Mortality inequalities in Australia

2009–2011

bulletin 124

Summary

Australia is one of the healthiest countries in the world. However, despite relatively high standards of health and health care in Australia, not all Australians fare equally well in terms of their health and longevity.

	Males have a mortality rate that is 1.5 times as high as the rate for females. There would have been 71,400 fewer male deaths over the 2009–2011 period if males had the same mortality rate as females.
	People living in *Remote* and *Very remote* areas had mortality rates 1.4 times as high as those for people living in *Major cities*, and higher rates of death due to diabetes and land transport accidents.
	People living in the lowest socioeconomic status (SES) areas had a mortality rate that was 1.3 times as high as the rate among people living in the highest SES areas, and higher rates of death due to diabetes and chronic obstructive pulmonary disease (COPD).
	Overseas-born Australian residents on average had lower mortality rates than Australian-born residents. Asian-born Australian residents had a mortality rate that was 36% lower than the rate for Australian-born residents.
	The overall mortality rate among Indigenous Australians was nearly twice that of non-Indigenous Australians, and five times as high among Indigenous people aged 35–44.
	Australians that fared the worst in terms of mortality rates tended to do so for causes of death that in many cases can be considered either preventable or treatable—these are often referred to as *potentially avoidable deaths*.

Many of the patterns in mortality inequalities for 2009–2011 were similar to results from 10 years earlier. While we did not examine in depth the extent to which differences between population groups have changed over time, it is clear that mortality inequalities are long-standing.

It is also clear that the greatest inequalities exist for what are considered to be avoidable causes of death.

Contents

1   Introduction

Australia is one of the healthiest countries in the world. In 2011 in Australia, 85% of adults, including 72% of people aged 65 and older, reported being in good health, the daily smoking rate was among the lowest in the world (16% of adults), life expectancy at birth was one of the highest among Organisation for Economic Co-operation and Development (OECD) countries at 82 years, and overall mortality was among the lowest, second only to Japan (ABS 2012; OECD 2013). However, despite relatively high standards of health and health care in Australia, not all Australians fare equally well. There are significant inequalities in terms of risk factors for ill health, incidence and prevalence of chronic conditions, use of health services, and dying early or from potentially avoidable causes.

The importance of reducing health inequalities is acknowledged worldwide (WHO 2008). Many efforts have been made by Australian governments and non-government organisations to improve health in disadvantaged groups and reduce health inequalities, for example the national Closing the Gap initiative, which seeks to reduce Indigenous health inequalities (CGCSC 2014).

We have produced this bulletin because in recent years there has been a lack of up-to-date *comprehensive* data on mortality inequalities in Australia. The last comprehensive, national report on the subject was published in 2004 (Draper et al. 2004).

The availability of up-to-date national information of this kind can support population health improvements by providing insights into the social determinants of health as well as informing national and targeted activities in relation to key population groups such as men, women and children, people living outside *Major cities* or in areas of socioeconomic disadvantage, people born overseas, and Aboriginal and Torres Strait Islander people.

This bulletin will also complement significant statistical work already completed in relation to health inequalities, both for specific population groups, such as Aboriginal and Torres Strait Islander people (AIHW 2014a) and for specific disease groups, such as cancer and cardiovascular disease (AIHW & AACR 2012; AIHW 2014b).

What we already know about mortality inequalities

Health inequalities, including mortality inequalities, are driven by many factors including biological, lifestyle, socioeconomic, societal and environmental factors (AIHW 2014a). In particular, health is affected by a range of social determinants, which are described by the World Health Organization (WHO) as the conditions into which people are born, grow, live, work and age (WHO 2014). Many of these social determinants of health are modifiable, which means there is potential to act on and improve outcomes for disadvantaged groups as well as the population as a whole.

Today, most deaths in Australia are due to chronic diseases and many of these deaths are considered to be potentially avoidable, either through prevention or treatment interventions (AIHW 2012a). Incidence and prevalence of chronic and other diseases, along with risk factors for disease, are distributed unevenly across population groups. Access to and use of health care services also varies across population groups, which can further influence the risk of dying early from certain preventable or treatable diseases.

Previous Australian studies have examined national mortality inequalities among population groups, both historically (AIHW 2005; Draper et al. 2004; Korda et al. 2006; Magnus & Sadkowsky 2006; Singh & de Looper 2002) and in recent times (AIHW 2013a; AIHW 2014a; NHPA 2013). Overall, these studies show that mortality outcomes are improving for nearly all population groups, but that substantial inequalities persist.

Objectives of bulletin

The objectives of this bulletin are to:

* Describe the nature and magnitude of inequalities in overall mortality, leading causes of death and potentially avoidable deaths, in relation to sex, remoteness of residence, socioeconomic disadvantage, country of birth and Indigenous status
* Provide an up-to-date statistical reference for policy makers, service providers, planners and researchers on mortality inequalities in Australia.

Supplementary tables for this bulletin are available online, from the AIHW publication webpage for *Mortality inequalities in Australia 2009–2011*, under additional material.

2   Methods

Data sources

Deaths data used in this bulletin come from the AIHW National Mortality Database and are based on deaths registered from 2009 to 2011. Cause-of-death data for these years are coded to the *International Statistical Classification of Diseases and Related Health Problems, 10th revision* (ICD-10). Cause-of-death data for 2010 and 2011 are revised and preliminary versions, respectively, and subject to revision by the Australian Bureau of Statistics (ABS).

Final rebased ABS population estimates for 2009–2011, and correspondence files according to the Australian Statistical Geography Standard (ASGS) (ABS 2010) were used with the deaths data to calculate mortality rates.

Analytical techniques

Mortality rates were calculated for the 2009–2011 period using the following formula:

$$Mortality\ rate = \frac{(Number\ of\ deaths\ registered\ 1\ January\ 2009\ to\ 31\ December\ 2011)}{(2009\ population\ +\ 2010\ population\ +\ 2011\ population)} \times 100,000$$

All mortality rates were directly age-standardised to the 2001 Australian standard population to enable comparisons between groups, and are presented as deaths per 100,000 population. The measures used in this bulletin to quantify inequalities are described at Box 1. Classifications used in this bulletin are described at Box 2.

Box 1: Measures of inequality used in this bulletin

Who is compared to whom?

To calculate measures of inequality, each population group is compared to a relevant reference group. For most analyses the reference group is the group that had the most favourable outcomes, i.e. the lowest mortality rates. For example, females were the reference group for males. Reference groups are further described in the results section.

Rate difference (absolute inequality)

The rate for the group of interest minus the rate for the reference group. A rate difference of greater than 0 indicates that the rate for the group of interest is *higher* than the rate for the reference group. A rate difference of less than 0 indicates that the rate for the group of interest is *lower* than the rate for the reference group. A rate difference of 0 indicates that the rate for the group of interest is the *same* as the rate for the reference group.

Rate ratio (relative inequality)

The rate for the group of interest relative to (divided by) the rate for the reference group. A rate ratio of greater than 1 indicates that the rate for the group of interest is *higher* than the rate for the reference group. A rate ratio of less than 1 indicates that the rate for the group of interest is *lower* than the rate for the reference group. A rate ratio of 1 indicates that the rate for the group of interest is the *same* as the rate for the reference group.

Excess deaths (number)

The total number of deaths in the population that would not have occurred if the mortality rate for the group of interest was the same as the rate for the reference group. Expressed as the total number of deaths that *actually* occurred within the group of interest minus the total deaths that *would* have occurred among the group of interest if it had the same rate as the reference group. Excess deaths are presented for broad groups, and are based on excess deaths calculated separately for 5 year age groups.

Excess deaths (per cent)

The proportion of deaths in the population that *would not* have occurred if the rate for the group of interest was the same as the rate for the reference group, expressed as a percentage of all deaths that *actually* occurred among the group of interest.

