



Australian Government

Australian Institute of Health and Welfare

Cardiovascular disease, diabetes and chronic kidney disease **Australian facts**

Mortality


risk factors
chronic kidney disease
cardiovascular disease
diabetes
stroke

Cardiovascular disease, diabetes and chronic kidney disease **Australian facts**

Mortality

risk factors
chronic kidney disease
cardiovascular disease
diabetes
stroke

The Australian Institute of Health and Welfare is a major national agency which provides reliable, regular and relevant information and statistics on Australia's health and welfare. The Institute's mission is *authoritative information and statistics to promote better health and wellbeing.*

© Australian Institute of Health and Welfare 2014 

This product, excluding the AIHW logo, Commonwealth Coat of Arms and any material owned by a third party or protected by a trademark, has been released under a Creative Commons BY 3.0 (CC BY 3.0) licence. Excluded material owned by third parties may include, for example, design and layout, images obtained under licence from third parties and signatures. We have made all reasonable efforts to identify and label material owned by third parties.

You may distribute, remix and build upon this work. However, you must attribute the AIHW as the copyright holder of the work in compliance with our attribution policy available at <www.aihw.gov.au/copyright/>. The full terms and conditions of this licence are available at <<http://creativecommons.org/licenses/by/3.0/au/>>.

Enquiries relating to copyright should be addressed to the Head of the Digital and Media Communications Unit, Australian Institute of Health and Welfare, GPO Box 570, Canberra ACT 2601.

This publication is part of the Australian Institute of Health and Welfare's Cardiovascular, diabetes and chronic kidney disease series. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 2204-1397

ISBN 978-1-74249-652-8

Suggested citation

Australian Institute of Health and Welfare 2014. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: Mortality. Cardiovascular, diabetes and chronic kidney disease series no. 1. Cat. no.CDK 1. Canberra: AIHW.

Australian Institute of Health and Welfare

Board Chair

Dr Mukesh C Haikerwal AO

Director

David Kalisch

Any enquiries about or comments on this publication should be directed to:

Digital and Media Communications Unit
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1032
Email: info@aihw.gov.au

Published by the Australian Institute of Health and Welfare

Please note that there is the potential for minor revisions of data in this report.
Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

Preface	iii
Acknowledgments	vi
Abbreviations	vii
Summary	viii
1. Introduction	1
2. Cardiovascular disease	3
All cardiovascular mortality	3
Coronary heart disease	12
Stroke.....	18
3. Diabetes	24
4. Chronic kidney disease	33
5. Deaths from cardiovascular disease, diabetes and chronic kidney disease	39
Appendix A: Some key CVD, diabetes and CKD milestones in Australia	44
Appendix B: Method and definitions	46
Appendix C: Classifications	51
Appendix D: Data sources	52
Appendix E: Detailed statistical tables	53
Glossary	64
References	67
List of tables	69
List of figures	71
Related publications	72

Preface

Cardiovascular disease, diabetes and chronic kidney disease—Australian facts, produced by the National Centre for Monitoring Vascular Diseases at the Australian Institute of Health and Welfare (AIHW), is a series of reports examining cardiovascular disease (CVD) (including conditions such as heart disease, stroke and heart failure), diabetes and chronic kidney disease (CKD), and their interrelationships. Each is a serious disease that contributes significantly to poor health affecting millions of Australians, often leading to further health complications, disability, loss of quality of life and premature death.

Some of the diseases covered in these reports, such as heart attack and stroke, can be immediately life-threatening events, whereas conditions such as diabetes and CKD persist over a long time. But they all require intensive management and impose a substantial burden on the Australian community and the health-care system. However, these diseases are largely preventable. Modifying and controlling risk factors for these diseases not only reduces the risk of onset of disease but also has a favourable impact on disease progression and the development of complications, leading to large health gains in the population.

There are complex causal relationships between CVD, diabetes and CKD. These, in combination with shared risk factors, often result in these diseases occurring together in an individual—known as *comorbidity*. The effects of comorbidity may lead to both more severe illness and poorer prognosis.

In the context of Australia's ageing population, the increasing risk of developing these diseases with age, the high prevalence of CVD, diabetes and CKD, and the rise in these diseases and their comorbidities will escalate the burden of CVD, diabetes and CKD on individuals, families and the health-care system in the future.

The purpose of this series of 5 reports, of which this report is the first, is to provide a compendium of the most recent information to monitor CVD, diabetes and CKD and their associations. Reports in the series will include:

- Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: mortality
- Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: prevalence and incidence
- Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: morbidity
- Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors
- Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: Indigenous Australians.

These reports present up-to-date statistics as well as trends, and examine age and sex characteristics. Variations across population groups, by geographical location, socioeconomic disadvantage and for Aboriginal and Torres Strait Islander people are also included where possible, reflecting that these diseases and associated risk factors are not uniformly distributed across Australia and affect some more than others.

This is the first time that all 3 diseases and their comorbidities have been brought together in one 'Australian facts' publication series. This approach will highlight the interrelated nature of CVD, diabetes and CKD and their determinants, as well as emphasise the burden of these 3 diseases individually and combined. Knowing more about the relationship between these diseases and common issues of concern can lead to shared prevention, management and treatment strategies, leading to improved health outcomes.

This report builds on the previous publications *Cardiovascular disease: Australian facts 2011* and *Diabetes: Australian facts 2008*.

The *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts* series is intended as a resource for policymakers and decision-makers, health professionals, researchers and academics, and the wider community.

Acknowledgments

The authors of this report were Michael de Loooper and Lany Trinh of the Cardiovascular, Diabetes and Kidney Unit at the Australian Institute of Health and Welfare (AIHW). Justine Boland, Helena Hurst, Sushma Mathur, Lisa McGlynn, Susana Senes, Claire Sparke and Jeanette Tyas from the AIHW provided valuable guidance and advice.

The report was prepared under the guidance of the **National Vascular Diseases Monitoring Advisory Group**, whose members are: Erin Lalor (Chair), Alan Cass, Derek Chew, Maria Craig, Wendy Davis, Rob Grenfell, Wendy Hoy, Lisa McGlynn, Tim Mathew, David Parker, Jonathan Shaw, Andrew Tonkin and Bernie Towler.

Valuable input was also received from the cardiovascular disease, diabetes and chronic kidney disease Expert Advisory Groups, whose members are:

Cardiovascular Disease Expert Advisory Group members: Andrew Tonkin (Chair), Tom Briffa, Derek Chew, Annette Dobson, Rob Grenfell, Belinda Lister, John Lynch and Mandy Thrift.

Diabetes Expert Advisory Group members: Jonathan Shaw (Chair), Janelle Babare, Stephen Colagiuri, Maria Craig, Wendy Davis, Mark Harris, Greg Johnson, Glynis Ross and Sophia Zoungas.

Chronic Kidney Disease Expert Advisory Group members: Tim Mathew (Chair), Alan Cass, Steven Chadban, Jeremy Chapman, Joan Cunningham, Bettina Douglas, Wendy Hoy, Stephen McDonald and David Parker.

The Australian Government Department of Health funded this report. The authors acknowledge the valuable comments from individual staff members.

Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
CHD	coronary heart disease
CKD	chronic kidney disease
CVD	cardiovascular disease
ESKD	end-stage kidney disease
ICD	International Classification of Diseases
NSW	New South Wales
NT	Northern Territory
OECD	Organisation for Economic Co-operation and Development
Qld	Queensland
SA	South Australia
SES	socioeconomic status
WA	Western Australia

Symbols

—	nil or rounded to zero
n.a.	not available

Summary

This report is the first in a series by the National Centre for Monitoring Vascular Diseases at the Australian Institute of Health and Welfare. It describes deaths in the Australian population that result from 3 chronic diseases, acting alone or together: cardiovascular disease (CVD) (including coronary heart disease (CHD) and stroke), diabetes and chronic kidney disease (CKD).

What impacts do CVD, diabetes and CKD have on mortality?

- In 2011, CVD, diabetes and CKD together were the underlying causes of 52,899 deaths, 36% of all deaths. Overall, 61% of all deaths had at least 1 of these diseases recorded as an underlying or associated cause of death.
- CVD was the underlying cause of 45,622 deaths, 31% of all deaths. CHD accounted for 47% of CVD deaths, followed by stroke (19%). CVD contributed to 56% of all deaths.
- Diabetes was the underlying cause of 4,209 deaths, 3% of all deaths. Of these, 43% were due to type 2 diabetes 9% to type 1 diabetes, and the rest did not specify. Diabetes was an underlying or associated cause of 15,093 deaths, 10% of all deaths.
- CKD was the underlying cause of 3,068 deaths, 2.1% of all deaths. It was an underlying or associated cause of 14,842 deaths, 10% of all deaths.

What are the trends in mortality?

- Between 1981 and 2011, the CVD death rate for males fell by 71% (from 689 to 202 deaths per 100,000 population), and for females by 67% (from 440 to 145 deaths per 100,000).
- The diabetes death rate was 16.3 deaths per 100,000 in 2011. It remained largely unchanged between 1981 and 2011.
- Although CKD mortality declined overall between 1981 (16.3 deaths per 100,000) and 2011 (11.5), rates have been relatively stable since 2000.

Who is affected most?

- CHD, diabetes and CKD death rates in 2011 were higher among males than females (1.8, 1.5 and 1.4 times as high, respectively). For stroke, male and female rates were similar.
- Death rates were higher among older persons. For CVD, for example, there was a fourfold increase in rates between ages 65–74 years, 75–84 and 85 and over.
- People in low socioeconomic groups, Aboriginal and Torres Strait Islander people and those living in *Remote and very remote* areas have higher rates. Indigenous diabetes and CKD death rates, for example, were over 3 times those of non-Indigenous Australians.

What associations are there?

- In 2011, at least 2 of CVD, diabetes and CKD were found in 14% of death records, with CVD and diabetes occurring together in half of these. About 2% of deaths had all 3 diseases recorded.
- Of diabetes deaths, 64% had CHD as an associated cause, and 27% CKD. For CKD, 29% of deaths had heart failure and cardiomyopathy as associated causes, and 27% CHD.
- CVD was listed as an associated cause of death for 25% of all deaths registered in 2011, diabetes for 7% and CKD for 8%.

1 Introduction

This report on mortality is part of the series *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts* authored by the National Centre for Monitoring Vascular Diseases at the Australian Institute of Health and Welfare (AIHW). It describes deaths in the Australian population that result from 3 chronic diseases, acting alone or together: cardiovascular disease (CVD) (including conditions such as heart disease and stroke), diabetes and chronic kidney disease (CKD).

CVD, diabetes and CKD are chronic diseases, meaning that they are long-lasting, with persistent effects that may never be cured completely and requiring long-term management. The development of CVD, diabetes or CKD is closely associated with behavioural risk factors such as smoking, physical inactivity, poor nutrition and the harmful use of alcohol. These behaviours contribute to the development of biomedical risk factors including overweight and obesity, high blood pressure and high blood cholesterol levels, which in turn can lead to chronic disease (see AIHW, forthcoming 2015). These risk factors, however, are modifiable and chronic diseases, once they develop, can often be effectively controlled through behavioural change, medication and other health-care interventions.

Nonetheless, these diseases and their comorbidity contribute substantially to poor health and mortality in Australia (AIHW 2014a). In 2011, CVD was the leading cause of death, underlying 31% of all deaths (see Box 1.1 for cause-of-death definitions). Diabetes was the underlying cause of 3% of deaths and CKD 2%.

Describing the mortality impact of diabetes and CKD using only the underlying cause of death understates their contribution. Diabetes and CKD often coexist with CVD and are also commonly associated with other causes of death (AIHW 2012). It is also known that diabetes and CKD as causes of death are often omitted from death certificates (AIHW 2012; IDF 2013). Despite these limitations, the 3 diseases contribute significantly to overall mortality, and combined were the underlying cause of 52,899 deaths in 2011—more than one-third of all deaths in Australia.

Monitoring the direct or indirect contribution of these diseases to mortality is important, so that their contribution to the population health burden can be assessed. Substantial progress has been made over a number of decades in improving cardiovascular health, with marked falls in CVD mortality. Mortality due to coronary heart disease and stroke—the 2 major causes of CVD mortality—has decreased by around 70% over the past 3 decades (AIHW 2014a), attributed in about equal measure to improved diagnosis and treatment, as well as lowering of the rates of smoking and high blood pressure (Briffa et al. 2009; Ford & Capewell 2011; Taylor et al. 2006) (see also Appendix A). Nevertheless, premature death from CVD continues to impose a heavy burden on the Australian population.

Improvements in mortality outcomes for people with diabetes and CKD are less evident, with death rates relatively unchanged in recent decades. The contribution of diabetes and CKD to the development and progress of various conditions that cause death are substantial, however, and need careful monitoring. Diabetes and CKD are commonly reported as an associated cause of death (see Box 1.1), both contributing to 10% of deaths in 2011. The interacting effects of CVD, CKD and diabetes, and their combined impact on mortality, are provided in this report.

The aim of the report is to summarise the most recent data on the contribution of these 3 key chronic diseases to mortality. The National Mortality Database at the AIHW is the source of information.

The report has 4 main sections: 1 for each disease group—CVD, diabetes and CKD—and 1 for their comorbidity. Each chapter includes analysis of trends in death rates, and how deaths are distributed by sex and age. Some demographic groups have higher rates of death from these conditions, particularly Aboriginal and Torres Strait Islander people, those in the lowest socioeconomic status (SES) group and those living in remote areas of Australia, and so information on inequalities in mortality are presented. International comparisons of mortality are also presented where possible. A series of appendixes provides supporting data, information on methods and a table of milestones in the historical course of these diseases in Australia.

Box 1.1 Describing causes of death

Death certificates document the diseases considered to be instrumental in causing a death. These are usually completed by a medical practitioner or coroner.

On a death certificate, the underlying cause of death is the condition, disease or injury that initiated the sequence of events leading directly to death; that is, the primary or main cause. For each death, only a single underlying cause is selected from among all the conditions reported on a death certificate.

Associated causes of death are all causes listed on the death certificate, other than the underlying cause of death. They include the immediate cause, any intervening causes, and conditions that contributed to the death but were not related to the disease or condition causing the death.

Since deaths rarely have a single cause, analysis using multiple causes of death data provides a more complete representation of all diseases and conditions that caused a death (AIHW 2012).

Data on causes of death in Australia are considered to be of high quality (Mathers et al. 2005). However, both diabetes and CKD are known to be under-reported in national mortality statistics, often being omitted from death certificates as contributory causes of death (IDF 2013; Li et al. 2003; Sparke et al. 2013; Whittall et al. 1990).

2 Cardiovascular disease

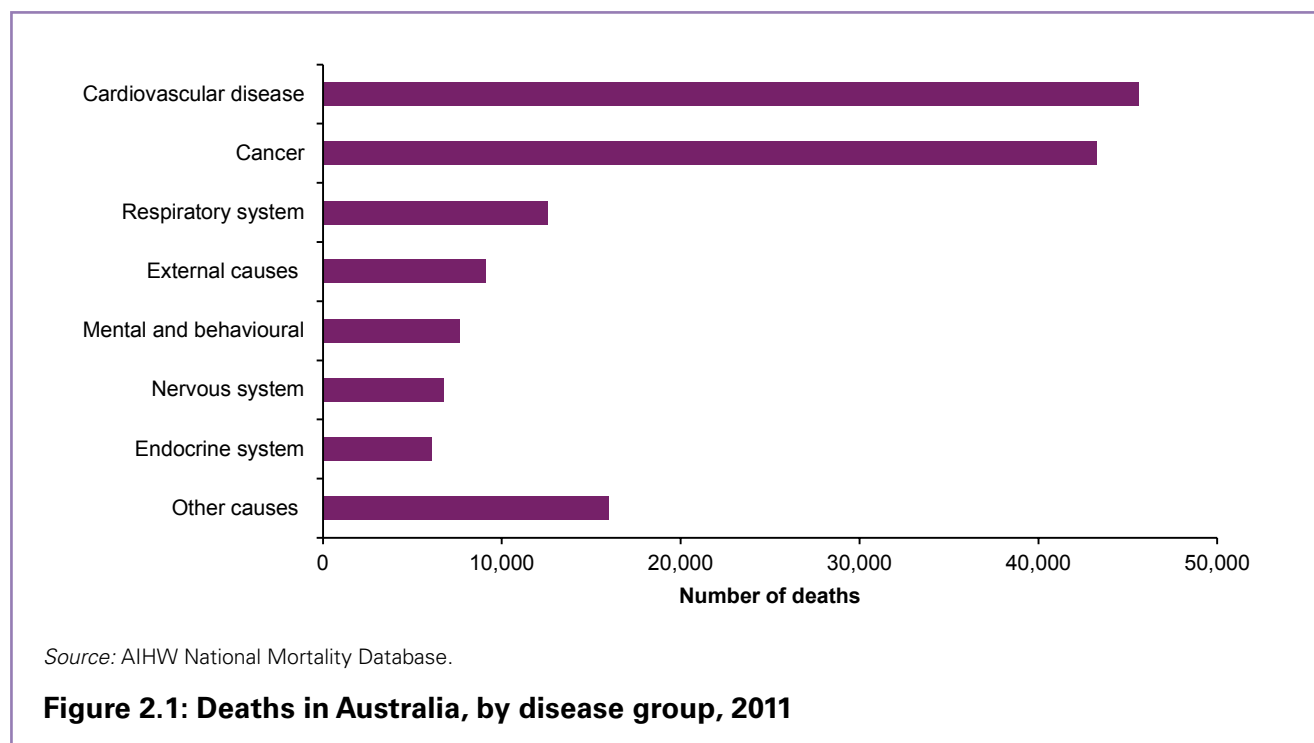
All cardiovascular mortality

The term cardiovascular disease (CVD) covers all diseases and conditions of the heart and blood vessels. The most common and serious types of CVD in Australia are coronary heart disease (CHD) and stroke. These conditions are described separately later in this chapter. In developed countries such as Australia, the main underlying cause of CVD is a process known as *atherosclerosis*. This is a condition where abnormal deposits of fat, cholesterol and other substances build up in the inner lining of the arteries to form *plaque*, which causes the artery walls to lose their elasticity. Atherosclerosis is most serious when it leads to reduced or blocked blood supply to the heart (causing angina or heart attack) or to the brain (causing a stroke). The process leading to atherosclerosis is slow and complex, often starting in childhood and progressing with age.

A number of factors are known to increase the risk of developing CVD. These include overweight and obesity, tobacco smoking, high blood pressure, high blood cholesterol, insufficient physical activity, poor nutrition and diabetes (see AIHW, forthcoming 2015).

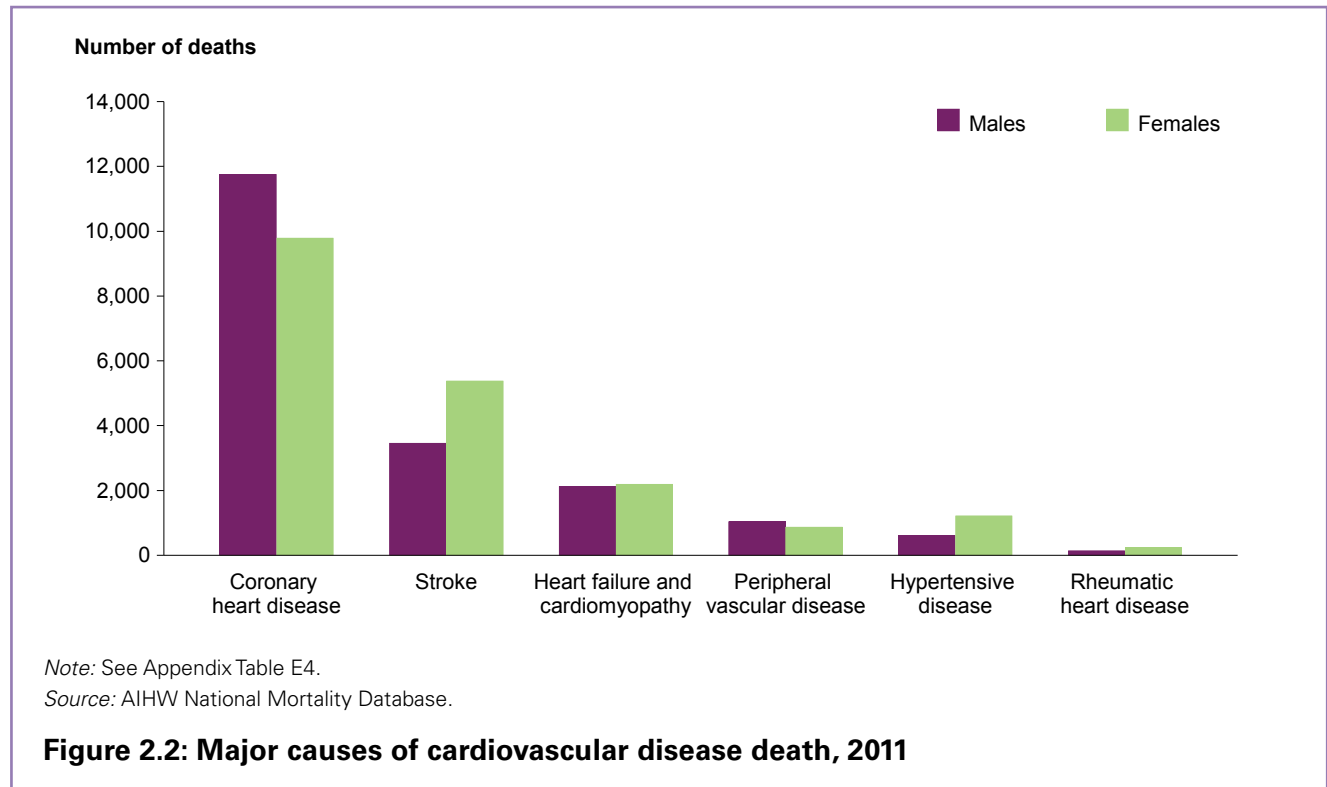
In 2011, CVD was the underlying cause of 45,622 (31%) of all deaths—responsible for more deaths than any other disease group. CVD was followed closely as a cause of death by cancer (29%), then diseases of the respiratory system (8%) and external causes (6%), with mental and behavioural problems and diseases of the nervous and endocrine systems each accounting for a further 5% (Figure 2.1).

