remote	2.56	1.07	2.40	1.22*

(continued)

Table 4.4.2 (continued): Age-standardised mortality rates and rate ratios by ARIA category and sex, persons aged 65 years and over, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Heart failure (I50)				
Highly accessible	0.97	1.00	0.88	1.00
Accessible	1.23	1.27***	1.17	1.33***
Moderately accessible	1.18	1.22*	1.15	1.31***
Remote/very remote	1.17	1.21	1.16	1.32*
Stroke (I60–I69)				
Highly accessible	4.47	1.00	4.11	1.00
Accessible	4.45	0.99	4.17	1.02
Moderately accessible	4.49	1.00	3.95	0.96
Remote/very remote	4.42	0.99	3.74	0.91
Diseases of arteries, arterioles and capillaries (I70–I79)				
Highly accessible	1.23	1.00	0.73	1.00
Accessible	1.48	1.20***	0.87	1.18***
Moderately accessible	1.36	1.10	0.84	1.15
Remote/very remote	1.10	0.89	0.67	0.92
Diseases of the respiratory system (J00–99)				
Highly accessible	4.81	1.00	2.55	1.00
Accessible	5.37	1.12***	2.58	1.01
Moderately accessible	5.03	1.05	2.31	0.91
Remote/very remote	6.33	1.31***	3.35	1.32***
Influenza and pneumonia (J10–J18)				
Highly accessible	0.90	1.00	0.69	1.00
Accessible	0.87	0.96	0.70	1.01
Moderately accessible	0.92	1.01	0.54	0.79*
Remote/very remote	1.20	1.33*	1.10	1.60
Chronic lower respiratory disease (J40–J47)				
Highly accessible	3.05	1.00	1.43	1.00
Accessible	3.75	1.23***	1.54	1.08
Moderately accessible	3.52	1.15**	1.40	0.98
Remote/very remote	4.34	1.42***	1.85	1.29*
Diseases of the digestive system (K00–K93)				
Highly accessible	1.37	1.00	1.06	1.00
Accessible	1.46	1.07	1.12	1.05
Moderately accessible	1.62	1.18*	1.28	1.21**
Remote/very remote	1.64	1.20	1.16	1.09
Diseases of the genitourinary system (N00–N99)				
Highly accessible	1.17	1.00	0.85	1.00
Accessible	1.10	0.94	0.82	0.97
Moderately accessible	0.99	0.85	0.87	1.02
Remote/very remote	1.56	1.34*	1.41	1.67***
Renal failure (N17–N19)				
Highly accessible	0.80	1.00	0.51	1.00
Accessible	0.79	0.99	0.52	1.03
Moderately accessible	0.67	0.84	0.48	0.96
Remote/very remote	1.03	1.29	0.87	1.73***

(continued)

Table 4.4.2 (continued): Age-standardised mortality rates and rate ratios by ARIA category and sex, persons aged 65 years and over, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Accidents and injury (V01–Y98)				
Highly accessible	1.12	1.00	0.67	1.00
Accessible	1.23	1.10	0.69	1.03
Moderately accessible	1.21	1.08	0.89	1.32***
Remote/very remote	1.57	1.14**	0.73	1.08
Falls (W00–W19)				
Highly accessible	0.17	1.00	0.11	1.00
Accessible	0.16	0.93	0.13	1.19
Moderately accessible	0.11	0.63	0.13	1.17
Remote/very remote	0.15	0.84	0.11	1.00

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Persons aged 65–74 and 75 years and over

Table 4.4.3 examines male and female mortality rates across the ARIA categories for a range of conditions for those aged 65–74 and 75 years and older. This table highlights some of the limitations of the foregoing data (in Table 4.4.2), which pertained to persons aged 65 years and over: examining deaths over such a wide age-range, especially given that most people now live well beyond 65, obscures some important patterns. Among the 65–74 year olds, we see a similar association between ARIA and mortality that was found for the younger age groups, namely, that mortality rates followed a graded pattern across the ARIA categories with the highest rates being observed in Remote/Very Remote areas. This is not evident among those aged 75 years and older: deaths among this group follow no obvious graded pattern (with the exception of diabetes among females) and it is those from Remote/Very Remote areas who experienced the lowest death rates.

Table 4.4.3: Age-standardised mortality rates and rate ratios by ARIA category, persons aged 65–74 years and 75 years and over, 1998–2000

	Males				Females			
	65–74 years		75 years & older		65–74 years		75 years & older	
Cause of death and ICD-10 codes	Rate(a)	Rate ratio	Rate(a)	Rate ratio	Rate(a)	Rate ratio	Rate(a)	Rate ratio
All causes								
Highly accessible	24.12	1.00	85.94	1.00	13.11	1.00	59.62	1.00
Accessible	26.11	1.08***	89.30	1.04***	13.96	1.06***	62.51	1.05***
Moderately accessible	27.73	1.15***	84.32	0.98	14.38	1.10**	60.82	1.02
Remote/very remote	32.38	1.34***	76.21	0.89***	18.81	1.43***	54.73	0.92**
Cancers (C00–C97)								
Highly accessible	9.84	1.00	21.27	1.00	5.47	1.00	10.89	1.00
Accessible	10.17	1.03	21.67	1.02	5.50	1.01	10.51	0.97
Moderately accessible	11.45	1.16***	20.84	0.98	5.54	1.01	11.01	1.01
Remote/very remote	11.55	1.17**	18.31	0.86**	6.14	1.12	8.59	0.79***
Diabetes mellitus (E10–E14)								
Highly accessible	0.66	1.00	1.90	1.00	0.40	1.00	1.31	1.00
Accessible	0.71	1.08	2.41	1.27***	0.46	1.13	1.71	1.30***
Moderately accessible	0.74	1.11	2.48	1.31**	0.54	1.33	2.11	1.61***
Remote/very remote	1.02	1.54*	1.92	1.01	1.19	2.94***	2.27	1.73***
Disease of the circulatory system (I00–I99)								
Highly accessible	8.51	1.00	39.09	1.00	4.14	1.00	30.69	1.00
Accessible	9.50	1.12***	41.08	1.05***	4.66	1.13***	33.14	1.08***
Moderately accessible	9.84	1.16***	38.05	0.97	4.60	1.11*	32.00	1.04*
Remote/very remote	10.92	1.28***	32.31	0.83***	6.17	1.49***	27.06	0.88***
Accidents and injury (V01–Y98)								
Highly accessible	0.60	1.00	1.91	1.00	0.30	1.00	1.25	1.00
Accessible	0.74	1.24**	1.98	1.04	0.26	0.86	1.37	1.09
Moderately accessible	0.69	1.16	2.00	1.05	0.48	1.62**	1.51	1.21*
Remote/very remote	1.30	2.17***	1.99	1.04	0.41	1.37	1.22	0.97

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Indigenous deaths among older persons, and their impact on geographic mortality inequalities

In 1999–2001, Indigenous Australians aged 65–74 and 75 years and older represented approximately 1% and 0.5% respectively of the total population of Queensland, South Australia, Western Australia and the Northern Territory (ABS & AIHW 2003). During this period, however, they accounted for a disproportionately higher number of deaths than would be expected given their representation in the population of these states and territories (Table 4.4.4).

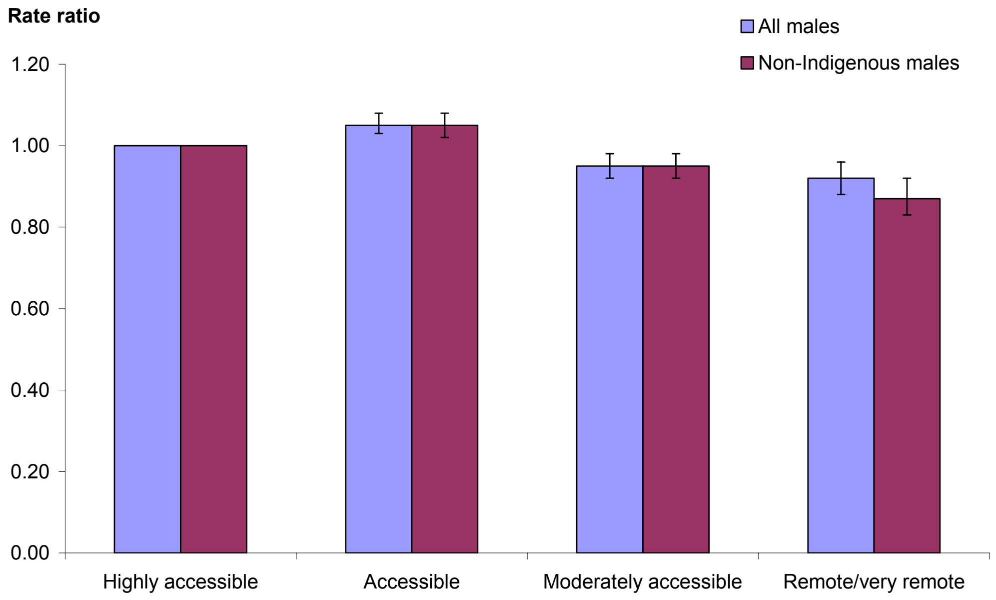
Table 4.4.4: Deaths identified as Indigenous,[(a)] persons aged 65 years and over, 1999–2001 (per cent)

Age group	Indigenous deaths as a proportion of all deaths	Indigenous population as a proportion of total population
65–74	2.6	1.0
75 years and older	0.8	0.5

(a) Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS & AIHW 2003.

Figures 4.4.2 and 4.4.3 present the all-cause mortality profiles for the ARIA categories for males and females aged 65 years and over, using data that first included and then excluded Indigenous persons. Among males, mortality rates in 1998–2000 were 8% lower in Remote/Very Remote areas than in Highly Accessible areas when based on all deaths, and 13% lower when deaths among Indigenous males were excluded (Figure 4.4.2). Mortality rates for the other ARIA categories were the same irrespective of whether they were calculated using deaths among all males or only non-Indigenous males.

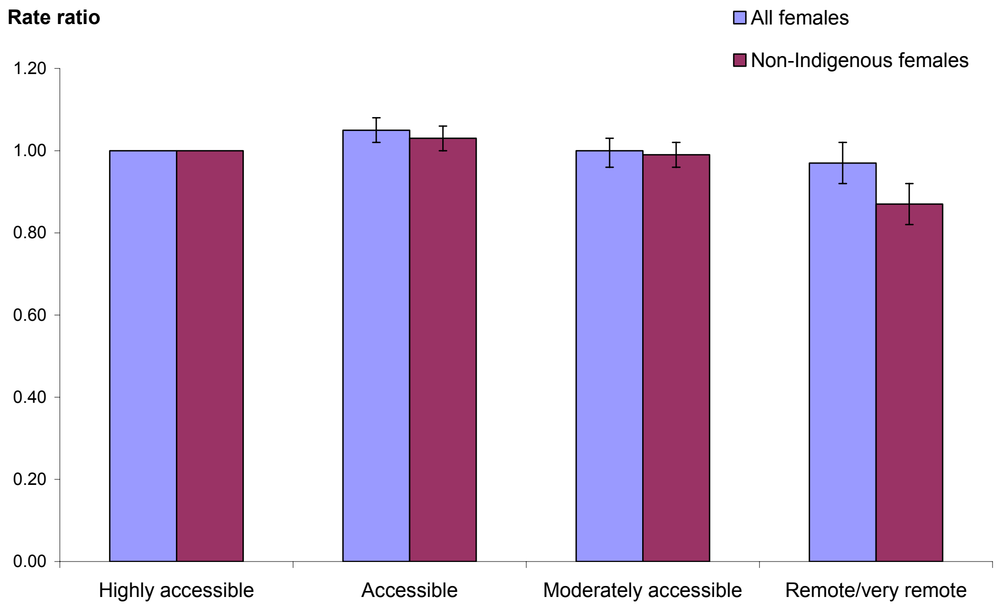


Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS mortality data.

Figure 4.4.2: Age-standardised all-cause mortality rate ratios by ARIA category, total male population and male non-Indigenous population aged 65 years and over, 1998–2000

For females, the all-cause mortality rate in Accessible areas was 5% higher than that found in Highly Accessible areas when based on all female deaths, and 3% higher with Indigenous deaths excluded (Figure 4.4.3). The corresponding difference for the Moderately Accessible category was 1%. In Remote/Very Remote areas, all-cause mortality was 3% lower than that observed in Highly Accessible areas when calculated using deaths among all females aged 65 years or more, and 13% lower with Indigenous deaths excluded.



Note: Data are for Queensland, South Australia, Western Australia and the Northern Territory.

Source: ABS mortality data.

Figure 4.4.3: Age-standardised all-cause mortality rate ratios by ARIA category, total female population and female non-Indigenous population aged 65 years and over, 1998–2000

4.5 Summary and discussion

This chapter has examined mortality inequalities by geographic region for males and females at different lifecourse stages, for the period 1998–2000. In general, the overall mortality pattern indicated that geographic remoteness and rates of death were positively related. For all causes of death, and for most specific causes, death rates tended to be lowest in Highly Accessible areas and highest in Remote/Very Remote areas. Importantly, mortality inequalities between geographic areas did not reduce simply to differences between the least and most remote areas; rather, death rates often followed a graded pattern, increasing in a step-wise manner across the ARIA categories (i.e. as remoteness increased). Life expectancy at birth, and at age 15 and 25, were also related to geographic remoteness, with predicted longevity being greatest in Highly Accessible areas and lowest in Remote/Very Remote areas. Further, analyses showed that geographic differences in mortality made a substantial contribution to the total mortality burden in the population. If it were possible to reduce death rates among the ARIA categories to a level equivalent to that of Highly Accessible areas, large savings in premature mortality would result: during 1998–2000 this was estimated at 304 deaths among infants (aged less than 1 year); 399 deaths among persons aged 0–14; 477 deaths among adolescents and young adults (15–24 years); and 3,459 deaths among working-aged adults (25–64 years). It should be noted that many of the geographic mortality inequalities presented in this chapter were probably actually larger than that reported due to the need to combine the Remote and Very Remote categories. The mortality estimate for the Remote/Very Remote category was in effect an average of the two separate categories, which served to attenuate the true difference in mortality inequalities across the ARIA categories.

The findings of this chapter are similar to that found in a number of earlier Australian studies (Mathers 1994a, 1994b, 1995, 1996; Strong et al. 1998a; Glover et al. 1999; AIHW 2002; ABS 2002), although the only other known study to report mortality inequalities using the ARIA classification was that conducted by Glover et al. (1999). This work showed that during the period 1992–1995, death rates among infants and those aged 15–64 were usually lowest in Highly Accessible areas, intermediate (but often increasing) across the Accessible, Moderately Accessible and Remote categories, and highest in Very Remote areas.

Among older persons, mortality rates by geographic region followed a somewhat more complicated pattern than was evident for the younger age groups. For males and females aged 65 years and over, there were few significant differences in rates of mortality across the ARIA categories, and where differences did exist, they were not necessarily between the Highly Accessible and Remote/Very Remote areas: very often, the differences were between the Highly Accessible, Accessible, and Moderately Accessible areas. On further examination it became evident that the use of a broad age grouping such as '65 or more' obscured a number of important underlying patterns. Specifically, among those aged 65–74, death rates followed a pattern across the ARIA categories that was consistent with those reported for younger people: namely, graded rates of death that increased in magnitude from Highly Accessible to Remote/Very Remote areas. Among males and females aged 75 years and older, however, we witnessed a flattening of the gradient (for most but not all conditions examined), with death rates often being highest in the Accessible and Moderately Accessible areas and lowest in the Remote/Very Remote areas. There are a number of possible reasons for this, and each probably makes a contribution to the flattening and reversal of the mortality gradient among this elderly group. First, this mortality patterning may be due to 'selective survival': at younger ages, males and females from Remote/Very Remote areas experience substantially higher levels of premature mortality, resulting in a disproportionate attrition of persons from these areas, leaving behind the most resilient (and presumably healthy) of their cohort, who as a result, manifest a mortality profile in old age that is similar to (and sometimes better than) their counterparts from Highly Accessible areas. Second, elderly persons from rural and remote areas who experience severe chronic illness late in life may relocate to urban areas for treatment and/or to be close to essential health services, or to spend their remaining time with family. This then becomes their place of residence, and hence place of death as recorded on the death information form.

Previous Australian studies investigating the relationship between geographic area and mortality have discussed the possibility that the higher death rates in non-metropolitan regions, especially Remote and Very Remote areas, was due to the combined effects of the disproportionate concentration of Indigenous peoples in these areas, and their much poorer mortality experience (Coory 2003; Glover et al. 1999; AIHW 2002). We examined this issue and, overall, our results confirmed that deaths among Indigenous persons contributed substantially to geographic differences in all-cause mortality, with the greatest impact on mortality rates being observed in Remote/Very Remote areas. This pattern was evident for males and females in all age groups, although it was much less marked among those aged 65 years or more. Thus the findings of this report suggest that a large part of the 'health disadvantage' of people living in rural and remote areas is due to the higher death rates of Indigenous persons. Importantly, it needs to be emphasised that this study used mortality as its sole indicator of health status, and while mortality is a valid, reliable, and objective measure, it is nevertheless a somewhat limited marker of health's many other dimensions. Thus when health is conceptualised more broadly—to encompass such things as morbidity, hospitalisation rates, risk factor behaviour, and health service provision and utilisation—it appears that the health of people living in rural and remote regions of Australia is worse than those living in metropolitan regions (Wilkinson & Blue 2002).

5 Mortality differences by socioeconomic disadvantage

A large and growing international literature has documented the association between socioeconomic position (SEP) and mortality (House & Williams 2000; Lynch & Kaplan 2000; Feinstein 1993; Krieger & Fee 1994; Ostrove & Adler 1998; Williams & Collins 1995; Davey Smith et al. 1998; Kaplan et al. 1996), with disadvantaged groups experiencing higher death rates for most major causes of death. These socioeconomic differences in mortality are evident for both males and females at every stage of the lifecourse (House et al. 1994; Mustard et al. 1997) and they have been found in different historic periods (Krieger & Fee 1996) and in all countries where socioeconomic data are collected (Ancona et al. 2000; Mackenbach 1994; Song & Byeen 2000). There is also growing evidence that mortality inequalities have widened over time in some countries (Marmot & McDowall 1986; Marang-van de Mheen et al. 1998; McCarron et al. 1994; Pappas et al. 1993; Feldman et al. 1989; Dunleep 1989; Borrell et al. 1997; Regidor et al. 1995). These increasing disparities appear to be due to faster declines in mortality among those in higher socioeconomic positions, although in a number of countries there is evidence of an actual increase in mortality rates for some conditions among the most disadvantaged.

Socioeconomic inequalities in mortality have also been repeatedly observed within the Australian population (McMichael 1985; Siskind et al. 1992; Mathers 1994a, 1994b, 1995, 1996; Bennett 1996; Burnley 1998; Turrell et al. 1999; Glover et al. 1999; Turrell & Mengersen 2000; Turrell & Mathers 2001). These studies have shown that Australia has substantial socioeconomic mortality inequalities, with death rates typically being highest among the disadvantaged.

This chapter examines area-based socioeconomic mortality inequalities among infants and children (0–14 years), young adults (15–24 years), working-aged adults (25–64 years), and older persons (65 years and older) for the period 1998–2000. We also examine trends in mortality inequalities over the period 1985–1987 to 1998–2000, plus estimate the proportion of total mortality in the Australian population that was attributable to socioeconomic disadvantage in the latter period.

We use a geographic measure of SEP known as the Index of Relative Socioeconomic Disadvantage (IRSD), developed by the Australian Bureau of Statistics (ABS) using 1996 Census data to categorise areas on the basis of their social and economic characteristics (ABS 1998b). The IRSD is derived from the following area-attributes:

- Persons aged 15 and over with no qualifications (%)
- Families with income less than $15,600 (%)
- Families with offspring having parental income less than $15,000 (%)
- Females (in labour force) unemployed (%)
- Males (in labour force) unemployed (%)
- Employed females classified as 'Labourer and Related Workers' (%)
- Employed males classified as 'Labourer and Related Workers' (%)
- Employed males classified as 'Intermediate Production and Transport Workers' (%)
- Employed females classified as 'Intermediate Production and Transport Workers' (%)
- Employed females classified as 'Elementary Clerical, Sales and Service Workers' (%)
- Employed males classified as 'Tradespersons' (%)

- One-parent families with dependent offspring only (%)
- Households renting (government authority) (%)
- Persons aged 15 and over separated or divorced (%)
- Dwellings with no motor cars at dwelling (%)
- Persons aged 15 and over who did not go to school (%)
- Aboriginals or Torres Strait Islanders (%)
- Occupied private dwellings with two or more families (%)
- Lacking fluency in English (%).

The IRSD is compiled initially at the Collector's District (CD) level, a census collection unit broadly equivalent in urban areas to a small group of suburban blocks, comprising approximately 250 dwellings (CDs in rural regions usually contain fewer dwellings). This study uses IRSD scores for Statistical Local Areas (SLAs), which in most cases correspond to council boundaries defined by Local Government Areas. IRSD scores for each SLA are constructed by computing weighted average scores (using population census counts) across all CDs comprising the SLA. In aggregate, SLAs cover the whole of Australia without gaps or overlaps. For the years 1985–87 and 1998–2000, deceased persons were classified into quintiles of socioeconomic disadvantage according to the value of the IRSD for their SLA of usual residence, with Quintile 1 corresponding to the highest socioeconomic area and Quintile 5 the lowest. SLAs were grouped into quintiles so that each contained approximately 20% of the total Australian population.

5.1 Persons aged 0–14 years

In 1998–2000, life expectancy at birth for boys born in the least disadvantaged areas of Australia was around 2.4 years higher than the national average, and 3.9 years higher than for boys born in the most disadvantaged areas (Table 5.1.1). Life expectancy for girls born in the most advantaged areas was 83.6 years: this was approximately 1.2 years higher than for all new-born girls, and 2.0 years greater than for girls born in the most disadvantaged areas.

Table 5.1.1: Life expectancy by IRSD quintile and sex, children born 1998–2000

IRSD quintile	Boys	Girls
Quintile 1 (Least disadvantaged)	79.2	83.6
Quintile 2	77.6	83.0
Quintile 3	76.4	82.2
Quintile 4	76.1	82.1
Quintile 5 (Most disadvantaged)	75.3	81.6
Total persons	**76.8**	**82.4**

Source: ABS mortality data.

Infants aged less than 1 year

In 1998–2000, infants from the most disadvantaged areas experienced significantly higher all-cause mortality rates than infants from the least disadvantaged areas: for boys, the difference was 80% (337 more deaths per 100,000) and for girls, 57% (214 more deaths per 100,000)(Table 5.1.2). Significant differences between the least and most disadvantaged areas were also found for certain conditions originating in the perinatal period, congenital malformations, deformations and chromosomal abnormalities, and SIDS: for each of these conditions, death rates were highest in the most disadvantaged areas.

Table 5.1.2: Selected causes of death, children aged less than 1 year by IRSD quintile and sex, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Quintile 1	419.6	1.00	372.3	1.00
Quintile 2	516.1	1.23**	408.6	1.10
Quintile 3	555.2	1.32***	424.2	1.14
Quintile 4	634.0	1.51***	519.8	1.40***
Quintile 5	756.7	1.80***	586.0	1.57***
Certain conditions originating in the perinatal period (P00–P96)				
Quintile 1	220.5	1.00	187.0	1.00
Quintile 2	252.6	1.15	219.9	1.18
Quintile 3	257.7	1.17	210.2	1.12
Quintile 4	279.7	1.27	226.5	1.21
Quintile 5	351.4	1.59***	238.6	1.28*
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)				
Quintile 1	116.4	1.00	103.2	1.00
Quintile 2	141.9	1.22	106.4	1.03
Quintile 3	133.7	1.15	130.1	1.26
Quintile 4	179.0	1.54**	151.9	1.47*
Quintile 5	187.0	1.61***	153.8	1.49**
Sudden Infant Death Syndrome (R95)				
Quintile 1	32.2	1.00	29.0	1.00
Quintile 2	48.6	1.51	29.8	1.03
Quintile 3	74.7	2.32***	26.3	0.91
Quintile 4	74.6	2.32***	62.9	2.97**
Quintile 5	97.9	3.04***	71.6	2.47***

(a) Deaths per 100,000 persons.

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

If infant death rates across the IRSD quintiles were equivalent to the most advantaged areas, approximately 1,197 deaths could have been avoided in 1998–2000 (Table 5.1.3). Substantial numbers of deaths could also have been avoided for a range of specific conditions.

Table 5.1.3: Excess mortality by IRSD quintile and sex, children aged less than 1 year, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Number[(a)]**	**Per cent[(b)]**	**Number[(a)]**	**Per cent[(b)]**
All causes	794	29.0	403	19.4
Certain conditions originating in the perinatal period (P00–P96)	198	18.7	101	12.7
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	156	24.3	112	21.8
Accidents and injury (V01–Y98)	199	63.9	78	38.4

(a) Total number of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged area.

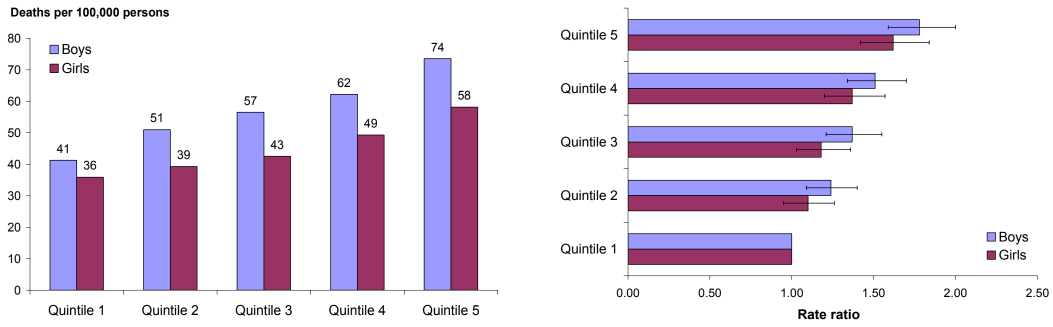
(b) Percentage of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged area.