Box 2: Classifications used in this bulletin

Leading causes of death

Leading causes of death (LCODs) are the causes of death that occur most frequently in a population. LCOD analyses are based on the underlying cause of death, which is the disease or injury that initiated the train of events leading to death. LCODs in this bulletin are classified using a list of disease groups recommended by WHO (Becker et al. 2006) with minor modifications to suit the Australian context.

Potentially avoidable deaths

Potentially avoidable deaths are deaths that might have been avoided through prevention, or through treatment, within the current health system. They are classified using nationally agreed definitions based on cause of death for people aged under 75 (AIHW 2014c). Examples include deaths due to road traffic accidents, lung cancer, diabetes and skin cancer (AIHW 2014c).

Remoteness

Area of usual residence of the deceased is reported on the death certificate, and coded to a Statistical Area Level 2 (SA2) as per the ASGS. There are over 2,000 different SA2s in Australia. For this report, SA2s have been grouped into ASGS 2011 Remoteness Areas.

Socioeconomic disadvantage

Socioeconomic disadvantage is classified according to Socio-Economic Indexes for Areas 2011 (SEIFA 2011), specifically the Index of Relative Socio-Economic Disadvantage (IRSD). IRSD is based on characteristics of households within an area that relate to income, employment, education and other indicators of disadvantage. SEIFA 2011 is based on 2011 Census data and is not directly comparable to earlier versions. SEIFA analysis in this bulletin uses area-based quintiles, each comprising approximately 20% of the population. Area level measures of socioeconomic inequality tend to underestimate inequality, due to the diversity of individuals within a given area. An area level measure was used because socioeconomic information on individuals was not available in the data. An additional limitation is that the area in which a person dies is not necessarily the same as the area in which they spent the majority of their life.

Country of birth

Country of birth is classified according to the *Standard Australian Classification of Countries* (ABS 2011). Countries are categorised into 5 groups: *Australia; United Kingdom and Ireland*; *Other Europe* (including North West, Southern and Eastern Europe); *Asia* (including South East, North East, Southern and Central Asia, North Africa and the Middle East); and *Other* (including the Americas, Sub-Saharan Africa, New Zealand and Oceania). These groupings have been used in previous Australian studies (Draper et al. 2004), which enables comparison with earlier published work.

Age group

Most analyses in this bulletin use the following age groups as appropriate: children (0–14 years), teenagers and young adults (15–24), working age adults (25–44, 45–64), and older adults (65–84, 85+).

3 Results

Sex

All causes of death

The mortality rate for males was 1.5 times as high as the rate for females, after taking differences in the age structure of the two populations into account. The greatest relative inequality was for people aged 15–24, with males in this age group dying at more than twice the rate of females. The greatest absolute inequality over the 2009–2011 period was for people aged 85 and older—in this age group there were 2,304 more male deaths per 100,000 males than there were female deaths per 100,000 females (Table 3.1).

In terms of excess deaths, if males had the same mortality rates as females, there would have been 71,400 (32%) fewer male deaths over the 2009–2011 period, including nearly 1,500 (56%) fewer deaths among males aged 15–24, and more than 40,000 (37%) fewer deaths among males aged 65–74.

The rate of potentially avoidable deaths was also higher for males in all age groups for which this measure is calculated (under 75).

Table 3.1: Deaths by sex and age group, 2009–2011

Sex	Age group	Number	Deaths per 100,000	Rate difference	Rate ratios	Excess deaths	Excess deaths (% of deaths)	PA deaths (per 100,000)
Males	0–14	2,960	44	10	1.29	668	23	25
	15–24	2,642	56	31	2.26	1,479	56	45
	25–44	10,495	113	56	1.97	5,188	49	88
	45–64	37,572	437	171	1.64	14,787	39	299
	65–84	107,494	3,005	1,122	1.60	40,149	37	1,092
	85+	59,951	15,191	2,304	1.18	9,094	15	..
	All ages	**221,134**	**695**	**220**	**1.46**	**71,365**	**32**	**192**
Females	0–14	2,173	34	..	..	..	..	19
	15–24	1,103	25	..	..	..	..	18
	25–44	5,336	57	..	..	..	..	41
	45–64	23,041	266	..	..	..	..	178
	65–84	79,947	1,883	..	..	..	..	648
	85+	98,422	12,886	..	..	..	..	..
	All ages	**210,031**	**475**	**..**	**..**	**..**	**..**	**110**

Note: Rates are age-standardised to the 2001 Australian standard population. Rate ratio is the age-standardised rate for males divided by the age-standardised rate for females. The all ages rate of potentially avoidable (PA) deaths is calculated only for people aged under 75.

Source: AIHW National Mortality Database, see supplementary tables online.

Leading causes of death

The 5 leading causes of death by age group were similar for males and females. However, for many causes, the rates differed substantially. Males fared worse than females for most leading causes of death (Figure 3.1). The biggest relative inequalities were for coronary heart disease among people aged 25–44 and 45–64, where the rates for males were 4.9 and 4.2 times as high, respectively, as those for females.

Females had higher overall mortality rates than males for breast cancer (difference not measured), for dementia and Alzheimer disease (1.2 times as high for all ages combined, and 1.4 times as high for age 85+), and for cerebrovascular diseases for age 85+ (1.2 times).

Suicide, accidental poisoning and land transport accidents were among the top 5 causes of death among people aged 25–44 for both males and females, but for males the mortality rates for these causes were 3.5 times as high as for females.

Rate ratio

| 1.5 (female rate higher) | 1.0 (no difference) | 1.5 | 2.0 | 3.0 | 4.0 | 5.0 (male rate higher) |

	All ages	**0–14**	**15–24**	**25–44**	**45–64**	**65–84**	**85+**
1	Coronary heart disease	Perinatal and congenital conditions	Land transport accidents	Suicide	Coronary heart disease	Coronary heart disease	Coronary heart disease
2	Cerebro-vascular diseases	SIDS	Suicide	Accidental poisoning	Lung cancer	Lung cancer	Cerebro-vascular diseases
3	Dementia and Alzheimer	Land transport accidents	Accidental poisoning	Land transport accidents	Breast cancer	Cerebrov-ascular diseases	Dementia and Alzheimer
4	Lung cancer	Other ill-defined causes	Event of undetermined intent	Coronary heart disease	Colorectal cancer	COPD	Heart failure
5	COPD	Accidental drowning	Assault	Breast cancer	Suicide	Dementia and Alzheimer	COPD