Most deaths in Australia are due to chronic diseases (89%). CVD deaths represented 35% of all chronic disease deaths in 2011.



Major causes of cardiovascular death

In 2011, CHD accounted for nearly half of all cardiovascular deaths (47%), followed by stroke (19%) (Figure 2.2). Other major causes of death were heart failure and cardiomyopathy (9%), peripheral vascular disease (4%) and hypertensive disease (4%). Rheumatic heart disease caused 362 deaths, close to 1% of all CVD deaths. Additionally, there were 165 deaths from congenital heart disease (Appendix Table E4).



Trends

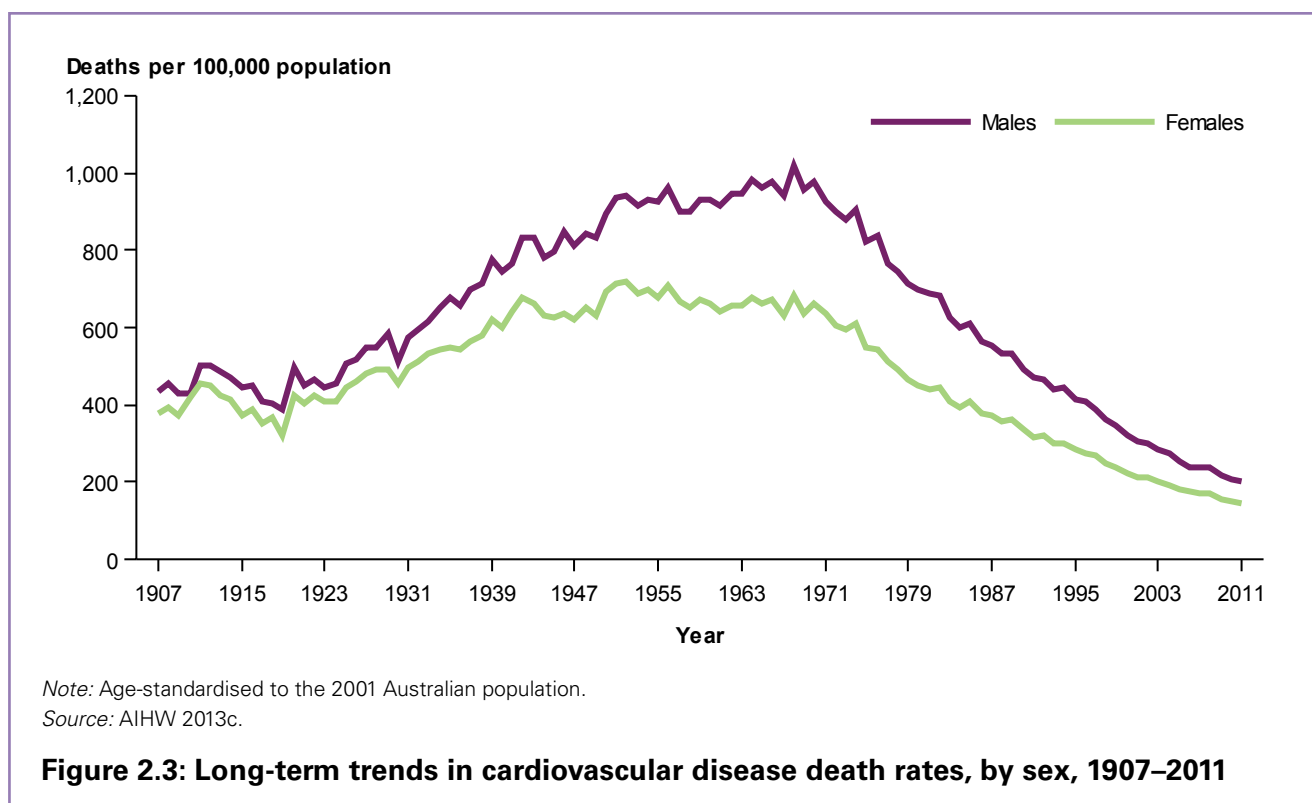
Over the last century, CVD mortality in Australia has risen and fallen, reaching a peak in the late 1960s, at around 60,000 deaths annually, and falling dramatically since then to around 44,000 deaths annually in recent years.

Male CVD death rates (1,020 per 100,000 population in 1968) peaked higher and later than female rates (718 per 100,000 in 1952). Rates began to decline steadily in both sexes from 1970, and the gap between males and females has also narrowed substantially (Figure 2.3).

Between 1981 and 2011, the CVD death rate for males fell by 71% (from 689 to 202 deaths per 100,000 population)—a 4.2% average annual decline. The female rate fell by 67% (from 440 to 145 deaths per 100,000)—a 3.8% average annual decline.

Much of the decline in CVD death rates can be attributed to improvements in the prevention, detection and management of CVD that have occurred in the past 60 years (AIHW 2009).

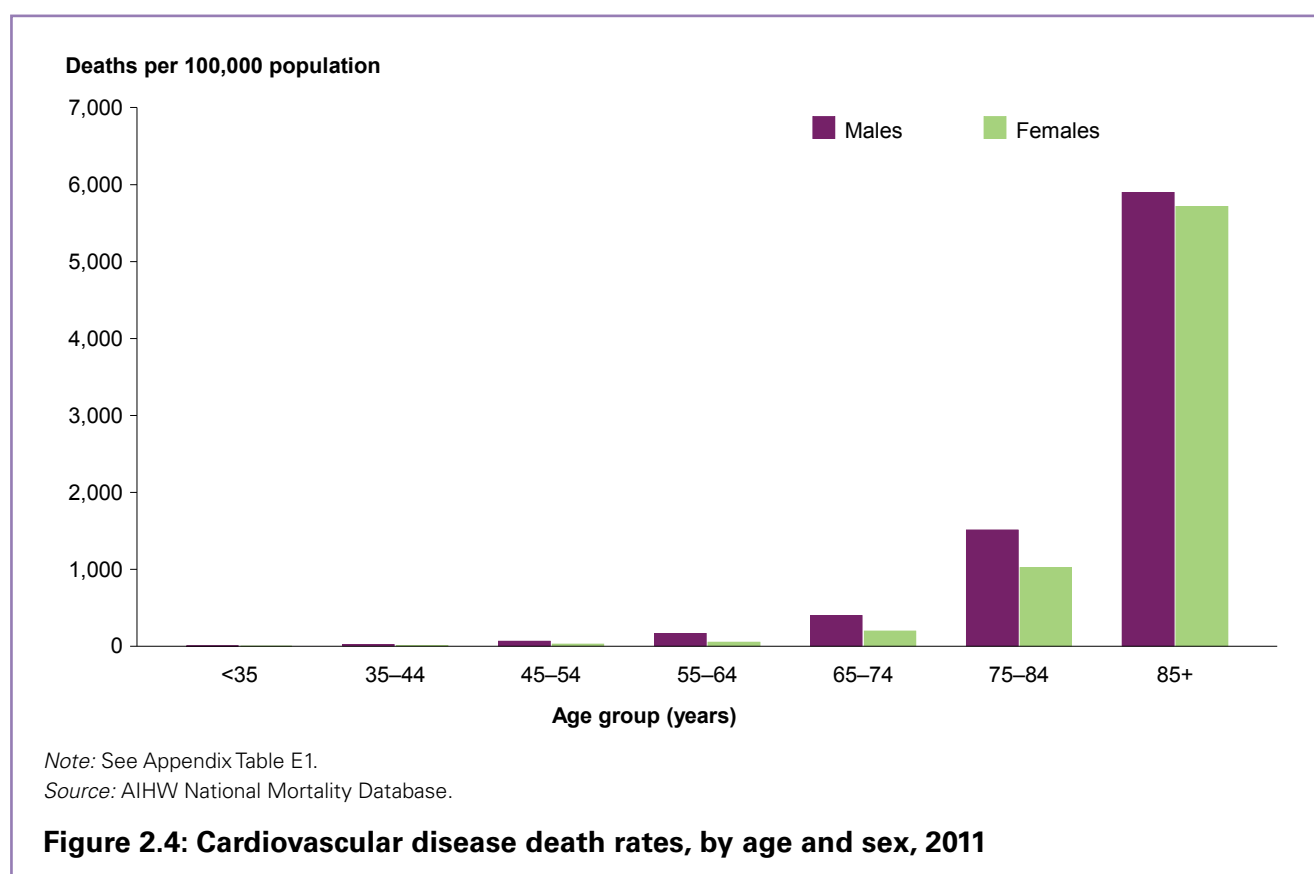
If CVD death rates had remained at their 1968 peak, there would have been 190,223 deaths for CVD in 2011—more than the number of deaths from all causes in that year. The actual number of CVD deaths that occurred in 2011 was 45,622.



Sex and age

Age-specific CVD death rates increase sharply with age. In 2011, there was a fourfold increase between the 65–74 and 75–84 year age groups and then a similar increase for those aged 85 and over. Male rates were higher than female rates across all age groups, with males aged 65–74 experiencing death rates more than 2 times as high as those for females of the same age (Figure 2.4).

Similar numbers of males and females died from CVD (21,867 compared with 23,755 in 2011, respectively), even though male CVD death rates were much higher than female rates (202 compared with 145 deaths per 100,000 population, respectively). The reason for this is that a higher proportion of the female population lives to older ages. The majority of CVD deaths among females (20,770, or 87%) occurred at age 75 and over compared with 69% (14,982) of male deaths.



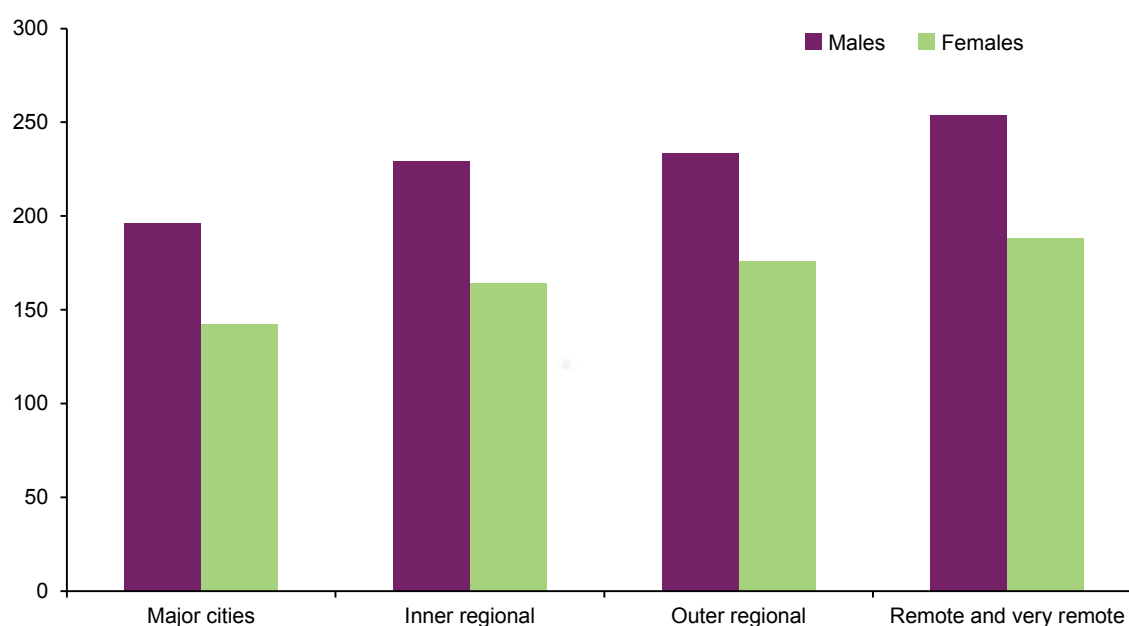
Inequalities

Remoteness

In 2009–2011, the overall CVD death rate in *Remote and very remote* areas (224 deaths per 100,000 population) was 1.3 times as high as that in *Major cities* (167 deaths per 100,000). Male CVD death rates in *Remote and very remote* areas were 1.3 times as high as in *Major cities* (254 and 196 deaths per 100,000, respectively), and female rates also 1.3 times as high (188 and 142 per 100,000, respectively) (Figure 2.5).

The higher CVD death rates in remote areas of Australia partly reflect the higher proportion of Indigenous Australians living in these areas, and their higher rates of CVD. Other contributing factors to the high death rates in remote areas include accessibility of health-care and social services and socioeconomic disadvantage experienced by people living in these areas (AIHW 2014a).

Deaths per 100,000 population



Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Table E1.

Source: AIHW National Mortality Database.

Figure 2.5: Cardiovascular disease death rates, by remoteness and sex, 2009–2011

Geographical areas

CVD death rates are mapped to geographical areas of Australia in Figure 2.6. Age-standardised mortality rates for all Statistical Area level 3 (SA3) geographical areas have been ranked from highest to lowest, and distributed into 5 equal groups which correspond to the ranges of rates presented in the map (see Appendix B for further details).

In 2009–2011, CVD death rates varied considerably across geographical areas of Australia. Generally, rates increase with increasing remoteness, although death rates within remoteness areas are not uniform. Each major city, regional or remote area may have a distribution of low, mid-range and high rates (AIHW 2007).

Some regional and remote geographical areas, such as Alice Springs (Northern Territory) and Pilbara (Western Australia), for example, have mid-range CVD death rates (172–192 deaths per 100,000 population). Barkly (Northern Territory), Far North (Queensland) and Lower Hunter (New South Wales), however, have higher rates (211 or more).

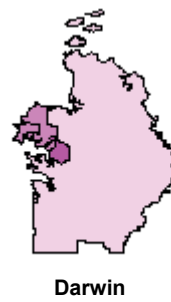
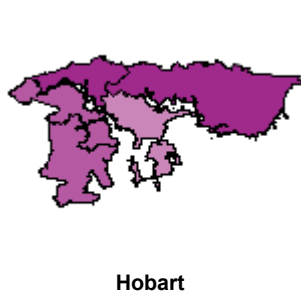
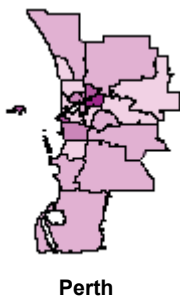
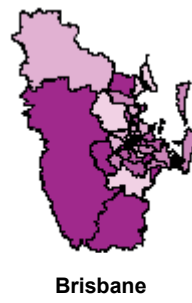
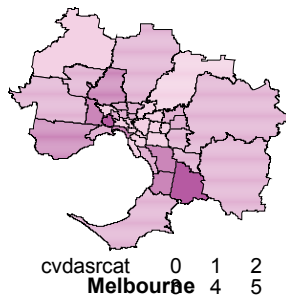
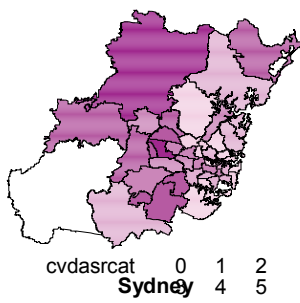
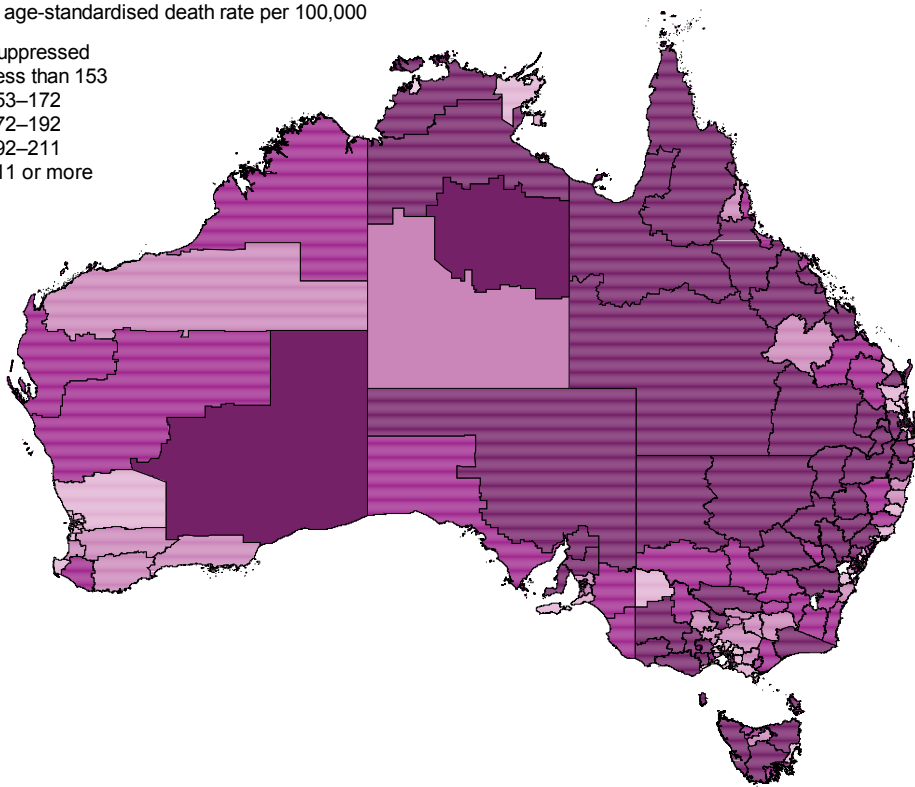
Variations in CVD death rates are also apparent within major cities. In Sydney, for example, CVD death rates are lower in some of the northern and southern suburbs (less than 153 deaths per 100,000 population) (Figure 2.6). Rates in some western and south-western suburbs of Sydney are higher, exceeding rates in regional areas of New South Wales such as Maitland, Southern Highlands and Port Stephens.

Several factors contribute to the unequal distribution of CVD mortality across geographical areas, including different health behaviours and risk factor levels, socioeconomic disadvantage, remoteness and access to health and welfare services within each area.

Geographical areas with higher death rates generally exhibit lower socioeconomic status (AIHW 2006).

CVD age-standardised death rate per 100,000

- Suppressed
- Less than 153
- 153–172
- 172–192
- 192–211
- 211 or more



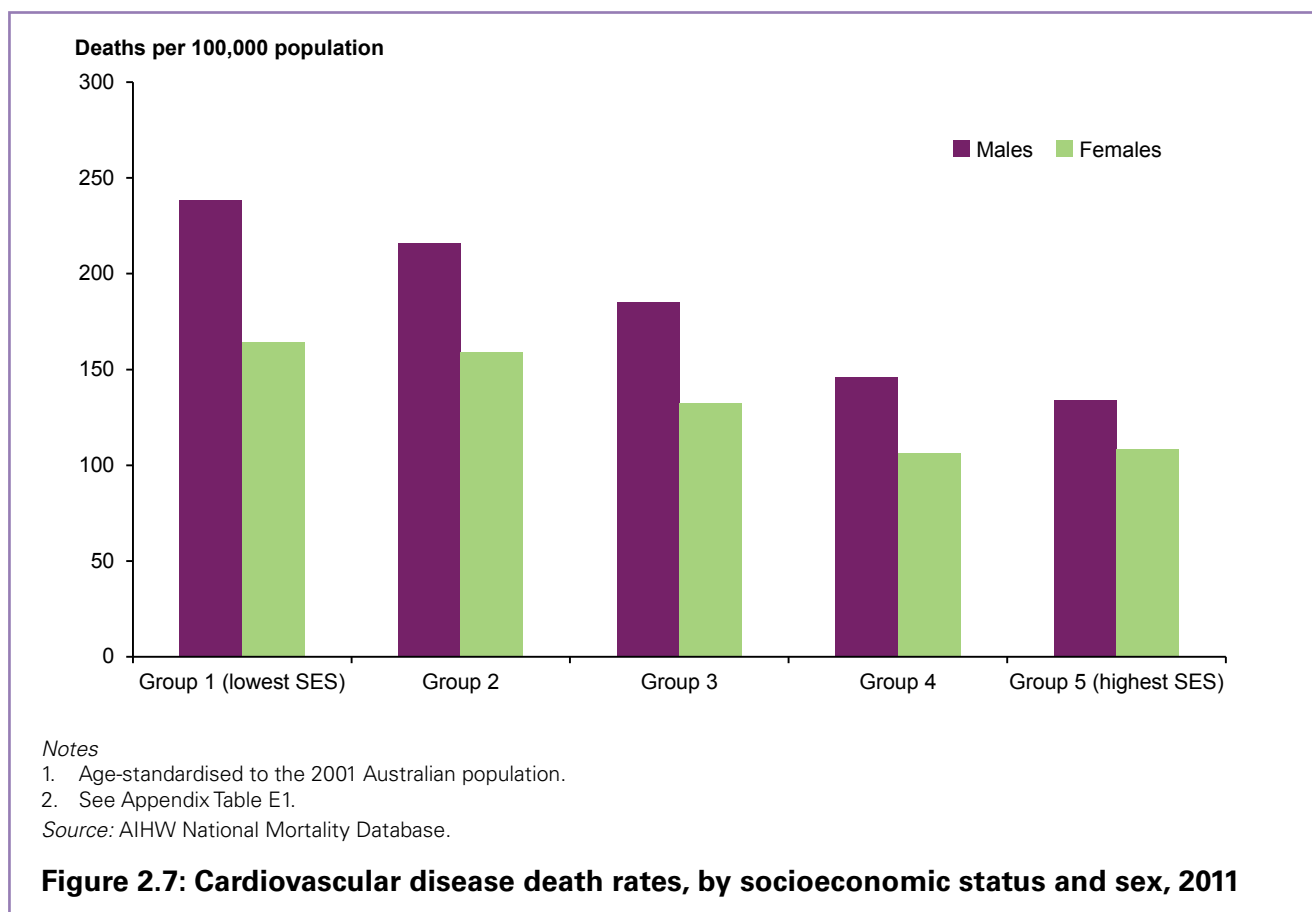
Source: AIHW National Mortality Database.