Source: ABS mortality data.

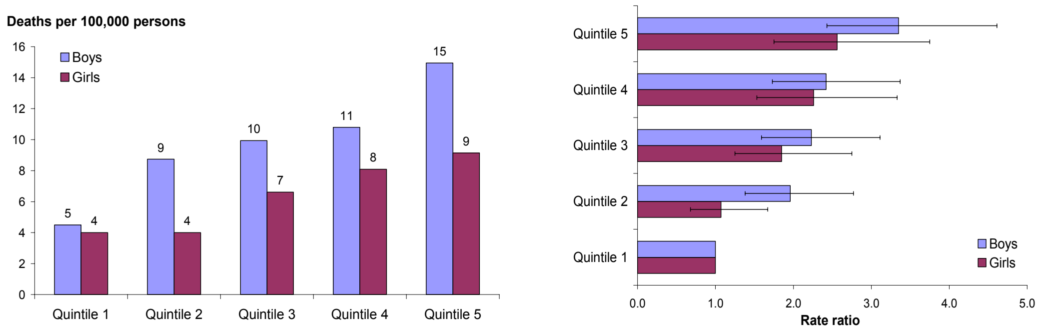
Children aged 0–14 years

In 1998–2000, young children from the most disadvantaged areas of Australia experienced significantly higher death rates for all causes: for male children, the difference between the most and least disadvantaged areas was 78% (32 more deaths per 100,000), and for female children, 62% (22 more deaths per 100,000)(Figure 5.1.1, Table 5.1.4). Children from disadvantaged areas also experienced a greater loss of potential years of life, higher mortality for potentially avoidable deaths, and substantially higher death rates for accidents and injury.

All causes



Accidents and injury



Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data.

Figure 5.1.1: Age-standardised mortality rates and rate ratios, selected causes of death by IRDS quintile and sex, children aged 0–14 years, 1998–2000

Table 5.1.4: Age-standardised mortality rates and rate ratios, children aged 0–14 years by IRSD quintile and sex, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Quintile 1	41.3	1.00	35.9	1.00
Quintile 2	51.0	1.24***	39.3	1.10
Quintile 3	56.5	1.37***	42.5	1.18*
Quintile 4	62.2	1.51***	49.3	1.37***
Quintile 5	73.5	1.78***	58.2	1.62***
PYLL[(b)]				
Quintile 1	28.1	1.00	24.3	1.00
Quintile 2	35.5	1.26***	27.3	1.13
Quintile 3	39.7	1.41***	29.9	1.23**
Quintile 4	43.9	1.56***	34.7	1.43***
Quintile 5	52.0	1.87***	41.1	1.70***
Potentially avoidable deaths				
Quintile 1	21.0	1.00	16.3	1.00
Quintile 2	26.0	1.23*	19.8	1.21
Quintile 3	26.3	1.25**	19.5	1.20
Quintile 4	31.9	1.52***	24.7	1.52***
Quintile 5	38.2	1.82***	28.7	1.76***
Accidents and injury (V01–Y98)				
Quintile 1	4.5	1.00	3.6	1.00
Quintile 2	8.7	1.96***	3.8	1.07
Quintile 3	9.9	2.23***	6.6	1.85**
Quintile 4	10.8	2.42***	8.1	2.26***
Quintile 5	15.0	3.35***	9.2	2.56***

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Approximately 1,491 deaths among 0–14 year olds (males n=958, females n=533) could have been avoided in 1998–2000 if the mortality rates for each of the IRSD quintiles were equivalent to that observed in the most advantaged quintile (Table 5.1.5). Large numbers of deaths could also have been avoided for accidents and injury.

Table 5.1.5: Excess mortality by IRSD quintile and sex, children aged 0–14 years, 1998–2000

	Boys		Girls	
Cause of death and ICD-10 codes	**Number[(a)]**	**Per cent[(b)]**	**Number[(a)]**	**Per cent[(b)]**
All causes	958	28.3	533	21.1
Accidents and injury (V01–Y98)	327	55.0	158	44.0

(a) Total number of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged area.

(b) Percentage of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged area.

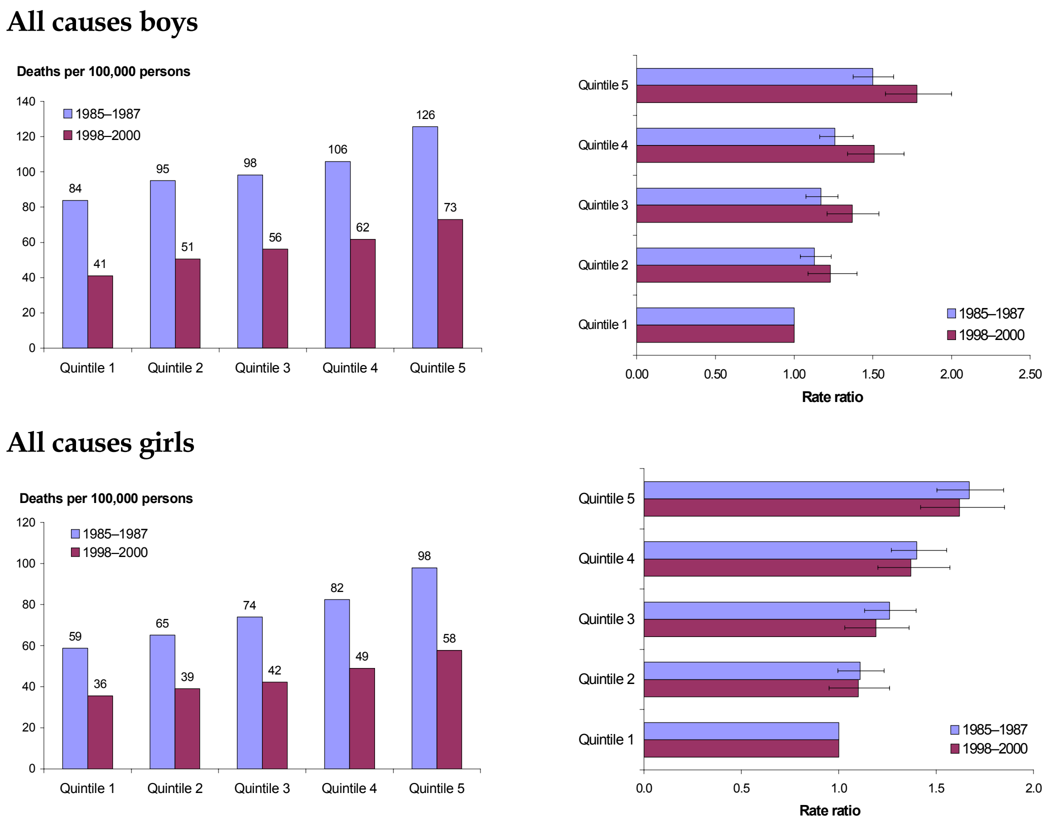
Source: ABS mortality data.

Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, all-cause mortality rates for children aged 0–14 years decreased markedly for all socioeconomic quintiles (Figure 5.1.2).

For boys, relative mortality inequalities for all causes widened over the period: in 1985–1987 death rates in the most disadvantaged areas were approximately 50% higher than in the least disadvantaged, and in 1998–2000 the corresponding difference was 78%. In terms of absolute death rates however, the difference between the most and least disadvantaged quintiles narrowed: from 42 deaths per 100,000 in 1985–1987 to 32 deaths per 100,000 in 1998–2000.

For girls, relative mortality inequality for all causes between the most and least disadvantaged areas declined slightly over the two periods from 66% in 1985–1987 to 61% in 1998–2000. Declines were also observed in terms of absolute death rates: in the earlier period, there was a difference of 39 deaths per 100,000 between the most and least disadvantaged areas, and in the later period, this difference was 22 deaths per 100,000.



Notes: Age-standardised to the total Australian population as of 30 June 1988. Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Sources: ABS mortality data; Mathers 1995.

Figure 5.1.2: Age-standardised mortality rates and rate ratios, all-cause mortality by IRSD quintile and sex, children aged 0–14 years, 1985–1987 and 1998–2000

5.2 Persons aged 15–24 years

In 1998–2000, males aged 15 years and living in the most disadvantaged areas of Australia had a life expectancy of 61.2 years: this was 3.5 years fewer than their counterparts from the most advantaged areas, who had a life expectancy of 64.7 years (Table 5.2.1). For females, the corresponding difference in life expectancy between the most and least disadvantaged areas was 1.7 years, with girls aged 15 years residing in the former areas living an estimated 67.3 years, and the latter, 69.0 years.

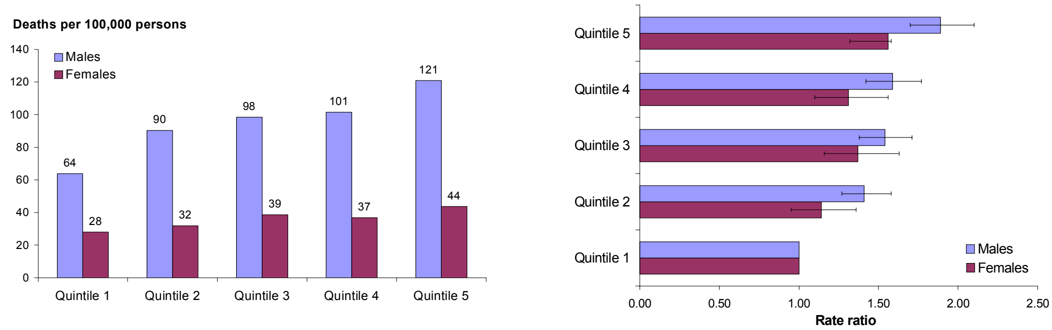
Table 5.2.1: Life expectancy, persons at 15 years by IRSD quintile and sex, 1998–2000

IRSD quintile	Males	Females
Quintile 1 (Least disadvantaged)	64.7	69.0
Quintile 2	63.2	68.5
Quintile 3	62.0	67.7
Quintile 4	61.8	67.7
Quintile 5 (Most disadvantaged)	61.2	67.3
Total persons	**62.5**	**68.0**

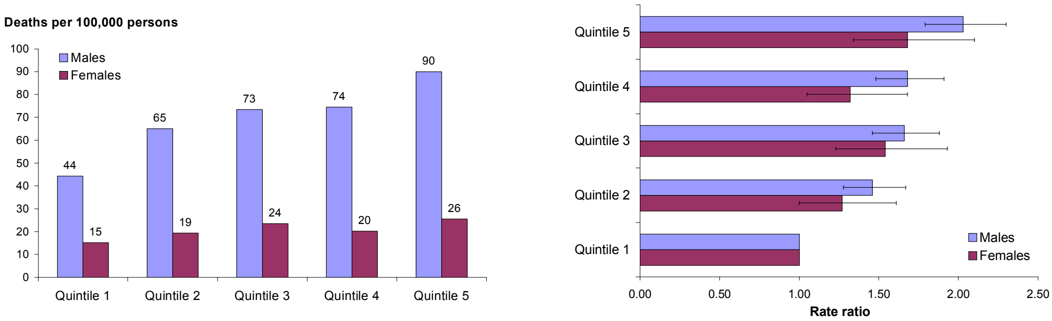
Source: ABS mortality data.

Males and females aged 15–24 from socioeconomically disadvantaged areas experienced significantly higher death rates for all causes, and for a number of specific causes (Figure 5.2.1; Table 5.2.2). Young adults from disadvantaged areas also experienced a greater loss of potential years of life, and higher mortality for potentially avoidable deaths.

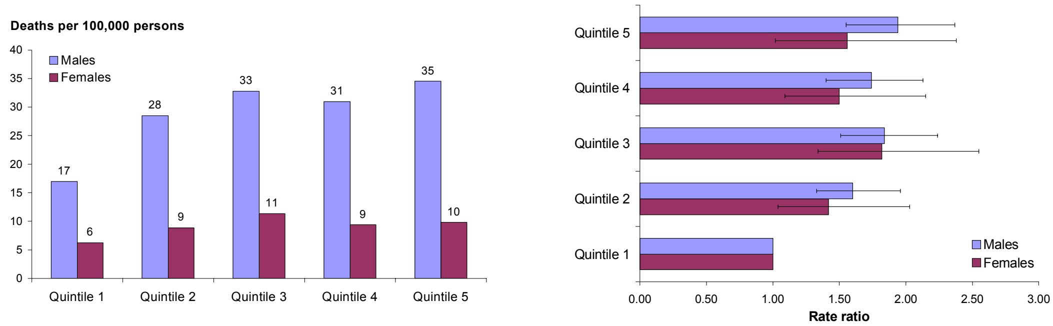
All causes



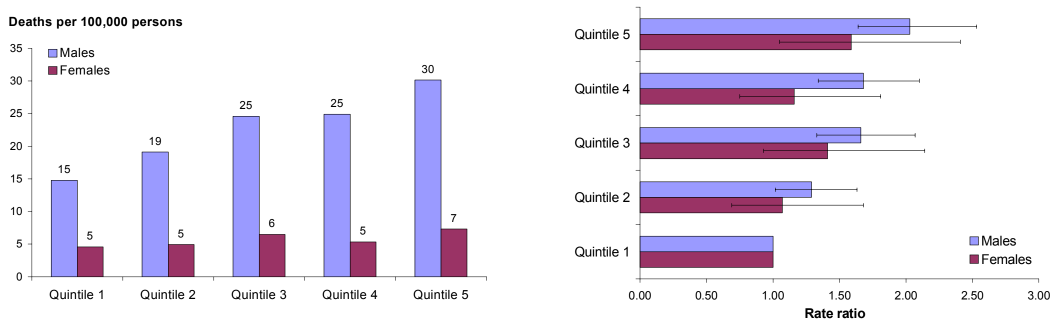
Accidents and injury



Transport accidents



Suicide



Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data.

Figure 5.2.1: Age-standardised mortality rates and rate ratios, selected causes of death by IRSD quintile and sex, persons aged 15–24 years, 1998–2000

Table 5.2.2: Age-standardised mortality rates and rate ratios, persons aged 15–24 years by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Quintile 1	63.9	1.00	28.0	1.00
Quintile 2	90.3	1.41***	31.9	1.14
Quintile 3	98.4	1.54***	38.5	1.37***
Quintile 4	101.4	1.59***	36.8	1.31**
Quintile 5	120.9	1.89***	43.7	1.56***
PYLL[(b)]				
Quintile 1	35.2	1.00	15.5	1.00
Quintile 2	49.8	1.41***	17.7	1.14
Quintile 3	54.1	1.53***	21.3	1.38***
Quintile 4	55.4	1.53***	20.3	1.31**
Quintile 5	66.0	1.87***	24.2	1.56***
Potentially avoidable deaths				
Quintile 1	39.0	1.00	14.4	1.00
Quintile 2	54.1	1.39***	16.7	1.16
Quintile 3	63.7	1.63***	24.8	1.71***
Quintile 4	61.5	1.58***	20.4	1.41**
Quintile 5	72.2	1.85***	23.9	1.66***
Accidents and injury (V01–Y98)				
Quintile 1	44.4	1.00	15.3	1.00
Quintile 2	65.0	1.46***	19.4	1.27*
Quintile 3	73.5	1.66***	23.5	1.54***
Quintile 4	74.5	1.68***	20.2	1.32*
Quintile 5	89.9	2.03***	25.6	1.68***
Transport accidents (V01–V99)				
Quintile 1	17.0	1.00	6.3	1.00
Quintile 2	28.5	1.60***	8.9	1.42
Quintile 3	32.8	1.84***	11.4	1.82***
Quintile 4	31.0	1.74***	9.4	1.50*
Quintile 5	34.5	1.94***	9.8	1.56*
Suicide (X60–X84)				
Quintile 1	14.8	1.00	4.6	1.00
Quintile 2	19.1	1.29*	4.9	1.07
Quintile 3	24.6	1.66***	6.5	1.41
Quintile 4	24.9	1.68***	5.3	1.16
Quintile 5	30.1	2.03***	7.3	1.59*

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

In 1998–2000, approximately 1,550 deaths could have been avoided among persons aged 15–24 years if death rates in Quintiles 2–5 were equivalent to those experienced by young adults in the least disadvantaged areas (Quintile 1) (Table 5.2.3). Substantial numbers of deaths could also have been avoided for accidents and injury (n=1,226) and suicide (n=359), particularly among males.

Table 5.2.3: Excess mortality, selected causes of death by IRSD quintile and sex, persons aged 15–24 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Number[(a)]**	**Per cent[(b)]**	**Number[(a)]**	**Per cent[(b)]**
All causes	1,251	32.3	299	21.4
Accidents and injury (V01–Y98)	1,011	35.7	215	26.4
Transport accidents (V01–V99)	452	38.2	112	31.4
Suicide (X60–X84)	315	34.2	44	19.7

(a) Total number of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged group.

(b) Percentage of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged group.

Source: ABS mortality data.

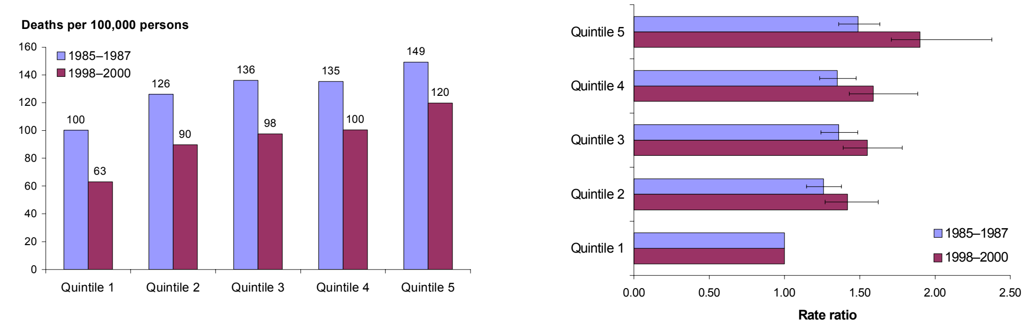
Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, all-cause mortality rates for persons aged 15–24 years decreased for all socioeconomic quintiles (Figure 5.2.2).

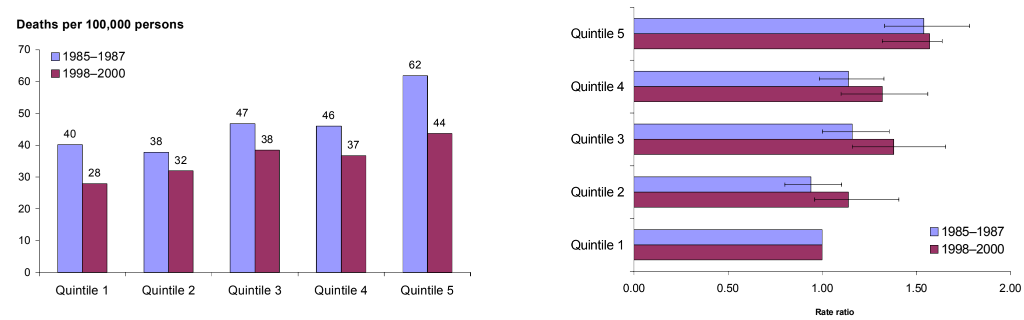
For males, relative mortality inequalities for all causes widened over the period: in 1985–1987 death rates in the most disadvantaged areas were approximately 49% higher than in the least disadvantaged, and in 1998–2000 the corresponding difference was 90%. In terms of absolute death rates, the difference between the most and least disadvantaged quintiles also increased: from 49 deaths per 100,000 in 1985–1987 to 57 deaths per 100,000 in 1998–2000.

For females, relative mortality inequality for all causes between the most and least disadvantaged areas increased slightly over the two periods from 55% in 1985–1987 to 57% in 1998–2000. In terms of absolute death rates however, declines were observed: in the earlier period, there was a difference of 22 deaths per 100,000 between the most and least disadvantaged areas, and in the later period, this difference was 16 deaths per 100,000.

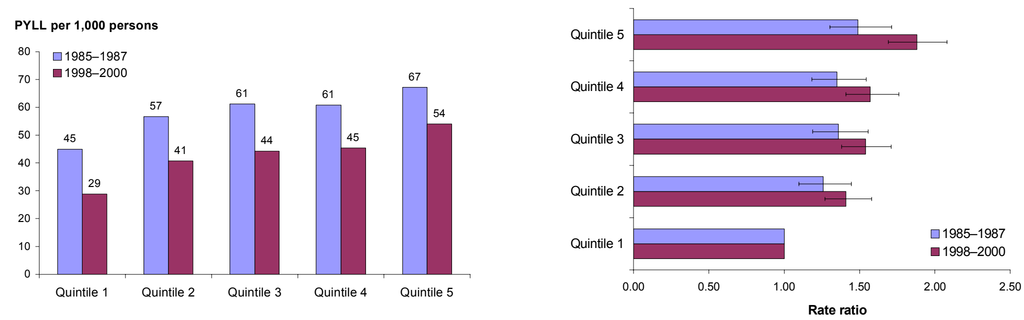
All causes males



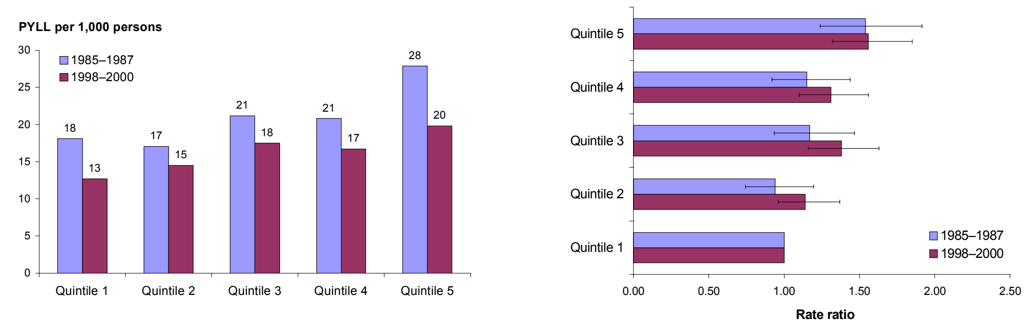
All causes females



PYLL males



PYLL females



Notes: Ages standardised to the total Australian population as of 30 June 1988. Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Sources: ABS mortality data; Mathers 1995.

Figure 5.2.2: Age-standardised mortality rates and rate ratios, all causes and PYLL by IRSD quintile and sex, persons aged 15–24 years, 1985–1987 and 1998–2000

5.3 Persons aged 25–64 years

In 1998–2000, males aged 25 years who were resident in the most disadvantaged areas had a life expectancy of 51.8 years, which was 3.3 years less than for 25 year old males living in the least disadvantaged areas (Table 5.3.1). Among females aged 25, differences in life expectancy between the least and most disadvantaged areas were somewhat smaller at 1.7 years.

Table 5.3.1: Life expectancy by IRSD quintile and sex, persons aged 25 years, 1998–2000

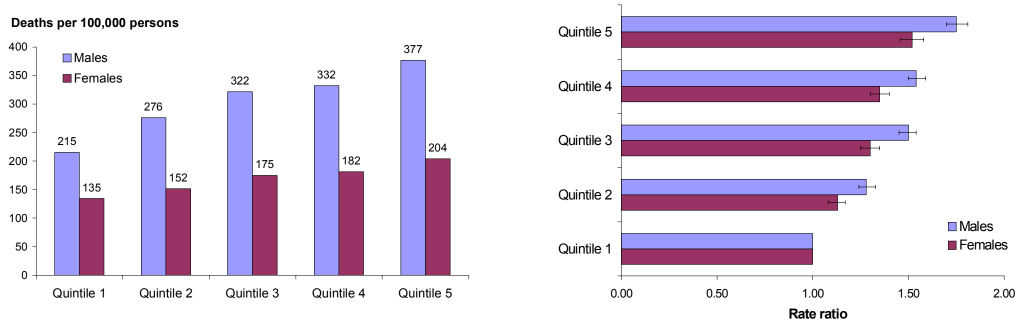
IRSD quintile	Males	Females
Quintile 1 (Least disadvantaged)	55.1	59.2
Quintile 2	53.8	58.7
Quintile 3	52.6	57.9
Quintile 4	52.4	57.9
Quintile 5 (Most disadvantaged)	51.8	57.5
Total population	**53.1**	**58.2**

Source: ABS mortality data.