Note: This figure presents leading causes of death by age group. The colour of the boxes represents a comparison of the age-standardised rates for males and females. The comparison is presented as 'times higher' for either males or for females. A rate ratio is not presented for breast cancer. COPD = Chronic obstructive pulmonary disease, SIDS = Sudden infant death syndrome.
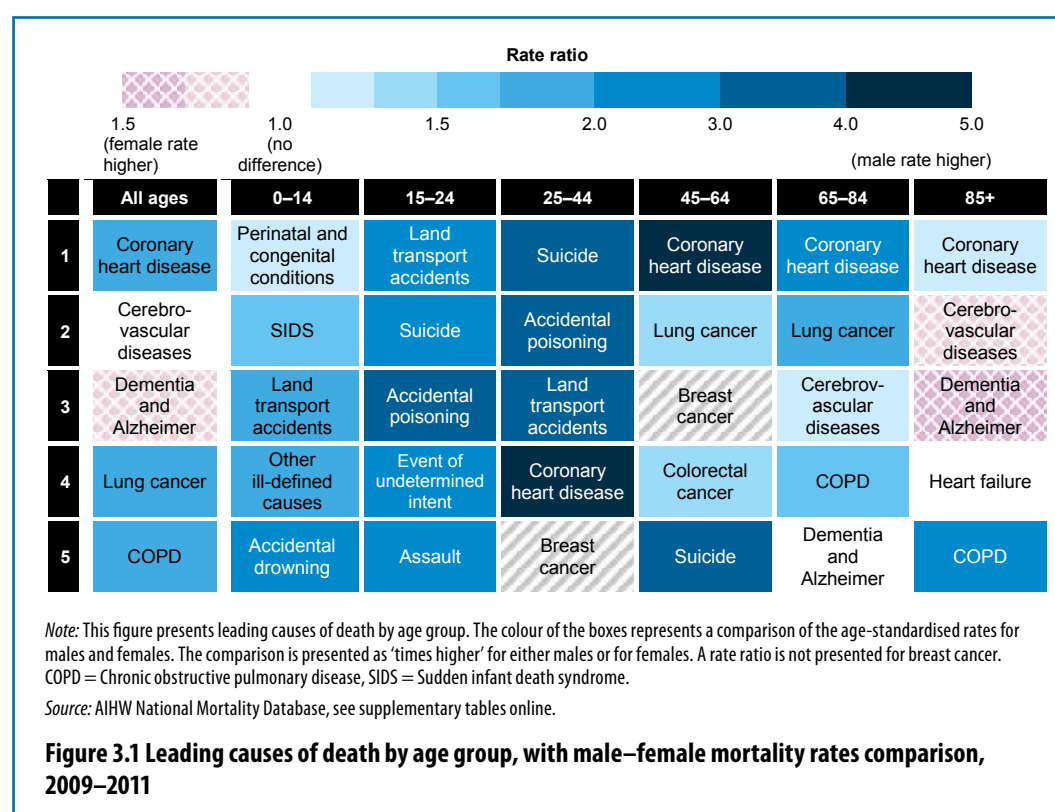
Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.1 Leading causes of death by age group, with male–female mortality rates comparison, 2009–2011

In terms of excess deaths and their population impact, if males had the same death rates as females in 2009–2011, among males there would have been:

- 16,178 fewer deaths due to coronary heart disease (46% fewer)
- 6,629 fewer deaths due to lung cancer (45% fewer)
- 3,761 fewer deaths due to suicide (70% fewer)
- 3,743 fewer deaths due to COPD (40% fewer)
- 2,377 fewer deaths due to colorectal cancer (35% fewer)
- 2,102 fewer deaths due to land transport accidents (65% fewer).

Remoteness

In 2011, the majority of Australians lived in *Major cities* (70.2%), with 30% living in regional and remote areas: 18.4% in *Inner regional* areas; 9.1% in *Outer regional* areas; 1.4% in *Remote* areas and 0.9% in *Very remote* areas.

All causes of death

Mortality rates increased as remoteness increased, for both males and females. The mortality rate among females living in *Remote* areas was 1.3 times as high as the rate among females in *Major cities*, and in *Very remote* areas it was 1.6 times as high. For males, the rate ratios were 1.2 and 1.4, respectively (Table 3.2). The mortality rate for all people living in *Remote* and *Very remote* areas was 1.4 times as high as the rate among people living in *Major cities*. The rate of potentially avoidable deaths also increased as remoteness increased.

If people living in regional and remote areas had the same mortality rates as people living in *Major cities*, there would have been nearly 20,000 fewer deaths in regional and remote areas between 2009 and 2011. This would be a 38% reduction in the age-standardised mortality rate for females living in *Very remote* areas, and a 30% reduction in the rate for males.
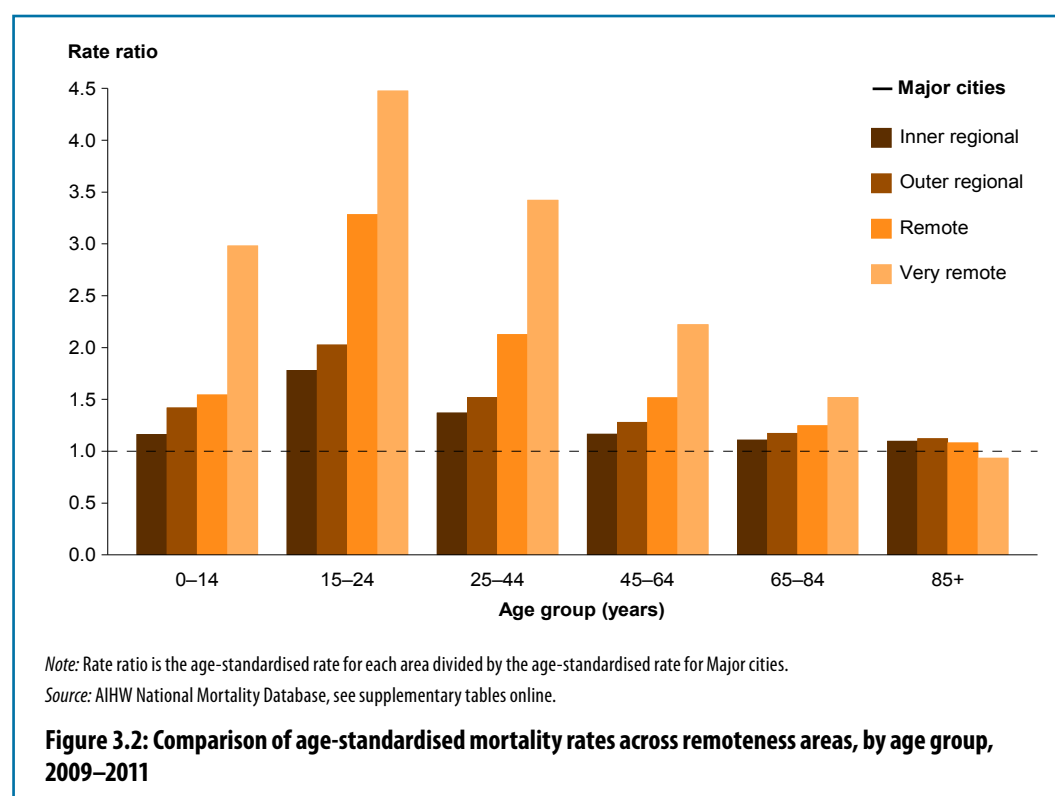
Table 3.2: Deaths by sex and remoteness area, 2009–2011

Sex	Remoteness area	Number	Deaths per 100,000	Rate difference	Rate ratio	Excess deaths	Excess deaths (% of deaths)	PA deaths per 100,000
Males	Major cities	140,927	660	..	..	..	..	175
	Inner regional	49,775	740	81	1.12	5,222	11	209
	Outer regional	24,237	774	114	1.17	3,615	15	227
	Remote	3,177	811	152	1.23	710	22	273
	Very remote	1,907	936	276	1.42	789	41	378
	All males	**221,134**	**695**	**..**	**..**	**10,335**	**5**	**192**
Females	Major cities	139,345	453	..	..	..	..	101
	Inner regional	46,150	506	54	1.12	4,567	10	120
	Outer regional	20,386	535	82	1.18	2,956	15	130
	Remote	2,249	577	125	1.28	504	22	169
	Very remote	1,269	730	278	1.61	592	47	294
	All females	**210,031**	**475**	**..**	**..**	**8,619**	**4**	**110**

Note: Rates are age-standardised to the 2001 Australian standard population. Rate ratio is the age-standardised rate for each area divided by the age-standardised rate for Major cities. The rate of potentially avoidable (PA) deaths is calculated only for people aged under 75.

Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.2 illustrates relative inequalities in overall mortality by remoteness for different age groups. Relative inequality in mortality rates by remoteness areas was most pronounced among people aged 15–24, where the rates in *Remote* and *Very remote* areas were more than 3 times as high as in *Major cities*. Relative inequality was less pronounced at older ages. Among people aged 65–84 the rate in *Remote* and *Very remote* areas was between 1.2 and 1.5 times as high as in *Major cities* and, among people aged 85 and older, the rates in *Very remote* areas were lower than in *Major cities*. Lower mortality rates among people aged 85 and older in *Very remote* areas may be due to migration of frail, elderly people to less remote areas where they can access services; however little published research exists to quantify this migration (AIHW 2007).
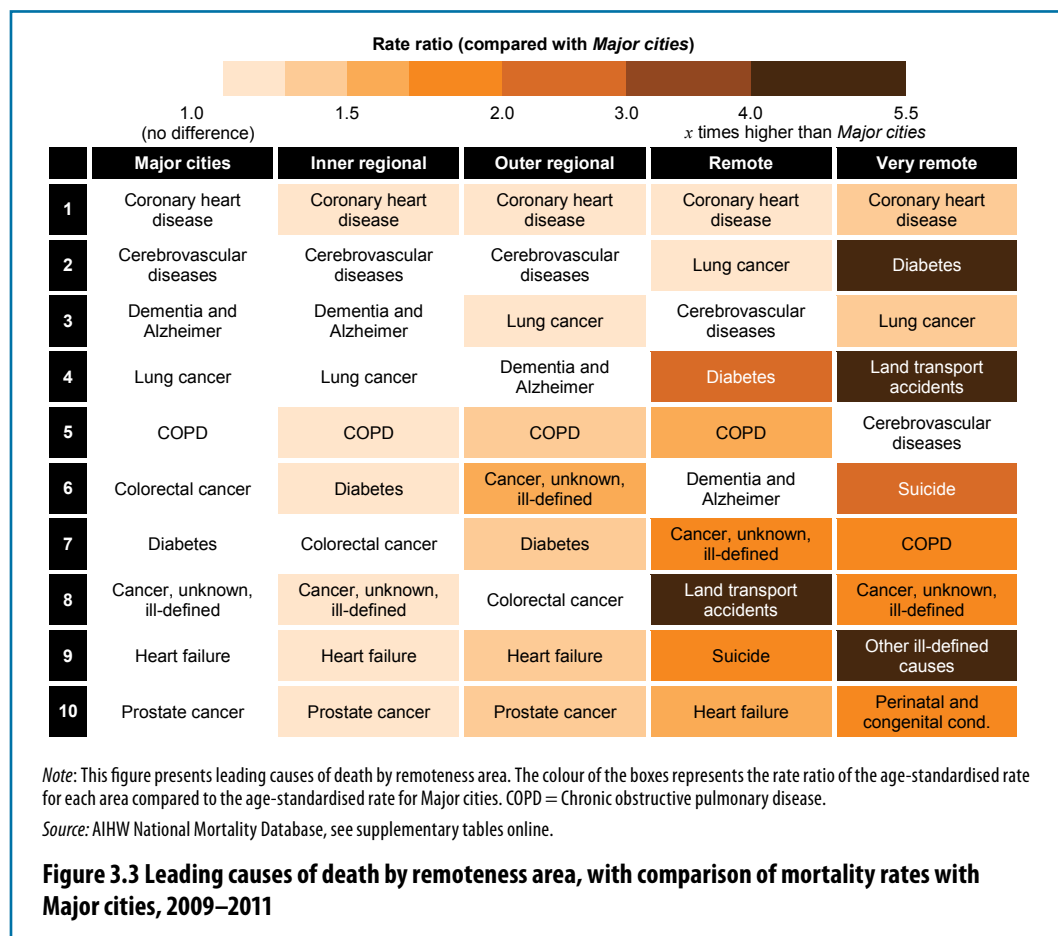
Health inequalities by remoteness of residence may be influenced by environmental or geographical factors such as long distances to access services. They may also be related to differences in population characteristics. For example, socioeconomic disadvantage is associated with higher mortality rates, and a higher proportion of people in regional and remote areas experience socioeconomic disadvantage, compared to people living in *Major cities*. Similarly, Indigenous Australians are more likely to live outside metropolitan areas than non-Indigenous Australians, and have higher mortality rates. Mortality inequalities by remoteness are likely a result of the interplay of many factors, worth further exploration in order to understand where actions could best be targeted to improve mortality outcomes in regional and remote areas (AIHW 2014a).

Note: Rate ratio is the age-standardised rate for each area divided by the age-standardised rate for Major cities.

Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.2: Comparison of age-standardised mortality rates across remoteness areas, by age group, 2009–2011

Leading causes of death

Figure 3.3 shows the 10 leading causes of death for each remoteness area. For nearly all leading causes of death, rates were higher for people living outside *Major cities*, with people in *Remote* and *Very remote* areas faring the worst.

Coronary heart disease was the leading cause of death for all areas, and mortality rates were between 1.2 and 1.5 times as high in regional and remote areas as in *Major cities*. In *Remote* and *Very remote* areas, the rate of dying due to a land transport accident was more than 4 times as high as in *Major cities*. For deaths due to diabetes, rates were between 2.5 and 4 times as high and, for suicide, between 1.8 and 2.2 times as high.

	Major cities	Inner regional	Outer regional	Remote	Very remote
1	Coronary heart disease	Coronary heart disease	Coronary heart disease	Coronary heart disease	Coronary heart disease
2	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases	Lung cancer	Diabetes
3	Dementia and Alzheimer	Dementia and Alzheimer	Lung cancer	Cerebrovascular diseases	Lung cancer
4	Lung cancer	Lung cancer	Dementia and Alzheimer	Diabetes	Land transport accidents
5	COPD	COPD	COPD	COPD	Cerebrovascular diseases
6	Colorectal cancer	Diabetes	Cancer, unknown, ill-defined	Dementia and Alzheimer	Suicide
7	Diabetes	Colorectal cancer	Diabetes	Cancer, unknown, ill-defined	COPD
8	Cancer, unknown, ill-defined	Cancer, unknown, ill-defined	Colorectal cancer	Land transport accidents	Cancer, unknown, ill-defined
9	Heart failure	Heart failure	Heart failure	Suicide	Other ill-defined causes
10	Prostate cancer	Prostate cancer	Prostate cancer	Heart failure	Perinatal and congenital cond.

Rate ratio (compared with *Major cities*)

1.0 (no difference) 1.5 2.0 3.0 4.0 5.5
x times higher than *Major cities*

Note: This figure presents leading causes of death by remoteness area. The colour of the boxes represents the rate ratio of the age-standardised rate for each area compared to the age-standardised rate for Major cities. COPD = Chronic obstructive pulmonary disease.

Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.3 Leading causes of death by remoteness area, with comparison of mortality rates with Major cities, 2009–2011

In terms of excess deaths and population impact, if people living in regional and remote areas had the same death rates as their urban counterparts, in regional and remote areas in 2009–2011 there would have been:

+ 3,632 fewer deaths due to coronary heart disease (16.5% fewer)

+ 1,666 fewer deaths due to COPD (26.0% fewer)

+ 1,405 fewer deaths due to land transport accidents (61.8% fewer)

+ 1,283 fewer deaths due to diabetes (26.8% fewer)

+ 945 fewer deaths due to lung cancer (11.1% fewer)

+ 831 fewer deaths due to cerebrovascular diseases (7.5% fewer)

+ 825 fewer deaths due to prostate cancer (22.7% fewer)

+ 624 fewer deaths due to hypertensive disease (29.8% fewer)

+ 544 fewer deaths due to suicide (22.3% fewer).

Socioeconomic disadvantage

All causes of death

Mortality rates were 1.3 times as high for the lowest SES areas compared to highest SES areas for males, 1.2 times as high for females (Table 3.3), and 1.3 for males and females combined. The rate of potentially avoidable deaths also increased with lower SES areas.

If people living in all areas had the same mortality rates as those in the highest SES areas, there would have been about 54,200 fewer deaths between 2009 and 2011, or 13% fewer deaths overall.