Figure 2.6: Cardiovascular disease death rates, Australia and capital cities, 2009–2011

Socioeconomic status

CVD mortality increases with decreasing socioeconomic status (Figure 2.7). In 2011, for both males and females, the CVD death rate was highest among those in the lowest socioeconomic group, and lowest for those in the highest group.

Overall, the death rate in the lowest socioeconomic group was 1.6 times as high as those in the highest group. The CVD death rate for males in the lowest socioeconomic group was 1.8 times as high, and for females 1.5 times as high.

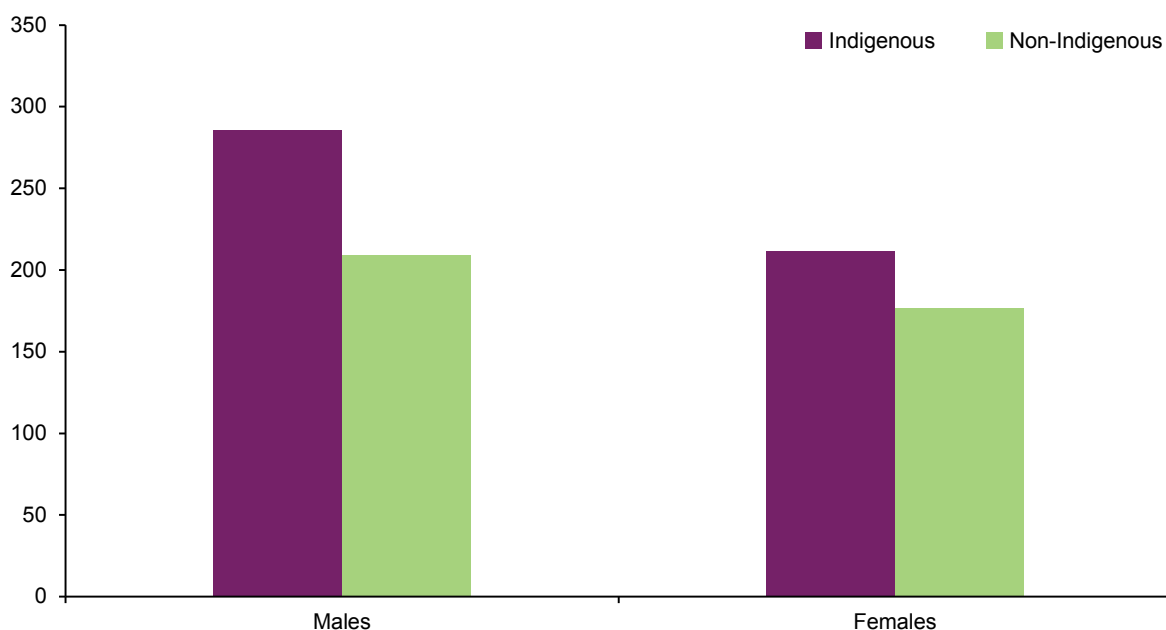


Aboriginal and Torres Strait Islander people

In 2009–2011, 1,465 deaths with an underlying cause of CVD were recorded for Aboriginal and Torres Strait Islander people in jurisdictions with adequate Indigenous identification (see Appendix B for further details). The age-adjusted CVD death rate for Indigenous Australians was 1.3 times as high as that for non-Indigenous Australians (245 compared with 193 deaths per 100,000 population, respectively). Indigenous males and females had CVD death rates 1.4 times and 1.2 times as high, respectively, as their non-Indigenous counterparts (Figure 2.8).

Indigenous Australians have one of the highest rates worldwide of acute rheumatic fever (ARF) and its consequence, rheumatic heart disease (RHD), however these conditions are rare among other Australians (AIHW 2013a). In 2007–2011, there were 66 ARF or RHD deaths among Indigenous Australians. The ARF and RHD death rate for Indigenous Australians (4.3 deaths per 100,000 population) was more than 3 times as high as the death rate for non-Indigenous Australians (1.3 per 100,000 population) (Appendix Table E4).

Deaths per 100,000 population



Notes

1. Age-standardised to the 2001 Australian population.
2. Data from NSW, Qld, WA, SA and NT only.
3. See Appendix Table E1.

Source: AIHW National Mortality Database.

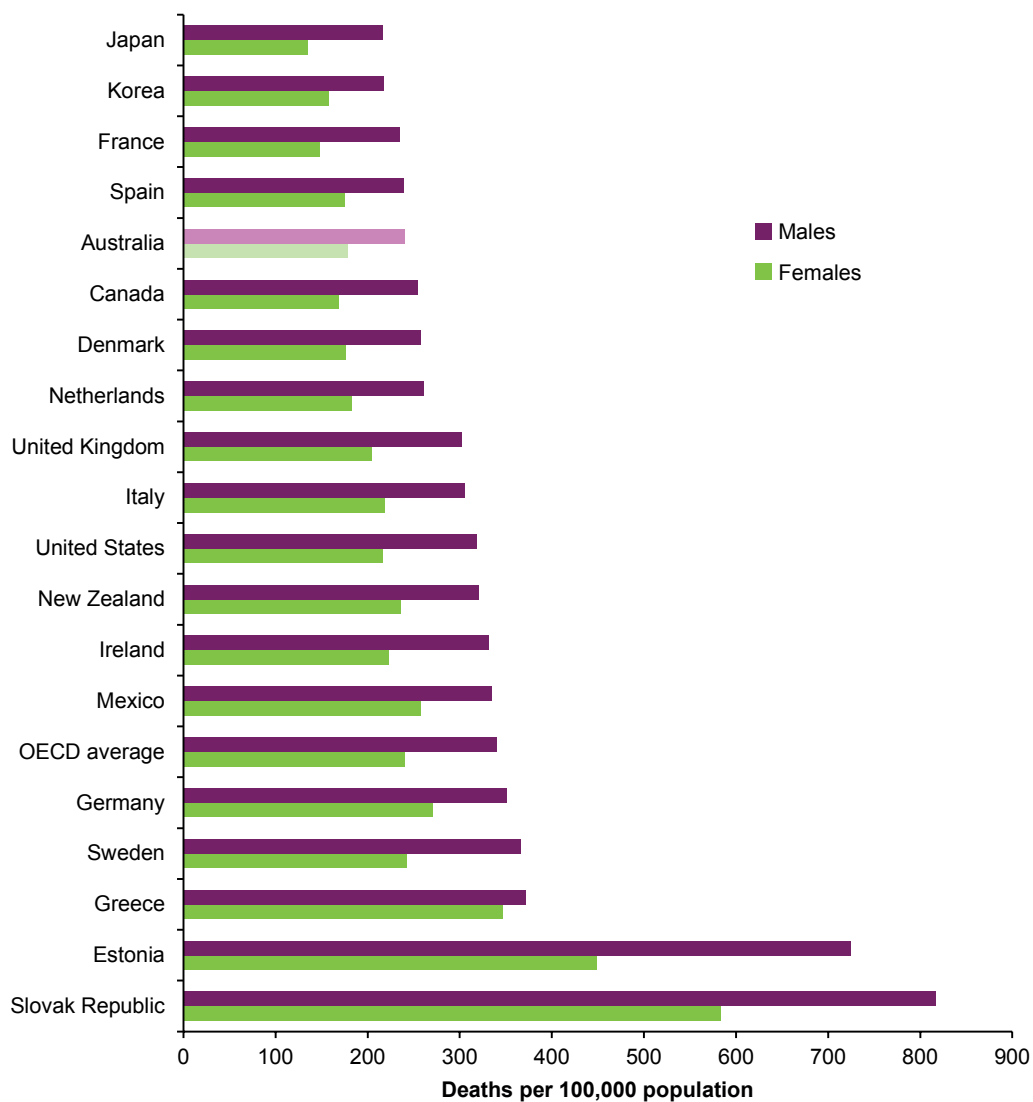
Figure 2.8: Deaths with cardiovascular disease as the underlying cause of death, by Indigenous status and sex, 2009–2011

International comparisons

The Organisation for Economic Co-operation and Development (OECD) publishes CVD mortality rates for its member countries (OECD 2013). The latest available data for Australia are for 2011, so in this report 2011 data were used to compare countries where possible.

Australia ranked in the lower third of a selected group of 19 OECD countries for CVD mortality in 2011, similar to France, Spain and Canada, and lower than the OECD average (Figure 2.9). The Slovak Republic had the highest CVD death rate for both males and females, and Japan had the lowest. Australia's CVD death rate was low compared with many OECD countries; fifth lowest for males (240 deaths per 100,000 population), and eighth lowest for females (179 deaths per 100,000) among 19 OECD countries (Figure 2.9).

Since 1990, most OECD countries have witnessed a substantial reduction in CVD death rates, with Australia's decline (57%) well ahead of the OECD average (48%).



Notes

1. Rates have been age-standardised to the 2010 OECD population.
2. Rates for Greece, Ireland, Italy, United Kingdom and United States of America are for 2010. Rates for Canada, France, Slovak Republic, Sweden and New Zealand are for 2009.

Source: OECD 2013.

Figure 2.9: Cardiovascular disease death rates, selected OECD countries, 2011 or nearest year

Coronary heart disease

CHD, or ischaemic heart disease as it is often referred to, is the most common form of CVD. There are 2 major clinical forms—heart attack (often known as acute myocardial infarction or AMI) and angina. A heart attack is a life-threatening event that occurs when a blood vessel supplying the heart itself is suddenly blocked completely, threatening to damage the heart muscle and its functions. Angina is a chronic condition in which non-sustained episodes of chest pain can occur periodically when the heart has a temporary deficiency in its blood supply.

In 2011, CHD accounted for more deaths (21,513) than any other single disease in Australia—15% of all deaths and 47% of deaths from CVD. Approximately half of CHD deaths (9,811) resulted from AMI (heart attack).

Trends

Between 1981 and 2011, the CHD death rate declined by almost three-quarters, falling from 295 to 81 deaths per 100,000 population. CHD death rates fell similarly for males (4.6% each year on average) and females (4.5%) (Figure 2.10). Overall, this downward trend occurred in each age group although the rate of decline for both males and females aged between 40 and 69 has slowed in the past decade (AIHW 2014b).

Much of the decline in CHD mortality in Australia over recent decades can be attributed to reductions in population risk factors, such as tobacco smoking, high blood cholesterol and high blood pressure (Taylor et al. 2006). Declines in CHD mortality can also be partially attributed to improvements in medical and surgical treatment. Better emergency care, the use of statins and agents to lower blood pressure and anti-platelet drugs, along with revascularisation procedures, have each contributed to achieving better CHD outcomes, both in and out of hospital (Briffa et al. 2009; Ford & Capewell 2011). Evidence from other countries attributes improvements in risk factors and treatments in about equal proportions (Bajekal et al. 2012; Wijeyesundera et al. 2010).

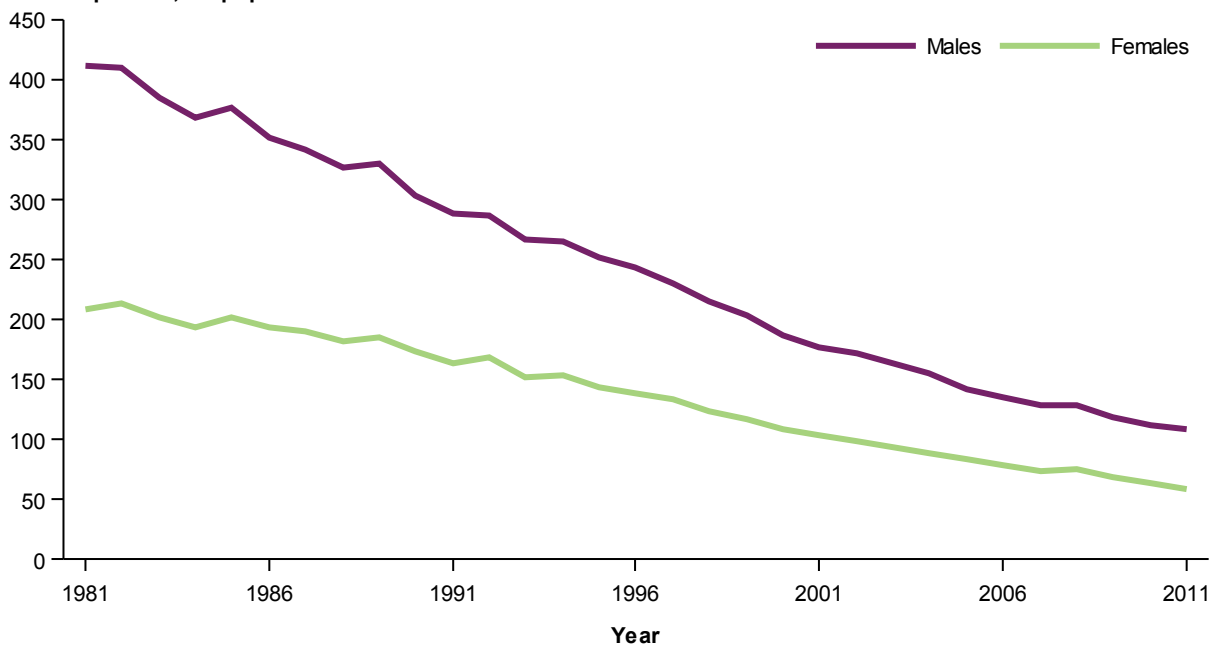
Sex and age

The CHD death rate increases markedly with age (Figure 2.11). Almost half (48%) of deaths occurred at age 85 or over in 2011. However, CHD was also responsible for a large proportion of premature deaths before age 75, especially in the male population—35% of males dying from CHD were aged less than 75, compared with 12% of females.

Overall, the male death rate from CHD in 2011 (107 deaths per 100,000 population) was 1.8 times as high as the female rate (59 per 100,000). Between the ages of 35 and 64, male rates were 4 to 5 times as high as female rates.

In 2011, half of all CHD deaths occurred at the age of 80 and over among males, and the age of 87 and over among females. Between 1981 and 2011, the average age at death due to CHD increased by 8 years for both males and females, reflecting similar increases in life expectancy over the period.

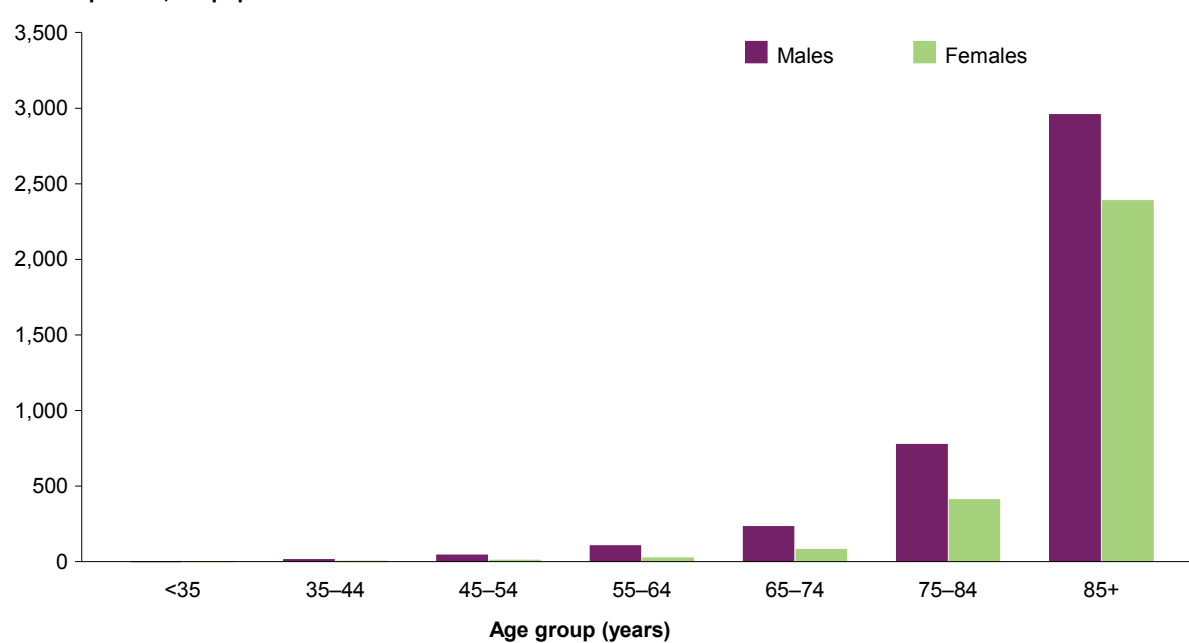
Deaths per 100,000 population



Note: Age-standardised to the 2001 Australian population.
 Source: AIHW National Mortality Database.

Figure 2.10: Trends in coronary heart disease death rates, by sex, 1981–2011

Deaths per 100,000 population



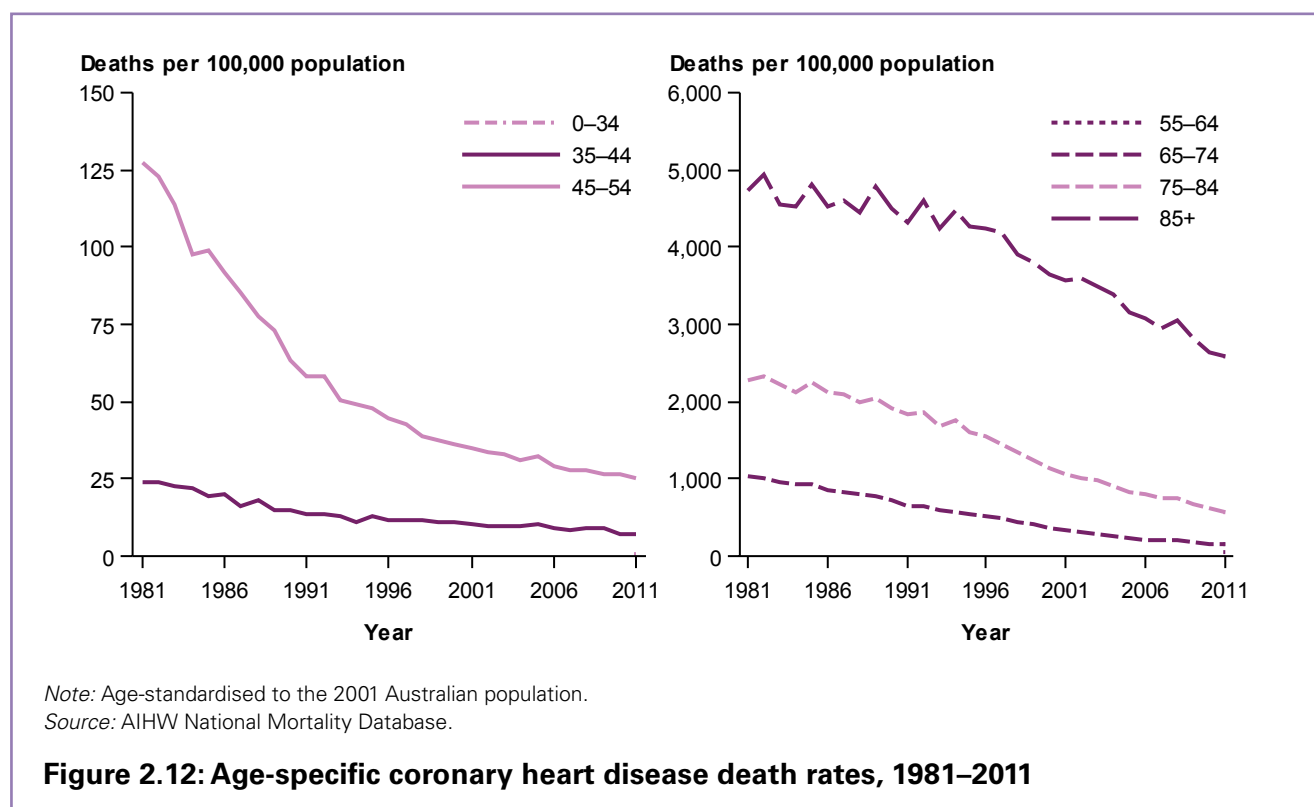
Note: See Appendix Table E2.
 Source: AIHW National Mortality Database.

Figure 2.11: Coronary heart disease death rates, by age and sex, 2011

Age-specific trends

All age groups have seen large declines in CHD mortality over the last 3 decades, although the decline for persons aged less than 65 has slowed since the mid-1990s (Figure 2.12). For 65–74 year olds, the decline has slowed more recently, from 2005 onwards. In contrast, improvements in CHD mortality for people aged 75 and over have occurred at an accelerated rate since the mid-1990s.

A slowing of the decline in CHD mortality among younger adults has also been observed in other research in Australia, as well as in several other developed countries, including the United Kingdom and the United States of America (AIHW 2014b).