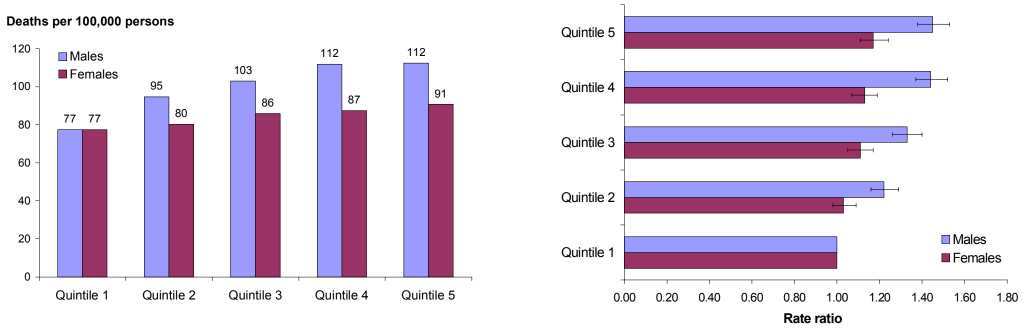
The all-cause mortality rate for males living in the most disadvantaged areas was 75% higher than for males from the least disadvantaged areas (Figure 5.3.1; Table 5.3.2). The corresponding difference in all-cause mortality among females was 52%. Significant differences in death rates were also found for many specific conditions. Compared with persons from the least disadvantaged areas of Australia, those from the most disadvantaged had higher mortality rates for:

- potentially avoidable deaths: 84% higher for males (113 more deaths per 100,000), 58% for females (48 more deaths per 100,000);
- lung cancer: 102% higher for males (15 more deaths per 100,000), 73% for females (6 more deaths per 100,000);
- diseases of the circulatory system: 112% higher for males (53 more deaths per 100,000), 127% for females (23 more deaths per 100,000);
- diseases of the respiratory system: 181% higher for males (10 more deaths per 100,000), 143% for females (7 more deaths per 100,000);
- diseases of the digestive system: 130% higher for males (10 more deaths per 100,000), 118% for females (4 more deaths per 100,000); and
- accidents and injury: 75% higher for males (36 more deaths per 100,000), 67% for females (20 more deaths per 100,000)

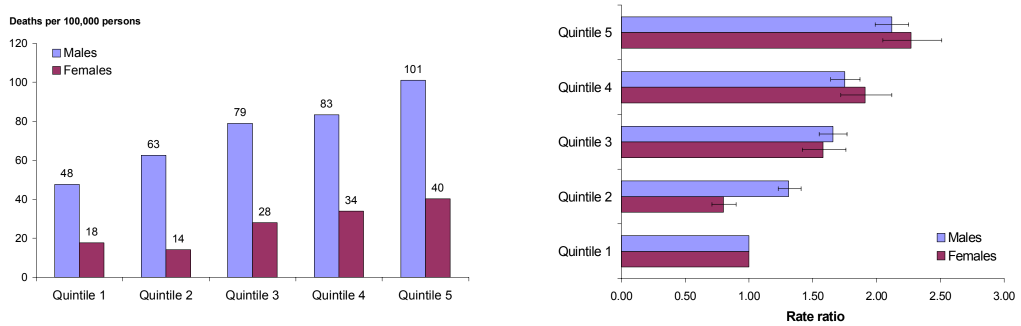
All causes



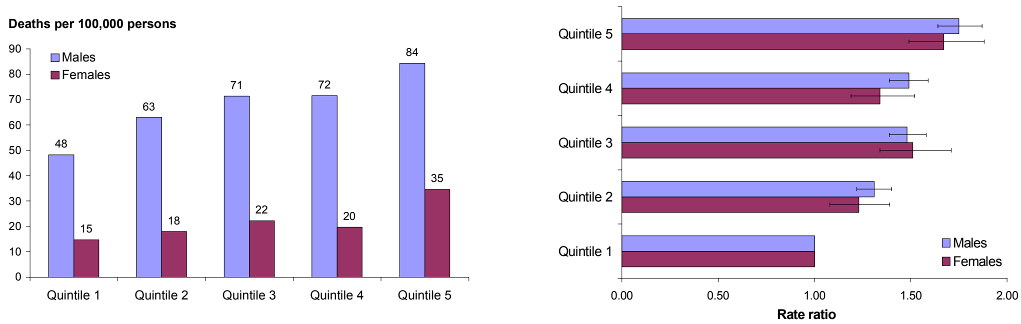
Cancers



Diseases of the circulatory system



Accidents and injury



Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data.

Figure 5.3.1: Age-standardised mortality rates and rate ratios, selected causes of death by IRSD quintile and sex, persons aged 25–64 years, 1998–2000

Table 5.3.2: Age-standardised mortality rates and rate ratios, persons aged 25–64 years by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Quintile 1	215.1	1.00	134.7	1.00
Quintile 2	276.3	1.28***	151.6	1.13***
Quintile 3	321.7	1.50***	174.8	1.30***
Quintile 4	332.1	1.54***	181.6	1.35***
Quintile 5	376.8	1.75***	204.2	1.52***
PYLL[(b)]				
Quintile 1	53.5	1.00	32.7	1.00
Quintile 2	68.4	1.28***	35.6	1.09***
Quintile 3	79.1	1.48***	41.5	1.27***
Quintile 4	83.2	1.55***	43.7	1.34***
Quintile 5	95.6	1.79***	50.5	1.55***
Potentially avoidable deaths				
Quintile 1	134.8	1.00	82.7	1.00
Quintile 2	176.7	1.31***	95.2	1.15***
Quintile 3	209.0	1.55***	108.2	1.31***
Quintile 4	217.2	1.61***	113.0	1.37***
Quintile 5	248.3	1.84***	130.8	1.58***
Cancers (C00–C97)				
Quintile 1	77.5	1.00	77.5	1.00
Quintile 2	94.7	1.22***	80.1	1.03
Quintile 3	103.1	1.33***	85.9	1.11***
Quintile 4	111.7	1.44***	87.4	1.13***
Quintile 5	112.3	1.45***	90.7	1.17***
Cancer of the digestive organs (C15–C26)				
Quintile 1	24.1	1.00	16.3	1.00
Quintile 2	30.6	1.27***	18.0	1.11
Quintile 3	31.8	1.32***	18.5	1.14*
Quintile 4	34.7	1.44***	18.6	1.15*
Quintile 5	33.3	1.38***	18.2	1.12
Colon cancer (C18)				
Quintile 1	7.9	1.00	6.4	1.00
Quintile 2	9.3	1.17	7.5	1.16
Quintile 3	10.0	1.26**	7.3	1.13
Quintile 4	10.4	1.31***	7.1	1.10
Quintile 5	9.8	1.23*	7.0	1.09
Melanoma of skin (C43)				
Quintile 1	4.4	1.00	2.8	1.00
Quintile 2	5.3	1.22	2.6	0.93
Quintile 3	4.2	0.97	2.7	0.94
Quintile 4	4.8	1.10	3.0	1.07
Quintile 5	5.4	1.24	3.0	1.05
Lung cancer (C33, C34)				
Quintile 1	14.1	1.00	8.5	1.00
Quintile 2	19.4	1.37***	9.9	1.18
Quintile 3	25.7	1.82***	12.4	1.47***
Quintile 4	27.1	1.92***	12.2	1.44***
Quintile 5	28.6	2.02***	14.6	1.73***

(continued)

Table 5.3.2 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Breast cancer (C50)				
Quintile 1	0.2	1.00	23.0	1.00
Quintile 2	0.1	0.61	21.6	0.94
Quintile 3	0.1	0.25	22.2	0.96
Quintile 4	0.2	0.93	22.5	0.98
Quintile 5	0.2	0.67	23.3	1.02
Cancer of the female genital organs (C51–C58)				
Quintile 1	—	—	8.5	1.00
Quintile 2	—	—	7.9	0.93
Quintile 3	—	—	9.0	1.06
Quintile 4	—	—	8.7	1.03
Quintile 5	—	—	9.0	1.06
Brain cancer (C71)				
Quintile 1	6.1	1.00	3.5	1.00
Quintile 2	5.6	0.92	3.7	1.08
Quintile 3	5.7	0.93	3.5	1.00
Quintile 4	5.5	0.89	4.0	1.15
Quintile 5	6.5	1.06	3.3	0.96
Cancer in the lymphoid, haematopoietic and related tissue (C81–C96)				
Quintile 1	9.6	1.00	7.4	1.00
Quintile 2	10.7	1.12	6.5	0.88
Quintile 3	10.2	1.06	7.7	1.03
Quintile 4	12.1	1.26**	7.7	1.03
Quintile 5	10.2	1.07	7.7	1.03
Mental and behavioural disorders due to psychoactive substance use (F10–F19)				
Quintile 1	6.2	1.00	1.9	1.00
Quintile 2	7.5	1.21	1.9	1.00
Quintile 3	10.0	1.60***	2.8	1.53*
Quintile 4	9.6	1.54***	2.2	1.17
Quintile 5	9.8	1.58***	2.5	1.37
Diseases of the circulatory system (I00–I99)				
Quintile 1	47.7	1.00	17.7	1.00
Quintile 2	62.6	1.31***	14.2	0.80***
Quintile 3	79.0	1.66***	28.0	1.58***
Quintile 4	83.4	1.75***	33.9	1.91***
Quintile 5	101.0	2.12***	40.3	2.27***
Ischaemic heart disease (I20–I25)				
Quintile 1	33.2	1.00	7.4	1.00
Quintile 2	42.6	1.28***	10.5	1.43***
Quintile 3	54.5	1.64***	13.3	1.78***
Quintile 4	58.8	1.77***	16.1	2.16***
Quintile 5	68.9	2.07***	20.1	2.70***
Acute myocardial infarction (I21)				
Quintile 1	15.0	1.00	3.6	1.00
Quintile 2	20.1	1.34***	5.5	1.55***
Quintile 3	27.1	1.80***	7.0	1.96***
Quintile 4	30.5	2.03***	9.1	2.55***
Quintile 5	36.7	2.44***	11.4	3.20***

(continued)

Table 5.3.2 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Stroke (I60–I69)				
Quintile 1	6.6	1.00	4.9	1.00
Quintile 2	7.9	1.19	6.2	1.25*
Quintile 3	10.5	1.58***	7.3	1.50***
Quintile 4	9.8	1.48***	7.9	1.61***
Quintile 5	12.8	1.93***	9.1	1.84***
Diseases of the respiratory system (J00–J99)				
Quintile 1	5.7	1.00	5.2	1.00
Quintile 2	9.1	1.60***	6.6	1.29*
Quintile 3	12.5	2.18***	9.1	1.76***
Quintile 4	12.3	2.16***	9.5	1.84***
Quintile 5	16.0	2.81***	12.5	2.43***
Chronic lower respiratory disease (J40–J47)				
Quintile 1	3.1	1.00	3.4	1.00
Quintile 2	5.8	1.89***	4.8	1.41**
Quintile 3	8.7	2.82***	6.4	1.87***
Quintile 4	8.7	2.83***	7.1	2.08***
Quintile 5	11.0	3.57***	9.5	2.78***
Diseases of the digestive system (K00–K93)				
Quintile 1	7.2	1.00	3.7	1.00
Quintile 2	11.5	1.59***	4.4	1.18
Quintile 3	12.6	1.74***	5.9	1.59***
Quintile 4	14.9	2.07***	6.4	1.73***
Quintile 5	16.7	2.30***	8.1	2.18***
Diseases of the liver (K70–K77)				
Quintile 1	5.1	1.00	2.4	1.00
Quintile 2	8.3	1.63***	2.7	1.12
Quintile 3	9.4	1.84***	3.2	1.34*
Quintile 4	11.2	2.21***	3.8	1.57*
Quintile 5	12.6	2.48***	4.9	2.05***
Accidents and injury (V01–Y98)				
Quintile 1	48.2	1.00	14.7	1.00
Quintile 2	63.0	1.31***	18.0	1.23***
Quintile 3	71.3	1.48***	22.2	1.51***
Quintile 4	71.5	1.49***	19.7	1.34***
Quintile 5	84.3	1.75***	34.6	1.67***
Transport accidents (V01–V99)				
Quintile 1	8.5	1.00	3.0	1.00
Quintile 2	13.8	1.63***	4.4	1.45**
Quintile 3	17.5	2.07***	6.0	2.00***
Quintile 4	17.0	2.00***	4.9	1.61***
Quintile 5	18.9	2.24***	6.1	2.03***

(continued)

Table 5.3.2 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Suicide (X60–X84)				
Quintile 1	22.4	1.00	6.6	1.00
Quintile 2	26.6	1.19***	7.1	1.08
Quintile 3	29.3	1.30***	7.9	1.20
Quintile 4	30.7	1.37***	6.6	1.01
Quintile 5	36.1	1.61***	8.3	1.27*

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Table 5.3.3 presents excess mortality estimates for persons aged 25–64 years associated with differences in mortality between IRSD quintiles. In 1998–2000, approximately 29.6% of male deaths, and 20.3% of female deaths, could have been avoided if all areas in Australia had experienced an all-cause mortality rate equivalent to that of the least disadvantaged. Put differently, among persons aged 25–64, socioeconomic disadvantage resulted in an unnecessary excess of 13,749 deaths among males, and 5,250 deaths among females. Substantial numbers of deaths could also have been avoided for cancers, diseases of the circulatory system, and accidents and injury.

Table 5.3.3: Excess mortality, selected causes by IRSD quintile and sex, persons aged 25–64 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Number[(a)]**	**Per cent[(b)]**	**Number[(a)]**	**Per cent[(b)]**
All causes	13,749	29.6	5,250	20.3
Cancers (C00–C97)	3,502	22.7	1,054	8.1
Lung cancer (C33, C34)	1,378	39.0	471	26.5
Diseases of the circulatory system (I00–I99)	4,237	36.7	1,432	34.9
Stroke (I60–I69)	449	30.7	328	30.5
Diseases of the digestive system (K00–K93)	842	42.9	297	33.9
Accidents and injury (V01–Y98)	2,872	28.9	768	26.2

(a) Total number of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged quintile.

(b) Percentage of deaths that would have been avoided if all IRSD quintiles had the same mortality rate as the least disadvantaged quintile.

Source: ABS mortality data.

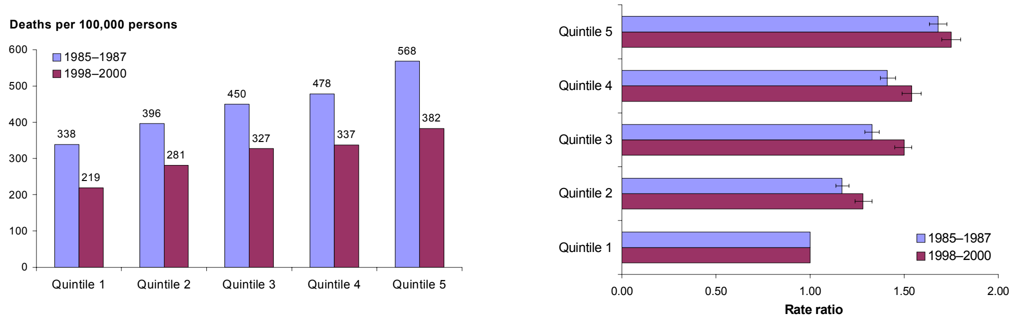
Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, all-cause mortality rates for persons aged 25–64 years decreased for all socioeconomic quintiles (Figure 5.3.2).

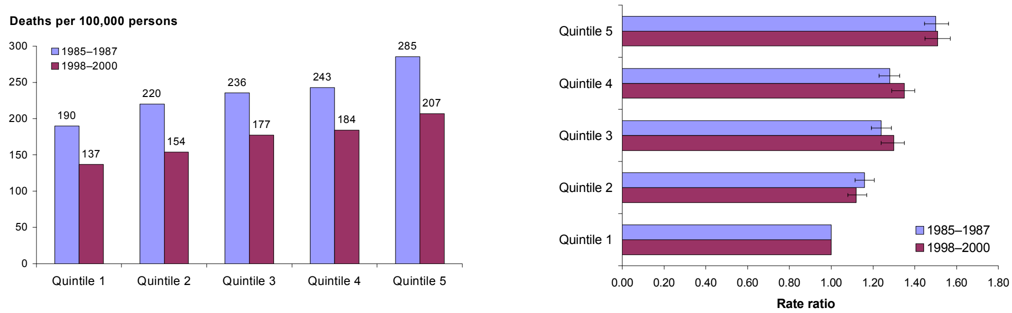
For males, relative mortality inequalities for all causes widened over the period: in 1985–1987 death rates in the most disadvantaged areas were approximately 68% higher than in the least disadvantaged, and in 1998–2000 the corresponding difference was 75% (Table 5.3.4). In terms of absolute death rates however, the difference between the most and least disadvantaged quintiles narrowed: from 230 deaths per 100,000 in 1985–1987 to 163 deaths per 100,000 in 1998–2000.

For females, relative mortality inequality for all causes between the most and least disadvantaged areas remained stable over the two periods at approximately 50%. In terms of absolute death rates however, declines were observed: in 1985–1987, there was a difference of 95 deaths per 100,000 between the most and least disadvantaged areas, and in 1998–2000, this difference was 70 deaths per 100,000.

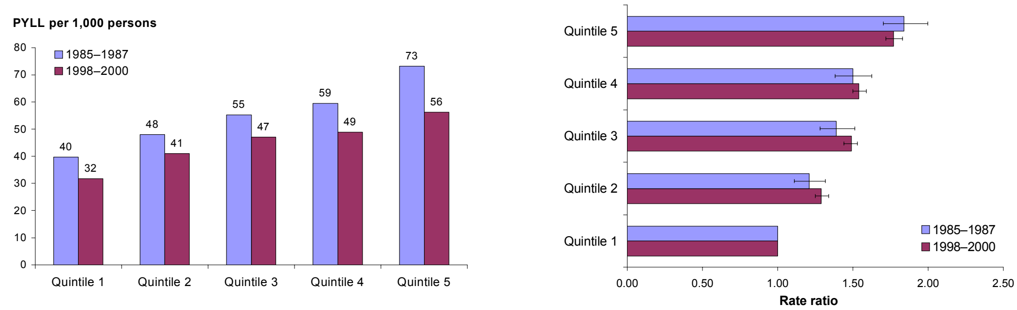
All causes males



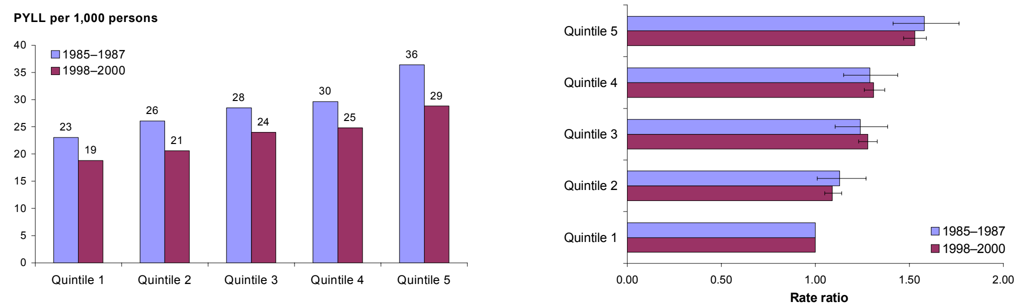
All causes females



PYLL males



PYLL females



Notes: Age-standardised to the total Australian population as of 30 June 1988. Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data; Mathers 1994a.

Figure 5.3.2: Age-standardised mortality rates and rate ratios, all causes and PYLL by IRSD quintile and sex, persons aged 25–64, 1985–1987 and 1998–2000

Table 5.3.4: Age-standardised mortality rate ratios, persons aged 25–64 years by IRSD quintile and sex, 1985–1987 and 1998–2000

	1985–1987				1998–2000			
	Males		Females		Males		Females	
Cause of death and ICD–10 codes	Rate[(a)]	Rate Ratio	Rate	Rate ratio	Rate	Rate ratio	Rate	Rate ratio
All causes								
Quintile 1	338.4	1.00	189.9	1.00	218.8	1.00	136.8	1.00
Quintile 2	396.3	1.17***	220.2	1.16***	281.1	1.28***	153.8	1.12***
Quintile 3	449.6	1.33***	235.5	1.24***	327.2	1.50***	177.2	1.30***
Quintile 4	478.1	1.41***	242.6	1.28***	337.3	1.54***	184.3	1.35***
Quintile 5	568.5	1.68***	285.5	1.50***	382.4	1.75***	206.7	1.51***
Cancers (C00–C97)								
Quintile 1	118.0	1.00	102.7	1.00	79.2	1.00	78.6	1.00
Quintile 2	122.6	1.04	108.8	1.06*	96.9	1.22***	81.2	1.13***
Quintile 3	138.9	1.18***	106.4	1.04	105.8	1.34***	87.2	1.22***
Quintile 4	139.2	1.18***	106.7	1.04	114.4	1.44***	88.6	1.29***
Quintile 5	150.6	1.28***	112.9	1.10***	115.1	1.45***	91.8	1.31***
Diseases of the circulatory system (I00–I99)								
Quintile 1	125.8	1.00	41.1	1.00	48.9	1.00	18.2	1.00
Quintile 2	150.7	1.20***	52.9	1.29***	63.9	1.31***	14.3	1.32***
Quintile 3	166.6	1.33***	65.5	1.60***	80.6	1.65***	28.6	1.64***
Quintile 4	180.8	1.44***	68.2	1.66***	84.9	1.74***	34.6	1.78***
Quintile 5	207.8	1.65***	80.8	1.97***	102.8	2.10***	41.0	2.15***

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

(a) Deaths per 100,000 persons.

Sources: ABS mortality data; Mathers 1994a.

*p<0.05, **p<0.01, ***p<0.001

5.4 Persons aged 65 years and over

In this report, deaths among those aged 65 years and over are expressed as rates per 1,000 persons, which is consistent with the earlier benchmark work of Mathers (1994b).

In 1998–2000, life expectancy for persons aged 65 was highest in the least disadvantaged areas (males 18.0 years, females 21.3 years) and lowest in the most disadvantaged areas (males 16.7 years, females 20.6 years). As was observed among the younger age groups, differences in life expectancy between the IRSD quintiles were larger for males than females (Table 5.4.1).

Table 5.4.1: Life expectancy by IRSD quintile and sex, persons aged 65 years, 1998–2000

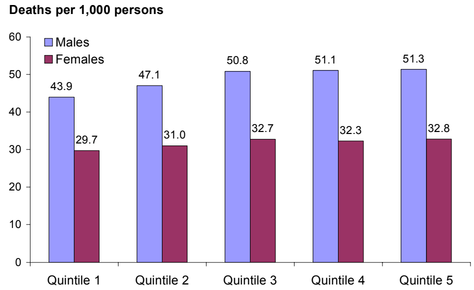
IRSD quintile	Males	Females
Quintile 1 (Least disadvantaged)	18.0	21.3
Quintile 2	17.5	21.0
Quintile 3	16.8	20.5
Quintile 4	16.7	20.7
Quintile 5 (Most disadvantaged)	16.7	20.6
Total population	**17.1**	**20.8**

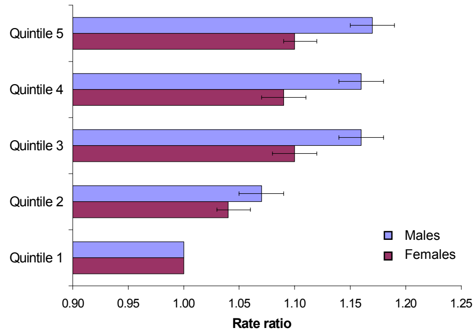
Source: ABS mortality data.

Significant differences in all-cause and specific-cause mortality were observed across the IRSD quintiles for persons aged 65 years and over, although the size of the differences was considerably smaller than that found for the younger age groups (Figure 5.4.1; Table 5.4.2). In addition, death rates among those aged 65 years or more were often not patterned as a continuous linear gradient from the least to the most disadvantaged quintile; by contrast, this was a characteristic feature of the mortality profile of younger persons. Among males, all-cause death rates in the most disadvantaged areas were 17% higher than in the least disadvantaged areas (7 more deaths per 1,000), and for females, the corresponding difference was 10% (3 more deaths per 1,000). Death rates in the most disadvantaged areas were also significantly higher for:

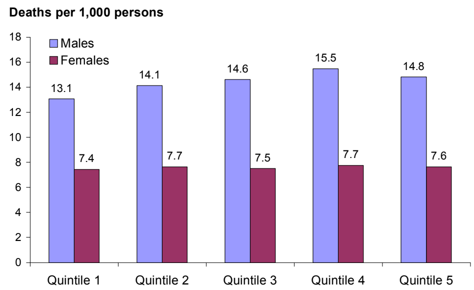
- lung cancer: 37% higher for males (1 more death per 1,000), 13% for females (0.14 more deaths per 1,000);
- diabetes mellitus: 44% higher for males (0.49 more deaths per 1,000), 84% for females (0.45 more deaths per 1,000);
- diseases of the circulatory system: 15% higher for males (3 more deaths per 1,000), 11% higher for females (1 more death per 1,000);
- diseases of the respiratory system: 39% higher for males (2 more deaths per 1,000), 18% higher for females (0.43 more deaths per 1,000);
- diseases of the digestive system: 30% higher for males (0.35 more deaths per 1,000), 27% higher for females (0.25 more deaths per 1,000); and
- renal failure: 24% higher for males (0.16 more deaths per 1,000), 19% for females (0.09 more deaths per 1,000).

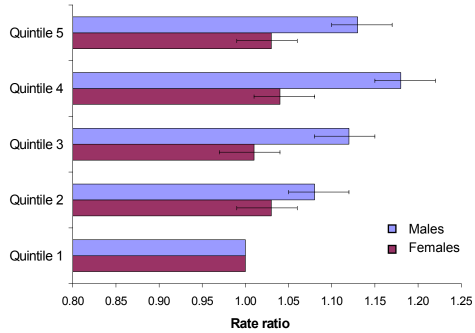
All causes



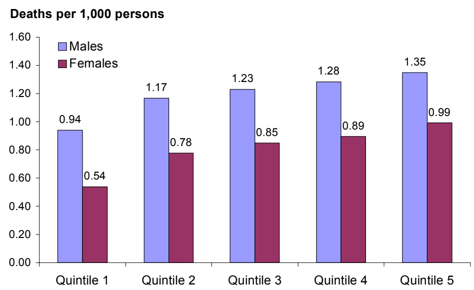


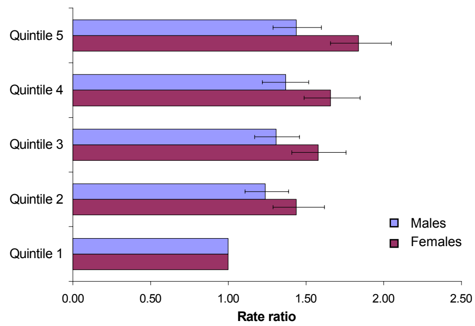
Cancers



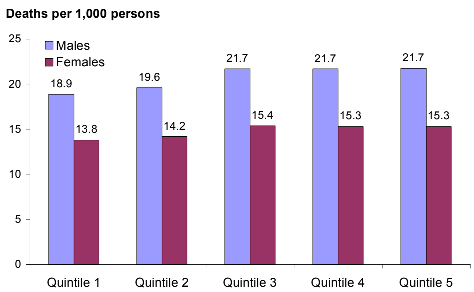


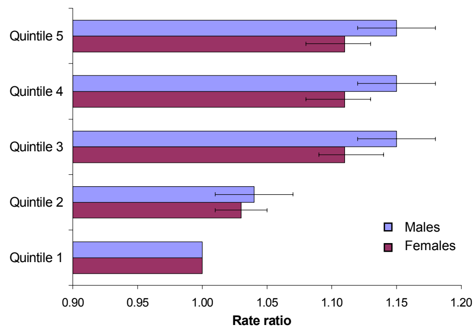
Diabetes





Diseases of the circulatory system





Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Source: ABS mortality data.