Table 3.3: Deaths by sex and socioeconomic quintile, 2009–2011

Sex	SES quintile	Number	Deaths per 100,000	Rate difference	Rate ratio	Excess deaths	Excess deaths	PA deaths per 100,000
Males	1 (lowest)	51,830	781	192	1.33	13,069	25	249
	2	50,236	737	148	1.25	10,357	21	215
	3	45,134	693	105	1.18	7,148	16	190
	4	37,880	651	62	1.11	3,957	10	166
	5 (highest)	34,937	589	..	..	..	..	130
	All	**221,134**	**695**	**..**	**..**	**34,531**	**16**	**192**
Females	1 (lowest)	45,994	518	97	1.23	6,998	15	140
	2	46,661	503	82	1.19	6,383	14	124
	3	42,166	472	51	1.12	3,996	10	108
	4	37,351	453	32	1.08	2,306	6	96
	5 (highest)	37,216	421	..	..	..	..	81
	All	**210,031**	**475**	**..**	**..**	**19,683**	**9**	**110**

Note: Rates are age-standardised to the 2001 Australian standard population. Rate ratio is the age-standardised rate for each group divided by the age-standardised rate for the highest SES group. The rate of potentially avoidable (PA) deaths is calculated only for people aged under 75.
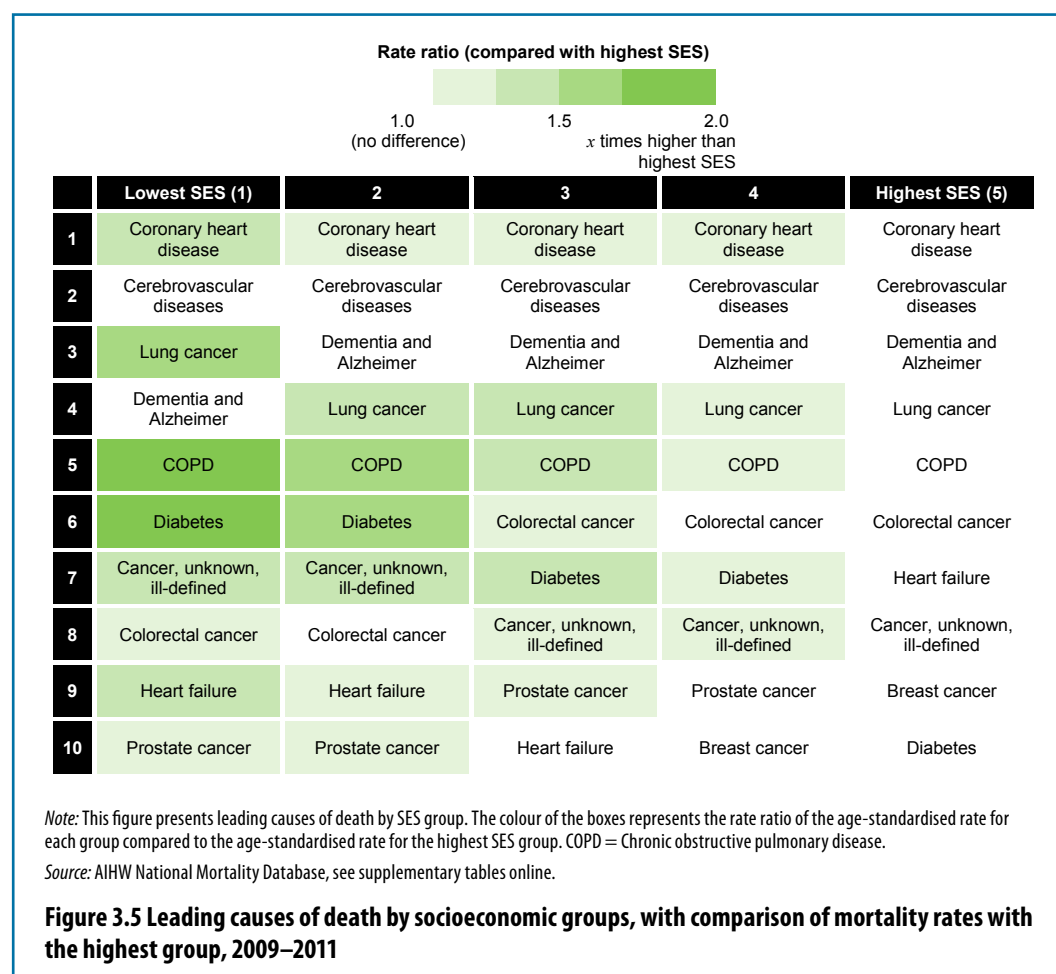
Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.4 illustrates relative inequalities in overall mortality by SES for different age groups. Relative inequality by SES was greatest among people aged 25–44, with 2.1 times as many deaths in the lowest SES areas compared to the highest. As age increased, relative inequalities by SES were less pronounced, and for people aged 85 and older, there was no difference in the overall mortality rates between the lowest and highest SES areas.

Note: Rate ratio is the age-standardised rate for each SES group divided by the age-standardised rate for highest SES group.

Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.4: Comparison of age-standardised mortality rates across socioeconomic groups, by age group, 2009–2011
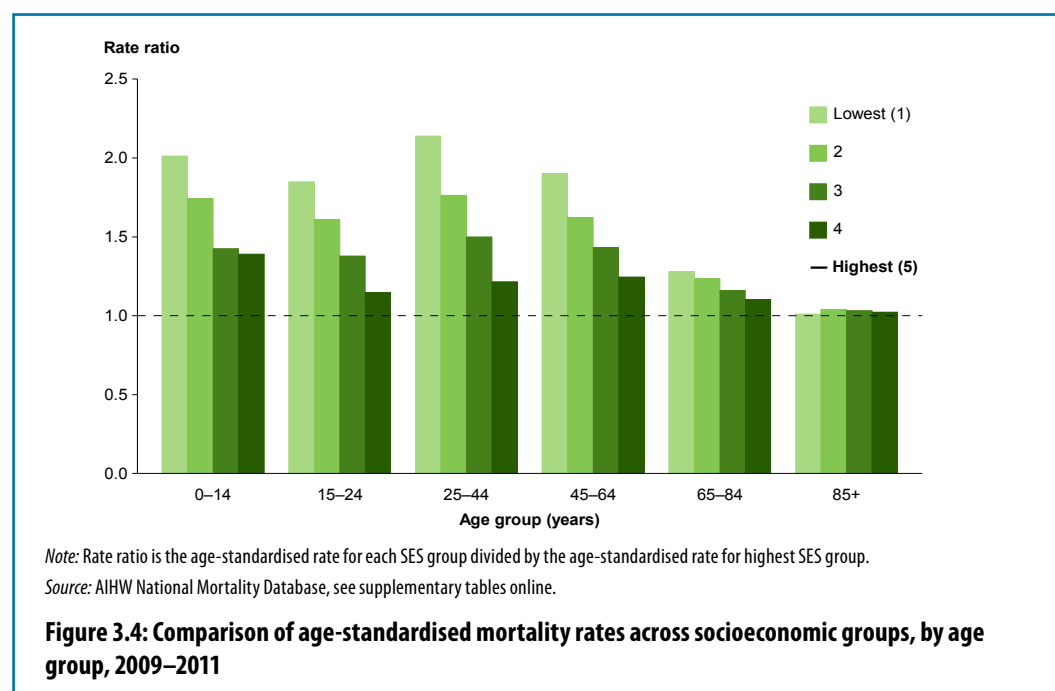
Leading causes of death

The leading cause of death among all 5 SES groups was coronary heart disease, and age-standardised rates increased with lower SES groups (Figure 3.5). For most leading causes of death, rates increased with lower SES groups.