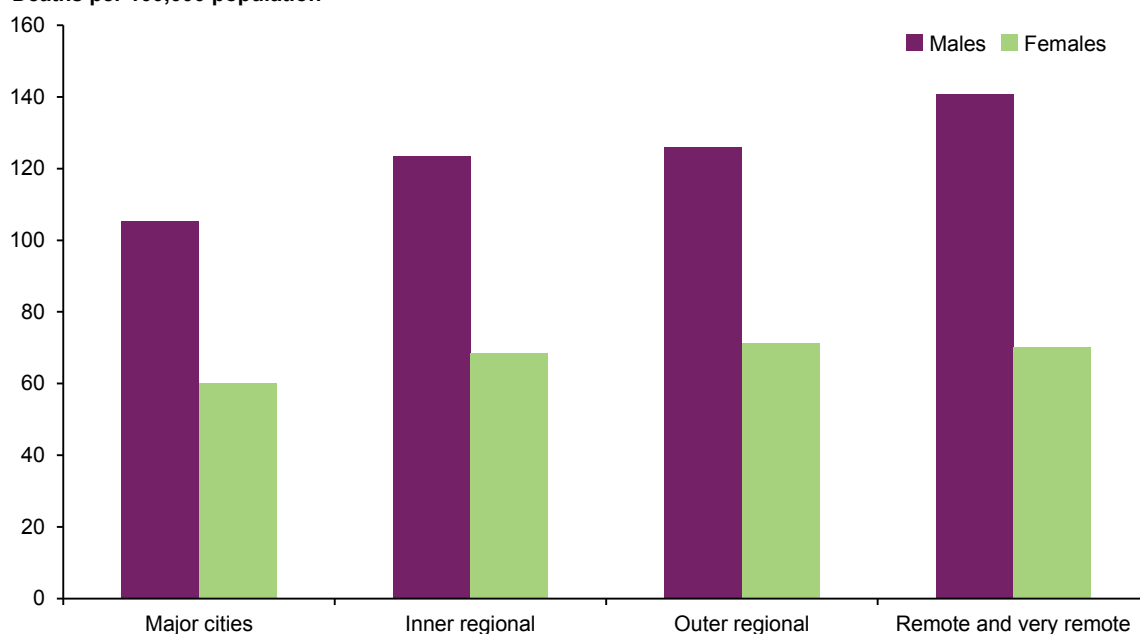
Inequalities

Remoteness

In 2009–2011, *Remote and very remote* areas had the highest CHD death rate (101 deaths per 100,000 population), 1.3 times as high as that in *Major cities* (80 deaths per 100,000). Male CHD death rates in *Remote and very remote* areas were 1.3 times as high as in *Major cities* (141 and 105 deaths per 100,000 population, respectively), and female rates 1.2 times as high (70 and 60 per 100,000, respectively) (Figure 2.13).

Higher CHD death rates in remote areas of Australia partly reflect the higher proportion of Indigenous Australians living in these areas, and their higher rates of CHD. Other contributing factors to the high death rates in remote areas include accessibility of health-care and social services and socioeconomic disadvantage experienced by people living in these areas (AIHW 2014a).

Deaths per 100,000 population



Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Table E2.

Source: AIHW National Mortality Database.

Figure 2.13: Coronary heart disease death rates, by remoteness and sex, 2009–2011

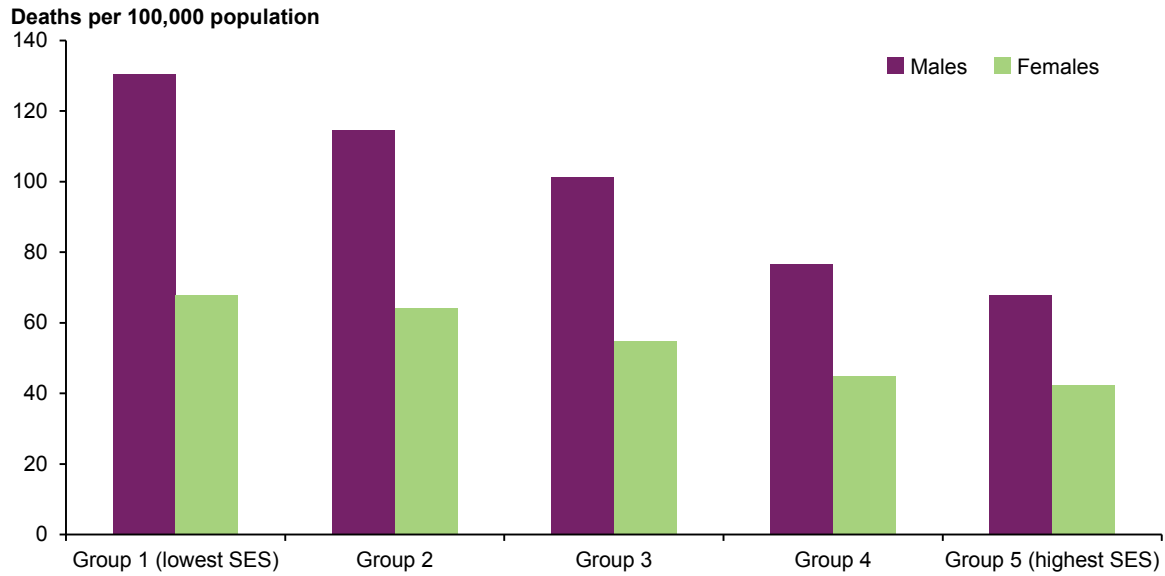
Socioeconomic status

In 2011, the CHD death rates were the highest in the lowest socioeconomic group, with a death rate almost twice as high as that in the highest group. The male CHD death rate in the lowest socioeconomic group was 1.9 times as high as in the highest group (130 compared with 68 deaths per 100,000 population, respectively), and the female rate 1.6 times as high (68 compared with 43, respectively) (Figure 2.14).

Aboriginal and Torres Strait Islander people

In 2009–2011, CHD was the underlying cause of death for 819 Indigenous people in the 5 jurisdictions with adequate and sufficient identification of Indigenous status. The CHD death rate for Indigenous Australians was 1.4 times as high as that for non-Indigenous Australians (127 compared with 92 deaths per 100,000 population, respectively).

CHD death rates for Indigenous males and females were 1.5 and 1.3 times as high as for their non-Indigenous counterparts, respectively (Figure 2.15).

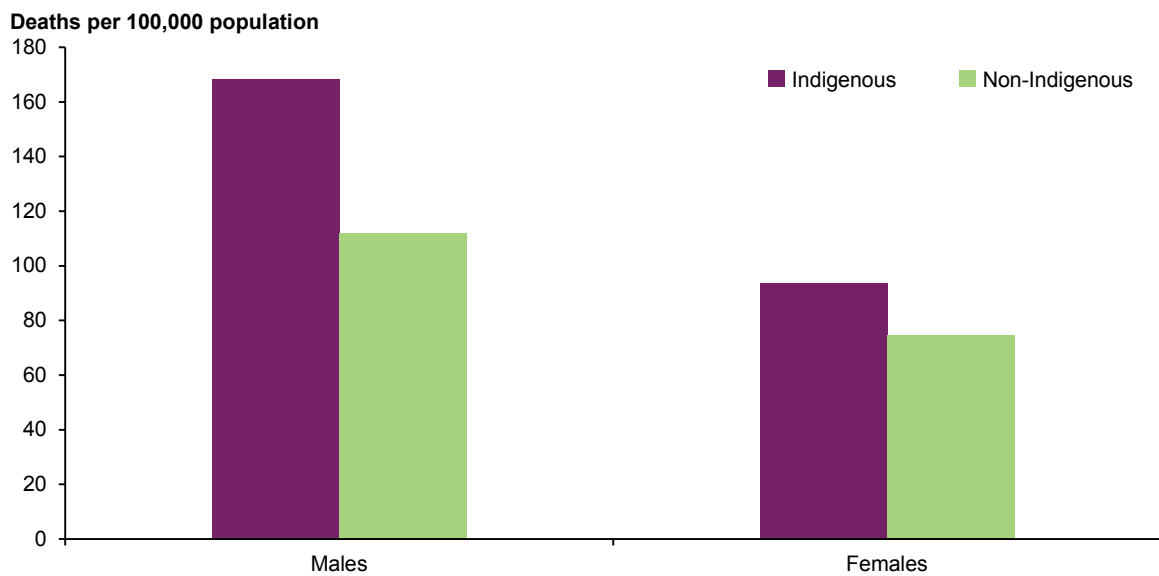


Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Table E2.

Source: AIHW National Mortality Database.

Figure 2.14: Coronary heart disease death rates, by socioeconomic status and sex, 2011



Notes

1. Age-standardised to the 2001 Australian population.
2. Data from NSW, Qld, WA, SA and NT only.
3. See Appendix Table E2.

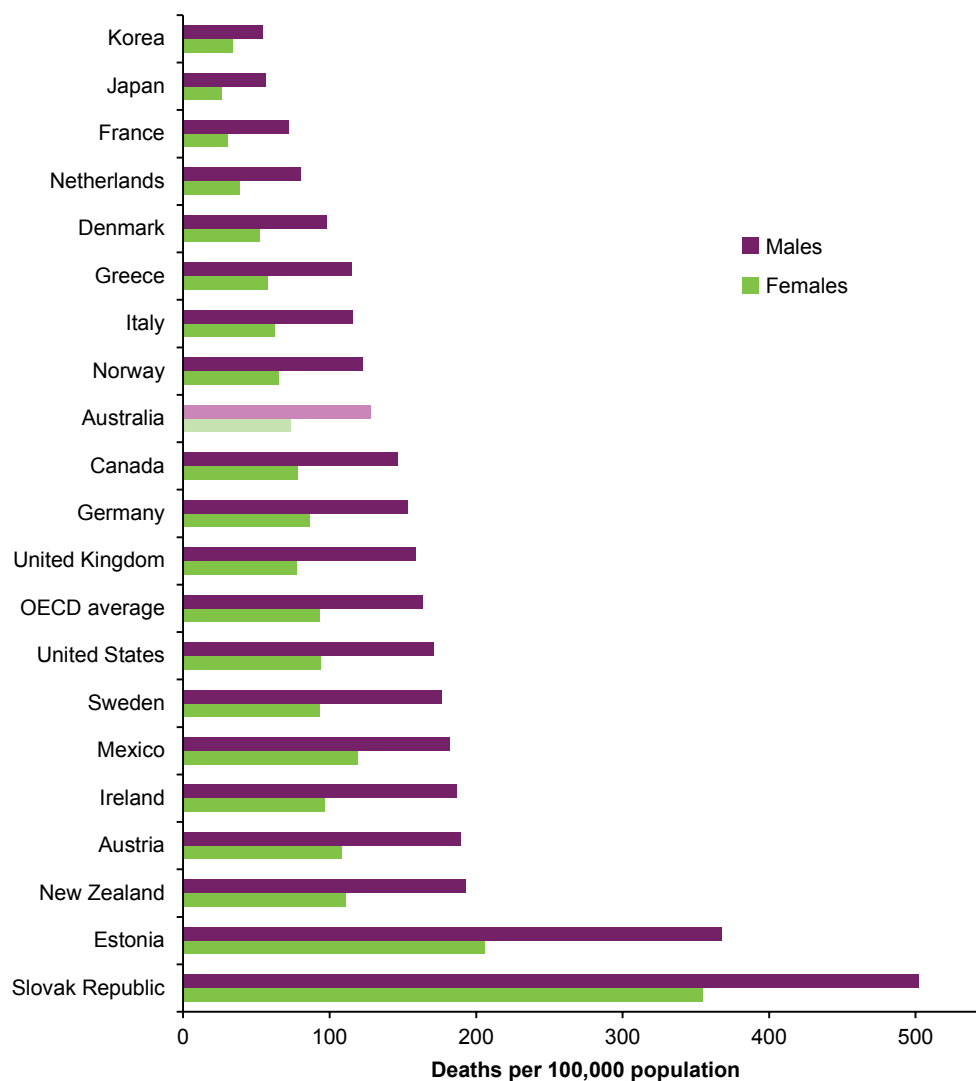
Source: AIHW National Mortality Database.

Figure 2.15: Deaths with coronary heart disease as the underlying cause of death, by Indigenous status and sex, 2009–2011

International comparisons

Australia ranked in the middle of a selected group of 19 OECD countries for CHD mortality in 2011, similar to Canada, Germany and the United Kingdom, and slightly lower than the OECD average (Figure 2.16). The Australian CHD death rate for males (128 per 100,000 population) was more than twice that of Korea (54), but only about a quarter that of the Slovak Republic (502), the country with the highest rate.

The Australian CHD death rate for females (74 per 100,000 population) was close to 3 times that of Japan (26), but only one-fifth of the Slovak Republic (355).



Notes

1. Rates have been age-standardised to the 2010 OECD population.
2. Rates for Greece, Ireland, Italy, United Kingdom and United States of America are for 2010. Rates for Canada, France, Slovak Republic, Sweden and New Zealand are for 2009.

Source: OECD 2013.

Figure 2.16: Coronary heart disease death rates, selected OECD countries, 2011 or nearest year

Stroke

Stroke occurs when an artery supplying blood to the brain either suddenly becomes blocked (known as ischaemic stroke) or ruptures and begins to bleed (known as haemorrhagic stroke). Either may result in part of the brain dying, leading to a sudden impairment that can affect a range of activities. Stroke often causes paralysis of parts of the body normally controlled by the area of the brain affected by the stroke, or speech problems and other symptoms, such as difficulties with swallowing, vision and thinking. Stroke is often fatal.

Stroke is sometimes referred to as cerebrovascular disease, although cerebrovascular disease is a broader category of diseases which includes stroke and other disorders of the blood vessels supplying the brain or its covering membranes. Approximately 78% of cerebrovascular disease deaths in 2011 were the result of stroke.

In 2011, stroke was the underlying cause of 8,824 deaths, which was 6% of all deaths and 19% of CVD deaths, making it the second most common cause of CVD death in Australia. On average, 24 people died of stroke each day in 2011. Of those having a first-ever stroke, 1 in 5 die as a result within the first month and 1 in 3 die within 12 months (Leyden et al. 2013; Marsden et al. 2010).

Trends

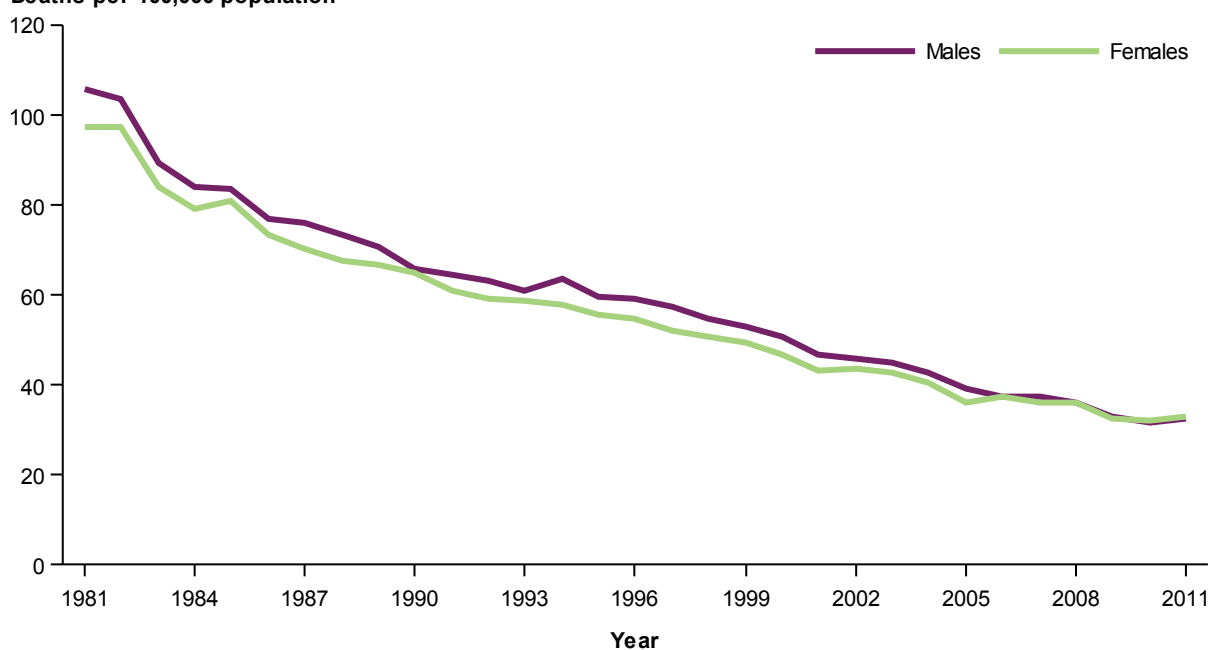
Stroke mortality has declined steadily since the early 1970s. Between 1981 and 2011, the stroke death rates fell by 68%, from 102 to 33 deaths per 100,000 population (Figure 2.17). Stroke death rates declined in a similar fashion for males and females, at an average annual rate of 3.6%.

Falling stroke death rates have been largely driven by improvements in risk factors, such as lowering rates of blood pressure and tobacco smoking, and an increased use of blood pressure-lowering drugs, treatment to prevent blood clots, access to stroke units in hospitals and other advances in medical care (AIHW 2013b; OECD 2013).

Sex and age

In 2011, stroke accounted for approximately 5% (3,458) of all male deaths and 7% (5,366) of all female deaths. As for CHD, stroke death rates increase greatly with age, with 82% occurring among those aged 75 and over. Age-specific death rates from stroke are similar among males and females, except at age 85 and over, where more females than males die from stroke (Figure 2.18). The average age at death for stroke (83) is slightly higher than for CHD (81).

Deaths per 100,000 population

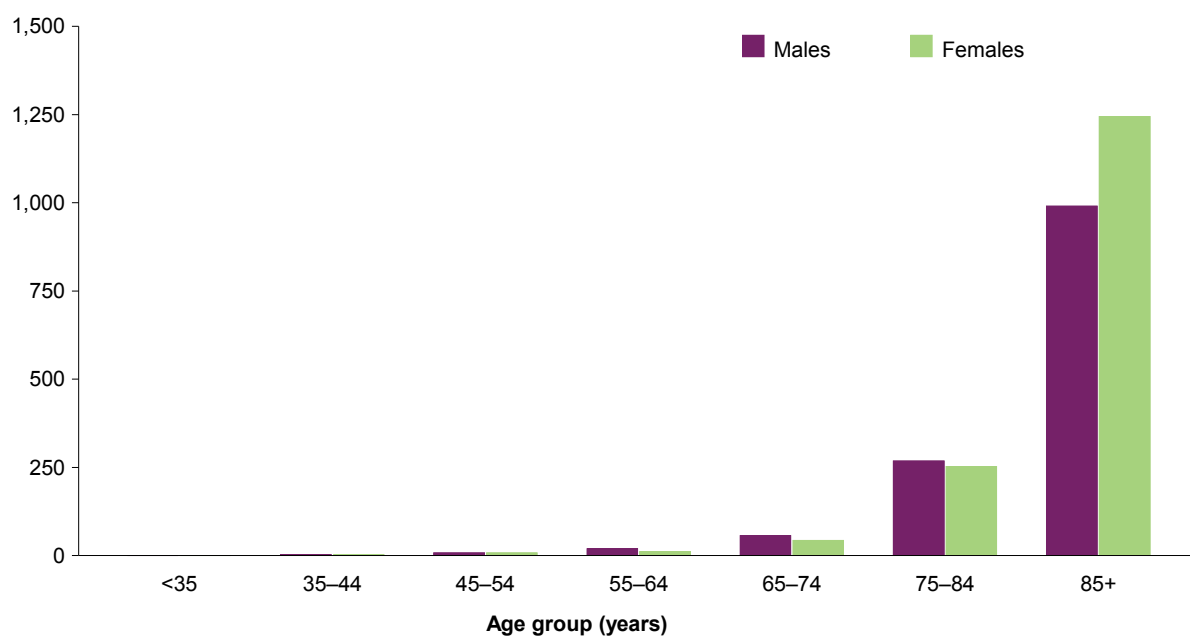


Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Mortality Database.

Figure 2.17: Trends in stroke death rates, by sex, 1981–2011

Deaths per 100,000 population



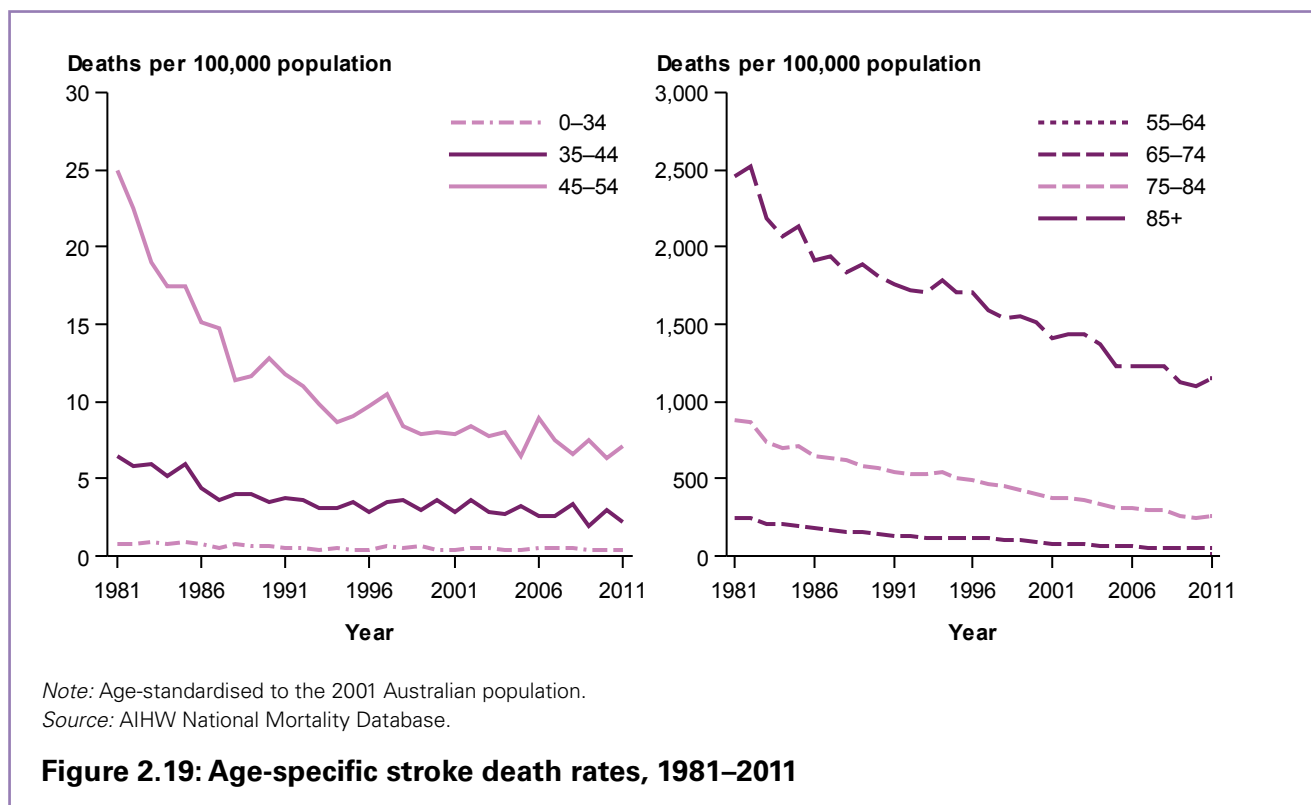
Note: See Appendix Table E3.