Figure 5.4.1: Age-standardised mortality rates and rate ratios, selected causes of death by IRSD quintile and sex, persons aged 65 years and over, 1998–2000

Table 5.4.2: Age-standardised mortality rates and rate ratios, persons aged 65 years and over by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Quintile 1	43.92	1.00	29.71	1.00
Quintile 2	47.06	1.07***	31.00	1.04***
Quintile 3	50.81	1.16***	32.72	1.10***
Quintile 4	51.07	1.06***	32.32	1.09***
Quintile 5	51.34	1.17***	32.79	1.10***
Cancers (C00–C97)				
Quintile 1	13.06	1.00	7.44	1.00
Quintile 2	14.14	1.08***	7.65	1.03
Quintile 3	14.60	1.12***	7.49	1.01
Quintile 4	15.46	1.18***	7.75	1.04*
Quintile 5	14.81	1.13***	7.64	1.03
Cancer of the digestive organs (C15–C26)				
Quintile 1	3.62	1.00	2.30	1.00
Quintile 2	3.77	1.04	2.33	1.01
Quintile 3	3.97	1.10**	2.37	1.03
Quintile 4	4.09	1.13***	2.38	1.03
Quintile 5	4.06	1.12***	2.38	1.03
Colon cancer (C18)				
Quintile 1	1.24	1.00	0.89	1.00
Quintile 2	1.16	0.94	0.90	1.00
Quintile 3	1.27	1.02	0.89	1.00
Quintile 4	1.33	1.07	0.86	0.96
Quintile 5	1.22	0.98	0.82	0.92
Cancer of the pancreas (C25)				
Quintile 1	0.56	1.00	0.49	1.00
Quintile 2	0.59	1.04	0.46	0.95
Quintile 3	0.59	1.05	0.47	0.97
Quintile 4	0.64	1.14	0.48	0.99
Quintile 5	0.58	1.02	0.50	1.03
Lung cancer (C33, C34)				
Quintile 1	2.69	1.00	1.06	1.00
Quintile 2	3.30	1.23***	1.21	1.15**
Quintile 3	3.43	1.27***	1.15	1.08
Quintile 4	3.78	1.40***	1.22	1.15**
Quintile 5	3.67	1.37***	1.20	1.13**
Breast cancer (C50)				
Quintile 1	—	—	0.97	1.00
Quintile 2	—	—	1.01	1.04
Quintile 3	—	—	0.93	0.96
Quintile 4	—	—	0.91	0.94
Quintile 5	—	—	0.96	0.99
Cancer of the male genital organs (C60–63)				
Quintile 1	2.24	1.00	—	—
Quintile 2	2.43	1.08*	—	—
Quintile 3	2.50	1.12**	—	—
Quintile 4	2.54	1.13***	—	—
Quintile 5	2.33	1.04	—	—

(continued)

Table 5.4.2 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Prostate cancer (C61)				
Quintile 1	2.22	1.00	—	—
Quintile 2	2.41	1.09*	—	—
Quintile 3	2.49	1.12**	—	—
Quintile 4	2.53	1.14***	—	—
Quintile 5	2.31	1.04	—	—
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)				
Quintile 1	1.41	1.00	0.91	1.00
Quintile 2	1.32	0.94	0.81	0.89*
Quintile 3	1.28	0.90*	0.80	0.88*
Quintile 4	1.40	0.99	0.87	0.95
Quintile 5	1.30	0.92	0.79	0.86**
Endocrine, nutritional and metabolic diseases (E00–E90)				
Quintile 1	1.22	1.00	0.81	1.00
Quintile 2	1.50	1.23***	1.08	1.34***
Quintile 3	1.62	1.32***	1.14	1.41***
Quintile 4	1.56	1.28***	1.18	1.47***
Quintile 5	1.69	1.39***	1.32	1.64***
Diabetes mellitus (E10–E14)				
Quintile 1	0.94	1.00	0.54	1.00
Quintile 2	1.17	1.24***	0.78	1.44***
Quintile 3	1.23	1.31***	0.85	1.58***
Quintile 4	1.28	1.37***	0.89	1.66***
Quintile 5	1.35	1.44***	0.99	1.84***
Diseases of the nervous system (G00–G99)				
Quintile 1	1.41	1.00	1.10	1.00
Quintile 2	1.39	0.99	1.06	0.97
Quintile 3	1.43	1.02	1.22	1.11**
Quintile 4	1.25	0.89*	1.03	0.94
Quintile 5	1.29	0.92	0.99	0.90*
Alzheimer's disease (G30)				
Quintile 1	0.43	1.00	0.55	1.00
Quintile 2	0.47	1.08	0.53	0.95
Quintile 3	0.57	1.32***	0.72	1.30***
Quintile 4	0.03	1.03	0.54	0.97
Quintile 5	0.03	1.08	0.55	0.99
Diseases of the circulatory system (I00–I99)				
Quintile 1	18.86	1.00	13.79	1.00
Quintile 2	19.60	1.04**	14.19	1.03*
Quintile 3	21.68	1.15***	15.36	1.11***
Quintile 4	21.66	1.15***	15.28	1.11***
Quintile 5	21.73	1.15***	15.27	1.11***
Ischaemic heart disease (I20–I25)				
Quintile 1	10.75	1.00	6.43	1.00
Quintile 2	11.31	1.05**	6.87	1.07***
Quintile 3	12.56	1.17***	7.58	1.18***
Quintile 4	12.60	1.17***	7.72	1.20***
Quintile 5	12.74	1.18***	7.76	1.21***

(continued)

Table 5.4.2 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Acute myocardial infarction (I21)				
Quintile 1	5.97	1.00	3.72	1.00
Quintile 2	6.28	1.05*	3.99	1.07**
Quintile 3	6.87	1.15***	4.21	1.13***
Quintile 4	7.07	1.18***	4.46	1.20***
Quintile 5	7.20	1.21***	4.37	1.17***
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)				
Quintile 1	2.29	1.00	1.93	1.00
Quintile 2	2.24	0.98	1.98	1.03
Quintile 3	2.62	1.14***	2.17	1.12***
Quintile 4	2.65	1.16***	2.15	1.11***
Quintile 5	2.49	1.08*	2.05	1.06*
Heart failure (I50)				
Quintile 1	0.89	1.00	0.81	1.00
Quintile 2	0.96	1.08	0.89	1.10*
Quintile 3	1.06	1.20**	1.07	1.32***
Quintile 4	1.10	1.24***	0.95	1.17***
Quintile 5	1.06	1.19**	0.93	1.14**
Stroke (I60–I69)				
Quintile 1	4.19	1.00	4.17	1.00
Quintile 2	4.35	1.04	4.06	0.97
Quintile 3	4.68	1.12***	4.19	1.00
Quintile 4	4.49	1.07*	4.05	0.97
Quintile 5	4.64	1.11***	4.04	0.97
Diseases of arteries, arterioles and capillaries (I70–I79)				
Quintile 1	1.19	1.00	0.70	1.00
Quintile 2	1.18	1.00	0.69	0.99
Quintile 3	1.28	1.08	0.80	1.13*
Quintile 4	1.35	1.14*	0.75	1.07
Quintile 5	1.33	1.13*	0.82	1.16**
Diseases of the respiratory system (J00–J99)				
Quintile 1	3.98	1.00	2.36	1.00
Quintile 2	4.62	1.16***	2.48	1.05
Quintile 3	5.27	1.32***	2.61	1.11***
Quintile 4	5.10	1.28***	2.51	1.06*
Quintile 5	5.55	1.39***	2.79	1.18***
Influenza and pneumonia (J10–J18)				
Quintile 1	0.89	1.00	0.70	1.00
Quintile 2	0.91	1.02	0.70	0.99
Quintile 3	0.93	1.05	0.68	0.97
Quintile 4	0.81	0.91	0.63	0.90*
Quintile 5	0.99	1.11	0.72	1.02
Chronic lower respiratory disease (J40–J47)				
Quintile 1	2.32	1.00	1.24	1.00
Quintile 2	2.90	1.25***	1.39	1.12**
Quintile 3	3.44	1.48***	1.51	1.21***
Quintile 4	3.48	1.50***	1.49	1.20***
Quintile 5	3.69	1.59***	1.62	1.31***

(continued)

Table 5.4.2 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by IRSD quintile and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Diseases of the digestive system (K00–K93)				
Quintile 1	1.19	1.00	0.92	1.00
Quintile 2	1.31	1.10	1.06	1.16***
Quintile 3	1.46	1.23***	1.10	1.20***
Quintile 4	1.43	1.21***	1.14	1.24***
Quintile 5	1.54	1.30***	1.17	1.27***
Diseases of the genitourinary system (N00–N99)				
Quintile 1	1.07	1.00	0.76	1.00
Quintile 2	1.14	1.06	0.82	1.08
Quintile 3	1.19	1.11	0.92	1.21***
Quintile 4	1.13	1.05	0.83	1.10
Quintile 5	1.24	1.16**	0.92	1.21***
Renal failure (N17–N19)				
Quintile 1	0.72	1.00	0.46	1.00
Quintile 2	0.79	1.11	0.52	1.12
Quintile 3	0.84	1.17**	0.54	1.17**
Quintile 4	0.77	1.07	0.50	1.09
Quintile 5	0.88	1.24***	0.55	1.19**
Accidents and injury (V01–Y98)				
Quintile 1	1.05	1.00	0.64	1.00
Quintile 2	1.17	1.12*	0.67	1.05
Quintile 3	1.13	1.08	0.73	1.14*
Quintile 4	1.20	1.15*	0.69	1.07
Quintile 5	1.16	1.11	0.70	1.09
Falls (W00–W19)				
Quintile 1	0.22	1.00	0.11	1.00
Quintile 2	0.18	0.83	0.11	1.01
Quintile 3	0.14	0.65**	0.13	1.24
Quintile 4	0.16	0.74*	0.09	0.88
Quintile 5	0.14	0.65**	0.13	1.17

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

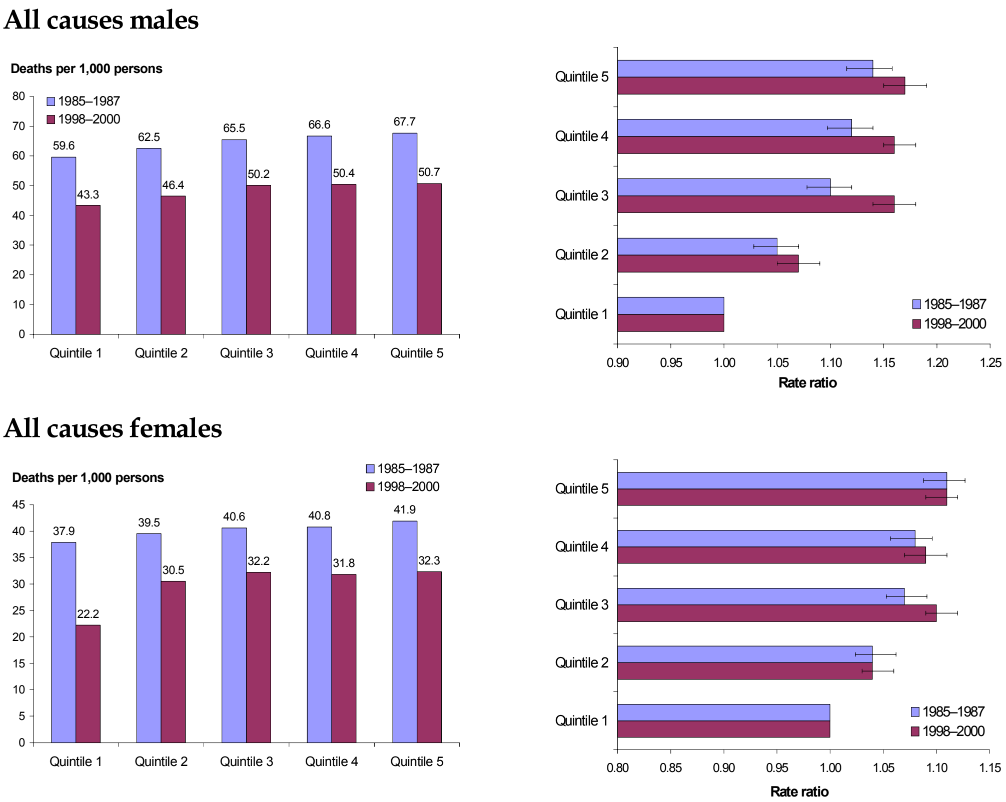
*p<0.05, **p<0.01, ***p<0.001

Trends in mortality rates and mortality inequality

Between 1985–1987 and 1998–2000, all-cause mortality rates for persons aged 65 years and over decreased for all socioeconomic quintiles (Figure 5.4.2; Table 5.4.3).

For males, relative mortality inequalities for all causes widened slightly over the period: in 1985–1987 death rates in the most disadvantaged areas were approximately 14% higher than in the least disadvantaged, and in 1998–2000 the corresponding difference was 17%. In terms of absolute death rates, the difference between the most and least disadvantaged quintiles was similar at each period: 8 deaths per 1,000 in 1985–1987 and 7 deaths per 1,000 in 1998–2000.

For females, relative mortality inequality for all causes between the most and least disadvantaged areas remained stable over the two periods at approximately 11%. In terms of absolute death rates, things also remained relatively stable: in 1985–1987, there was a difference of 4 deaths per 1,000 between the most and least disadvantaged areas, and in 1998–2000, this difference was 3 deaths per 1,000.



Notes: Age-standardised to the total Australian population as of June 1988. Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

Sources: ABS mortality data; Mathers 1994b.

Figure 5.4.2: All-cause age-standardised mortality rates and rate ratios, by IRSD quintile, persons aged 65 years and over, 1985–1987 and 1998–2000

Table 5.4.3: Age-standardised mortality rate ratios, persons aged 65 years and over by IRSD quintile and sex, 1985–1987 and 1998–2000

	1985–1987				1998–2000			
	Males		Females		Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate	Rate ratio	Rate	Rate ratio	Rate	Rate ratio
All causes								
Quintile 1	59.6	1.00	37.9	1.00	43.3	1.00	29.2	1.00
Quintile 2	62.5	1.05***	39.5	1.04***	46.4	1.07***	30.5	1.04***
Quintile 3	65.5	1.10***	40.6	1.07***	50.2	1.16***	32.2	1.10***
Quintile 4	66.6	1.12***	40.8	1.08***	50.4	1.16***	31.8	1.09***
Quintile 5	67.7	1.14***	41.9	1.11***	50.7	1.17***	32.3	1.11***
Cancers (C00–C97)								
Quintile 1	14.5	1.00	7.8	1.00	13.0	1.00	7.4	1.00
Quintile 2	15.4	1.06**	8.0	1.03	14.0	1.08***	7.6	1.03
Quintile 3	15.5	1.07***	7.8	1.00	14.5	1.12***	7.4	1.01
Quintile 4	15.3	1.06**	7.9	1.01	15.4	1.19***	7.7	1.04*
Quintile 5	15.8	1.09***	7.7	0.99	14.7	1.14***	7.6	1.03
Diseases of the circulatory system (I00–I99)								
Quintile 1	31.8	1.00	22.3	1.00	18.5	1.00	13.5	1.00
Quintile 2	32.6	1.03	23.2	1.04**	19.3	1.04**	13.9	1.13*
Quintile 3	34.1	1.07***	23.9	1.07***	21.4	1.15***	15.1	1.12***
Quintile 4	34.9	1.10***	23.8	1.07***	21.3	1.15***	15.0	1.11***
Quintile 5	35.1	1.10***	24.7	1.11***	21.4	1.15***	15.0	1.11***

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

(a) Deaths per 1,000 persons.

Sources: ABS mortality data; Mathers 1994b.

*p<0.05, **p<0.01, ***p<0.001

Persons aged 65–74, and 75 years and over

Among males and females aged 65–74, significant (and often graded) associations were found between area disadvantage and death rates from all causes, and for a number of specific causes including cancers, diabetes mellitus, diseases of the circulatory system, and accidents and injury (Table 5.4.4). In most cases, mortality rates were lowest in the least disadvantaged areas, and highest in the most disadvantaged. Statistically significant differences in mortality rates across the IRSD quintiles were also observed for males and females aged 75 years and older, with the least disadvantaged areas experiencing the lowest rates. The association between area disadvantage and mortality for this older group, however, was weaker (i.e. smaller in magnitude) than that found among those aged 65–74 (with the notable exception of diabetes mellitus), and the association did not follow a graded step-wise pattern.

Table 5.4.4: Age-standardised mortality rates and rate ratios, persons aged 65–74 years and 75 years and over by IRSD quintile and sex, 1998–2000

Cause of death and ICD-10 codes	Males				Females			
	65–74 years		75 years and older		65–74 years		75 years and older	
	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes								
Quintile 1	19.99	1.00	80.74	1.00	11.32	1.00	58.01	1.00
Quintile 2	23.18	1.16***	83.79	1.04***	12.49	1.10***	59.47	1.03**
Quintile 3	25.87	1.29***	89.16	1.10***	13.99	1.24***	61.52	1.06***
Quintile 4	26.58	1.33***	88.74	1.10***	13.94	1.23***	60.58	1.04***
Quintile 5	27.09	1.36***	88.63	1.10***	14.75	1.30***	60.53	1.04***
Cancers (C00–C97)								
Quintile 1	8.43	1.00	20.19	1.00	5.19	1.00	10.90	1.00
Quintile 2	9.50	1.13***	21.27	1.05*	5.49	1.06	10.97	1.01
Quintile 3	10.16	1.21***	21.42	1.06**	5.44	1.05	10.66	0.98
Quintile 4	11.08	1.31***	22.21	1.10***	5.68	1.09**	10.93	1.00
Quintile 5	10.55	1.25***	21.37	1.06**	5.64	1.09**	10.72	0.98
Diabetes mellitus (E10–E14)								
Quintile 1	0.50	1.00	1.61	1.00	0.25	1.00	0.98	1.00
Quintile 2	0.65	1.30**	1.96	1.22**	0.39	1.56***	1.37	1.40***
Quintile 3	0.70	1.38***	2.05	1.28***	0.45	1.80***	1.46	1.49***
Quintile 4	0.66	1.31**	2.24	1.39***	0.48	1.93***	1.53	1.56***
Quintile 5	0.85	1.68***	2.12	1.32***	0.54	2.16***	1.69	1.72***
Diseases of the circulatory system (I00–I99)								
Quintile 1	5.94	1.00	37.20	1.00	3.33	1.00	29.88	1.00
Quintile 2	8.16	1.18***	37.20	1.00	3.73	1.12**	30.26	1.01
Quintile 3	9.29	1.34***	40.75	1.10***	4.63	1.39***	31.86	1.07***
Quintile 4	9.41	1.36***	40.50	1.09***	4.56	1.37***	31.76	1.06***
Quintile 5	9.63	1.39***	40.35	1.08***	4.84	1.46***	31.32	1.05***
Accidents and injury (V01–Y98)								
Quintile 1	0.55	1.00	1.81	1.00	0.25	1.00	1.24	1.00
Quintile 2	0.64	1.15	2.00	1.10	0.29	1.16	1.25	1.01
Quintile 3	0.68	1.23*	1.83	1.01	0.33	1.31*	1.34	1.09
Quintile 4	0.59	1.07	2.14	1.18*	0.29	1.14	1.30	1.05
Quintile 5	0.70	1.26*	1.87	1.03	0.33	1.30*	1.26	1.02

Note: Quintile 1 = least disadvantaged; quintile 5 = most disadvantaged.

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

5.5 Summary and discussion

This chapter examined mortality inequalities by area-level socioeconomic disadvantage for males and females aged 0–14, 15–24, 25–64 and 65 years or more for the period 1998–2000. Where data permitted, we also examined socioeconomic inequalities in mortality for the periods 1985–1987 and 1998–2000.

Australia at the end of the 20th century showed large area-based socioeconomic inequalities in mortality. Life expectancy at birth and at age 15, 25, and 65 was related to area disadvantage, with predicted longevity being greatest in socioeconomically advantaged areas, and lowest in the most disadvantaged areas. With few exceptions, death rates were highest in the most disadvantaged areas for males and females in each age group up to and including 65–74 year olds. Moreover, mortality rates very often fell in a continuous gradient from the most to the least disadvantaged quintile. Thus in Australia, as elsewhere (Adler et al. 1994), mortality inequalities are not confined to differences between the rich and poor but, rather, are observed across the entire socioeconomic spectrum.

As part of our analysis, we estimated the extent to which socioeconomic inequalities in death rates contributed to the total mortality burden in the population. In other words, if it were possible to reduce death rates among the socioeconomic areas to a level equivalent to that of the least disadvantaged quintile, what would be the potential savings in mortality? Our results showed that the mortality burden attributable to area-based socioeconomic inequality was large: during 1998–2000, this was estimated to be 1,197 deaths among infants (children under 1 year); 1,491 deaths among 0–14 year olds; 1,550 deaths among adolescents and young adults (15–24 years); and 18,999 deaths among working-aged adults (25–64 years). The size of the mortality burden attributable to variability among the quintiles of area disadvantage in Australia clearly has far-reaching implications, not only in terms of the unnecessary loss of life, but also in terms of the loss of economically productive members of society, and added costs for the health care system and other public sectors more generally (Woodward & Kawachi 2000).

Between 1985–1987 and 1998–2000, all-cause mortality rates for each socioeconomic quintile decreased for males and females aged 0–14, 15–24, 25–64, and 65 years and over. Differences in the nature and extent of relative and absolute mortality inequalities between the most and least disadvantaged quintiles for the two periods are summarised below.

Table 5.5.1: Relative and absolute all-cause mortality inequalities between the most and least disadvantaged quintiles, males and females, 1985–1987 and 1998–2000

		Relative mortality inequalities between most and least disadvantaged areas(a)		Difference in absolute death rates between the most and least disadvantaged areas(b)	
Age-group		1985–1987	1998–2000	1985–1987	1998–2000
0–14 years	Males	50%	78%	42	32
	Females	66%	61%	39	22
15–24 years	Males	49%	90%	49	57
	Females	55%	57%	22	16
25–64 years	Males	68%	75%	230	163
	Females	50%	51%	95	70
65 years and over	Males	14%	17%	8	7
	Females	11%	11%	4	3

(a) Difference as expressed using the rate ratio.

(b) Difference between the most and least disadvantaged quintiles in absolute death rates per 100,000 persons for each period.

In terms of relative mortality inequalities for all causes of death, increases between the two periods were observed for males in each age group, although the absolute differences in the gaps for each age group have decreased. Similar findings were also reported in an earlier Australian study that examined mortality inequalities for the period 1985–1987 to 1995–1997 (Turrell & Mathers 2001). Widening relative socioeconomic inequalities in mortality have also been reported in Britain (Marmot & McDowall 1986; Marang van de Mheen et al. 1998; Phillimore et al. 1994; Drever & Bunting 1997), the US (Pappas et al. 1993; Feldman et al. 1989), and Europe (Borrell et al. 1997; Regidor et al. 1995; Jozan & Forster 1993; Dahl & Kjaersgaard 1993). Among females however, a somewhat different pattern was observed—relative mortality inequalities for all causes declined between 1985–1987 and 1995–1997 for 0–14 year olds, and remained stable (or increased slightly) for females aged 15–24, 25–64 and 65 years and over. In terms of absolute death rates for all causes, differences between the most and least disadvantaged quintiles declined for males and females in each age group, with one exception—among males aged 15–24, where the death rate difference between the most and least disadvantaged areas increased from 49 deaths per 100,000 persons in 1985–1987 to 57 deaths per 100,000 in 1998–2000.

When considering this report's findings, we need to be mindful of a number of potential sources of bias in the mortality analysis, and in the use of the area-based Index of Relative Socioeconomic Disadvantage (IRSD). First, death rates are calculated using numerator data that are collected as part of the mortality registration process, whereas the denominator data are derived from the population census. Mortality rates will be in error to the extent that deaths for a particular sex–age subgroup attributed to an SLA are not in fact drawn from that SLA. Quantifying the magnitude of bias resulting from these types of errors is difficult; however, our best estimates indicate that misclassification of deaths based on sex and place of residence is small, thus the overall impact on the mortality rate is likely to be minimal. Second, prior to calculating the mortality rate it was necessary to exclude death records where the identifier for the SLA of usual residence was missing, or where it was not possible to assign the SLA an IRSD score (because of small population numbers, IRSD was not calculated for a few SLAs). These problems arose for a very small number of deaths, thus the exclusion of these cases will have had little effect on the estimates of mortality inequality. Third, in assessing the mortality inequalities, it should be remembered that the Australian population has been classified into quintiles using a small area-based index of socioeconomic disadvantage. Different estimates of mortality inequality would have been obtained if we had used any of the following: a different reference group (e.g. top decile rather than top quintile); a smaller, more socioeconomically homogenous unit of analysis (e.g. Collector's District rather than SLA); or an individual-level rather than an area-based indicator of socioeconomic status (because the IRSD relates to the average disadvantage of all people living in the area). We used quintiles of socioeconomic disadvantage to ensure direct comparability with the methodology used by Mathers (1994a, 1994b, 1995, 1996), thus allowing us to assess whether inequalities had widened or narrowed during the ensuing 15 years. Further, Australian death data do not permit area-based analyses of mortality inequality to be conducted using smaller units such as Collector's Districts. Importantly, it should be stressed that the data and measurement limitations that constrained our approach have produced estimates of mortality inequality that almost certainly understate the true extent of the mortality burden by level of socioeconomic disadvantage in Australia. Finally, it should be noted that the IRSD measures used for 1985–1987 and 1998–2000 were calculated using data from the relevant population censuses and hence some SLAs may have changed quintile between 1986 and 1996. Additionally, there are differences between some SLA boundaries for the two time-periods. Thus the corresponding quintiles for the two periods do not consist of exactly the same areas, although for both periods, the bottom and top quintiles contain the 20% most disadvantaged and 20% least disadvantaged areas.