Rate ratio (compared with highest SES)

| | 1.0 (no difference) | | 1.5 | 2.0 x times higher than highest SES |

	Lowest SES (1)	2	3	4	Highest SES (5)
1	Coronary heart disease	Coronary heart disease	Coronary heart disease	Coronary heart disease	Coronary heart disease
2	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases
3	Lung cancer	Dementia and Alzheimer	Dementia and Alzheimer	Dementia and Alzheimer	Dementia and Alzheimer
4	Dementia and Alzheimer	Lung cancer	Lung cancer	Lung cancer	Lung cancer
5	COPD	COPD	COPD	COPD	COPD
6	Diabetes	Diabetes	Colorectal cancer	Colorectal cancer	Colorectal cancer
7	Cancer, unknown, ill-defined	Cancer, unknown, ill-defined	Diabetes	Diabetes	Heart failure
8	Colorectal cancer	Colorectal cancer	Cancer, unknown, ill-defined	Cancer, unknown, ill-defined	Cancer, unknown, ill-defined
9	Heart failure	Heart failure	Prostate cancer	Prostate cancer	Breast cancer
10	Prostate cancer	Prostate cancer	Heart failure	Breast cancer	Diabetes

Note: This figure presents leading causes of death by SES group. The colour of the boxes represents the rate ratio of the age-standardised rate for each group compared to the age-standardised rate for the highest SES group. COPD = Chronic obstructive pulmonary disease.

Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.5 Leading causes of death by socioeconomic groups, with comparison of mortality rates with the highest group, 2009–2011

For leading causes of death in males, the largest relative inequalities in rates between the lowest SES areas and the highest SES areas were for land transport accidents (2.2 times as high in the lowest SES areas), cirrhosis of the liver (1.9), diabetes (1.8) and COPD (1.8). For leading causes of death in females, the largest relative inequalities in rates between the lowest SES areas and the highest SES areas were for diabetes (1.9 times as high in the lowest areas), cirrhosis of the liver (1.8), maternal, perinatal and congenital conditions (1.7, with the majority of these deaths being among people aged 0–4) and COPD (1.6).

In terms of excess deaths and population impact, if all Australians had the same death rates as the 20% of Australians living in the areas with the highest SES, in 2009–2011 there would have been 54,214 fewer deaths including:

- 10,308 fewer deaths due to coronary heart diseases (15.7% fewer)
- 6,013 fewer deaths due to lung cancer (25.1% fewer)

- 4,723 fewer deaths due to COPD (28.5% fewer)
- 3,690 fewer deaths due to diabetes (29.9% fewer)
- 1,747 fewer deaths due to land transport accidents (39.3% fewer)
- 1,483 fewer deaths due to cirrhosis of the liver (31.4% fewer)
- 1,323 fewer deaths due to suicide (18.8% fewer).

Country of birth

In 2009–2011, Australian-born residents made up 73% of the Australian population, followed by Australian residents born in Asia (including North Africa and the Middle East) (10%); UK and Ireland (6%); 'Other Europe' (North West, Southern and Eastern Europe) (5.1%); and all other countries (including the Americas, Sub-Saharan Africa and Oceania) (5.5%).

All causes of death

Mortality rates among Australians vary substantially by country/region of birth. On average, overseas-born residents have lower death rates than Australian-born residents (Table 3.4). For example, compared to Australian-born residents, mortality rates were:

- 36% lower for Asian-born Australian residents for both males and females (that is, a rate ratio of 0.64 for males and females)
- 15% lower for resident males born in North West, Southern and Eastern Europe and 24% lower for resident females born in these countries.

Overseas-born Australian residents also had lower rates of potentially avoidable deaths than their Australian-born counterparts (Table 3.4).

Table 3.4: Deaths by sex and country/region of birth, 2009–2011

Sex	Country/ region of birth	Number	Deaths per 100,000	Rate difference	Rate ratio	% death rate is lower than rate among Australian-born	PA deaths per 100,000
Males	Australia	149,011	728	..	..	..	206
	UK & Ireland	24,594	700	-28	0.96	4	174
	Other Europe	29,328	616	-113	0.85	15	163
	Asia	9,717	467	-261	0.64	36	122
	Other	7,174	623	-105	0.86	14	170
Females	Australia	150,097	554	..	..	..	120
	UK & Ireland	22,200	546	-8	0.99	1	102
	Other Europe	22,501	423	-132	0.76	24	82
	Asia	8,712	353	-201	0.64	36	66
	Other	5,852	471	-84	0.85	15	106

Note: Rates are age-standardised to the 2001 Australian standard population. Rate ratio is the age-standardised rate for overseas-born residents divided by the age-standardised rate for Australian-born residents. The rate of potentially avoidable (PA) deaths is calculated only for people aged under 75.

Source: AIHW National Mortality Database, see supplementary tables online.

Leading causes of death

Coronary heart disease, cerebrovascular diseases, dementia and Alzheimer disease, and lung cancer were the 4 leading causes of death for all country/region of birth groups, despite differences in the age structures of these groups in Australia (Figure 3.6). But there were considerable relative inequalities in the rates of leading causes of death by country/region of birth (after taking the different age structures into account).

Rate ratio

2.0	1.5	1.0	1.5	2.0	2.4
(overseas-born rate higher)		(no difference)			(Australian-born rate higher)

	Australia	UK & Ireland	Other Europe	Asia	Other
1	Coronary heart disease	Coronary heart disease	Coronary heart disease	Coronary heart disease	Coronary heart disease
2	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases	Cerebrovascular diseases
3	Dementia and Alzheimer	Dementia and Alzheimer	Dementia and Alzheimer	Lung cancer	Lung cancer
4	Lung cancer	Lung cancer	Lung cancer	Dementia and Alzheimer	Dementia and Alzheimer
5	COPD	COPD	Diabetes	Diabetes	Colorectal cancer
6	Colorectal cancer	Cancer, unknown, ill-defined	Colorectal cancer	Colorectal cancer	Breast cancer
7	Cancer, unknown, ill-defined	Colorectal cancer	COPD	Liver cancer	Suicide
8	Diabetes	Diabetes	Heart failure	Breast cancer	COPD
9	Heart failure	Prostate cancer	Cancer, unknown, ill-defined	COPD	Cancer, unknown, ill-defined
10	Prostate cancer	Heart failure	Prostate cancer	Cancer, unknown, ill-defined	Diabetes

Note: This figure presents leading causes of death by country/region of birth. The colour of the boxes represents the rate ratio of the age-standardised rate for each country/region of birth group compared to the age-standardised rate for Australian-born residents. COPD = Chronic obstructive pulmonary disease.
Source: AIHW National Mortality Database, see supplementary tables online.

Figure 3.6 Leading causes of death by country/region of birth, 2009–2011

UK and Ireland-born residents had a similar profile to Australian-born residents for the 10 leading causes of death, but with higher rates of dementia and Alzheimer disease (14% higher) and lung cancer (26% higher), and lower rates of colorectal cancer (11% lower than the rate for Australian-born residents), and heart failure (13% lower).

North West, Southern and Eastern Europe-born residents (Other Europe) had lower rates for most leading causes of death compared to Australian-born residents, and in particular for COPD, with a rate that was half the rate of Australian-born residents.

Asian-born residents had lower rates for all 10 leading causes of death except liver cancer, where the rate for Asian-born residents was twice the rate of Australian-born residents.

Residents in the 'Other' group had similar or lower rates for all leading causes of death compared to Australian-born residents—in particular, the rate for COPD was 28% lower.

Indigenous Australians

In 2011, Aboriginal and Torres Strait Islander people made up approximately 3% of the Australian population. Indigenous Australians predominantly live in Australia's most populated areas, with about 60 per cent living in *Major cities* and *Inner regional* areas, and just over 20 per cent living in *Remote* and *Very remote* areas (ABS 2013a). The age profile of the Indigenous population is much younger than for the non-Indigenous population, and Indigenous Australians experience more socioeconomic disadvantage, and more ill-health.