Source: AIHW National Mortality Database.

Figure 2.18: Stroke death rates, by age and sex, 2011

Age-specific trends

Stroke death rates have been declining for all age groups in recent decades. Between 1981 and 2011, the greatest declines occurred for the 55–64 and 65–74 age groups, with falls of over 80% (Figure 2.19), although the numbers of deaths in these age groups are much smaller than for ages 75–84 and 85 and over. From 1987–1996 to 1997–2006, the rate of decline among older age groups (65–74, 75–84 and 85 and over) increased (AIHW 2010).



Inequalities

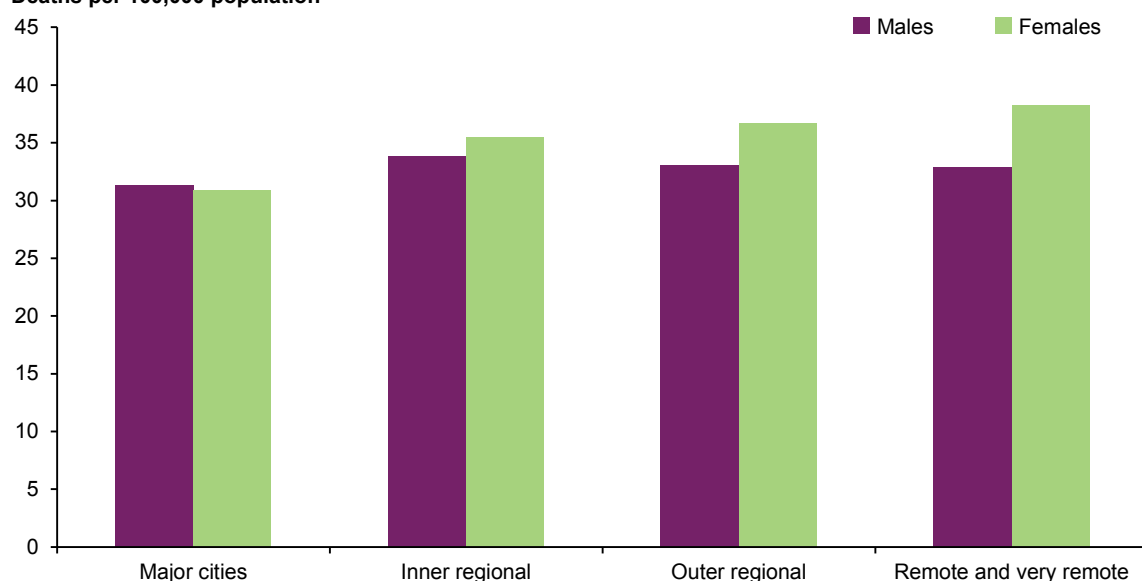
Remoteness

The difference in stroke mortality between urban and remote areas is not as pronounced as for CHD mortality. In 2009–2011, the female rate in *Remote and very remote* areas (38 deaths per 100,000 population) was 1.2 times as high as that in *Major cities* (31), while male rates were similar (about 32 deaths per 100,000) (Figure 2.20).

Socioeconomic status

In 2011, the stroke death rates were the highest in the lowest socioeconomic group, with an overall death rate 1.4 times as high as that in the highest group (Figure 2.21). The stroke death rate for males in the lowest socioeconomic group (36 deaths per 100,000 population) was 1.6 times as high as that in the highest group (23 deaths per 100,000). For females in the lowest socioeconomic group, the rate was 1.4 times as high (36 compared with 26 deaths per 100,000, respectively).

Deaths per 100,000 population



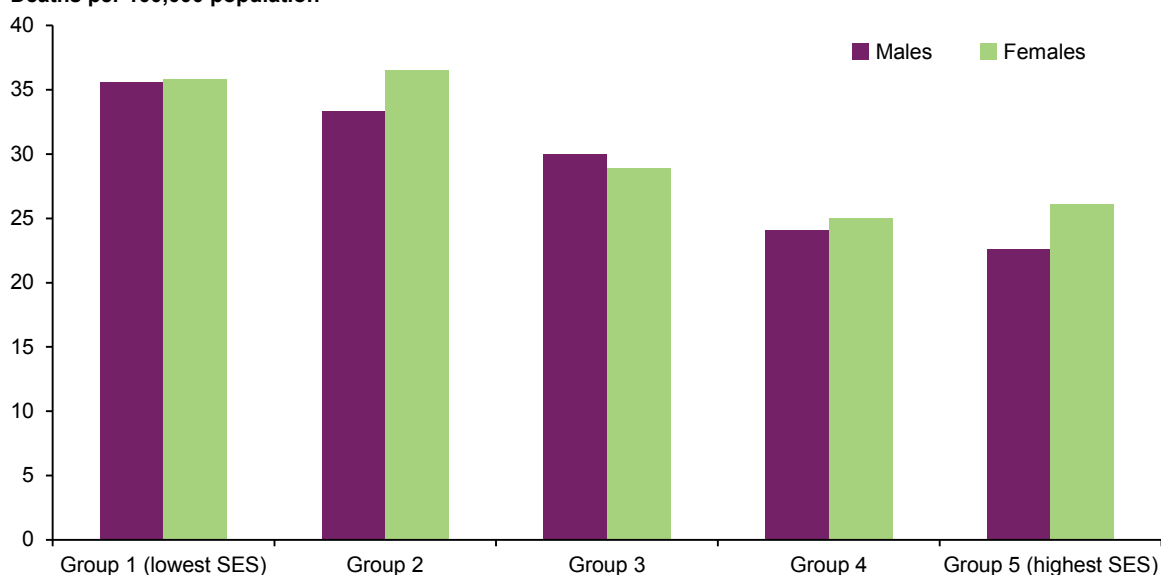
Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Table E3.

Source: AIHW National Mortality Database.

Figure 2.20: Stroke death rates, by remoteness and sex, 2009–2011

Deaths per 100,000 population



Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Table E3.

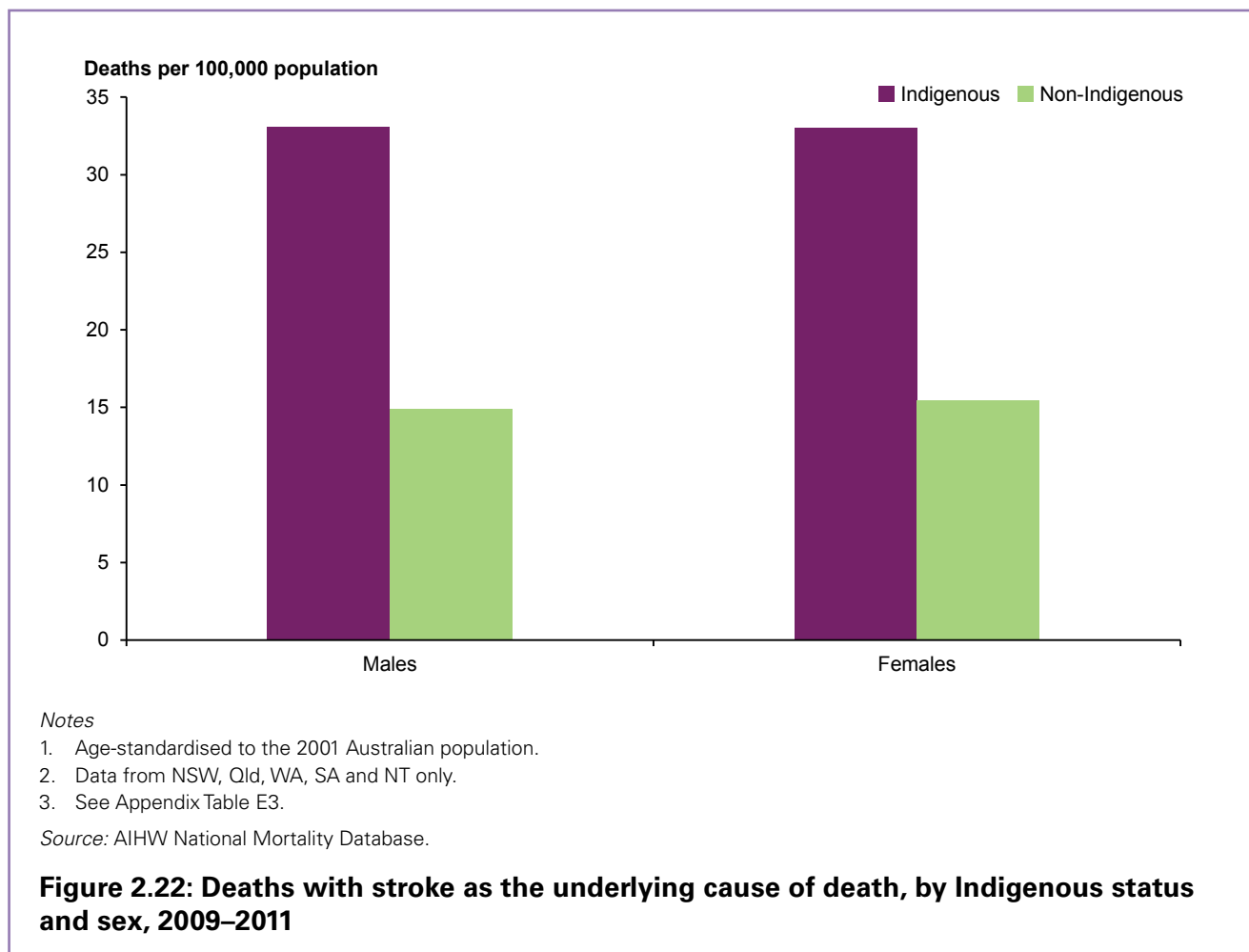
Source: AIHW National Mortality Database.

Figure 2.21: Stroke death rates, by socioeconomic status and sex, 2011

Aboriginal and Torres Strait Islander people

In 2009–2011, 170 Aboriginal and Torres Strait Islander people died from stroke in the 5 jurisdictions with adequate identification of Indigenous status. The stroke death rate for Indigenous Australians was 2.2 times as high as that for non-Indigenous Australians (33 compared with 15 deaths per 100,000 population, respectively).

Stroke death rates for Indigenous males and females were 2.2 and 2.1 times as high as their non-Indigenous counterparts (Figure 2.22).

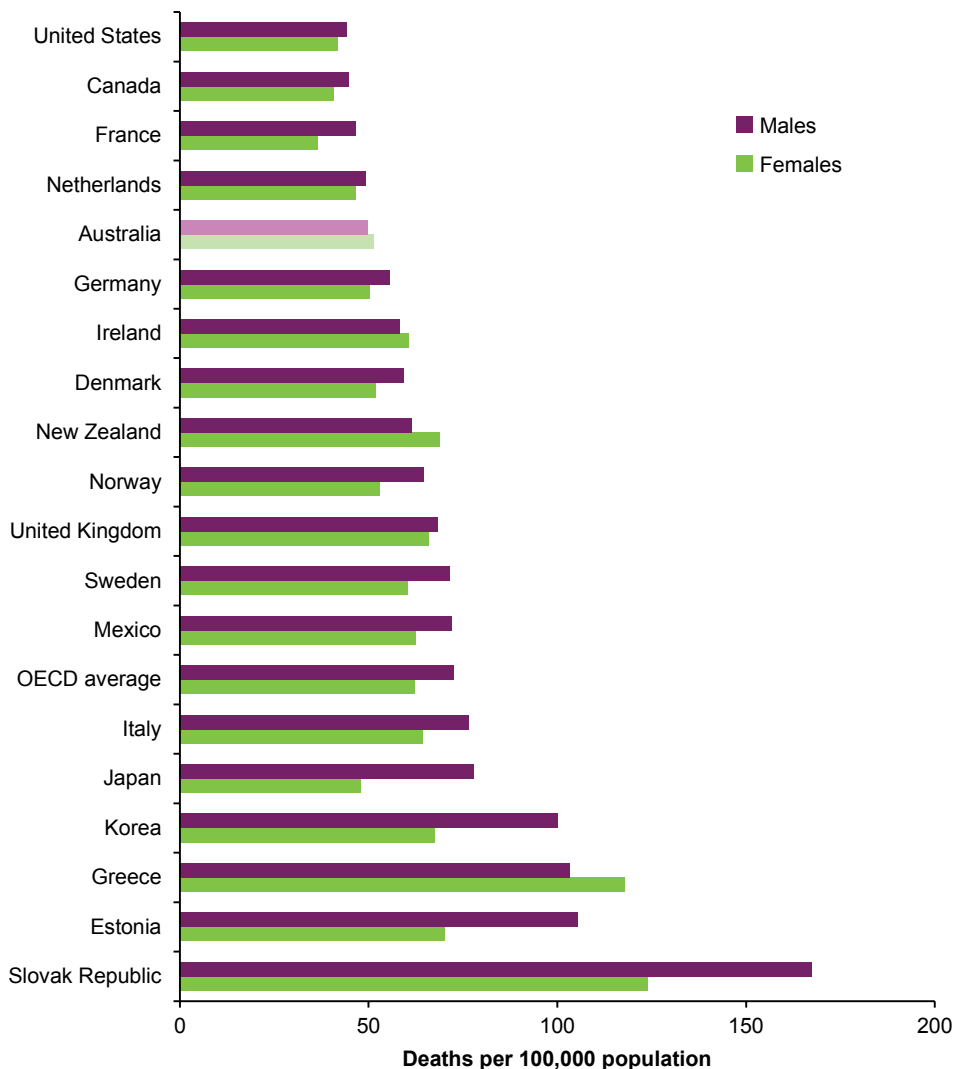


International comparisons

This section presents mortality due to cerebrovascular diseases—a larger disease category that includes stroke and other conditions. In Australia, stroke mortality comprises approximately 78% of cerebrovascular mortality.

Among OECD countries compared, Australia had the fifth lowest male cerebrovascular disease death rate, a rate similar to that of the Netherlands and Germany. The rate was 12% higher than for males in the United States of America, who had the lowest rate, and was 70% lower than for males in the Slovak Republic, who had the highest rate. For males, the Australian rate was one-third (31%) lower than the OECD average for 19 countries.

The rate for females in Australia, also similar to the Netherlands and Germany, ranked seventh lowest. The Australian rate was 40% higher than for females in France who had the lowest rate, and 60% lower than for females in the Slovak Republic who had the highest rate. For females, the Australian rate was 17% lower than the OECD average for 19 countries (Figure 2.23).



Notes

1. Rates have been age-standardised to the 2010 OECD population.
2. Rates for Greece, Ireland, Italy, United Kingdom and United States of America are for 2010. Rates for Canada, France, Slovak Republic, Sweden and New Zealand are for 2009.

Source: OECD 2013.

Figure 2.23: Cerebrovascular disease death rates, selected OECD countries, 2011 or nearest year

3 Diabetes

Diabetes is a chronic condition marked by high levels of glucose in the blood. It is caused either by the inability to produce insulin (a hormone produced by the pancreas to control blood glucose levels), by the body not being able to use insulin effectively, or both. The main types of diabetes are: **type 1 diabetes**—an autoimmune disease that usually has an onset in childhood or early adulthood but can be diagnosed at any age; **type 2 diabetes**—largely preventable, usually associated with lifestyle factors and with a later onset; and **gestational diabetes**—when higher than normal blood glucose is diagnosed in pregnancy. Diabetes may increase the risk of complications, including CHD, stroke, kidney disease, retinopathy (loss of vision), heart failure and limb amputation.

A number of factors are known to increase the risk of developing diabetes, including physical inactivity, poor diet, overweight and obesity, tobacco smoking, high blood pressure and high blood lipids (see AIHW, forthcoming 2015).

Underlying cause of death

Diabetes is among the 10 leading causes of death of Australians. In 2011, diabetes was the **underlying cause of death**—which is the condition or disease initiating the sequence of events leading directly to death—in 4,209 deaths (3% of all deaths). Of these, about 9% were due to type 1 diabetes, 42% were due to type 2 diabetes and for remaining deaths the type of diabetes was not specified.

Where diabetes was listed as the underlying cause of death, conditions most commonly listed as associated causes of death included CHD (in 64% of deaths), hypertensive disease (35%), other CVD (29%), CKD (27%), cerebrovascular disease (23%) and heart failure (21%).

Diabetes is rarely listed as the only cause of death on death certificates. In 2011, diabetes was recorded as the only cause of death in 71 deaths, representing 2% of all deaths with diabetes as the underlying cause of death.

Associated cause of death

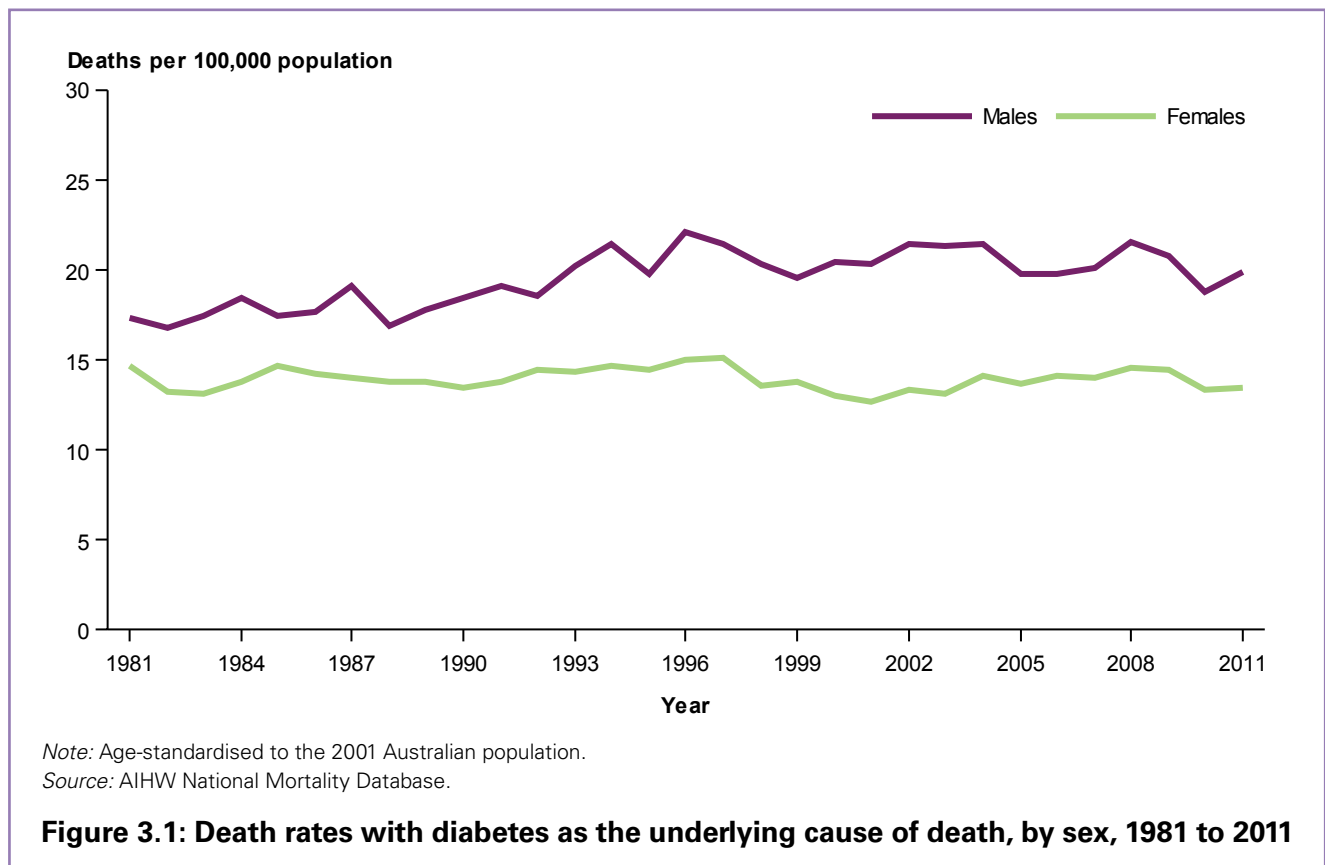
Diabetes has a substantial impact on mortality in Australia, however it may not be diabetes itself that directly leads to death, but 1 of its many complications. As a result, it is commonly the complication, and not diabetes, which is listed as the underlying cause of death on the death certificate (AIHW 2012).

A more complete picture of the mortality burden of diabetes can be obtained by examining both diabetes as the underlying cause, and diabetes as an **associated cause of death**—all causes listed on the death certificate, other than the underlying cause of death, including the immediate cause, any intervening causes, and conditions that contributed to the death but were not related to the disease or condition causing the death. In 2011, there were 15,093 deaths that listed diabetes as either an underlying or associated cause of death—equivalent to 10% of all deaths. However, deaths from diabetes are known to be under-reported in national mortality statistics, as diabetes is often omitted from death certificates as a cause of death (IDF 2013; Whittall et al. 1990).