How are we to interpret the strong associations between area disadvantage and mortality that were documented in this chapter? What might be some of the factors that contributed to the much poorer mortality profile of persons from socioeconomically disadvantaged areas? Answering these questions with any certainty is difficult, and a large part of the difficulty stems from the fact that we used a composite area-based index—this measure is adequate for analytic purposes (i.e. examining the nature and extent of association between socioeconomic status and mortality), but it tells us very little about the specific factor(s) that are producing the mortality inequalities. This and other limitations associated with the IRSD (and SEIFA more generally) have been discussed by McCracken (2001). The main contributors to the higher death rates in socioeconomically disadvantaged areas could be due to the lower average educational attainment of people residing in these areas, or their low incomes, or their greater propensity to be unemployed, or a combination of these. Alternatively, higher mortality rates in disadvantaged areas might not exclusively reflect the socioeconomic composition of the resident individuals but, rather, the impact of wider contextual and environmental influences that transcend the characteristics of individuals (e.g. inadequate housing, lack of health care facilities, pollution, poor public transport, or limited access to healthy and nutritious food). In sum, the use of the IRSD permits only a very general non-specific interpretation (i.e. socioeconomic disadvantage is bad for your health) and, by extension, the IRSD is limited in terms of its capacity to inform policies and interventions to reduce socioeconomic health inequalities.

6 Mortality differences by occupation

Occupation is a commonly used indicator of socioeconomic position (Liberatos et al. 1988; Berkman & Macintyre 1997; Krieger et al. 1997) and there now exists a large overseas literature documenting an association between occupation and mortality (Blakely 2002; Gregorio et al. 1997; Davey Smith et al. 1998). This evidence typically shows that persons employed in manual (blue-collar) occupations have higher mortality rates for most causes of death than their counterparts employed in managerial or professional occupations. Australian health researchers have also investigated the relationship between occupation and mortality (McMichael & Hartshorne 1980, 1982; Leeder at al. 1984; Gibberd et al. 1984; McMichael 1985; Dobson et al. 1991; Mathers 1994a; Bennett 1996; Burnley 1998, 1999), and these studies also show that death rates for most conditions are highest among blue-collar groups. A notable limitation of most of these earlier Australian studies was their near exclusive focus on occupational mortality among males. Occupational data on female decedents were not collected on death registration forms prior to the mid-1980s, and data collected in the years immediately after this period were very incomplete (Mathers 1994a) and hence too unreliable for any meaningful analysis to be undertaken.

In this chapter, we examine occupational mortality inequalities among males and females aged 25 to 54 years for the period 1998–2000. There are a number of potential sources of error and bias associated with the estimation of occupational inequalities which are outlined in more detail in the final section of this chapter. Briefly, our analysis was limited to persons aged 25–54 in an attempt to minimise any misclassification that might have arisen due to numerator or denominator inconsistencies. Restricting the age group to 25–54 is also consistent with the approach used by Mathers (1994a), thus allowing us to compare our findings with this earlier work. Error was also minimised by excluding decedents who were not in the workforce (e.g. the unemployed, home duties, retired, pensioners, and other miscellaneous groups) and members of the permanent defence force, diplomatic personnel of overseas governments, and members of non-Australian military forces stationed in Australia.

In this analysis, occupations were coded to the Australian Standard Classification of Occupations (ASCO) (ABS 1997b). ASCO is a skill-based measure that groups together occupations requiring similar levels of education, knowledge, responsibility, on-the-job training and experience. The occupational groupings are hierarchically ordered based on their relative skill levels, with those occupations having the most extensive skill requirements located at the top of the hierarchy (Turrell et al. 1994). As at 1998–2000, occupational information on death certificates (i.e. the numerator data) was coded in accordance with the first edition of ASCO, whereas occupation data collected from labour force surveys (i.e. the denominator data) were coded to the second edition of ASCO. Table 6.0.1 shows the major occupational groupings used in each edition.

Table 6.0.1: Australian Standard Classification of Occupations (ASCO) major groupings

ASCO First Edition	ASCO Second Edition
1. Managers and administrators	1. Managers and administrators
2. Professionals	2. Professionals
3. Para-professionals	3. Associate professionals
4. Tradespersons	4. Tradespersons and related workers
5. Clerks	5. Advanced clerical and service workers
6. Salespersons and personal services workers	6. Intermediate clerical, sales and service workers
7. Plant and machine operators, and drivers	7. Intermediate production and transport workers
8. Labourers and related workers	8. Elementary clerical, sales and service workers
	9. Labourers and related workers

The ASCO major occupation groups were subsequently re-categorised as follows:

ASCO First Edition (used for the numerator)

Managers, administrators & professionals	Groups 1, 2 and 3
White-collar	Groups 5 and 6
Blue-collar	Groups 4, 7 and 8

ASCO Second Edition (used for the denominator)

Managers, administrators & professionals	Groups 1, 2 and 3
White-collar	Groups 5, 6 and 8
Blue-collar	Groups 4, 7 and 9

The use of three broad occupational groupings allowed us to closely match the two different editions of ASCO, thus minimising any extraneous misclassification error. More generally, collapsing the original ASCO categories into three groups served to further dampen error resulting from other sources. Importantly, similar three-level classifications have been used by other Australian researchers, who have demonstrated that the categories are sufficiently sensitive to discriminate between occupation groups in terms of a range of health and social outcomes (Mathers 1994a; Bennett 1996; Turrell 2000c; Burton & Turrell 2000).

6.1 Occupational mortality inequalities among persons aged 25–54 years

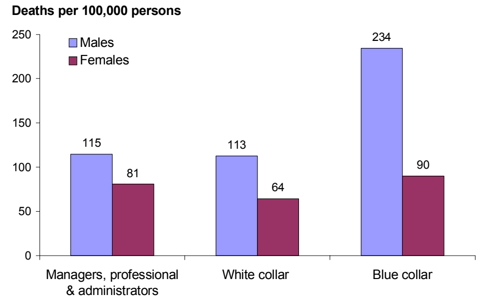
In 1998–2000, male blue-collar workers recorded an all-cause mortality rate of 234 deaths per 100,000 persons, whereas males employed in managerial, administrative and professional occupations recorded a rate of 115 deaths per 100,000 persons. This was a difference of 104%. The lowest male death rate (113 deaths per 100,000 persons), however, was observed among white-collar workers (Figure 6.1.1; Table 6.1.1). An identical mortality patterning was found among females, although the difference in all-cause death rates between the occupation groups was smaller than that observed for males.

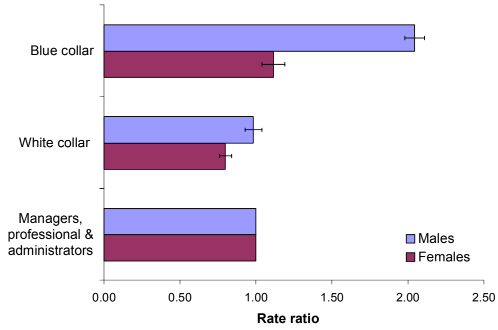
Occupational differences were also found for a number of specific causes. Blue-collar workers, for example, had significantly higher death rates than managers, administrators and professionals for:

- all cancers: males 55% higher (18 more deaths per 100,000);
- diseases of the circulatory system: males 116% higher (24 more deaths per 100,000), females 74% higher (6 more deaths per 100,000);
- diseases of the respiratory system: males 129% higher (2 more deaths per 100,000), females 139% higher (2 more deaths per 100,000);
- diseases of the digestive system: males 212% higher (6 more deaths per 100,000); females 102% higher (2 more deaths per 100,000);
- accidents and injury: males 130% higher (55 more deaths per 100,000); and
- suicide: males 123% higher (23 more deaths per 100,000)

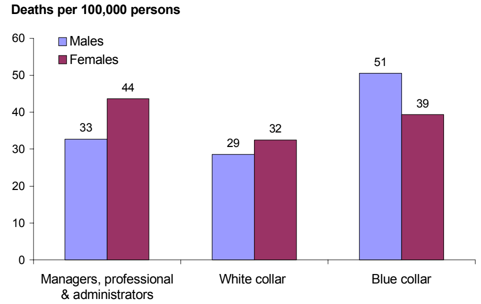
A more complicated specific-cause mortality pattern was found between managers, administrators and professionals, and white-collar workers. For some conditions, these groups had similar rates of death (e.g. lung cancer, diseases of the circulatory system); for other conditions white-collar workers experienced significantly higher death rates (e.g. diseases of the digestive system and liver among males). For other causes, white-collar workers recorded the lowest death rates (e.g. PYLL, all cancers, accidents and injury).

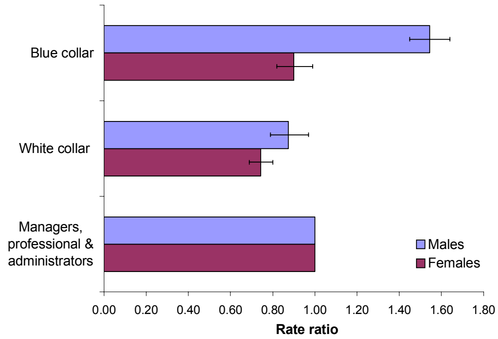
All causes



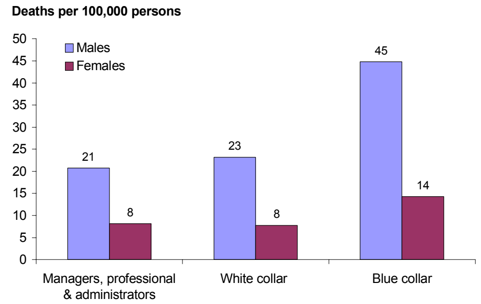


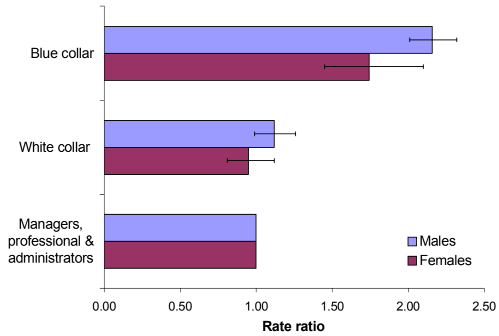
Cancers



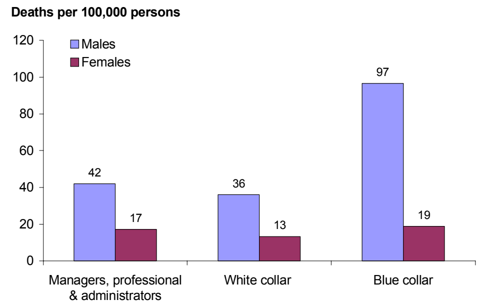


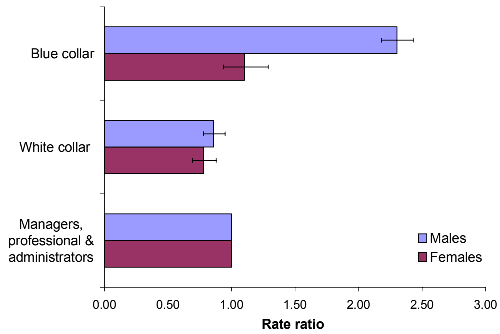
Diseases of the circulatory system





Accidents and injury





Source: ABS mortality data.

Figure 6.1.1: Age-standardised mortality rates and rate ratios by occupation and sex, selected causes of death, persons aged 24–54 years, 1998–2000

Table 6.1.1: Age-standardised mortality rates and rate ratios by occupation and sex, persons aged 25–54 years, 1998–2000

Cause of death and ICD-10 codes	Males		Females	
	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Managers, professionals & administrators	114.6	1.00	80.7	1.00
White-collar	112.5	0.98	64.5	0.80***
Blue-collar	234.2	2.04***	90.0	1.12***
PYLL[(b)]				
Managers, professionals & administrators	39.8	1.00	27.1	1.00
White-collar	37.3	0.94*	21.7	0.80***
Blue-collar	80.0	2.01***	31.6	1.17***
Potentially avoidable deaths				
Managers, professionals & administrators	72.2	1.00	51.3	1.00
White-collar	74.8	1.04	41.1	0.80***
Blue-collar	153.5	2.13***	56.1	1.09*
Cancers (C00–C97)				
Managers, professionals & administrators	32.7	1.00	43.7	1.00
White-collar	28.6	0.87*	32.4	0.74***
Blue-collar	50.6	1.55***	39.4	0.90*
Cancer of the digestive organs (C15–C26)				
Managers, professionals & administrators	10.4	1.00	8.1	1.00
White-collar	8.7	0.84	5.7	0.70***
Blue-collar	14.1	1.36***	6.7	0.83
Colon cancer (C18)				
Managers, professionals & administrators	3.1	1.00	3.2	1.00
White-collar	2.6	0.82	2.2	0.59**
Blue-collar	3.4	1.08	2.2	0.68*
Melanoma of skin (C43)				
Managers, professionals & administrators	2.8	1.00	1.8	1.00
White-collar	2.2	0.79	2.1	1.19
Blue-collar	3.4	1.21	1.3	0.71
Lung cancer (C33, C34)				
Managers, professionals & administrators	3.9	1.00	3.5	1.00
White-collar	4.1	1.05	2.9	0.85
Blue-collar	9.9	2.55***	5.3	1.52**
Breast cancer (C50)				
Managers, professionals & administrators	—	—	15.4	1.00
White-collar	—	—	10.2	0.66***
Blue-collar	—	—	10.9	0.71***
Cancer of the female genital organs (C51–C58)				
Managers, professionals & administrators	—	—	4.3	1.00
White-collar	—	—	3.4	0.78*
Blue-collar	—	—	4.3	1.00
Brain cancer (C71)				
Managers, professionals & administrators	3.5	1.00	2.8	1.00
White-collar	2.3	0.65*	1.3	0.47***
Blue-collar	4.3	1.23*	2.3	0.80
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)				
Managers, professionals & administrators	5.2	1.00	3.6	1.00
White-collar	4.2	0.81	3.2	0.91
Blue-collar	6.0	1.15	3.6	1.00

(continued)

Table 6.1.1 (continued): Age-standardised mortality rates and rate ratios by occupation and sex, persons aged 25–54 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Mental and behavioural disorders due to psychoactive substance use (F10–F19)				
Managers, professionals & administrators	3.3	1.00	1.1	1.00
White-collar	3.1	0.95	1.1	1.03
Blue-collar	12.0	3.69***	1.6	1.41
Diseases of the circulatory system (I00–I99)				
Managers, professionals & administrators	20.8	1.00	8.2	1.00
White-collar	23.2	1.12	7.8	0.95
Blue-collar	44.8	2.16***	14.3	1.74***
Ischaemic heart disease (I20–I25)				
Managers, professionals & administrators	13.8	1.00	2.6	1.00
White-collar	15.3	1.11	2.6	1.01
Blue-collar	29.9	2.16***	5.4	2.08***
Acute myocardial infarction (I21)				
Managers, professionals & administrators	6.5	1.00	1.4	1.00
White-collar	7.9	1.22	1.2	0.89
Blue-collar	13.3	2.05***	3.0	2.21***
Cerebrovascular diseases (I60–I69)				
Managers, professionals & administrators	2.8	1.00	3.0	1.00
White-collar	3.2	1.13	2.5	0.82
Blue-collar	5.6	2.00***	3.8	1.26
Diseases of the respiratory system (J00–J99)				
Managers, professionals & administrators	1.6	1.00	1.5	1.00
White-collar	2.1	1.31	2.0	1.30
Blue-collar	3.7	2.29***	3.6	2.39***
Chronic lower respiratory disease (J40–J47)				
Managers, professionals & administrators	0.9	1.00	1.0	1.00
White-collar	1.3	1.50	1.3	1.35
Blue-collar	2.1	2.49***	2.1	2.16**
Diseases of the digestive system (K00–K93)				
Managers, professionals & administrators	2.9	1.00	1.7	1.00
White-collar	4.8	1.63***	1.7	0.96
Blue-collar	9.2	3.12***	3.5	2.02***
Diseases of the liver (K70–K77)				
Managers, professionals & administrators	2.1	1.00	1.2	1.00
White-collar	4.2	1.99***	1.2	0.93
Blue-collar	7.2	3.45***	2.5	2.01**
Accidents and injury (V01–Y98)				
Managers, professionals & administrators	42.0	1.00	17.1	1.00
White-collar	36.0	0.86**	13.3	0.78***
Blue-collar	96.7	2.30***	18.8	1.10
Transport accidents (V01–V99)				
Managers, professionals & administrators	11.2	1.00	5.1	1.00
White-collar	7.3	0.65***	3.9	0.76*
Blue-collar	23.2	2.07***	5.3	1.03

(continued)

Table 6.1.1 (continued): Age-standardised mortality rates and rate ratios by occupation and sex, persons aged 25–54 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Suicide (X60–X84)				
Managers, professionals & administrators	18.4	1.00	6.5	1.00
White-collar	18.1	0.98	5.6	0.85
Blue-collar	41.0	2.23***	7.2	1.11

(a) Deaths per 100,000 persons.

(b) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Table 6.1.2 presents the number and percentage of deaths that would have been avoided in 1998–2000 if blue-collar workers experienced the same mortality rate as their counterparts in managerial, administrative and professional occupations. Among males, an estimated 5,642 deaths could have been avoided, and among females, 100 deaths. The small number of potentially avoidable deaths among females reflects the fact that, for many causes of death, blue-collar workers experienced similar or significantly lower rates of death than females employed in managerial, administrative or professional occupations (see Table 6.1.1).

Table 6.1.2: Excess mortality by occupation and sex, persons aged 25–54 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Number[(a)]**	**Per cent[(b)]**	**Number[(a)]**	**Per cent[(b)]**
All causes	5,642	33.7	100	2.6
Cancers (C00–C97)	864	20.6	–60	2.9
Lung cancer (C33, C34)	291	41.7	27	13.3
Diseases of the circulatory system (I00–I99)	1,153	35.2	78	16.7
Stroke (I60–I69)	133	32.2	13	8.3
Diseases of the digestive system (K00–K93)	300	50.0	23	21.7
Accidents and injury (V01–Y98)	2,534	40.0	9	1.2

(a) Total number of deaths that would have been avoided if blue-collar workers experienced the same mortality rate as managerial, administrative or professional workers.

(b) Percentage of deaths that would have been avoided if blue-collar workers experienced the same mortality rate as managerial, administrative or professional workers.

Source: ABS mortality data.

6.2 Summary and discussion

This examination of the relationship between occupation and mortality has produced evidence that is difficult to summarise in general terms and, by extension, to interpret and understand. Arguably, the clearest mortality pattern was for male blue-collar workers: compared with managers, administrators, and professionals, this group had significantly higher death rates for all causes, and for the majority of specific causes. Differences in death rates between these two groups were especially large for lung cancer (155%, 6 more deaths per 100,000), mental and behavioural disorders due to psychoactive substance use (269%, 9 more deaths per 100,000), diseases of the digestive system (212%, 6 more deaths per 100,000) and diseases of the liver (245%, 5 more deaths per 100,000). Significantly higher death rates among male blue-collar workers have been reported in most other Australian studies investigating the relation between occupation and mortality. The large difference in death rates between male blue-collar workers and managers, administrators, and professionals was reflected in the excess mortality estimates that were calculated, which showed that 5,642 deaths could have been avoided in 1998–2000 if the death rate among males employed in blue-collar jobs was equivalent to that of their counterparts in managerial, administrative, and professional occupations. The relationship between occupation and mortality was less clear and consistent for males employed in white-collar jobs. For many conditions, white-collar employees, and managers, administrators, and professionals, had very similar rates of death, whereas for PYLL, all cancers, brain cancer, total accidents and injury, and transport accidents, death rates among white-collar workers were significantly lower, and for diseases of the digestive system and liver, death rates were significantly higher among white-collar workers.

Among females, the patterning of occupational mortality was both similar to and different from that observed for males. Females employed in blue-collar jobs experienced significantly higher all-cause death rates than female managers, administrators, and professionals, and for a number of specific causes. Typically, the size of these mortality differentials was smaller than that found among males (although deaths from acute myocardial infarction and diseases of the respiratory system were notable exceptions). By contrast, death rates among female blue-collar workers were similar to or significantly lower than those among managers, administrators, and professionals for all cancers, and for most specific types of cancers (e.g. breast and colon), with the exception of lung cancer. Other studies have also reported higher death rates from breast and colon cancer among females employed in higher status occupations or from socioeconomically advantaged backgrounds (Faggiano et al. 1994; Smith et al. 1996; van Loon et al. 1995). The mixed and variable mortality patterning between female blue-collar workers and managers, administrators, and professionals was reflected in their excess mortality data. Specifically, higher death rates among blue-collar workers for some conditions, and lower death rates for others, seemingly had an overall equalising effect, such that when all deaths were considered in total, it showed that only 100 deaths could have been avoided in 1998–2000 if death rates among female blue-collar workers were equivalent to those of females in managerial, administrative, and professional occupations. Finally, when death rates between female white-collar workers and managers, administrators, and professionals were examined, we found that, for the majority of causes, death rates were similar or significantly lower among white-collar employees.

A number of data limitations and potential sources of bias need to be considered when interpreting the findings of this analysis of occupation and mortality. The most important issue is bias that arises from the fact that the numerator and denominator data in the mortality analysis are drawn from different sources (Blakely 2002; Bennett 1996; Mathers 1994a; Lee et al. 1987). This bias can arise from any of the following:

- *Last or current occupation:* Occupation information collected from death registrations comprises the numerator data in mortality analysis. As part of the death registration process, information is sought about the decedent's 'last occupation': this may or may not reflect their primary lifetime occupation, as some people change jobs (often into less demanding lower socioeconomic positions) as retirement approaches. By contrast, occupation information forming the denominator was collected using data from ABS labour force surveys, which ask about a person's current job, or their job held in the previous week.
- *Collection and reporting of occupation data:* Information about the decedent's last occupation is usually provided by a relative or acquaintance, and the tendency is to report jobs that are more socially desirable, or to elevate (promote) the occupational position or status of the deceased. This practice tends to artificially inflate the mortality rates of higher socioeconomic occupations and thus moderate mortality differences between occupational categories (Bennett 1996). Sometimes, occupational data on the deceased are provided by an institutional official (e.g. nursing home staff) who may have limited information about the deceased's last occupation. By contrast, occupational data from ABS labour force surveys are

usually self-reported by the survey respondent, and elicited by a trained interviewer using standardised procedures for data collection and recording.

- *Coding of occupation using different classifications:* For the period 1998–2000, occupation data collected during the death registration process was coded in accordance with the ASCO first edition, whereas data from the ABS labour force survey were coded using the ASCO second edition.

These and other sources of error associated with the use of different data for the numerator and denominator have a tendency to attenuate rather than widen occupational mortality inequalities. Thus, estimates reported in this chapter are likely to be somewhat smaller than the 'true' magnitude of occupational differences in mortality. Moreover, our use of three broad occupation categories, and limiting the analysis to persons aged 25–54 years, would have helped minimise error resulting from misclassification.

We also need to consider the possibility that the occupational differences in mortality were not due entirely to occupation per se but, rather, to the confounding effects of other socioeconomic factors that are associated with occupation, such as education and income. Given that socioeconomic measures correlate, the use of occupation on its own may have produced mis-estimated mortality rates.

Aside from misclassification and confounding, what substantive factors might have contributed to the occupational differences in mortality that were found in this chapter? It is difficult to answer this question in general terms, or with any certainty, as the relationship between occupation and mortality often showed a different pattern depending on sex, cause of death, and the occupation groups being compared. Thus, it seems that we need to seek explanations for occupational differences that are more narrowly conceived, that are specific to a particular cause or group of causes with a similar aetiological profile, and that occur over a similar timeframe. For example, the significantly higher mortality rate for blue-collar workers for diseases of the circulatory system, lung cancer, diseases of the digestive system, and accidents and injury might reflect different exposures to physical and environmental hazards in the workplace (Lund & Bjerkedal 2001; Park et al. 2002), or longer-term adverse changes to physiological and biological functioning brought about by the sustained influence (often over many decades) of adverse psychosocial processes such as perceived lack of control, empowerment, and autonomy in the workplace (Whitehead 1995; Theorell 2000; Marmot et al. 1999). Occupational differences in mortality for chronic disease probably also reflect health behaviour differences: there is now a large body of research showing that manual blue-collar groups are more likely to smoke (Mathers 1994a; Turrell et al. 2002b), are less likely to engage in physical activity sufficient for the accrual of health benefits (Burton & Turrell 2000), and less likely to have food and nutrient intakes that are consistent with lower risk for the onset of chronic disease (Turrell et al. 2003; Turrell et al. 2002a). Somewhat differently, higher mortality rates for breast cancer among females in managerial, administrative, and professional occupations are believed to be due in part to reproductive factors—nulliparity, late age at first birth, and late age at menopause—each of which are risk factors for breast cancer (McPherson et al. 2000) and each are more likely to characterise women from higher socioeconomic backgrounds (Heck & Pamuk 1997; Liu et al. 1998; Pukkala & Weiderpass 1999; Kelsey & Bernstein 1996). Nutritional differences between socioeconomic groups in childhood (i.e. higher energy intakes among girls from advantaged backgrounds) have also been suggested as a possible contributor to increased breast cancer mortality among women from higher socioeconomic groups (Lawson 1999).

Many of the 'explanations' for occupational differences in mortality are based on associational evidence and/or informed speculation, and numerous patterns in the data are difficult to account for. How, for example, can we explain higher rates of colon cancer among females in managerial, administrative, and professional occupations, for this group has a dietary profile that would seemingly reduce the risk of this condition. Further, how can we account for the fact that, with the exception of lung cancer, the occupational mortality profile for males and females for other forms of cancer is completely opposite in direction. This evidence seems to suggest that exposure to socioeconomic advantage and disadvantage has differential effects on men's and women's health. Clearly, we are still some way from disentangling the complex relation between occupation and mortality for many conditions. For some relationships, however, such as higher lung cancer rates among blue-collar workers, the links are clearer and more strongly evidence-based, and thus present opportunities for policies and interventions to reduce the inequalities.