Mortality statistics by Indigenous status are summarised at Box 3. Results have been sourced from recent publications that feature comprehensive analysis on Indigenous mortality (see AIHW 2014a for more details).

Box 3: Indigenous mortality summary

Life expectancy

- Indigenous boys born between 2010 and 2012 can expect to live to 69.1 years and Indigenous girls to 73.7 years compared with 79.7 for non-Indigenous boys and 83.1 for non-Indigenous girls.

All-cause mortality

- Indigenous Australians tend to die earlier than non-Indigenous Australians and their deaths rates are almost twice those of non-Indigenous Australians.

- Indigenous Australians had higher death rates than non-Indigenous Australians across all age groups during 2007–2011. In the 35–44 age group, Indigenous people died at about 5 times the rate of non-Indigenous people.

Specific causes of death

- Between 2007 and 2011, Indigenous Australians were most likely to die from circulatory conditions (26% of all Indigenous deaths), cancer (19%) and external causes such as suicides, falls, transport accidents and assaults (15%).

- Indigenous Australians were 5 times as likely as non-Indigenous Australians to die from endocrine, nutritional and metabolic conditions (including diabetes), and 3 times as likely to die of digestive conditions.

- The largest gap in death rates between Indigenous and non-Indigenous Australians was in circulatory disease deaths (22% of the gap) followed by endocrine, metabolic and nutritional disorders (particularly diabetes) (14% of the gap).

Trends

- Between 2001 and 2011, there was a 6% fall in the rate of deaths for Indigenous Australians and a narrowing of the gap between Indigenous and non-Indigenous Australians.

- Indigenous children aged 0–4 died at more than twice the rate of non-Indigenous children in 2012 (165 per 100,000 compared with 77 per 100,000 population). Indigenous child death rates fell by 30% from 2001 to 2012 compared with 22% for non-Indigenous children.

Note: Results are based on data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory combined. Other jurisdictions have a small number of Indigenous deaths and identification of Indigenous status in the data is poor. Indigenous people tend to be underidentified in mortality data (ABS 2013b, AIHW 2014a), and population data that account for this underidentification were supplied by the ABS (ABS 2013b).

Source: AIHW 2014a.

Time trends

Age and sex

Age-standardised overall mortality rates in Australia have stayed higher for males than for females over the past century, though overall mortality rates have fallen dramatically for both males and females during this time (AIHW 2013b). Between 1907 and 2011 age-standardised mortality fluctuated between 1.2 and 1.7 times as high for males compared with females. Relative inequality (rate ratio) was lowest between 1907 and 1939 and highest in the late 1970s to mid-1980s; in 2011 it was 1.5. Absolute inequality (rate difference) was highest in 1968, and lowest in 2011 (Figure 3.7).

The increase in relative mortality for males compared to females from 1940 to 1980 was largely driven by an increase in deaths due to circulatory diseases such as coronary heart disease. The age-standardised mortality rate for circulatory diseases among females peaked in the 1950s, but for males, the rate continued to rise and peaked later, in 1968, at 1,019 male deaths per 100,000 (AIHW 2013b). Over this period there was also a large increase in cancer deaths among males, in particular from lung cancer, while the increase for females was moderate.

The reduction in relative inequality between male and female rates since 1980 has largely been driven by the reduction in deaths due to circulatory diseases (Magnus & Sadkowsky 2006). The latter was influenced by several factors, including improvements in surgical techniques, hospital care, diagnosis and pharmaceuticals, as well as modifications to lifestyle factors such as smoking, diet and high blood pressure (AIHW 2014b).

Note: Rates are age-standardised to the Australian 2001 standard population.

Source: AIHW 2013b.

Figure 3.7 Rate ratio of male death rate to female death rate (age-standardised), 1907–2011
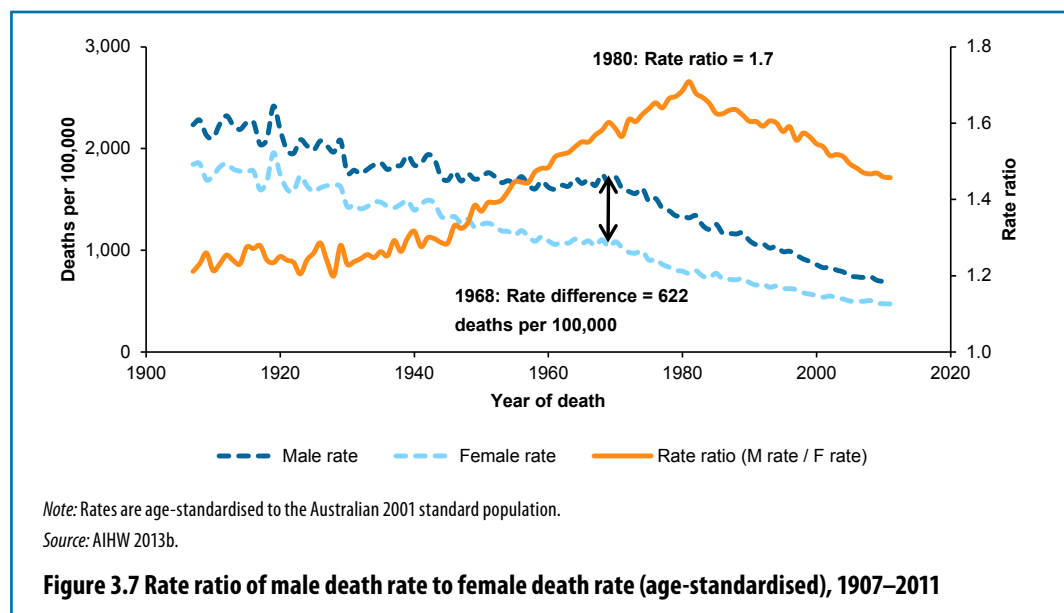
Remoteness

Mortality inequalities by remoteness in 2009–2011 were similar to those indicated by statistics from 1998–2000 (see Draper et al. 2004) although the earlier figures were based on a different remoteness index (the Accessibility/Remoteness Index of Australia rather than the Australian Statistical Geography Standard).

In other words, relative inequalities in mortality rates across remoteness, including the major causes of death, do not appear to have changed substantially in the last decade. Other earlier reports on mortality in rural and remote areas also noted that the gap between urban and rural mortality rates overall, and by broad cause grouping, did not appear to be changing substantially (AIHW 2007).

Socioeconomic disadvantage

It is difficult to compare results for 2009–2011 (based on SEIFA 2011) with results from earlier years, as SEIFA is primarily designed to compare the relative socioeconomic characteristics of areas at a given point in time, and is not suited to trend analysis. People living in the areas of lowest SES have historically fared worse in terms of overall mortality and dying from potentially preventable or treatable conditions such as injuries, diabetes and diseases of the respiratory and circulatory systems (Draper et al. 2004; Korda et al. 2006).

Country of birth

In 2011, just over 30% of Australian residents were born overseas, which is higher than past figures of 24% in 2005–06 and 20% in 1986—but the proportion has fluctuated over time. Mortality rates have been lower among overseas-born residents than Australian-born residents for many years (Donovan et al. 1992; Singh & de Looper 2002; AIHW 2008). This is in part due to the 'healthy migrant effect', which is based on two principles: firstly, that people who are willing and able to migrate often have lower levels of ill-health than the general population, and secondly, that people who are accepted as migrants in most cases undergo a government selection process which involves evaluation of eligibility criteria related to health, education, language and job skills (AIHW 2008). Not all immigrants to Australia are healthy migrants, but on average they tend to be healthier than Australian-born residents.