In 2011, of the 10,884 deaths where diabetes was listed as an associated cause of death, CHD was recorded as the underlying cause of death in 24% of deaths. Cancer (26%) and stroke (7%) were the other main underlying causes listed with diabetes as an associated cause of death (see Chapter 5 for further details).

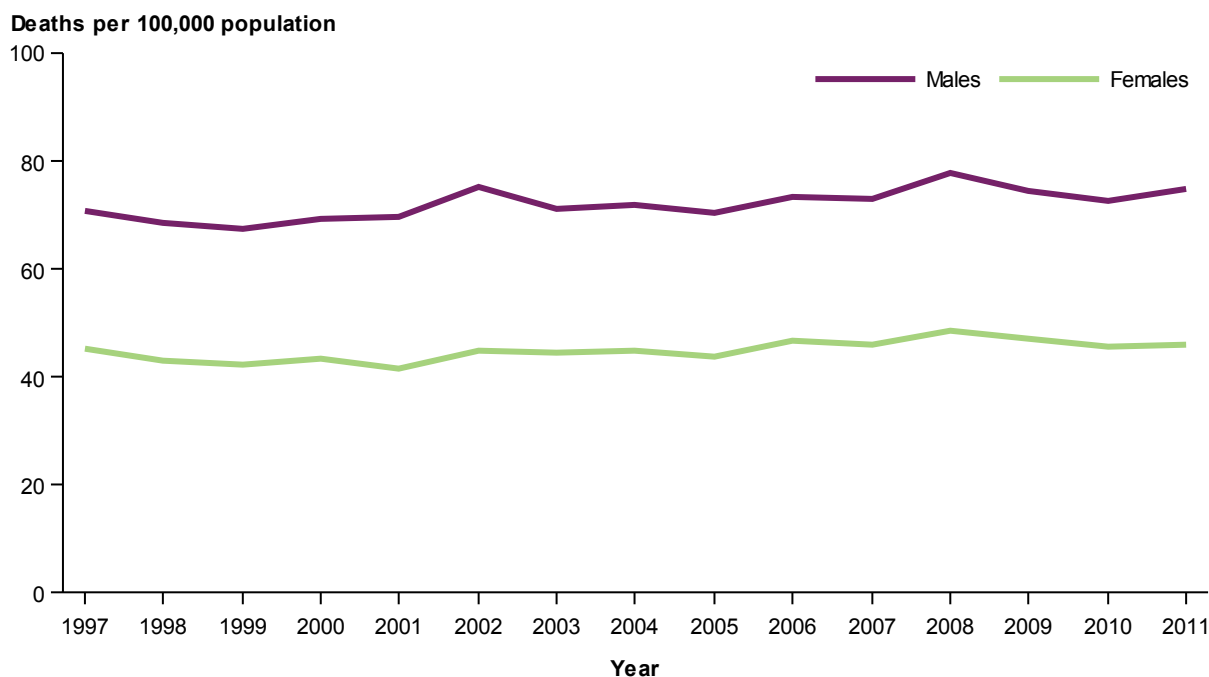
Trends

Between 1981 and 2011, 87,587 deaths were registered where diabetes was recorded as the underlying cause, equating to an average of 2,825 deaths per year. Despite large declines for CHD and stroke, diabetes death rates have remained largely unchanged over the last 30 years (Figure 3.1). Male rates were consistently higher than female rates. The rate increased slightly for males, with an average annual increase of 0.6% between 1981 and 2011. For females, the rate decreased by 0.1% per year on average over the same period.



Data for diabetes as an associated cause of death first became available in 1997, and so trends for deaths with diabetes as an underlying or associated cause are presented for the years 1997 to 2011.

Over the 14-year period, there were 179,656 deaths registered where diabetes was listed as an underlying or associated cause of death (an average of 12,833 deaths per year), representing 9.5% of all deaths registered in that period. Males experienced higher death rates than females across all years, and rates for both males and females remained stable between 1997 and 2011 (Figure 3.2).



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Mortality Database.

Figure 3.2: Death rates with diabetes as the underlying or associated cause of death, by sex, 1997 to 2011

Sex and age

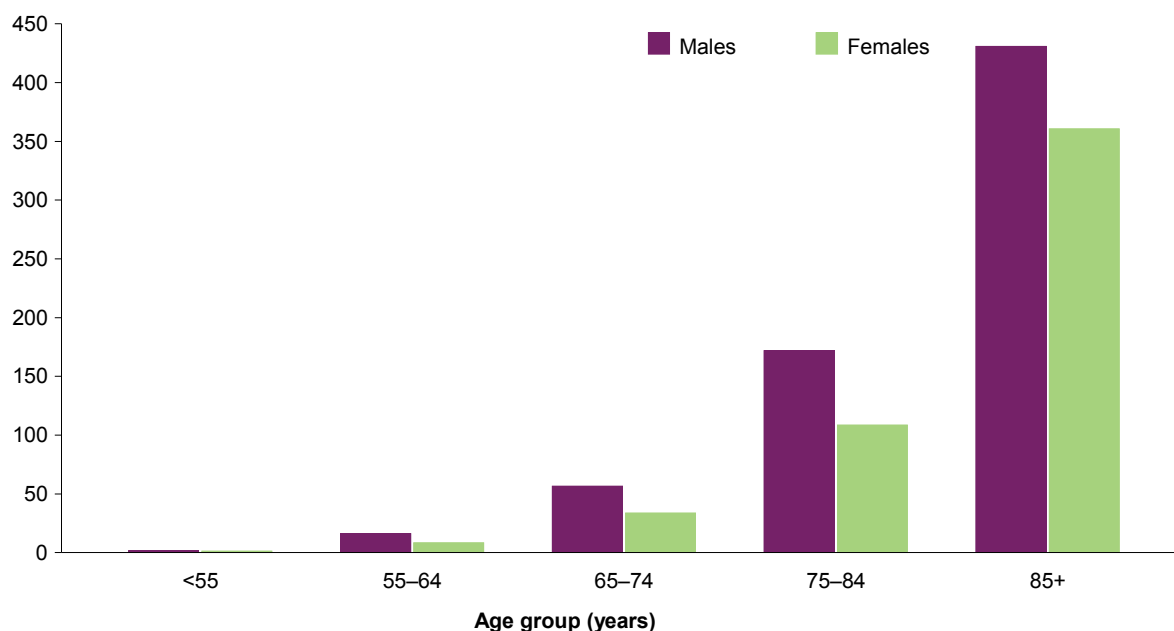
Slightly more males (2,178) than females (2,031) died from diabetes as an underlying cause of death in 2011. Diabetes death rates were 50% higher among males than females (a death rate of 20 per 100,000 compared with 13, respectively). Diabetes mortality increased with age, with 87% of deaths occurring in those aged 65 and over in 2011 (Figure 3.3).

In 2011, the average age at death for persons who died from diabetes as an underlying cause was 78, lower than those dying from CHD (81) or stroke (83).

In 2011, 1,797 deaths resulted from type 2 diabetes, and 369 from type 1 diabetes, with diabetes type recorded as 'not specified' for the remaining deaths (2,043). For both type 1 and type 2 diabetes, death rates are higher in older age groups (Figure 3.4).

The sex and age distribution of deaths with diabetes as the underlying or associated cause is similar to that of deaths with diabetes listed as an underlying cause. In 2011, the total number of deaths was higher for males than for females (8,172 deaths compared with 6,921 deaths, respectively). As for the rates of death with diabetes as an underlying cause (Figure 3.3), the majority of deaths with diabetes as the underlying or associated cause (88%) occurred in those aged 65 and over (Figure 3.5).

Deaths per 100,000 population

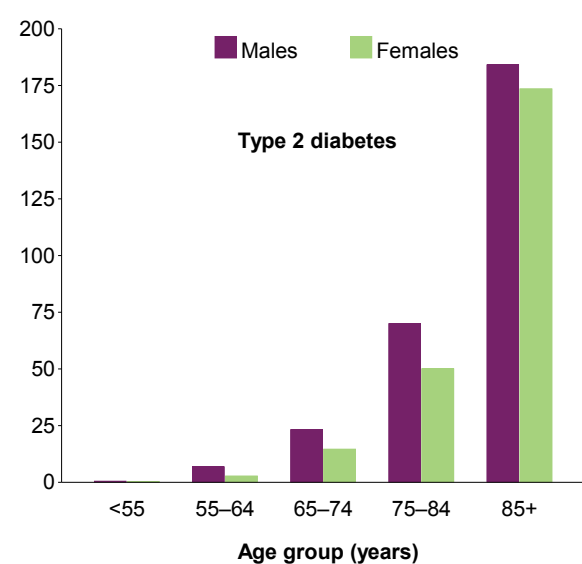


Note: See Appendix Table E5.

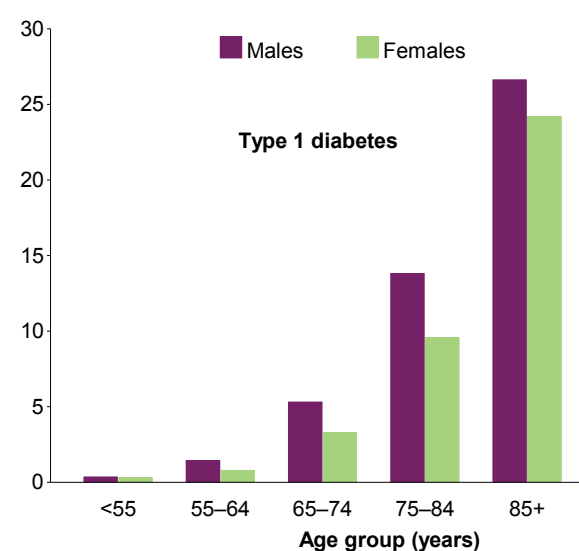
Source: AIHW National Mortality Database.

Figure 3.3: Deaths with diabetes as the underlying cause of death, by age and sex, 2011

Deaths per 100,000 population



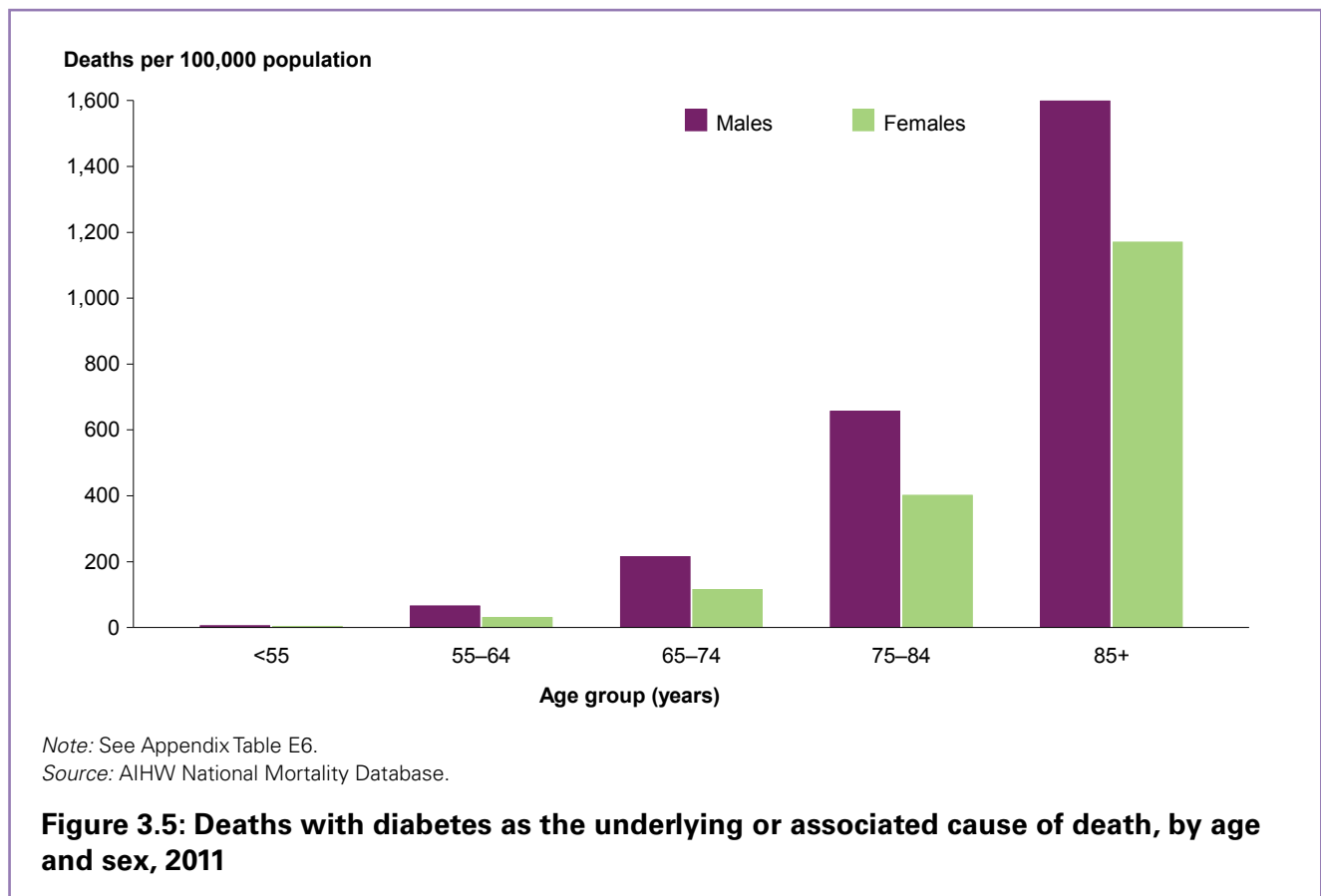
Deaths per 100,000 population



Note: See Appendix Tables E7 and E8.

Source: AIHW National Mortality Database.

Figure 3.4: Deaths with type 2 and type 1 diabetes as an underlying cause of death, by age and sex, 2011



Inequalities

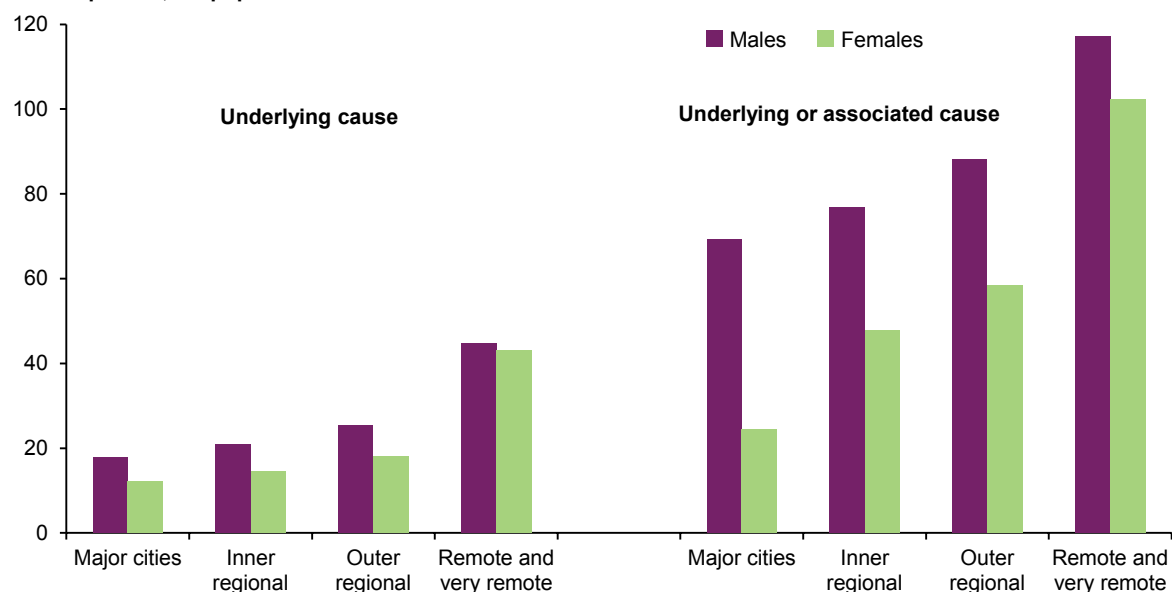
Remoteness

In 2009–2011, the death rate from diabetes as the underlying cause of death increased with increasing remoteness, with people in *Remote and very remote* areas having a rate 3 times the rate in *Major cities* (44 compared with 15 deaths per 100,000 population, respectively) (Figure 3.6).

A similar pattern was observed for deaths where diabetes was the underlying or associated cause of death. The diabetes death rate in *Remote and very remote* areas (110 per 100,000 population) was twice the rate in *Major cities* (54).

The higher death rates in remote areas may reflect the higher proportion of Indigenous Australians living in these areas who have higher rates of diabetes. Other geographical, environmental and social factors also contribute to the poorer health of people living in remote areas (AIHW 2014a).

Deaths per 100,000 population



Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Tables E5 and E6.

Source: AIHW National Mortality Database.

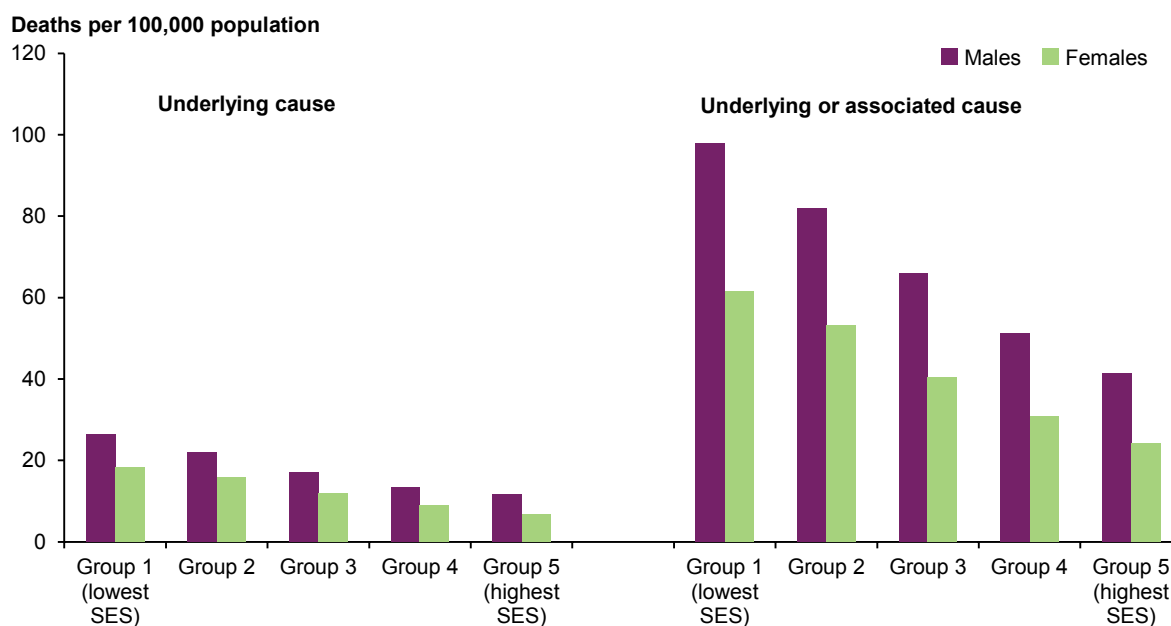
Figure 3.6: Deaths with diabetes as the underlying or associated cause of death, by remoteness and sex, 2009–2011

Socioeconomic status

In 2011, lower socioeconomic status was associated with higher diabetes mortality, for both males and females, and for diabetes as either an underlying or an associated cause of death (Figure 3.7).

When diabetes was the underlying cause of death, people in the lowest socioeconomic group had a death rate of 22 per 100,000 population, 2.5 times as high as people in the highest group (9 per 100,000).

When diabetes was the underlying or associated cause of death, people in the lowest socioeconomic group had a death rate of 78 per 100,000 population, also 2.5 times as high as people in the highest group (32 per 100,000).



Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Tables E5 and E6.

Source: AIHW National Mortality Database.

Figure 3.7: Deaths with diabetes as the underlying or associated cause of death, by socioeconomic status and sex, 2011

Aboriginal and Torres Strait Islander people

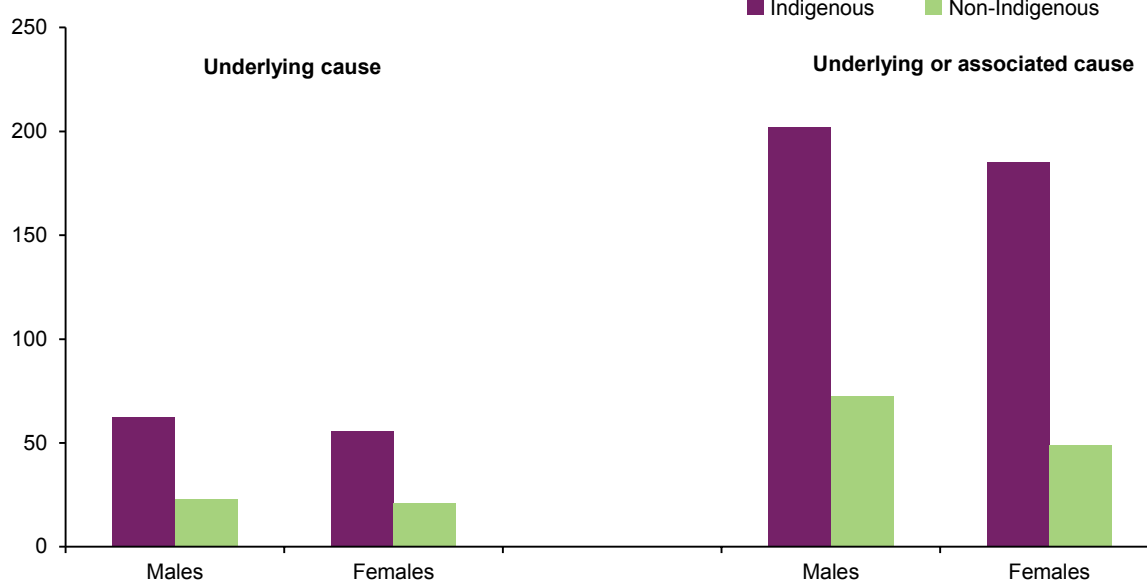
Aboriginal and Torres Strait Islander people were over 3 times as likely as non-Indigenous Australians to have diabetes, particularly type 2 diabetes. Diabetes is one of the main contributors to the gap in death rates between Indigenous and non-Indigenous Australians (AIHW 2014a).