7 Mortality differences by country of birth

Previous research has found that Australian residents born overseas have lower mortality rates for most causes of death than those born in Australia (Lee et al. 1987; Young 1992; Mathers 1994a; Singh & de Looper 2002; AIHW 2002). There are, however, a number of exceptions to this otherwise general and consistent pattern. Death rates due to lung cancer are reportedly higher among Australian residents from the UK and Ireland, as are death rates from breast cancer (Mathers 1994a; AIHW 2002). These studies have also shown that Australian residents born in Asia experience significantly higher mortality rates for diabetes mellitus.

This chapter examines the mortality profile of overseas and Australian-born residents aged 15–24, 25–64, and 65 years and over, for the period 1998–2000. As part of the death registration process, country of birth is coded in accordance with the ABS Standard Australian Classification of Countries (ABS 1998a). For this present analysis, country of birth was categorised into five birthplace groups as follows:

- Australia
- UK & Ireland — United Kingdom and Ireland
- Other Europe — continental Europe, including Eastern Europe, the former USSR and Baltic states
- Asia — includes Northeast, Southeast and Southern Asia, the Middle East, and Northern Africa
- Other — includes New Zealand, Oceania, North and South America, and Southern Africa

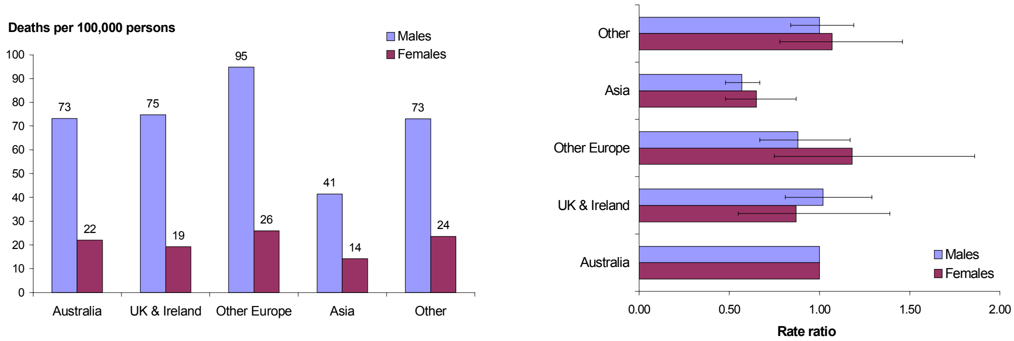
The use of these broad birthplace categories was necessary due to the small numbers of deaths for many individual countries. The categories are also consistent with those used in previous studies of mortality differentials by birthplace (Mathers 1994a; AIHW 2002), thus allowing us to compare our findings with this earlier work.

7.1 Persons aged 15–24 years

In 1998–2000, Australian residents aged 15–24 years who were born in the UK & Ireland, Other Europe or Asia experienced lower all-cause mortality rates than their Australian-born counterparts; however, only death rates among Asian-born residents reached statistical significance (Figure 7.1.1; Table 7.1.1). Residents from countries classified as ‘Other’ experienced higher all-cause death rates than the Australian-born, although the rates only reached statistical significance for females. Mortality rates for potentially avoidable causes of death, and accidents and injury, were significantly lower among Australian residents born in Asia (Table 7.1.1).

All causes

Accidents and injury



Source: ABS mortality data.

Figure 7.1.1: Age-standardised mortality rates and rate ratios, selected causes of death by country of birth, persons aged 15–24 years, 1998–2000

Table 7.1.1: Age-standardised mortality rates and rate ratios by country of birth, persons aged 15–24 years, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Australia	100.5	1.00	37.5	1.00
UK & Ireland	99.1	0.98	32.2	0.86
Other Europe	88.1	0.88	32.6	0.87
Asia	53.4	0.53***	24.2	0.65***
Other	109.6	1.09	49.0	1.31*
Potentially avoidable deaths				
Australia	61.4	1.00	21.1	1.00
UK & Ireland	62.1	1.01	17.6	0.84
Other Europe	55.7	0.91	24.7	1.17
Asia	32.7	0.53***	13.5	0.64**
Other	60.9	0.99	24.7	1.17
Accidents and injury (V01–Y98)				
Australia	73.2	1.00	22.1	1.00
UK & Ireland	74.7	1.02	19.3	0.87
Other Europe	94.7	0.88	26.0	1.18
Asia	41.4	0.57***	14.2	0.65**
Other	73.1	1.00	23.5	1.07

(a) Deaths per 100,000 persons.

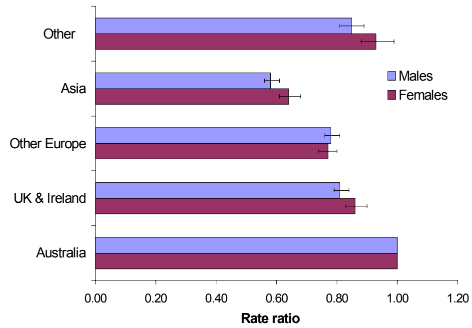
Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

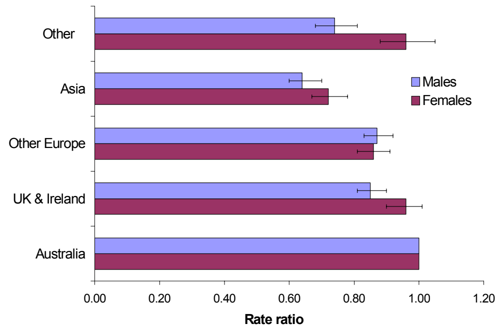
7.2 Persons aged 25–64 years

Overseas-born residents aged 25–64 experienced significantly lower all-cause mortality rates than the Australian-born in 1998–2000, with males and females from Asia exhibiting the lowest rates (42% and 36% lower than the Australian-born respectively) (Figure 7.2.1; Table 7.2.1). The overseas-born also experienced significantly lower mortality rates for most specific causes of death, including all cancers, colon and lung cancer, diseases of the circulatory system, diseases of the respiratory system, and accidents and injury. There were, however, a number of exceptions to this pattern: compared with Australian-born females, death rates among females from the UK and Ireland were 13% higher for breast cancer (3 more deaths per 100,000) and 52% higher for diseases of the liver (2 more deaths per 100,000); and 37% higher among females from ‘Other’ countries for cancer of the genital organs (3 more deaths per 100,000).

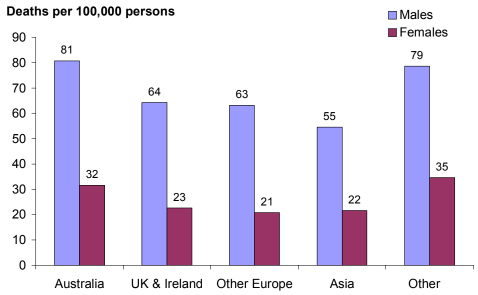
All causes

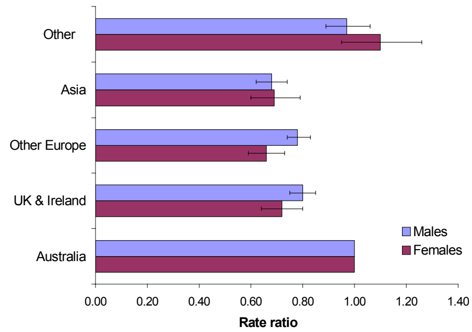


Cancers

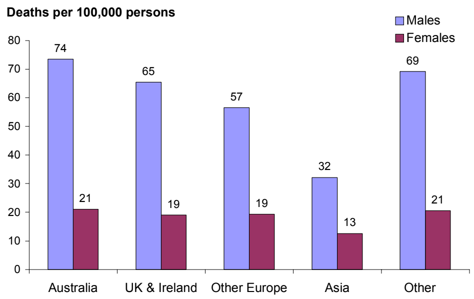


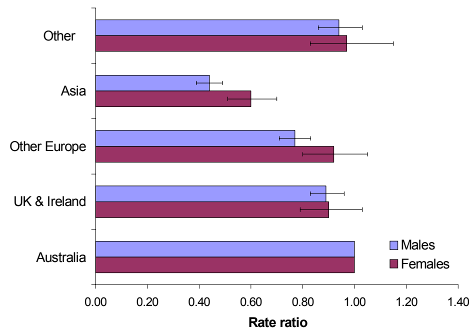
Diseases of the circulatory system





Accidents and injury





Source: ABS mortality data.

Figure 7.2.1: Age-standardised mortality rates and rate ratios, selected causes by country of birth and sex, persons aged 25–64 years, 1998–2000

Table 7.2.1: Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
All causes				
Australia	331.2	1.00	181.7	1.00
UK & Ireland	269.6	0.81***	157.0	0.86***
Other Europe	259.7	0.78***	139.4	0.77***
Asia	192.4	0.58***	117.0	0.64***
Other	281.2	0.85***	169.4	0.93*
PYLL[(b)]				
Australia	81.0	1.00	42.6	1.00
UK & Ireland	72.8	0.90***	42.2	0.99
Other Europe	78.3	0.97*	42.8	1.01
Asia	41.7	0.51***	24.9	0.58***
Other	67.2	0.83***	37.0	0.87***
Potentially avoidable deaths				
Australia	214.6	1.00	113.9	1.00
UK & Ireland	174.5	0.81***	97.1	0.85***
Other Europe	168.6	0.79***	87.5	0.77***
Asia	121.3	0.57***	72.7	0.64***
Other	182.0	0.85***	105.2	0.92*
Cancers (C00–C97)				
Australia	106.6	1.00	87.6	1.00
UK & Ireland	90.9	0.85***	83.8	0.96
Other Europe	93.1	0.87***	75.2	0.86***
Asia	68.7	0.64***	63.4	0.72***
Other	78.7	0.74***	84.3	0.96
Cancer of the digestive organs (C15–C26)				
Australia	31.8	1.00	18.4	1.00
UK & Ireland	27.1	0.85***	15.2	0.83**
Other Europe	31.1	0.98	18.8	1.02
Asia	28.0	0.88*	16.9	0.92
Other	26.6	0.84*	16.8	0.91
Colon cancer (C18)				
Australia	10.8	1.00	7.9	1.00
UK & Ireland	7.6	0.70***	5.6	0.71**
Other Europe	8.2	0.75***	5.9	0.75**
Asia	4.4	0.40***	4.3	0.55***
Other	9.2	0.85	6.4	0.81
Melanoma of skin (C43)				
Australia	6.2	1.00	3.6	1.00
UK & Ireland	2.8	0.46***	1.6	0.44***
Other Europe	2.4	0.39***	1.0	0.28***
Asia	—	—	—	—
Other	4.0	0.64*	2.9	0.62
Lung cancer (C33, C34)				
Australia	24.1	1.00	12.2	1.00
UK & Ireland	22.0	0.91	12.8	1.05
Other Europe	23.4	0.97	7.9	0.65***
Asia	15.7	0.65***	8.2	0.67***
Other	17.3	0.72***	11.6	0.95

(continued)

Table 7.2.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Breast cancer (C50)				
Australia	—	—	22.8	1.00
UK & Ireland	—	—	25.9	1.13*
Other Europe	—	—	20.8	0.91
Asia	—	—	16.3	0.72***
Other	—	—	21.5	0.94
Cancer of the female genital organs (C51–C58)				
Australia	—	—	8.6	1.00
UK & Ireland	—	—	8.2	0.95
Other Europe	—	—	7.5	0.86
Asia	—	—	7.9	0.92
Other	—	—	11.8	1.37**
Cancer of the brain (C71)				
Australia	6.4	1.00	3.7	1.00
UK & Ireland	6.3	0.99	4.1	1.11
Other Europe	5.0	0.79*	3.5	0.94
Asia	2.6	0.41**	2.1	0.57*
Other	3.6	0.57**	3.4	0.93
Cancer in the lymphoid, haematopoietic and related tissue (C81–C96)				
Australia	10.8	1.00	7.9	1.00
UK & Ireland	11.2	1.04	6.3	0.80*
Other Europe	9.1	0.84*	6.8	0.86
Asia	8.9	0.83	5.3	0.67**
Other	11.7	1.08	8.0	1.02
Mental and behavioural disorders due to psychoactive substance use (F10–F19)				
Australia	9.8	1.00	2.6	1.00
UK & Ireland	9.0	0.92	2.4	0.92
Other Europe	6.2	0.63***	1.2	0.45**
Asia	3.5	0.36***	0.8	0.31***
Other	6.7	0.69**	2.0	0.77
Diseases of the circulatory system (I00–I99)				
Australia	80.7	1.00	31.6	1.00
UK & Ireland	64.2	0.80***	22.7	0.72***
Other Europe	63.1	0.78***	20.8	0.66***
Asia	54.5	0.68**	21.7	0.69***
Other	78.6	0.97	34.6	1.10
Ischaemic heart disease (I20–I25)				
Australia	55.4	1.00	15.5	1.00
UK & Ireland	45.5	0.82***	9.4	0.61***
Other Europe	44.1	0.80***	10.0	0.64***
Asia	37.8	0.68***	7.6	0.49***
Other	54.1	0.98	15.2	0.98
Acute myocardial infarction (I21)				
Australia	26.2	1.00	6.8	1.00
UK & Ireland	23.5	0.90*	4.4	0.65***
Other Europe	23.0	0.88**	4.1	0.61***
Asia	17.5	0.67***	3.4	0.51***
Other	29.1	1.11	7.4	1.10

(continued)

Table 7.2.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Stroke (I60–I69)				
Australia	10.1	1.00	7.4	1.00
UK & Ireland	7.6	0.75**	7.2	0.98
Other Europe	8.4	0.83*	4.9	0.67***
Asia	8.8	0.88	8.4	1.14
Other	10.3	1.02	8.5	1.15
Diseases of the respiratory system (J00–J99)				
Australia	13.5	1.00	10.1	1.00
UK & Ireland	9.0	0.67***	7.5	0.74**
Other Europe	5.8	0.43***	3.3	0.33***
Asia	4.9	0.36***	3.0	0.29***
Other	7.4	0.55***	7.7	0.76
Chronic lower respiratory disease (J40–J47)				
Australia	9.3	1.00	7.6	1.00
UK & Ireland	5.4	0.58***	5.5	0.73
Other Europe	3.6	0.38***	2.2	0.28**
Asia	2.9	0.32***	1.7	0.22***
Other	4.3	0.46***	5.2	0.68*
Diseases of the digestive system (K00–K93)				
Australia	13.5	1.00	6.0	1.00
UK & Ireland	12.2	0.91	7.1	1.18
Other Europe	11.0	0.82**	5.0	0.83
Asia	6.7	0.50***	1.8	0.31***
Other	10.4	0.77*	4.1	0.68*
Diseases of the liver (K70–K77)				
Australia	9.8	1.00	3.4	1.00
UK & Ireland	9.1	0.93	5.1	1.52***
Other Europe	8.8	0.90	3.3	0.99
Asia	4.7	0.47***	0.8	0.24***
Other	7.7	0.78	2.1	0.63
Accidents and injury (V01–Y98)				
Australia	73.5	1.00	21.1	1.00
UK & Ireland	65.4	0.89**	19.0	0.89
Other Europe	56.6	0.77***	19.4	0.77
Asia	32.2	0.44***	12.6	0.44***
Other	69.2	0.94	20.5	0.94
Transport accidents (V01–V99)				
Australia	16.7	1.00	5.2	1.00
UK & Ireland	16.9	0.77**	4.5	0.88
Other Europe	12.5	0.75***	4.6	0.89
Asia	8.8	0.53***	4.5	0.87
Other	17.4	1.05	4.8	0.94

(continued)

Table 7.2.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 25–64 years by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Suicide (X60–X84)				
Australia	31.2	1.00	7.5	1.00
UK & Ireland	29.7	0.95	6.4	0.86
Other Europe	24.9	0.80***	8.0	1.06
Asia	9.6	0.31***	4.3	0.57***
Other	26.5	0.85*	8.6	1.14

(a) Deaths per 100,000 persons.

(b) PYLL per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

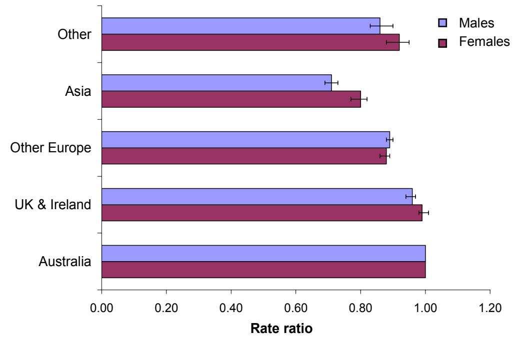
7.3 Persons aged 65 years and over

In this report, deaths among those aged 65 years and over are expressed as rates per 1,000 persons, which is consistent with the earlier (benchmark) work of Mathers (1994b).

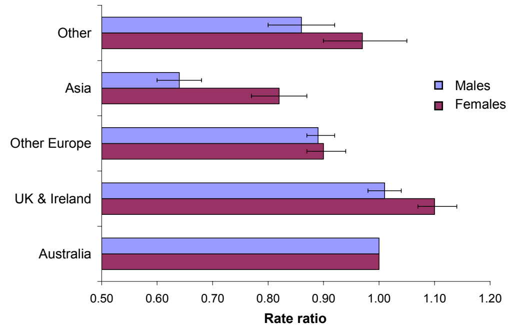
In 1998–2000, Australian residents aged 65 years or more who were born overseas experienced significantly lower all-cause mortality rates than the Australian-born, with residents from Asia experiencing the lowest rates (Figure 7.3.1; Table 7.3.1). A similar pattern was observed for the majority of specific causes of death; however, mortality rates were significantly higher among overseas born residents for the following conditions:

- all cancers: females from UK & Ireland;
- cancer of the pancreas: females from Other Europe;
- lung cancer: males and females from UK & Ireland; males from Other Europe;
- endocrine, nutritional and metabolic disorders: males and females from UK & Ireland and Other Europe;
- diabetes mellitus: males and females from Other Europe and Asia, and females from Other countries;
- Alzheimer's disease: females from UK & Ireland;
- diseases of the respiratory system: males and females from UK & Ireland;
- chronic lower respiratory disease: females from UK & Ireland;
- renal failure: females from Other Europe; and
- accidents and injury: females from Other countries.

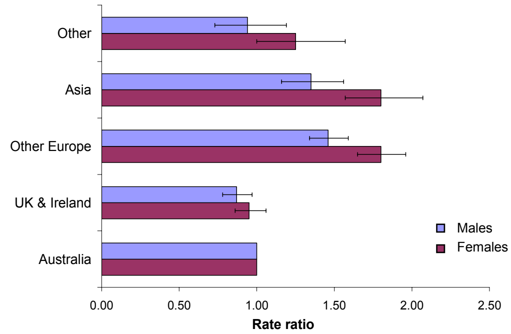
All causes



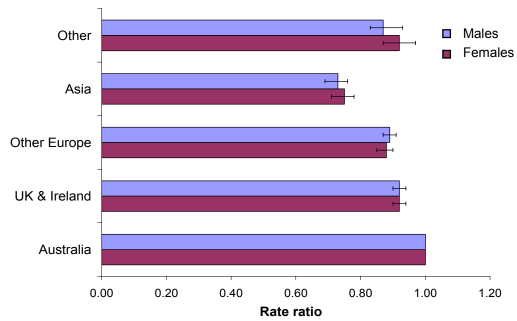
Cancers



Diabetes



Diseases of the circulatory system



Source: ABS mortality data.

Figure 7.3.1: Age-standardised mortality rates and rate ratios, selected causes by country of birth and sex, persons aged 65 years and over, 1998–2000

Table 7.3.1: Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes				
Australia	50.52	1.00	32.38	1.00
UK & Ireland	48.26	0.96***	32.20	0.99
Other Europe	44.97	0.89***	28.36	0.88***
Asia	35.85	0.83***	25.80	0.80***
Other	43.69	0.86***	29.64	0.92***
Cancers (C00–C97)				
Australia	14.86	1.00	7.65	1.00
UK & Ireland	15.01	1.01	8.44	1.10***
Other Europe	13.25	0.89***	6.91	0.90***
Asia	9.52	0.64***	6.27	0.82***
Other	12.76	0.86***	7.44	0.97
Cancer of the digestive organs (C15–C26)				
Australia	3.95	1.00	2.37	1.00
UK & Ireland	3.97	1.01	2.34	0.98
Other Europe	3.85	0.97	2.29	0.96
Asia	2.98	0.76***	2.30	0.97
Other	3.61	0.91	1.95	0.82*
Colon cancer (C18)				
Australia	1.36	1.00	0.94	1.00
UK & Ireland	1.14	0.84***	0.76	0.80***
Other Europe	1.00	0.74***	0.69	0.74***
Asia	0.65	0.48***	0.55	0.59***
Other	1.03	0.76*	0.71	0.76*
Cancer of the pancreas (C25)				
Australia	0.58	1.00	0.46	1.00
UK & Ireland	0.64	1.09	0.52	1.11
Other Europe	0.65	1.12	0.55	1.18*
Asia	0.42	0.72*	0.51	1.10
Other	0.64	1.11	0.46	0.99
Lung cancer (C33, C34)				
Australia	3.27	1.00	1.14	1.00
UK & Ireland	4.18	1.28***	1.87	1.65***
Other Europe	3.48	1.06*	0.82	0.72***
Asia	2.39	0.73***	0.89	0.78**
Other	3.11	0.95	1.19	1.05
Breast cancer (C50)				
Australia	—	—	0.97	1.00
UK & Ireland	—	—	1.04	1.07
Other Europe	—	—	0.85	0.87**
Asia	—	—	0.68	0.70***
Other	—	—	1.15	1.18
Cancer of the male genital organs (C60–63)				
Australia	2.68	1.00	—	—
UK & Ireland	2.27	0.85***	—	—
Other Europe	1.62	0.61***	—	—
Asia	1.13	0.42***	—	—
Other	1.88	0.70***	—	—

(continued)

Table 7.3.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Prostate cancer (C61)				
Australia	2.66	1.00	—	—
UK & Ireland	2.24	0.84***	—	—
Other Europe	1.61	0.60***	—	—
Asia	1.11	0.42***	—	—
Other	1.85	0.69***	—	—
Cancer of the lymphoid, haematopoietic and related tissue (C81–C96)				
Australia	1.36	1.00	0.85	1.00
UK & Ireland	1.26	0.92	0.82	0.96
Other Europe	1.40	1.02	0.85	0.10
Asia	1.07	0.79**	0.72	0.85
Other	1.37	1.00	0.90	1.06
Endocrine, nutritional and metabolic diseases (E00–E90)				
Australia	1.45	1.00	1.02	1.00
UK & Ireland	1.25	0.87**	0.98	0.96
Other Europe	2.02	1.40***	1.57	1.54***
Asia	1.77	1.22**	1.63	1.59***
Other	1.28	0.88	1.12	1.09
Diabetes mellitus (E10–E14)				
Australia	1.12	1.00	0.72	1.00
UK & Ireland	0.97	0.87**	0.69	0.95
Other Europe	1.64	1.46***	1.30	1.80***
Asia	1.51	1.35***	1.30	1.80***
Other	1.05	0.94	0.91	1.25*
Diseases of the nervous system (G00–G99)				
Australia	1.39	1.00	1.13	1.00
UK & Ireland	1.45	1.04	1.17	1.04
Other Europe	1.14	0.82***	0.79	0.70***
Asia	0.97	0.70***	0.63	0.56***
Other	1.31	0.94	0.95	0.84
Alzheimer's disease (G30)				
Australia	0.50	1.00	0.60	1.00
UK & Ireland	0.54	1.07	0.70	1.17**
Other Europe	0.37	0.74***	0.39	0.66***
Asia	0.21	0.42***	0.28	0.47***
Other	0.51	1.01	0.35	0.59**
Diseases of the circulatory system (I00–I99)				
Australia	21.48	1.00	15.22	1.00
UK & Ireland	19.75	0.92***	13.96	0.92***
Other Europe	19.17	0.89***	13.34	0.88***
Asia	15.64	0.73***	11.39	0.75***
Other	18.80	0.87***	14.05	0.92**
Ischaemic heart disease (I20–I25)				
Australia	12.42	1.00	7.46	1.00
UK & Ireland	11.70	0.94***	7.07	0.95***
Other Europe	11.16	0.90***	6.67	0.89***
Asia	8.83	0.71***	5.40	0.72***
Other	10.76	0.87***	6.88	0.92*

(continued)

Table 7.3.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
Acute myocardial infarction (I21)				
Australia	6.95	1.00	4.26	1.00
UK & Ireland	6.61	0.95*	4.17	0.98
Other Europe	6.11	0.88***	3.80	0.89***
Asia	4.66	0.67***	2.98	0.70***
Other	5.76	0.83***	3.70	0.87**
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)				
Australia	2.52	1.00	2.11	1.00
UK & Ireland	2.31	0.91*	1.89	0.90***
Other Europe	2.41	0.96	1.98	0.94
Asia	1.86	0.74***	1.47	0.70***
Other	2.44	0.97	1.73	0.82**
Heart failure (I50)				
Australia	1.04	1.00	0.95	1.00
UK & Ireland	0.97	0.93	0.85	0.90*
Other Europe	0.97	0.93	0.87	0.92
Asia	0.78	0.75**	0.75	0.79**
Other	0.85	0.81	0.78	0.82
Stroke (I60–I69)				
Australia	4.65	1.00	4.24	1.00
UK & Ireland	4.01	0.86***	3.79	0.89***
Other Europe	4.09	0.88***	3.50	0.82***
Asia	3.67	0.79***	3.54	0.83***
Other	3.92	0.84**	4.16	0.98
Diseases of arteries, arterioles and capillaries (I70–I79)				
Australia	1.33	1.00	0.79	1.00
UK & Ireland	1.32	0.99	0.70	0.88**
Other Europe	1.08	0.81***	0.58	0.73***
Asia	0.78	0.59***	0.49	0.61***
Other	1.23	0.92	0.77	0.98
Diseases of the respiratory system (J00–J99)				
Australia	5.25	1.00	2.68	1.00
UK & Ireland	5.17	1.16***	3.11	1.16***
Other Europe	3.61	0.56***	1.51	0.56***
Asia	3.15	0.61***	1.63	0.61***
Other	4.31	0.44***	1.19	0.44***
Influenza and pneumonia (J10–J18)				
Australia	0.94	1.00	0.71	1.00
UK & Ireland	0.95	1.01	0.78	1.09
Other Europe	0.76	0.81***	0.45	0.63***
Asia	0.54	0.58***	0.51	0.72**
Other	0.93	0.99	0.55	0.76*
Chronic lower respiratory disease (J40–J47)				
Australia	3.49	1.00	1.57	1.00
UK & Ireland	3.25	0.93*	1.85	1.18***
Other Europe	2.07	0.59***	0.66	0.42***
Asia	1.89	0.54***	0.72	0.46***
Other	2.66	0.76***	1.19	0.76**

(continued)

Table 7.3.1 (continued): Age-standardised mortality rates and rate ratios, persons aged 65 years and over by country of birth and sex, 1998–2000

	Males		Females	
Cause of death and ICD-10 codes	**Rate[(a)]**	**Rate ratio**	**Rate[(a)]**	**Rate ratio**
Diseases of the digestive system (K00–K93)				
Australia	1.45	1.00	1.11	1.00
UK & Ireland	1.37	0.94	1.15	1.40
Other Europe	1.25	0.86**	0.87	0.79***
Asia	1.03	0.71***	0.90	0.81*
Other	1.05	0.72**	0.87	0.78*
Diseases of the genitourinary system (N00–N99)				
Australia	1.17	1.00	0.86	1.00
UK & Ireland	1.04	0.89*	0.75	0.88**
Other Europe	1.22	1.04	0.84	0.98
Asia	1.01	0.86	1.00	1.16
Other	1.01	0.86	0.68	0.79
Renal failure (N17–N19)				
Australia	0.81	1.00	0.51	1.00
UK & Ireland	0.69	0.86*	0.46	0.90
Other Europe	0.88	1.09	0.53	1.05
Asia	0.78	0.97	0.71	1.40***
Other	0.70	0.87	0.49	0.97
Accidents and injury (V01–Y98)				
Australia	1.15	1.00	0.67	1.00
UK & Ireland	1.06	0.92	0.66	0.98
Other Europe	1.22	1.06	0.74	1.10
Asia	0.84	0.73**	0.63	0.93
Other	1.13	0.98	0.89	1.32*
Falls (W00–W19)				
Australia	0.17	1.00	0.12	1.00
UK & Ireland	0.17	0.98	0.10	0.87
Other Europe	0.15	0.89	0.08	0.71*
Asia	0.11	0.62	0.10	0.85
Other	0.19	1.09	0.14	1.13

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

Persons aged 65–74 years, and 75 years and over

Overseas-born Australian residents aged 65–74 years, and 75 years or more, experienced significantly lower all-cause mortality rates than their Australian-born counterparts, with residents from Asia experiencing the lowest death rates. A similar pattern was observed for a number of specific conditions, most notably for diseases of the circulatory system. However, death rates among overseas-born residents were significantly higher for:

- all cancers: among males aged 75 years or more and females aged 65–74 and 75 years or more from UK & Ireland;
- diabetes mellitus: among males and females in both age groups from Other Europe and Asia, and females aged 65–74 from Other countries; and
- accidents and injury: among females aged 65–74 from Other countries.