Findings from 2009–2011 were generally consistent with findings based on similar country groupings from 1998–2000 (Draper et al. 2004) and earlier (Donovan et al. 1992; Singh & de Looper 2002; AIHW 2008). Overall, of all overseas-born residents, Asian-born residents have historically had the best mortality outcomes compared to Australian-born residents.

4   Discussion

The primary aim of this bulletin was to describe the nature and magnitude of mortality inequalities in Australia and how these have changed over time. Analysis has shown that substantial mortality inequalities exist in the Australian population. These inequalities are seen for overall mortality, and for specific causes of death, including most leading causes of death. In many cases these inequalities have existed for decades or longer.

Overall, males had mortality rates that were 1.5 times as high as for females. People in *Remote* and *Very remote* areas had rates that were 1.4 times as high as people in *Major cities*. People in the lowest SES areas had rates that were 1.3 times as high as people in the highest SES areas, and Indigenous Australians had rates that were nearly twice those of non-Indigenous Australians. Overseas-born residents on average fared better than Australian-born residents.

Groups that fared the worst in terms of relative mortality from leading causes of death tended to do so for causes that are in many cases considered to be either preventable or treatable. For example:

+ For males aged 25–64, the rate of coronary heart diseases deaths was more than 4 times the rate for females. Coronary heart disease deaths in this age group are considered potentially preventable, as they might have been avoided through better preventive health activities such as screening, good nutrition, exercise and avoiding tobacco smoking. They are also considered potentially treatable, meaning they might have been avoided through timely and effective medical services and therapeutic interventions such as surgery or medication (NHPA 2013).

+ For people living in rural and remote areas, large relative inequalities exist for deaths due to land transport accidents and diabetes. Land transport accidents are considered potentially preventable, for example through seat belt use, avoiding drink driving, road improvements, and through a range of other transport-related rules and safety measures (for example, relating to vehicles such as quad bikes). They are potentially treatable through effective air and road ambulance services, emergency departments and other hospital services.

+ Diabetes deaths are potentially preventable through diet and exercise, and potentially treatable through appropriate and timely medical care, medication, diet and exercise.

+ People living in the lowest SES areas had the highest mortality rates for diabetes and COPD (COPD is potentially preventable, largely through avoiding tobacco smoking).

+ Indigenous Australians had higher rates of potentially avoidable deaths than non-Indigenous Australians, including those caused by circulatory conditions and diabetes.

Each of these inequalities highlights areas where actions could be targeted to further reduce potentially avoidable deaths, bearing in mind overlaps among the population groups analysed here. For example, *Remote* and *Very remote* areas tend to have higher levels of socioeconomic disadvantage, and a higher proportion of the population that is Indigenous (AIHW 2014a); the effects of remoteness have not been examined independent of these factors.

Access to and use of health services such as primary care, hospital emergency department and outpatient services, specialist care, and community services, varies substantially across population groups. This can influence people's health and risk of dying early or from avoidable causes. Many other factors can have a similar level of influence such as adequate nutrition, clean water, a safe environment (at work, home and play), education, and social support.

Many risk factors for early mortality can be modified. Obesity, harmful alcohol consumption and tobacco use are risk factors for most of Australia's health burden and many leading causes of death (Friel 2009), and often exist in harmful combinations (AIHW 2012b). In Australia there has been great progress in recent decades in reducing tobacco use, while less progress has been made in reducing risky alcohol consumption and obesity levels.

Improving levels of these risk factors involves modifying health behaviours, which in turn are influenced by the conditions into which people are born, grow, live, work and age. For example, eating fresh fruit and vegetables is more difficult in locations where such produce is not readily available and when it is less affordable than calorie dense alternatives (AIHW 2012c). And undertaking adequate physical exercise is more feasible for people who live in safe and accessible environments and have access to organised physical activities (AIHW 2011).

In many cases, the most advantaged groups have the lowest levels of risk factors, and have seen the greatest improvements in their risk profile over time (ABS 2012). For example, since the 1980s, daily smoking rates have fallen in Australia, but have fallen most for Australians with higher levels of education and in the highest socioeconomic groups. Many possible reasons/scenarios have been put forward for this, such as the following example from the National Preventative Health Taskforce (2009): 'Young people who do well at school are more likely to understand information about health risks, feel connected to school, get a good job, and are less likely to end up in stressful personal circumstances, or be part of social groups where people smoke'.

Many of the mortality inequalities reported in this bulletin are similar in type and magnitude to those of 10 years ago. While it is difficult to ascertain precisely how much particular population groups are improving or worsening in relation to others, it is clear that large mortality inequalities still exist in Australia today.

What's missing?

Elements that were not examined in this bulletin, but would be worth pursuing are:

* analysis by state/territory or smaller geographical areas
* analysis by multiple causes of death
* detailed time trend analyses
* the additive effects of multiple factors—for example remoteness, socioeconomic disadvantage and Indigenous status.

Further investigation could be undertaken on the combined effects of country of birth and years resident in Australia, which have both been shown to affect mortality outcomes (Donovan et al. 1992; AIHW 2006).

Socioeconomic factors such as highest level of education achieved (Miech 2011), occupation (AIHW 2005; Draper et al. 2004) and income (WHO 2008) are known to be associated with mortality and specific causes of death. This information is not collected in Australian deaths data.

This bulletin does not explain why inequalities exist, nor how socioeconomic, environmental and demographic factors interact to influence inequality. Further study of the social determinants of health could help to explain these relationships in order to better inform policy development.

Appendix

This bulletin includes supplementary tables which can be downloaded free of charge from the publication webpage for *Mortality inequalities in Australia 2009–2011,* under additional material. The publication webpage can be accessed from the AIHW website at <http://www.aihw.gov.au/publications/deaths-related/>.

- ICD-10 codes for leading causes of death are included in supplementary tables online.
- ICD-10 codes for potentially avoidable deaths are available at the following link: <http://meteor.aihw.gov.au/content/index.phtml/itemId/497242>.

Table A1: Summary of findings

		2009–2011		
		All-cause mortality (rate ratio)	**Potentially avoidable deaths (per 100,000)**	**Major differences among 10 leading causes of death**
Sex:	Females	..	110	..
	Males	1.46	192	✓✓
Remoteness:	Major cities	..	137	..
	Inner regional	1.13	165	✗
	Outer regional	1.19	180	✓
	Remote	1.28	225	✓✓
	Very remote	1.54	341	✓✓
SES:	Highest (5)	..	105	..
	4	1.09	131	✗
	3	1.16	149	✗
	2	1.23	169	✓
	Lowest (1)	1.29	194	✓
Country of birth:	Australia	..	163	..
	UK & Ireland	0.98	139	✗
	Other Europe	0.82	123	✗
	Asia	0.64	93	✓
	Other	0.86	138	✗
Indigenous status:	Non-Indigenous	..	140	..
	Indigenous	1.81	487	✓✓

✓   Rate for at least 1 leading cause more than 1.5 times as high as reference group.

✓✓ Rate for at least 1 leading cause more than 2 times as high as reference group.

✗   No rates of leading causes more than 1.5 times as high as reference group.

Note: Indigenous and non-Indigenous leading cause of death comparisons based on 2007–2011 data. Other Indigenous comparisons based on 2011 data.

Sources: ABS 2013c; AIHW National Mortality Database, see supplementary tables online; AIHW 2014a.

Acknowledgments

Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ASGS	Australian Statistical Geography Standard
COPD	chronic obstructive pulmonary disease
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
IRSD	Index of Relative Socio-Economic Disadvantage
LCOD	leading cause of death
OECD	Organisation for Economic Co-operation and Development
SA2	Statistical Area Level 2
SIDS	sudden infant death syndrome
SEIFA	Socio-Economic Indexes for Areas
SES	socioeconomic status
WHO	World Health Organisation

Symbols

. .	not applicable

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