In 2009–2011, diabetes was the underlying or associated cause of death for 1,129 Aboriginal and Torres Strait Islander people in the 5 jurisdictions with adequate identification of Indigenous status. One-third of these deaths (343) had diabetes as an underlying cause of death.

Ten per cent of all deaths with diabetes as the underlying or associated cause of death in these jurisdictions were among Indigenous Australians, despite the Indigenous population comprising just 3% of the total Australian population.

The diabetes death rate for Indigenous Australians was 2.7 times that of non-Indigenous Australians when diabetes was the underlying cause of death (58 compared with 22 deaths per 100,000 population, respectively). Indigenous males and females had diabetes death rates (as an underlying cause) 2.7 and 2.6 times as high, respectively, as their non-Indigenous counterparts (Figure 3.8).

Deaths per 100,000 population



Notes

1. Age-standardised to the 2001 Australian population.
2. Data from NSW, Qld, WA, SA and NT only.
3. See Appendix Tables E5 and E6.

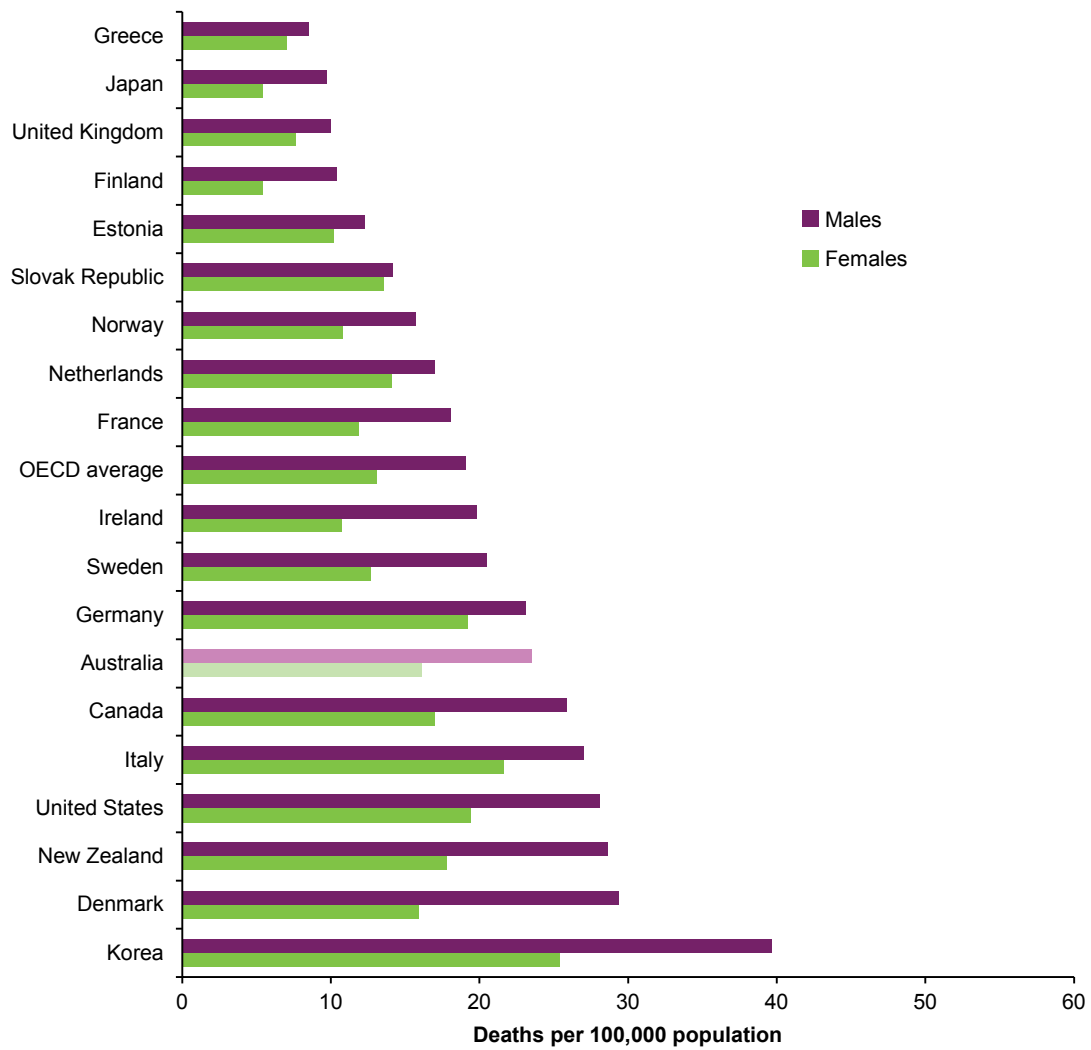
Source: AIHW National Mortality Database.

Figure 3.8: Deaths with diabetes as the underlying or associated cause of death, by Indigenous status and sex, 2009–2011

International comparisons

International comparisons of diabetes mortality should be undertaken with caution, since practices in recording diabetes as the underlying cause of death may vary between countries (Lu et al. 2006; Venkat Narayan et al. 2010).

In 2011, Australia's diabetes mortality rate, recorded as the underlying cause of death, was similar to that of Germany and Canada, and around one-fifth higher than the average of 19 OECD countries compared (Figure 3.9). The Australian diabetes death rate for males (24 per 100,000 population) was almost 3 times that of Greece, but 60% that of Korea. Similarly, the rate for females (16 per 100,000) was 3 times that of Japan, but two-thirds that of Korea.



Notes

1. Rates have been age-standardised to the 2010 OECD population.
2. Rates for Greece, Ireland, Italy, United Kingdom and United States of America are for 2010. Rates for Canada, France, Slovak Republic, Sweden and New Zealand are for 2009.
3. Practices in recording diabetes as the underlying cause of death may vary between countries (Lu et al. 2006, Venkat Narayan et al. 2010).

Source: OECD 2013.

Figure 3.9: Diabetes death rates, selected OECD countries, 2011 or nearest year

4 Chronic kidney disease

CKD refers to all kidney conditions where a person has evidence of kidney damage and/or reduced kidney function, lasting at least 3 months. Many people do not know that they have kidney disease, as up to 90% of kidney function can be lost before symptoms appear. CKD is a common complication of diabetes.

People who have end-stage kidney disease (ESKD)—the most severe form of CKD—often require kidney replacement therapy to survive in the form of dialysis or kidney transplantation. The most common causes of ESKD in Australia are diabetic nephropathy and hypertensive vascular disease.

CKD is common and often largely preventable, because some of its risk factors are modifiable, such as high blood pressure, tobacco smoking and being overweight or obese. Many of the risk factors for CKD also apply to other chronic diseases, such as CVD and diabetes, which in turn are risk factors for CKD (see AIHW, forthcoming 2015).

Underlying or associated cause of death

CKD is also a significant cause of mortality in Australia. As for diabetes, CKD can be recorded as the underlying cause on a death certificate, but is more often listed as an associated cause. CKD is also under-recorded on death certificates (Li et al. 2003; Sparke et al. 2013).

There are some limitations on cause-of-death data for CKD and ESKD based on death certificates. Less than half (44%) of persons who died between 2003 and 2007 who were receiving kidney replacement therapy had ESKD listed as the underlying cause of death, as defined by a set list of International Classification of Diseases (ICD) codes (AIHW 2011). The same proportion (44%) had another CKD cause of death, although not ESKD. The remaining 12% did not have CKD listed as a cause of death at all.

In 2011, CKD was listed as an underlying or associated cause of death in 14,842 cases—10% of all deaths in that year. CKD was listed as the underlying cause in about one-fifth of these deaths (3,068 deaths).

When CKD was listed as the underlying cause of death, chronic kidney failure (1,337 deaths) and unspecified kidney failure (655 deaths) were the 2 leading types of CKD recorded. These were also the most common types of CKD listed as an associated cause of death (Table 4.1).

In 2011, there were 11,774 deaths where CKD was recorded as an associated cause of death—6,421 male deaths and 5,353 female deaths. For 39% of these, the underlying cause was disorders of the circulatory system—highlighting the well-established relationship between CVD and CKD (see Chapter 5 for further details).

Table 4.1: Deaths with chronic kidney disease as the underlying or associated cause of death, 2011

Type of kidney disease ^(a)	Underlying cause of death	Associated cause of death
Chronic kidney failure	1,337	6,135
Unspecified kidney failure	655	4,145
Hypertensive kidney disease	607	283
Diabetic nephropathy	215	201
Others disorders of the kidney and ureter	92	727
Glomerular diseases	69	153
Congenital malformation of the kidney and ureter	50	35
Kidney tubulo-interstitial diseases	43	95
Total	3,068	11,774

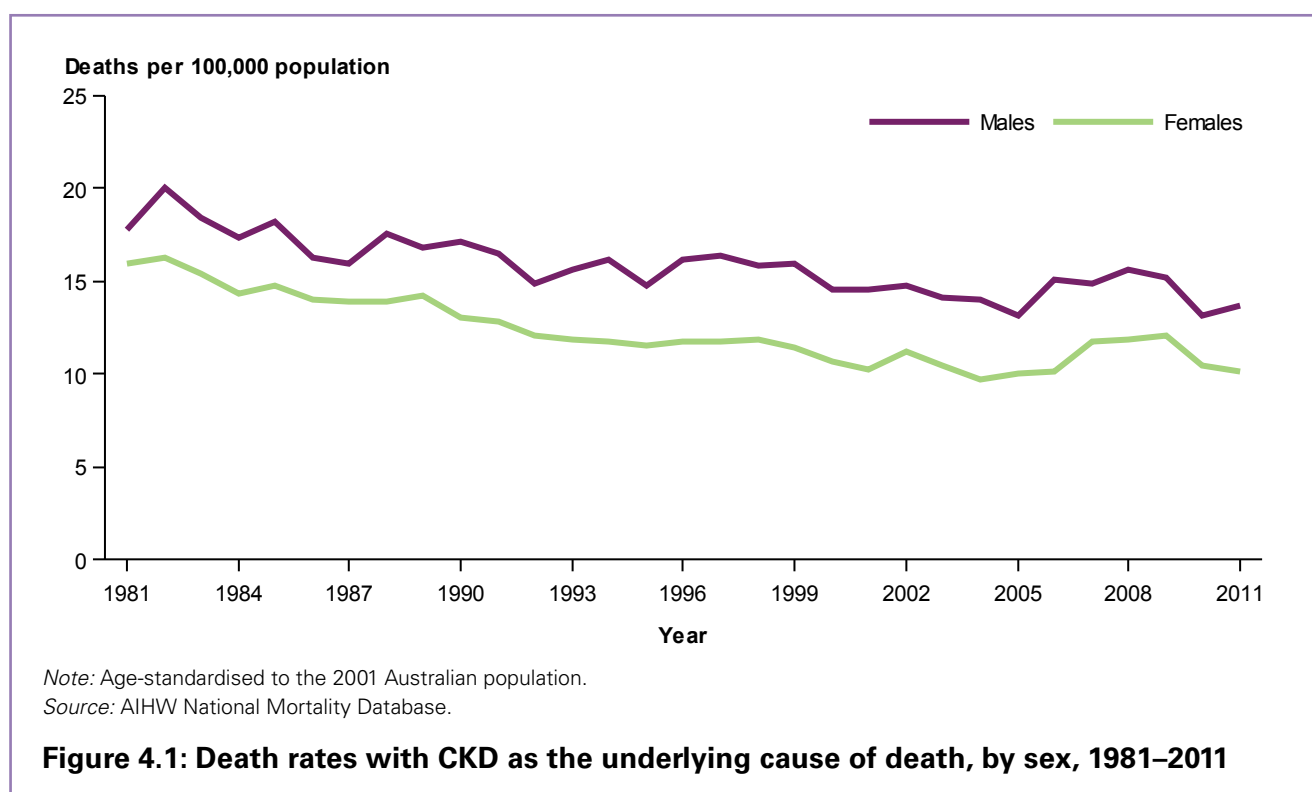
(a) ICD-10 codes used for diagnosis groups available in Appendix C.

Source: AIHW National Mortality Database.

Trends

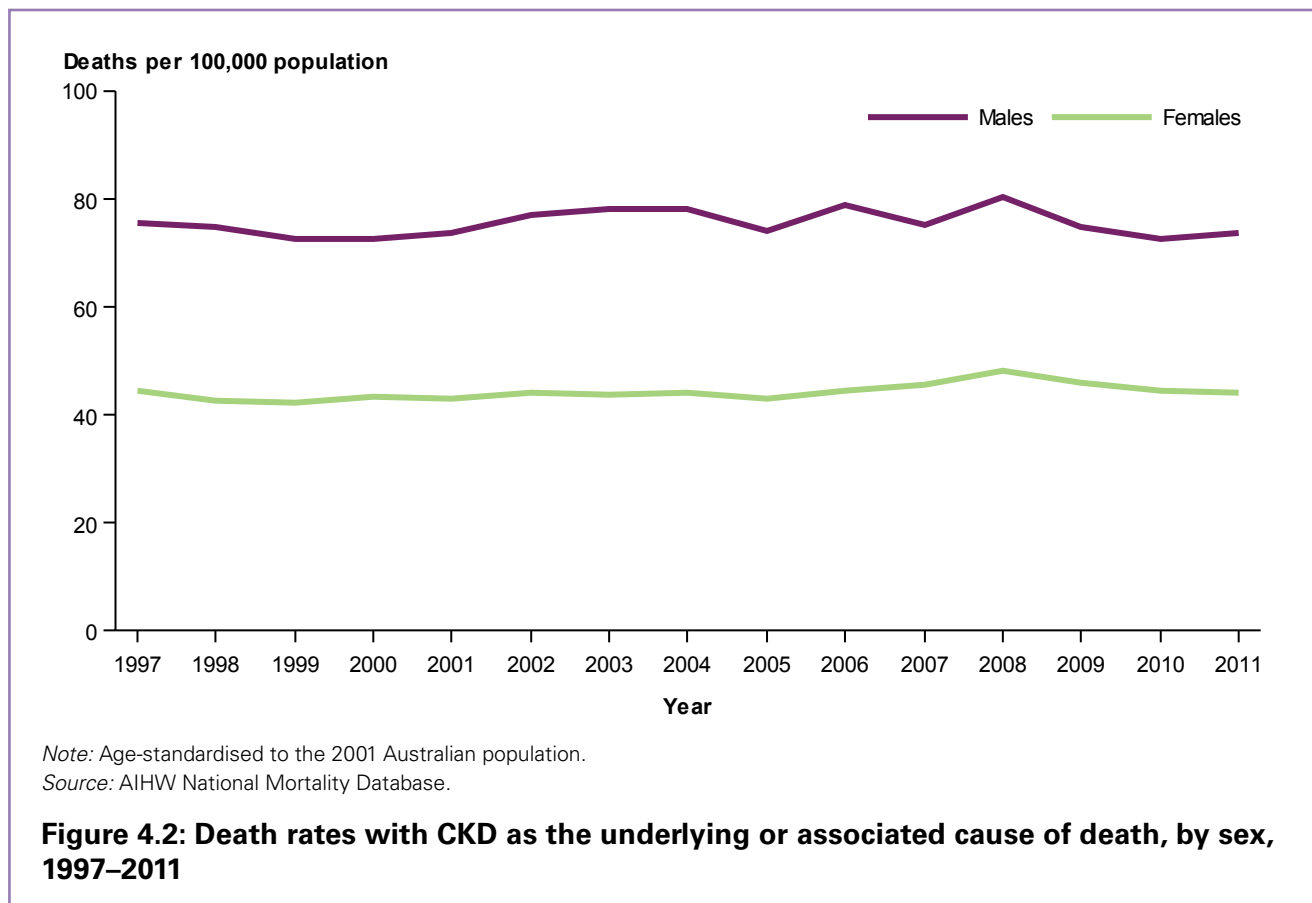
Between 1981 and 2011, the mortality rate for CKD as the underlying cause of death has declined (16 deaths per 100,000 population in 1981 compared with 12 in 2011). The male CKD death rate has remained slightly higher than that of females.

Both male and female CKD death rates have remained relatively stable since 2000 (Figure 4.1). This has led to increased numbers of people living with CKD, and so more people are receiving kidney replacement therapy (dialysis or transplantation) for their ESKD. The prevalence of treated ESKD rose by 35% from 61 to 83 per 100,000 population over the period 2000 to 2011 (AIHW 2014a).



Data for CKD as an associated cause of death first became available in 1997, and so trends for deaths with CKD as an underlying or associated cause are presented for the years 1997 to 2011.

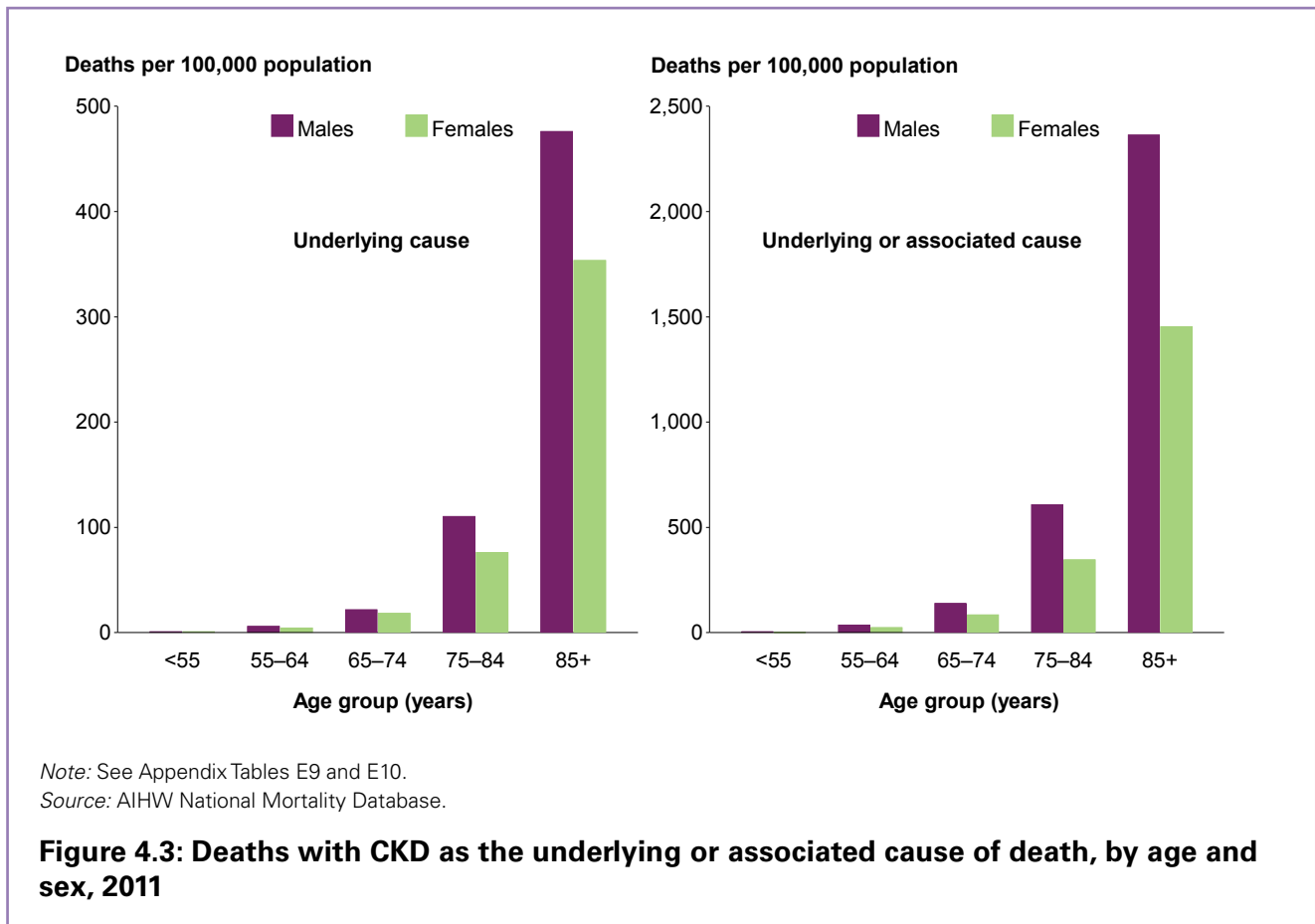
Rates for CKD as an underlying or associated cause of death remained stable between 1997 and 2011 (56 per 100,000 population in 1997 and in 2011). Males experienced higher death rates than females across all years (Figure 4.2).



Sex and age

More females (1,615) than males (1,453) died from CKD in 2011, although death rates were higher for males (14 per 100,000 compared with 10 per 100,000, respectively).

CKD mortality as an underlying cause increases with age, with over 80% of deaths occurring in persons aged 75 and over in 2011. The sex and age distribution of deaths with CKD as the underlying or associated cause is similar (Figure 4.3).