Table 7.3.2: Age-standardised mortality rates and rate ratios, females aged 65–74 years and 75 years and over by country of birth, 1998–2000

	Males				Females			
	65–74 years		75 years and older		65–74 years		75 years and older	
	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio	Rate[(a)]	Rate ratio
All causes								
Australia	25.91	1.00	88.37	1.00	13.82	1.00	60.92	1.00
UK & Ireland	23.35	0.90***	86.57	0.98*	14.19	1.03	59.90	0.98*
Other Europe	22.50	0.87***	79.52	0.90***	11.34	0.82***	54.55	0.90***
Asia	18.22	0.70***	62.96	0.71***	10.60	0.77***	49.17	0.81***
Other	22.46	0.87***	76.35	0.86***	13.02	0.94	55.20	0.91***
Cancers (C00–C97)								
Australia	10.46	1.00	21.62	1.00	5.62	1.00	10.78	1.00
UK & Ireland	9.90	0.95*	22.86	1.06**	6.32	1.12***	11.70	1.09***
Other Europe	9.23	0.88***	19.44	0.90***	4.68	0.83***	10.34	0.96
Asia	6.35	0.61***	14.38	0.67***	4.03	0.72***	9.71	0.90**
Other	8.54	0.82***	19.24	0.89*	5.39	0.96	10.60	0.98
Diabetes mellitus (E10–E14)								
Australia	0.63	1.00	1.87	1.00	0.38	1.00	1.25	1.00
UK & Ireland	0.54	0.86	1.63	0.87*	0.33	0.86	1.25	1.00
Other Europe	0.85	1.34***	2.85	1.52***	0.61	1.62***	2.35	1.88***
Asia	0.99	1.55***	3.32	1.24*	0.69	1.83***	2.24	1.79***
Other	0.70	1.10	1.59	0.85	0.62	1.65**	1.34	1.07
Diseases of the circulatory system (I00–I99)								
Australia	9.07	1.00	40.57	1.00	4.43	1.00	31.82	1.00
UK & Ireland	8.03	0.88***	37.78	0.93***	3.98	0.90**	29.30	0.92***
Other Europe	8.26	0.91***	35.95	0.89***	3.83	0.86***	27.96	0.88***
Asia	7.13	0.79***	28.74	0.71***	3.42	0.77***	23.66	0.74***
Other	8.54	0.94	34.56	0.85***	4.25	0.96	29.13	0.92***
Accidents and injury (V01–Y98)								
Australia	0.66	1.00	1.91	1.00	0.29	1.00	1.26	1.00
UK & Ireland	0.53	0.80	1.87	0.98	0.27	0.94	1.25	0.99
Other Europe	0.66	1.00	2.07	1.09	0.34	1.19	1.35	1.07
Asia	0.43	0.65**	1.48	0.77*	0.33	1.15	1.08	0.85
Other	0.72	1.08	1.79	0.92	0.47	1.62*	1.53	1.22

(a) Deaths per 1,000 persons.

Source: ABS mortality data.

*p<0.05, **p<0.01, ***p<0.001

7.4 Summary and discussion

Generally, in 1998–2000, Australian residents who were born overseas had a better mortality profile than the Australian-born. Irrespective of age, residents from the UK and Ireland, Other Europe, Asia, and countries classified as 'Other' experienced significantly lower mortality rates for all causes of death combined, and for most specific causes. These patterns concur with that reported in earlier investigations of the relationship between country of birth and mortality (Mathers 1994a, 1994b, 1996; AIHW 2002; Taylor et al. 1999; Powles & Gifford 1990; Easthope 1995; Strong et al. 1998b). A number of findings of this present study, however, ran counter to that observed in some of this previous work. Mathers (1994a), for example, using mortality data for the period 1985–87, found that males and females aged 25–64 from the UK and Ireland experienced significantly higher death rates from lung cancer than the Australian-born; whereas we found that lung cancer mortality rates between these countries were similar, possibly reflecting a convergence in rates of smoking in more recent decades. The AIHW (2002), using mortality data for the period 1997–1999, also reported significantly higher mortality rates for lung cancer among males and females from the UK and Ireland. Consistent across most studies conducted to date are findings showing that mortality from breast cancer is significantly higher among females from the UK and Ireland, and that diabetes mellitus is higher among Australian residents from Asia and Other Europe.

The main reason for lower mortality rates among Australian residents born overseas is health selection (Mathers 1994a; AIHW 2002). Specifically, the Australian government requires that migrants meet strict health criteria prior to migration being authorised. Also, residents of overseas countries with poor health are less likely to have the financial resources or capacity needed to initiate or pursue a migration application. Other factors likely to contribute to lower death rates among the overseas-born include the protective effect of some lifestyle behaviours (e.g. diets low in saturated fat) and more favourable genetic constitutions. Importantly, the size of the mortality inequality between overseas and Australian-born residents is not constant but, rather, mortality rates among those born overseas tend to increase with length of residency such that, over time, differences in death rates by birthplace narrow. This process seems in part to be the result of migrants adopting the lifestyle behaviours and cultural practices of the host country. It may also be the case that some aspects of the culture and lifestyle of overseas-born Australians increase the risk of some types of mortality. Higher rates of breast and genital cancer among some migrant groups, for example, might reflect ethnic differences in health service use, the diffusion and uptake of health promotion and eduction information, lay symptomatology, or disease self-management (Jameson et al. 1999; Cheek et al. 1999).

8 Discussion and conclusions

The health of the Australian population improved markedly during the twentieth century (AIHW 1998, 2002; Dunn et al. 2002). For example:

- the toll of infectious disease was reduced sharply;
- life expectancy at birth continued to increase;
- since the late 1960s, death rates from coronary heart disease and stroke have declined; and
- in more recent years, we have witnessed a downward trend in deaths from lung, colorectal and breast cancer (AIHW 2002; Mathers et al. 1999).

Despite these (and other) improvements in population health, Australia at the end of the twentieth century still had considerable health inequalities. As this report has shown, during the period 1998–2000, death rates were strongly patterned by sex, geographic region, area socioeconomic disadvantage, occupation, and country of birth. Irrespective of age, death rates were highest for males, for persons living in Remote and Very Remote regions, for residents of socioeconomically disadvantaged areas, for blue-collar workers, and for the Australian-born. In this final chapter we present a summary of these findings, examine some possible explanations for the patterns observed, consider a number of issues of relevance for policy, and suggest some directions for the future monitoring of mortality inequalities in Australia.

Summary of mortality inequalities in Australia

Mortality inequalities by sex. Chapter 3 of this report examined mortality inequalities by sex, and found that males had a lower life expectancy at birth, and they experienced higher death rates for all causes, and for most specific causes. The smallest all-cause mortality inequality between the sexes was among infants and the largest was among adolescents and young adults. During the period 1985–1987 to 1998–2000, absolute death rates declined for both males and females in each age group. Relative mortality inequalities also declined: in 1985–1987, the difference in all-cause death rates between males and females aged 0–14, 15–24, 25–64 and 65 years or more was 35%, 177%, 92% and 61% respectively. The corresponding difference in death rates between males and females in 1998–2000 was 27%, 161%, 81%, and 55%. Among males and females aged 25–64, mortality inequalities since the mid-1980s also declined for all cancers, and diseases of the circulatory system.

As part of our analysis we also estimated the extent to which sex inequalities in death rates contributed to the total mortality burden in the general population. We found that if death rates among males aged 0–64 years could have been reduced to a level equivalent to those of similarly aged females, approximately 24,427 deaths would have been avoided in 1998–2000.

Mortality inequalities by geographic region. Chapter 4 of this report examined mortality inequalities by geographic region using the Accessibility/Remoteness Index of Australia (ARIA). Among persons aged 0–1, 0–14, 15–24, 25–64 and 65–74, death rates (for most conditions) followed a graded pattern across the ARIA categories, with rates being the lowest in areas classified as 'Highly Accessible' and highest in Remote/Very Remote areas. By contrast, a different mortality pattern was evident among persons aged 75 years and older: here, death rates were (with the exception of diabetes mellitus among females) significantly lower in Remote/Very Remote areas than in Highly Accessible areas. Our analysis also found that life expectancy was shorter among males and females from Remote/Very Remote areas, and that an estimated 4,639 deaths could have been avoided among persons aged 0–64 in 1998–2000 if all geographic regions in Australia had a mortality rate equivalent to that in Highly Accessible areas.

Possibly the most significant finding of our analysis of geographic differences in mortality was that the higher death rates in Remote/Very Remote regions, and to a lesser extent in Accessible and Moderately Accessible areas, were largely accounted for by the poorer mortality profile of Indigenous persons. For each age group examined, mortality rates were highest in Remote/Very Remote areas when based on deaths among all Australian residents (Indigenous and non-Indigenous). However, when Indigenous deaths were excluded, mortality rates in Remote/Very Remote areas were similar to those found in Highly Accessible areas. Indeed, in some cases, death rates in the former areas were actually lower than those found in the latter when based exclusively on deaths among non-Indigenous persons. Thus, what initially appeared to be mortality inequalities resulting from differences between urban and rural areas in terms of social and economic factors and access to services was largely due to the vastly different mortality experiences of Indigenous and non-Indigenous Australians (ABS & AIHW 2003). This finding, which is consistent with that reported in other studies (Coory 2003; Glover et al. 1999; AIHW 2002), raises important and difficult questions about how to best tackle geographic differences in mortality, and where to target our efforts and financial resources.

Mortality inequalities by area socioeconomic disadvantage. In Chapter 5, we examined the relation between mortality and socioeconomic status using the Index of Relative Socioeconomic Disadvantage (IRSD), which involved grouping Statistical Local Areas (SLAs) covering all states and territories into quintiles (20%) based on their IRSD score. As with other studies (Turrell & Mathers 2001; Mathers 1994a, 1994b, 1995, 1996; Glover et al. 1999), we found that socioeconomically disadvantaged areas experienced significantly higher mortality rates for most major causes of death, and that these differences were evident for males and females at every stage of the lifecourse: in infancy and childhood, adolescence and young adulthood, among the working aged, and well into late adulthood. Moreover, for each sex–age subgroup, mortality rates very often increased in a step-wise gradient from the least to the most disadvantaged quintile. Further, we estimated that in 1998–2000 approximately 16,752 male deaths and 6,485 female deaths would have been avoided among persons aged 0–64 years if all SLAs in Australia had an all-cause mortality rate equivalent to that in the 20% least disadvantaged areas.

As part of Chapter 5 we also examined trends in socioeconomic mortality inequalities for the periods 1985–1987 and 1998–2000. For males and females in each age group, death rates for most causes declined for all socioeconomic quintiles between the mid-1980s and the late 1990s. In terms of relative mortality inequality for all causes for males, the gap between the most and least disadvantaged quintiles widened for each age group. In terms of the absolute death rate however, differences between the top and bottom quintiles narrowed, except among males aged 15–24, where the difference in absolute all cause death rates per 100,000 persons actually widened between 1985–1987 and 1998–2000. Among females, relative mortality inequalities for all causes either decreased (among 0–14 year olds) or were stable over the two periods; and differences between the most and least disadvantaged quintiles in terms of absolute death rates per 100,000 persons declined for each age group.

Mortality inequalities by occupation. Chapter 6 examined the association between occupation and mortality among males and females aged 25–54 years. An implicit expectation when examining mortality inequalities by occupation is that one will find a clearly graded relation between occupation level and death rate, with rates being lowest among managers, administrators and professionals, intermediate for white-collar employees, and highest for blue-collar workers (reflecting in part underlying differences in other socioeconomic attributes such as education or income). Rarely, however, was this the case. The most consistent occupational patterning was between males employed in managerial, administrative and professional jobs and their blue-collar counterparts. Male blue-collar workers experienced significantly higher death rates for all causes and for most specific causes. The difference in death rates between these two occupational groups was especially marked for lung cancer, for deaths due to mental and behavioural disorders resulting from psychoactive substance use, diseases of the circulatory system, diseases of the respiratory system, diseases of the digestive system, accidents and injury, and suicide. Female blue-collar workers also experienced the highest death rates for a number of these conditions, although the difference between the occupation groups was usually smaller than for males.

Mortality inequalities by country of birth. The final substantive chapter in this report (Chapter 7) compared the mortality profiles of overseas and Australian-born residents. In keeping with previous research (Strong et al. 1998b; Mathers 1994a, 1994b, 1996; AIHW 2002; Taylor et al. 1999; Powles & Gifford 1990; Easthope 1995), we found that, in most cases, Australian residents who were born overseas experienced significantly lower mortality rates. This pattern was evident for both males and females, and all age groups. The primary reason for the better mortality profile of the overseas-born is health selection. Persons applying to migrate to Australia need to meet strict health criteria, so that those who become Australian residents are usually among the healthiest from their country of origin, and clearly (as the mortality data suggest) healthier than the average resident of their country of destination. The results of this study, however, also showed that overseas-born residents experienced significantly higher mortality rates for a number of conditions, including cancer of the genital organs (females aged 25–64 from Other countries); diseases of the liver (females aged 25–64 from UK & Ireland); cancer of the pancreas (among females aged 65 years and over from Other Europe); lung cancer (among males and females aged 65 years and over from UK & Ireland, and among males from Other Europe); and diabetes mellitus (among males and females aged 65–74 and 75 years or more from Other Europe and Asia). Higher death rates for these types of conditions among the overseas-born may reflect such things as birthplace differences in health behaviours and risk factor prevalence, English language difficulties (affecting the comprehension and subsequent uptake of health promotion messages), and cultural customs influencing lay symptomatology, disease self-management, or help-seeking practices (i.e. use of health care services).

Explaining and reducing mortality inequalities in Australia

At present, our levels of understanding and extent of knowledge about the genesis and persistence of mortality inequalities are limited. However, with the exception of sex inequalities and country of birth inequalities which are due primarily to health selection effects, social factors appear to operate with all other inequalities (Eckersley et al. 2001). In previous work, (Turrell et al. 1999; Turrell & Mathers 2000; Turrell 2002), a conceptual framework has been proposed that attempts to identify the main determinants of these inequalities (Figure 8.1). Whilst this framework was originally compiled to help explicate the pathways and mechanisms linking socioeconomic factors and health (including occupation), it arguably has broader applicability and relevance to our understanding of mortality inequalities based on sex and geographic region. Each of the main contributors to mortality inequality are positioned in the framework according to whether they represent an upstream (macro), midstream (intermediate) or downstream (micro) determinant of health. The structure and flow of the framework (and the empirical evidence that underpins it) suggest that chronic disease mortality is ultimately a consequence of adverse biological reactions that occur as a result of changes or disruptions to the functioning of physiological systems. Thus, part of the poorer mortality profile of residents of disadvantaged areas, blue-collar workers, Indigenous persons, and males is due to more sustained and/or longer term adverse changes to physical and biological functioning. These changes are often initiated by psychosocial processes and health behaviours (acting independently and interdependently). These in turn are a consequence of differential exposure across the lifecourse to adverse social, physical, economic, and environmental circumstances, which are themselves influenced by things such as the actions and decisions of governments, the market, civic society, and broader global forces. The framework also indicates a more direct link between social factors and mortality resulting from accidents, injury, and violence.

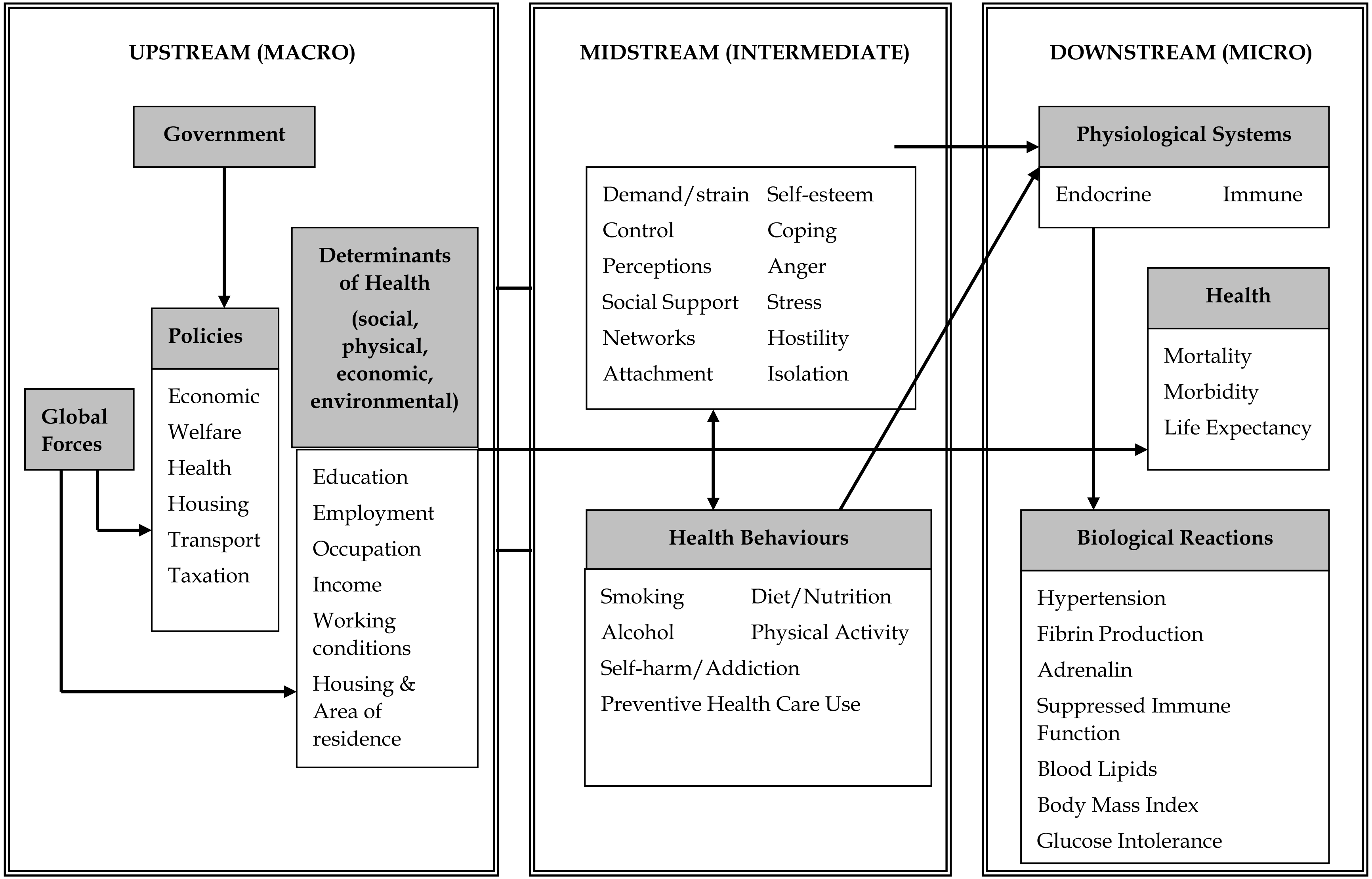


Figure 8.1: A framework of the social determinants of health

Importantly, although the ordering and flow of relationships in the framework make the explicit claim that health inequalities are due fundamentally to social and economic factors impacting on health, it needs to be recognised that the relationships can potentially flow in the opposite direction. Specifically, health status can be a determinant of social position rather than vice versa. Healthy people are more likely to move up the social ladder, whereas the less healthy are more likely to experience downward social mobility. The net effect of this health-related mobility up and down the social hierarchy is to increase the mortality differential between groups, amplifying in particular the death rates of disadvantaged groups. Whilst there is no doubt that for some people poor health contributes to downward mobility, or makes upward mobility difficult, data from longitudinal studies show that the overall contribution of health selection to health inequalities is small (Blane et al. 1993; Power et al. 1996).

Whilst furthering our understanding of the determinants of mortality inequalities represents an important goal for public health, even more important (and challenging) is the development of policies, interventions, and other initiatives to reduce the inequalities. There now exists a growing body of literature on addressing health inequalities (Turrell et al. 1999; Turrell 2002c; Oldenburg et al. 2000a; Graham 2001; Sibthorpe & Dixon 2001; Acheson 1998; Benzeval et al. 1995; Gepkins & Gunning-Schepers 1996). A detailed discussion of this material lies outside the scope of this report—briefly, however, the approaches suggested fall into one or more of the following categories: changing macro-level social and economic policies; improving living and working conditions; involving local communities in health initiatives; changing health damaging behaviours; empowering individuals and strengthening their social and family networks; and improving the equity of the health care system (Oldenburg et al. 2000b). The conceptual framework also provides useful insights and raises issues that need to be considered as part of the development and implementation of policies and interventions to reduce mortality inequalities. These issues include (but are not limited to) the following:

- The identification of entry points: where do we intervene or direct our efforts? Efforts can be directed at upstream, midstream or downstream factors. Where we focus and concentrate these, however, has implications in terms of making a measurable impact on health inequalities. Attempts to tackle inequalities by focusing on upstream factors are likely to result in the greatest impact on population-wide disparities; however, societal-level changes are the most difficult to bring about, and the most politically sensitive. Policies and interventions that focus on midstream factors, by contrast, might benefit the groups or areas that are targeted, but they are unlikely to reduce health inequalities at the national level. Moreover, midstream efforts might improve psychosocial health, or result in behaviour change, but they are not likely to alter the social and economic conditions that gave rise to the problems in the first place. We could also focus our efforts at the micro level, via for example, health promotion information provided at GP visits. This approach, whilst important, probably only serves to improve individual health, and is not likely to impact in any discernible way on national-level health inequalities
- Whilst approaches will differ in their impact depending on where they are directed (upstream, midstream, or downstream), attempts to tackle health inequalities should focus simultaneously on macro, intermediate, and micro influences. Policies and interventions need to be implemented on a broad front (Acheson 1998).
- Evidence about the causes of socioeconomic health inequalities points to the need for a 'whole of society' approach to the problem. Health inequalities originate from societal-level conditions associated with housing, employment, education, income, transport, etc., and reducing inequalities will not be achieved exclusively (or even primarily) by actions taken within the health sector. An effective response to health inequalities will therefore require actions from all sectors, thus inter-sectoral collaboration and joined-up efforts are essential.

- To be maximally effective, efforts to tackle health inequalities should focus on both contexts and individuals, by taking a social-ecological approach to the problem. To date, policy and intervention efforts have largely been non-contextual, and targeted at individuals. This has had limited success in terms of reducing socioeconomic health inequalities. Indeed, an individualised, non-contextual approach may have actually widened health inequalities between social groups. For example, health promotion programs that attempt to change individual behaviour have been more effective among the socioeconomically advantaged (Whitehead 1995; Kawachi & Marmot 1998). This is because disadvantaged groups are often constrained by their social and economic circumstances that make behavioural change difficult.
- The need to adopt a lifecourse perspective, which explicitly acknowledges that many adult diseases, health behaviours, and psychosocial conditions have their origins in early life and are tied closely to the quality of the social, physical and economic environments that are experienced throughout life.
- Finally, while public (health) policy and interventions have apparently been effective in terms of improving average health, population-wide approaches do not necessarily alter the underlying health inequalities. This was amply demonstrated in this report, which showed that many health inequalities (measured relatively) remained unchanged or increased between 1985–1987 and 1998–2000, even though overall health status improved. This implies that national or large-scale efforts to improve population health need to be complemented by approaches that are specifically targeted at groups and areas with the poorest mortality profile.

In summary, this report has clearly demonstrated that there are considerable mortality inequalities in Australia based on sex, geographic region, socioeconomic disadvantage, occupation, and country of birth. It was also shown that deaths attributable to inequality contributed substantially to the total mortality burden in the general population, and that deaths resulting from inequality are potentially avoidable, and hence unnecessary. An overview of some of the possible pathways and mechanisms linking sex, geographic region, socioeconomic disadvantage, and occupation with mortality was also provided. Further, the report presented a brief discussion of some of the issues that need to be considered as part of the development and implementation of policies and interventions that are directed at narrowing the mortality gap between social groups. Future reports in this series will focus on health inequalities in morbidity, health-related behaviours, risk factor prevalence, and health service utilisation, and on measuring socioeconomic position in population health monitoring and health research.

Implications of this report's findings for the future monitoring of mortality inequalities

Given the magnitude of mortality inequalities in Australia, and in some cases their widening, it is concerning to observe that the monitoring of health inequalities in this country has to date been conducted in an episodic, ad hoc, and unsystematic manner (Turrell et al. 1999). Hence, important knowledge and information are lacking about the nature and extent of health inequalities, their patterning at national, state, and local levels, and trends over time. As a result, our capacity to address the problem, that is, to allocate resources cost-effectively, to identify priority groups, to develop and implement policies and strategies to reduce inequalities, is limited. What is required is a nationally coordinated monitoring system and research program for health inequalities, similar to that which exists in other countries (Mackenbach 1994; Mackenbach & Bakker 2002). The establishment of a health inequalities monitoring system and an associated research program would represent a significant advance in our efforts to narrow the health inequalities that currently exist between many population subgroups, and to further improve the health of the population as a whole.

Glossary

age standardisation: A method of removing the influence of age when comparing populations with different age structures. Adjustments are made for each of the comparison populations against a standard population.

cancer: A range of diseases where some of the body's cells begin to multiply out of control. Deaths attributed to cancer throughout this report were classified to ICD-10 codes C00–C96 (Malignant neoplasms).

cause of death: Sourced from information reported on death certificates, where the cause of each death is classified by the underlying cause of death according to the rules and conventions of the 10th revision of the International Classification of Diseases. The underlying cause of death is determined to be the disease that initiated the train of events leading directly to death. Deaths related to accidents and injury are classified according to the circumstances which produced the accident or injury rather than the nature of the injury.

confidence interval: A statistical term describing a range of values within which we can be 'confident' that the true value lies. Generally reported in terms of a 95% confidence level, where the true value has a 95% or higher chance of falling within the reported range.

excess mortality: Provides an indication of the number of deaths that could have been avoided if mortality across one or more population groups was the same as that of a reference population.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community with which he or she is associated.

international classification of diseases: The World Health Organization's internationally accepted classification of death and disease.

ischaemic heart disease: Heart attack and angina (chest pain). Also known as coronary heart disease.

life expectancy: An indication of how long a person can expect to live if death rates do not change. Generally reported as the number of years of life remaining to a person at a particular age.

lung cancer: Deaths attributed to lung cancer throughout this report were classified to ICD-10 codes C33 and C34 (Malignant neoplasms of the trachea, bronchus and lung).

melanoma: A cancer of the body's cells that contain pigment (melanin), mainly affecting the skin.

mortality: Death.

myocardial infarction: Term commonly used to mean heart attack, but more correctly refers only to those heart attacks which have caused some death of heart muscle.

perinatal: Pertaining to or occurring in the period shortly before or (usually 28 days) after birth.

potentially avoidable deaths: Conditions that are determined to be preventable through factors such as behaviour change, early intervention, management or medical intervention. Generally recorded for persons aged less than 75 years.

potential years of life lost (PYLL): Number of potential years of life lost in a population as a result of premature death.

quintile: A group derived by ranking the population according to specified criteria and dividing it into five equal parts.

statistical significance: An indication from a statistical test that an observed difference or association may be significant or 'real' because it is unlikely to be due to chance.

stroke: When an artery supplying blood to the brain suddenly becomes blocked or bleeds. Often causes paralysis of parts of the body normally controlled by that area of the brain, or speech problems and other symptoms. Deaths attributed to stroke throughout this report were classified to ICD-10 codes I60–I69 (Cerebrovascular diseases).

suicide: Deliberately ending one's own life. Deaths attributed to suicide throughout this report were classified to ICD-10 codes X60–X84 (Intentional self-harm).

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Appendix A

Number of deaths for each condition

Table A.1: Selected causes of death, children aged less than 1 year, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	Number	Per cent	Number	Per cent	Number	Per cent
Certain conditions originating in the perinatal period (P00–P96)	1,058	47.2	797	46.7	1,855	47.0
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	585	26.1	480	28.1	1,065	27.0
SIDS (R95)	257	11.5	162	9.5	419	10.6
Accidents and injury (V01–Y98)	87	3.9	53	3.1	140	3.5
All causes	2,243	100.0	1,707	100.0	3,950	100.0

Source: ABS mortality data.

Table A.2: Selected causes of death, persons aged 0–14 years, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	Number	Per cent	Number	Per cent	Number	Per cent
Accidents and injury (V01–Y98)	602	17.6	360	14.1	962	16.1
All causes	3,418	100.0	2,557	100.0	5,975	100.0

Source: ABS mortality data.

Table A.3: Selected causes of death, persons aged 15–24 years, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	Number	Per cent	Number	Per cent	Number	Per cent
Accidents and injury (V01–Y98)	2,898	73.1	847	58.7	3,745	69.3
Transport accidents (V01–V99)	1,207	30.4	374	25.9	1,581	29.2
Suicide (X60–X84)	936	23.6	228	15.8	1,164	21.5
All causes	3,965	100.0	1,442	100.0	5,407	100.0

Source: ABS mortality data.

Table A.4: Selected causes of death, persons aged 25–64 years, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Cancers (C00–C97)	15,519	33.0	13,080	50.2	28,599	39.1
Digestive organs (C15–C26)	4,814	10.2	2,765	10.6	7,579	10.4
Colon (C18)	1,468	3.1	1,084	4.2	2,552	3.5
Melanoma of skin (C43)	750	1.6	431	1.7	1,181	1.6
Lung cancer (C33, C34)	3,553	7.5	1,782	6.8	5,335	7.3
Breast (C50)	24	0.1	3,538	13.6	3,562	4.9
Female genital organs (C51–C58)	—	—	1,337	5.1	1,337	1.8
Brain (C71)	926	2.0	554	2.1	1,480	2.0
Lymphoid, haematopoietic and related tissue (C81–C96)	1,643	3.5	1,137	4.4	2,780	3.8
Mental and behavioural disorders due to psychoactive substance use (F10–F19)	1,298	2.8	337	1.3	1,635	2.2
Diseases of the circulatory system (I00–I99)	11,720	24.9	4,384	16.8	16,104	22.0
Ischaemic heart diseases (I20–I25)	8,120	17.3	2,061	7.9	10,181	13.9
Acute myocardial infarction (I21)	4,041	8.6	1,107	4.2	5,148	7.0
Stroke (I60–I69)	1,479	3.1	1,097	4.2	2,567	3.5
Diseases of the respiratory system (J00–J99)	1,696	3.6	1,297	5.0	2,993	4.1
Chronic lower respiratory disease (J40–J47)	1,136	2.4	943	3.6	2,079	2.8
Diseases of the digestive system (K00–K93)	1,992	4.2	884	3.4	2,876	3.9
Diseases of the liver (K70–K77)	1,484	3.2	531	2.0	2,015	2.8
Accidents and injury (V01–Y98)	10,204	21.7	3,001	11.5	13,205	18.1
Transport accidents (V01–V99)	2,309	4.9	748	2.9	3,057	4.2
Suicide (X60–X84)	4,325	9.2	1,084	4.2	5,409	7.4
All causes	47,067	100.0	26,053	100.0	73,120	100.0

Source: ABS mortality data.

Table A.5: Selected causes of death, persons aged 65 and over, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Cancers (C00–C97)	43,868	29.9	32,399	21.3	76,276	25.5
Digestive organs (C15–C26)	11,874	8.1	10,223	6.7	22,097	7.4
Colon (C18)	3,787	2.6	3,791	2.5	7,578	2.5
Pancreas (C25)	1,802	1.2	2,061	1.4	3,863	1.3
Lung cancer (C33, C34)	10,399	7.1	4,684	3.1	15,083	5.0
Breast (C50)	36	0.0	4,030	2.6	4,066	1.4
Male genital organs (C60–63)	7,199	4.9	—	—	7,199	2.4
Prostate (C61)	7,153	4.9	—	—	7,153	2.4
Lymphoid, haematopoietic and related tissue (C81–C96)	4,082	2.8	3,638	2.4	7,720	2.6
Endocrine, nutritional and metabolic diseases (E00–E90)	4,585	3.1	5,096	3.3	9,681	3.2
Diabetes mellitus (E10–E14)	3,600	2.5	3,703	2.4	7,303	2.4
Diseases of the nervous system (G00–G99)	4,014	2.7	5,322	3.5	9,336	3.1
Alzheimer's disease (G30)	1,394	1.0	3,058	2.0	4,452	1.5
Diseases of the circulatory system (I00–I99)	61,840	42.2	74,525	48.9	136,365	45.6
Ischaemic heart diseases (I20–I25)	36,024	24.6	36,180	23.7	72,204	24.1
Acute myocardial infarction (I21)	20,088	13.7	20,398	13.4	40,486	13.5
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)	7,250	4.9	10,630	7.0	17,880	6.0
Heart failure (I50)	2,935	2.0	5,043	3.3	7,978	2.7
Stroke (I60–I69)	13,213	9.0	21,000	13.8	34,213	11.4
Diseases of arteries, arterioles and capillaries (I70–I79)	3,792	2.6	3,795	2.5	7,587	2.5
Diseases of the respiratory system (J00–99)	14,697	10.0	12,209	8.0	26,906	9.0
Influenza and pneumonia (J10–J18)	2,630	1.8	3,753	2.5	6,383	2.1
Chronic lower respiratory disease (J40–J47)	9,572	6.5	6,432	4.2	16,004	5.4
Diseases of the digestive system (K00–K93)	4,161	2.8	5,235	3.4	9,396	3.1
Diseases of the genitourinary system (N00–N99)	3,388	2.3	4,274	2.8	7,662	2.6
Renal failure (N17–N19)	2,341	1.6	2,608	1.7	4,949	1.7
Accidents and injuries (V01–Y98)	3,423	2.3	3,331	2.2	6,754	2.3
Falls (W00–W19)	503	0.3	565	0.4	1,068	0.4
All causes	146,633	100.0	152,421	100.0	299,054	100.0

Source: ABS mortality data.

Table A.6: Selected causes of death, persons aged 65–74 years, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Cancers (C00–C97)	18,973	40.2	11,375	40.6	30,348	40.4
Digestive organs (C15–C26)	5,498	11.7	3,248	11.6	8,746	11.6
Colon (C18)	1,752	3.7	1,210	4.3	2,962	3.9
Pancreas (C25)	839	1.8	697	2.5	1,536	2.0
Lung cancer (C33, C34)	2,143	4.5	5,234	18.7	7,377	9.8
Lymphoid, haematopoietic and related tissue (C81–C96)	1,673	3.5	1,117	4.0	2,790	3.7
Endocrine, nutritional and metabolic diseases (E00–E90)	1,686	3.6	1,181	4.2	2,867	3.8
Diabetes mellitus (E10–E14)	1,297	2.7	894	3.2	2,191	2.9
Diseases of the nervous system (G00–G99)	972	2.1	786	2.8	1,758	2.3
Alzheimer's disease (G30)	200	0.4	204	0.7	404	0.5
Diseases of the circulatory system (I00–I99)	16,804	35.6	9,040	32.3	25,844	34.4
Ischaemic heart diseases (I20–I25)	10,994	23.3	4,989	17.8	15,983	21.3
Acute myocardial infarction (I21)	6,134	13.0	2,998	10.7	9,132	12.1
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)	1,485	3.1	993	3.5	2,478	3.3
Heart failure (I50)	344	0.7	246	0.9	590	0.8
Stroke (I60–I69)	2,857	6.1	2,134	7.6	4,991	6.6
Diseases of arteries, arterioles and capillaries (I70–I79)	1,022	2.2	466	1.7	1,488	2.0
Diseases of the respiratory system (J00–J99)	4,120	8.7	2,363	8.4	6,483	8.6
Influenza and pneumonia (J10–J18)	333	0.7	211	0.8	544	0.7
Chronic lower respiratory disease (J40–J47)	3,167	6.7	1,876	6.7	5,043	6.7
Diseases of the digestive system (K00–K93)	1,384	2.9	865	3.1	2,249	3.0
Diseases of the genitourinary system (N00–N99)	463	1.0	477	1.7	940	1.2
Renal failure (N17–N19)	246	0.5	199	0.7	445	0.6
Accidents and injury (V01–Y98)	1,216	2.6	632	2.3	1,848	2.5
Falls (W00–W19)	141	0.3	97	0.3	238	0.3
All causes	47,187	100.0	28,024	100.0	75,211	100.0

Source: ABS mortality data.

Table A.7: Selected causes of death, persons aged 75 and over, Australia, 1998–2000

	Males		Females		Persons	
Cause of death and ICD-10 code	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Cancers (C00–C97)	24,889	25.0	21,024	16.9	45,913	20.5
Digestive organs (C15–C26)	6,376	6.4	6,975	5.6	13,351	6.0
Colon (C18)	2,035	2.0	2,581	2.1	4,616	2.1
Pancreas (C25)	936	0.9	1,364	1.1	2,300	1.0
Lung cancer (C33, C34)	5,165	5.2	2,541	2.0	7,706	3.4
Lymphoid, haematopoietic and related tissue (C81–C96)	2,409	2.4	2,521	2.0	4,930	2.2
Endocrine, nutritional and metabolic diseases (E00–E90)	2,899	2.9	3,915	3.1	6,814	3.0
Diabetes mellitus (E10–E14)	2,303	2.3	2,809	2.3	5,112	2.3
Diseases of the nervous system (G00–G99)	3,042	3.1	4,536	3.6	7,578	3.4
Alzheimer's disease (G30)	1,194	1.2	2,858	2.3	4,052	1.8
Diseases of the circulatory system (I00–I99)	45,036	45.3	65,485	52.6	110,521	49.4
Ischaemic heart diseases (I20–I25)	25,030	25.2	31,191	25.1	56,221	25.1
Acute myocardial infarction (I21)	13,954	14.0	17,400	14.0	31,354	14.0
Pulmonary heart disease of pulmonary circulation and other forms of heart disease (I26–I52)	5,765	5.8	9,637	7.7	15,402	6.9
Heart failure (I50)	2,591	2.6	4,797	3.9	7,388	3.3
Stroke (I60–I69)	10,356	10.4	18,866	15.2	29,222	13.1
Diseases of arteries, arterioles and capillaries (I70–I79)	2,770	2.8	3,329	2.7	6,099	2.7
Diseases of the respiratory system (J00–J99)	10,577	10.6	9,846	7.9	20,423	9.1
Influenza and pneumonia (J10–J18)	2,297	2.3	3,542	2.8	5,839	2.6
Chronic lower respiratory disease (J40–J47)	6,405	6.4	4,556	3.7	10,961	4.9
Diseases of the digestive system (K00–K93)	2,777	2.8	4,370	3.5	7,147	3.2
Diseases of the genitourinary system (N00–N99)	2,925	2.9	3,797	3.1	6,722	3.0
Renal failure (N17–N19)	2,095	2.1	2,409	1.9	4,504	2.0
Accidents and injury (V01–Y98)	2,207	2.2	2,699	2.2	4,906	2.2
Falls (W00–W19)	362	0.4	468	0.4	830	0.4
All causes	99,446	100.0	124,397	100.0	223,843	100.0

Source: ABS mortality data.

Appendix B

Potentially avoidable deaths

Table B.1: ICD-10 codes used to calculate potentially avoidable deaths

Potentially avoidable condition	ICD-10	Conditions involved
Enteritis and other diarrhoeal diseases	A00–A09	Diarrhoeal diseases
Tuberculosis	A15–A19, A23, A35–A37, A49.2, B90	Tuberculosis
Immunisation-preventable diseases	A33, A35–A37, A80, B05–B06, P35.0, A49.2, G00.0	Diphtheria, whooping cough, tetanus, polio, Hib, measles, rubella
HIV/AIDS	B20–B24	HIV/AIDS
Hepatitis and liver cancer	B15–B19, C22.0, C22.1, C22.9	Hepatitis A, B, C, D, E, primary liver cancer
Sexually transmitted diseases	A50–A64, M02.3, N34.1, N70.0, N70.9, N71.0, N71.1, N72, N73.0–N73.5, N73.8, N75.0, N75.1, N76.0, N76.2, N76.4, N76.6, N76.8, N77.0, N77.1, N77.8, O00, R59.1	Syphilis, gonorrhoea + other STDs, ectopic pregnancy
Skin cancers	C00,C43–C44	Lip, melanoma, other skin cancer
Colorectal cancer	C18–C21	Colorectal cancer
Oral cancers	C02–C06, C09–C10, C12–C14, C32	Malignant neoplasm mouth, pharynx, larynx
Lung cancers	C33–C34	Malignant neoplasm, trachea, bronchus, lung
Breast cancer	C50	Breast cancer
Nutrition	D50–53, E40–E46, E50–E56,E63–E64	Nutritional deficits including anaemia
Alcohol-related conditions	F10, I42.6, K29.2, K70	Psychosis, alcoholism, cardiac, gastric or liver damage due to alcohol
Chronic obstructive respiratory diseases	J40–J44	Chronic bronchitis and emphysema
Ischaemic heart disease	I20–I22, I24, I25.1–I25.9	Ischaemic heart disease
Stroke	I61, I62.0, I63.0–I63.5, I63.8–I63.9, I64–I66, I67.8	Intracerebral haemorrhage or occlusion
Neural tube defects	Q00–Q07	Congenital anomalies of brain and spinal cord
Low birthweight babies	P05–P07, P22, P27	Prematurity, low birthweight, respiratory disease from prematurity
Sudden Infant Death Syndrome	R95	SIDS
Road traffic injury	See table B2 for further details	Road traffic injury
Poisoning	X40–X49	Poisoning
Swimming pool injury	W16, W67, W68	Swimming pool falls and drownings
Sport injury	W01.30, W02, W03.30, W09, W21, X50	Falls from playground equipment, sport injury
Fire	X00–X09	Burns and scalds
Drowning	W65, W69, W70, W73, W74, Y21	Drowning
Suicide	X60–X84,Y87.0, Y10–Y34	Suicide

(continued)

Table B.1 (continued): ICD-10 codes used to calculate potentially avoidable deaths

Potentially avoidable condition	ICD-10	Conditions involved
Other infections	A23–A26, A28.0, A28.2–A28.9, A30, A31, A32.9, A38, A39, A46, B50–B54, G00, G01, J02.0, P23, P35.1–P35.9, P36–P39	Brucellosis & other zoonoses, streptococcus, malaria, meningitis, congenital
Cervical cancer	C53	Cervical cancer
Thyroid disease	E03.2, E03.8, E03.9, E04–E05, E89.0	Goitre, thyrotoxicosis, hypothyroidism
Newborn screening conditions	E03.1, E25, E70.0, E70.1, E74.2	Congenital hypothyroidism, CAH, PKU, galatosaemia
Diabetes	E10–E14	Diabetes
Epilepsy	G40–G41	Epilepsy
Ear infections	H65–H70	Otitis media and mastoiditis
Rheumatic fever/heart disease	I00–I09	Acute rheumatic fever, heart disease
Hypertensive disease	I10–I15, I67.4	Hypertensive disease
Respiratory infections	J00, J01.1–J01.2, J01.8–J01.9, J02–J06, J10, J11.0, J12–J15, J16.8, J17.0–J17.2, J17.8, J18.0, J18.8, J20–J22	Respiratory infections including pneumonia and influenza
Asthma	J45–J46	Asthma
Peptic ulcer	K25–K28	Gastric and duodenal ulcers
Pregnancy complications	O01–O08, O10–O99	Complications of pregnancy
Musculoskeletal infections	L01–L08, L98.0, M00, M01.1–M01.3, M01.5–M01.8, M02.1, M02.3, M03.2, M35.2, M46.2, M86, M87.1–M87.9, M89.6, M90.0–M90.2	Skin, bone and joint infections
Stomach cancer	C16	Stomach cancer
Cancer of uterus	C54, C55	Cancer of uterus
Cancer of testis	C62	Cancer of testis
Eye cancer	C69	Eye cancer
Thyroid cancer	C73	Thyroid cancer
Hodgkin's disease	C81	Hodgkin's disease
Leukaemia	C91.0–C91.3, C91.7, C91.9	Lymphoid leukaemias
Benign cancers	D10–D36	Benign & in situ cancers
Appendicitis	K35–K38	Appendicitis
Intestinal obstruction and hernia	K40–K46, K56	Intestinal obstruction and hernia
Gallbladder disease	K80–K83, K91.5	Gallbladder disease
Acute renal failure	N17	Acute renal failure
Congenital anomalies	Q10–Q23.3, Q23.8–Q23.9, Q24–Q28, Q35–Q84	Congenital cardiac, digestive, genitourinary, musculoskeletal anomalies
Birth trauma and asphyxia	P10–P15, P20–P21, P50, P51, P95	Birth trauma and asphyxia
Other perinatal conditions	P08, P22, P22.1, P25, P26, P28, P52–P96	Respiratory disease, haemolytic disease, jaundice, etc.
Iatrogenic conditions	Y60–Y84	Complications of treatment

Source: NSW Health: (http://www.health.nsw.gov.au/public-health/chorep/toc/app_icd_avm.htm).

Table B.2: Additional ICD-10 codes for potentially avoidable deaths related to traffic injury

ICD-10 codes for road traffic injury
V01.1, V02.1, V03.1, V04.1, V05.1, V06.1, V09.2, V09.3, V10.4, V10.5, V10.9, V11.4, V11.5, V11.9, V12.4, V12.5, V12.9, V13.4, V13.5, V13.9, V14.4, V14.5, V14.9, V15.4, V15.5, V15.9, V16.4, V16.5, V16.9, V17.4, V17.5, V17.9, V18.4, V18.5, V18.9, V19.4, V19.5, V19.6, V19.9, V20.4, V20.5, V20.9, V21.4, V21.5, V21.9, V22.4, V22.5, V22.9, V23.4, V23.5, V23.9, V24.4, V24.5, V24.9, V25.4, V25.5, V25.9, V26.4, V26.5, V26.9, V27.4, V27.5, V27.9, V28.4, V28.5, V28.9, V29.4, V29.5, V29.6, V29.9, V30.5, V30.6, V30.7, V30.9, V31.5, V31.6, V31.7, V31.9, V32.5, V32.6, V32.7, V32.9, V33.5, V33.6, V33.7, V33.9, V34.5, V34.6, V34.7, V34.9, V35.5, V35.6, V35.7, V35.9, V36.5, V36.6, V36.7, V36.9, V37.5, V37.6, V37.7, V37.9, V38.5, V38.6, V38.7, V38.9, V39.4, V39.5, V39.6, V39.9, V40.5, V40.6, V40.7, V40.9, V41.5, V41.6, V41.7, V41.9, V42.5, V42.6, V42.7, V42.9, V43.5, V43.6, V43.7, V43.9, V44.5, V44.6, V44.7, V44.9, V45.5, V45.6, V45.7, V45.9, V46.5, V46.6, V46.7, V46.9, V47.5, V47.6, V47.7, V47.9, V48.5, V48.6, V48.7, V48.9, V49.4, V49.5, V49.6, V49.9, V50.5, V50.6, V50.7, V50.9, V51.5, V51.6, V51.7, V51.9, V52.5, V52.6, V52.7, V52.9, V53.5, V53.6, V53.7, V53.9, V54.5, V54.6, V54.7, V54.9, V55.5, V55.6, V55.7, V55.9, V56.5, V56.6, V56.7, V56.9, V57.5, V57.6, V57.7, V57.9, V58.5, V58.6, V58.7, V58.9, V59.4, V59.5, V59.6, V59.9, V60.5, V60.6, V60.7, V60.9, V61.5, V61.6, V61.7, V61.9, V62.5, V62.6, V62.7, V62.9, V63.5, V63.6, V63.7, V63.9, V64.5, V64.6, V64.7, V64.9, V65.5, V65.6, V65.7, V65.9, V66.5, V66.6, V66.7, V66.9, V67.5, V67.6, V67.7, V67.9, V68.5, V68.6, V68.7, V68.9, V69.4, V69.5, V69.6, V69.9, V70.5, V70.6, V70.7, V70.9, V71.5, V71.6, V71.7, V71.9, V72.5, V72.6, V72.7, V72.9, V73.5, V73.6, V73.7, V73.9, V74.5, V74.6, V74.7, V74.9, V75.5, V75.6, V75.7, V75.9, V76.5, V76.6, V76.7, V76.9, V77.5, V77.6, V77.7, V77.9, V78.5, V78.6, V78.7, V78.9, V79.4, V79.5, V79.6, V79.9, V80.0, V80.1, V80.2, V80.3, V80.4, V80.5, V80.6, V80.7, V80.8, V80.9, V81.1, V82.1, V82.9, V83.0, V83.1, V83.2, V83.3, V84.0, V84.1, V84.2, V84.3, V85.0, V85.1, V85.2, V85.3, V86.0, V86.1, V86.2, V86.3, V87.0, V87.1, V87.2, V87.3, V87.4, V87.5, V87.6, V87.7, V87.8, V87.9, V89.2, V89.3

Source: NSW Health: (http://www.health.nsw.gov.au/public-health/chorep/toc/app_icd_avm.htm).