Inequalities

Remoteness

In 2009–2011, the death rate from CKD as the underlying cause of death was higher in *Remote and very remote* areas (23 per 100,000 population); around twice as high as in *Major cities* (12), *Inner regional* (12) or *Outer regional* (14) areas (Figure 4.4).

Death rates where CKD was the underlying or an associated cause of death were also higher in remote areas. During 2009–2011, the CKD death rate in *Remote and very remote* areas was 1.7 times the rate in *Major cities*.

The disparity in death rates by geographical region may reflect the higher proportion of Aboriginal and Torres Strait Islander people in *Remote and very remote* areas compared with urban and regional centres, since Indigenous Australians are more likely to have CKD. The higher proportion of Indigenous Australians in remote areas only partly explains the higher CKD death rates in *Remote and very remote* areas, since other geographical, environmental and social factors can contribute to the poorer health of people living in remote areas (AIHW 2014a).



Notes

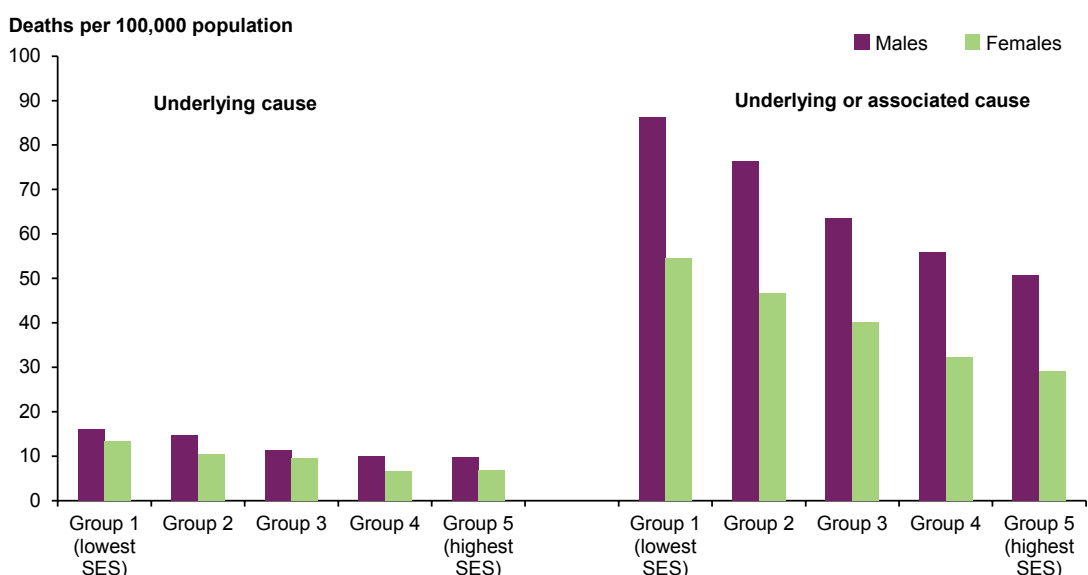
1. Age-standardised to the 2001 Australian population.
2. See Appendix Tables E9 and E10.

Source: AIHW National Mortality Database.

Figure 4.4: Deaths with CKD as the underlying or associated cause of death, by remoteness and sex, 2009–2011

Socioeconomic status

In 2011, lower socioeconomic status was associated with higher CKD mortality rates for both males and females (Figure 4.5). CKD death rates in the lowest socioeconomic group were almost twice that of persons in the highest group, for both underlying (15 compared with 8 deaths per 100,000 population) and underlying or associated causes (68 compared with 38 per 100,000).



Notes

1. Age-standardised to the 2001 Australian population.
2. See Appendix Tables E9 and E10.

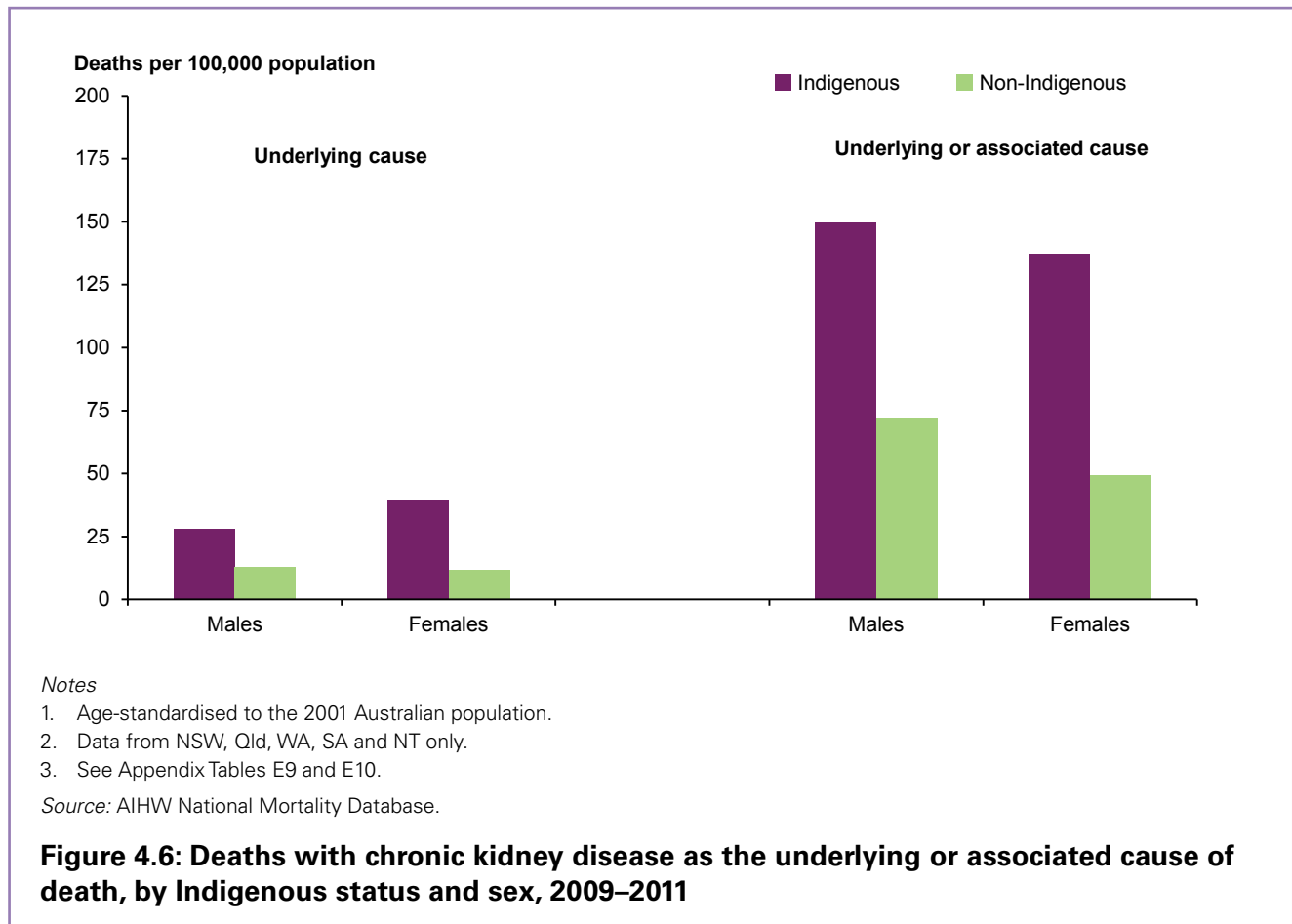
Source: AIHW National Mortality Database.

Figure 4.5: Deaths with CKD as the underlying or associated cause of death, by socioeconomic status and sex, 2011

Aboriginal and Torres Strait Islander people

In 2009–2011, CKD was the underlying or associated cause of death of 801 Aboriginal and Torres Strait Islander people in the 5 jurisdictions with adequate identification of Indigenous status. In less than half of these deaths (371), CKD was recorded as an underlying cause of death. Indigenous deaths represented 3% of all CKD deaths (as an underlying or associated cause of death) in the 5 jurisdictions.

When CKD was the underlying cause of death, the death rate for Indigenous Australians was 2.8 times as high as that for non-Indigenous Australians (35 compared with 12 deaths per 100,000 population, respectively). CKD death rates for Indigenous males and females were 2.2 times and 3.4 times as high, respectively, as their non-Indigenous counterparts (Figure 4.6).



5 Deaths from cardiovascular disease, diabetes and chronic kidney disease

There are complex causal relationships between CVD, diabetes and CKD, and these diseases are often caused by, or are a complication of, 1 or both of the other diseases. These, in combination with shared risk factors, often result in CVD, diabetes and CKD occurring together in an individual. The coexistence of these conditions is known as comorbidity. Even within CVD there can be comorbidities—having a stroke and CHD, for example. Comorbid conditions frequently share common risk factors and pathologies. They are increasingly being seen as acting together to determine health status. There is great potential for integrating prevention and care, and treating these collectively, to keep people healthy for as long as possible.

Often, 2 or more comorbid diseases can contribute to a death. Along with the *underlying* cause of death—the disease that initiated the train of events leading directly to death—a medical practitioner or coroner will also record *associated* causes on a death certificate, these being any conditions, diseases and injuries—other than the underlying cause—considered to have intervened or significantly contributed to a death. Since deaths rarely have a single cause, analysis using multiple causes of death data provides a more complete representation of all diseases and conditions that caused a death (AIHW 2012).

CVD is commonly recorded on death certificates as an underlying cause of death, whereas diabetes and CKD are more likely to be recorded as associated causes of death (AIHW 2012). In addition, both diabetes and CKD are known to be under-reported in national mortality statistics, often being omitted from death certificates as contributory causes of death (IDF 2013; Li et al. 2003; Sparke et al. 2013; Whittall et al. 1990).

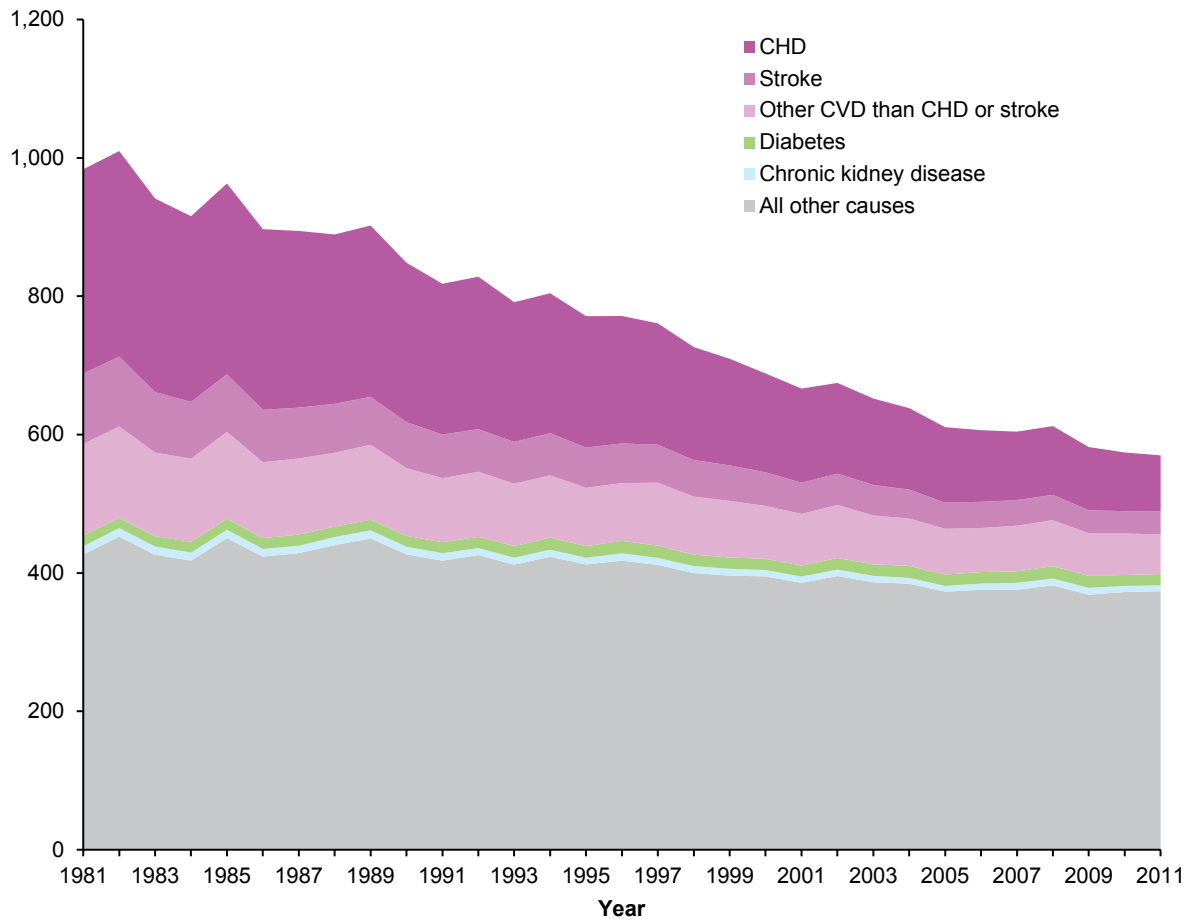
Describing diabetes and CKD by only using underlying cause of death underestimates the contribution that these chronic diseases make to overall mortality, and so this section describes the combined contribution of the 3 diseases to mortality.

Contribution to all deaths

In 2011, there were 146,932 deaths registered in Australia. CVD (45,622), diabetes (4,209) and CKD (3,068) were together the underlying cause of 52,899 deaths, accounting for 36% of all deaths.

The contribution of CVD, diabetes and CKD to all deaths has lessened in recent decades (Figure 5.1). In 1981, they were the underlying causes of 57% of total deaths. Much of the decline between 1981 and 2011 was due to the reduction in deaths from CHD and stroke.

Deaths per 100,000 population



Note: Age-standardised to the 2001 Australian population.

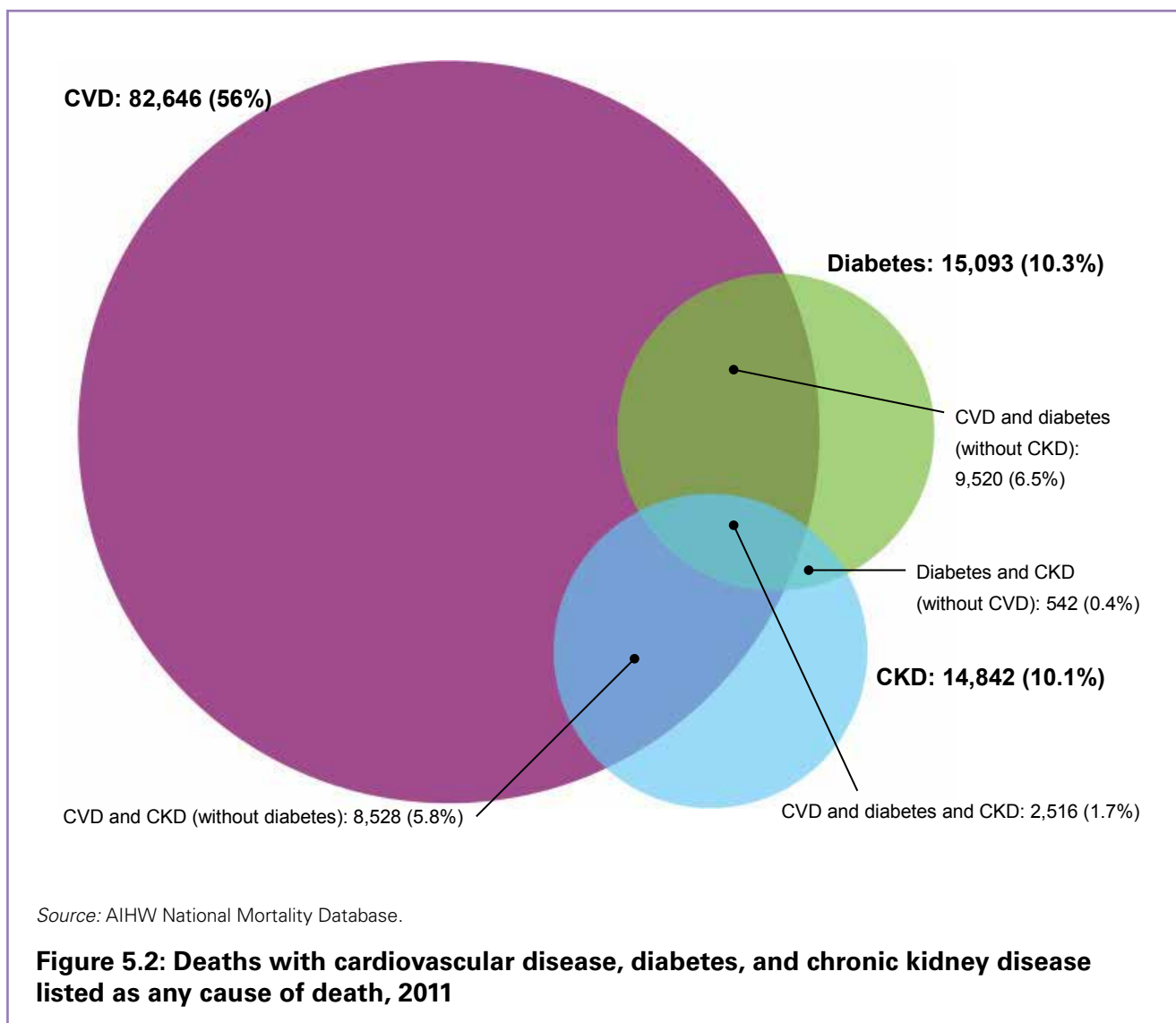
Source: AIHW National Mortality Database.

Figure 5.1: Contribution of CVD, diabetes and CKD to total death rate, 1981–2011

Association of CVD, diabetes and CKD deaths

Of the 146,932 deaths registered in Australia in 2011, CVD was listed as either an underlying or associated cause of death in 82,646 (56% of deaths), while diabetes (15,093) and CKD (14,842) were each associated with about 10% of deaths (Figure 5.2). In total, 61% of deaths had at least 1 of these diseases recorded.

At least 2 of CVD, diabetes and CKD were found in 21,106 death certificates, representing 14% of all deaths. CVD and diabetes occur together in half of these, contributing to 9,520 (7% of all deaths), while CVD and CKD was associated with 8,528 deaths (6%). Diabetes and CKD (542 deaths) accounted for less than 1% of deaths. About 2% of deaths (2,516) in 2011 had all 3 diseases recorded.



Diseases commonly associated with CVD, diabetes and CKD

Diseases most often associated with CVD, diabetes or CKD when these are the underlying causes of death are described in Table 5.2.

When a type of CVD was the underlying cause of death, another type of CVD was the most common associated cause of death. For example, 37% of deaths due to CHD listed *Other CVD* as an associated cause, and 29% of deaths due to cerebrovascular disease had hypertensive disease as an associated cause.

Deaths with an underlying cause of diabetes commonly had CVD or CKD listed as associated causes; 64% of deaths due to diabetes, for example, had CHD as an associated cause, 35% hypertensive disease, 29% *Other CVD* and 27% CKD.

Deaths with an underlying cause of CKD also commonly had CVD as an associated cause; 29% had heart failure and cardiomyopathy as an associated cause, 28% had *Other CVD* and 27% CHD.

Dementia and Alzheimer disease, influenza and pneumonia, and chronic obstructive pulmonary disease (COPD) were other common associated causes of death for deaths due to CVD.

Table 5.1: Most common associated causes of death where cardiovascular disease, diabetes or chronic kidney disease are the underlying cause of death, 2011

Underlying cause of death	Most common associated causes of death (per cent of deaths)				
Cardiovascular disease (CVD)	Dementia and Alzheimer disease (13.1)	CKD (11.4)	Diabetes (10.0)	Influenza and pneumonia (8.5)	Chronic obstructive pulmonary disease (COPD) (8.0)
Coronary heart disease (CHD)	Other CVD (37.3)	Heart failure and cardiomyopathy (26.5)	Hypertensive disease (21.3)	Dementia and Alzheimer (12.1)	Diabetes (12.0)
Cerebrovascular disease	Hypertensive disease (28.5)	Other CVD (18.9)	Dementia and Alzheimer disease (17.7)	CHD (11.9)	Influenza and pneumonia (10.7)
Heart failure and cardiomyopathy	Other CVD (12.8)	Influenza and pneumonia (8.5)	CKD (8.1)	COPD (5.0)	Dementia and Alzheimer (4.0)
Peripheral vascular disease	Other CVD (29.5)	CHD (18.2)	Hypertensive disease (16.8)	CKD (11.1)	Unspecified sepsis (9.8)
Hypertensive disease	Other CVD (47.9)	Heart failure and cardiomyopathy (38.3)	CKD (28.4)	Dementia and Alzheimer disease (21.5)	Diabetes (11.0)
Diabetes	CHD (64.0)	Hypertensive disease (34.8)	Other CVD (29.0)	CKD (26.8)	Cerebrovascular disease (22.6)
Chronic kidney disease (CKD)	Heart failure and cardiomyopathy (29.1)	Other CVD (27.8)	CHD (26.5)	Hypertensive disease (19.8)	Acute kidney failure unspecified (17.5)

 Cardiovascular disease

 Diabetes

 Chronic kidney disease

Source: AIHW National Mortality Database.

CVD, diabetes or CKD are often listed as associated causes when other conditions are the underlying cause of death (Table 5.3). In 2011:

- **CVD** was most commonly listed as an associated cause of death for deaths due to dementia and Alzheimer disease (11%), diabetes (10%), chronic obstructive pulmonary diseases (8%) and lung cancer (6%).
- **Diabetes** was most commonly listed as an associated cause of death for deaths due to CHD (24%), cerebrovascular disease (9%) and dementia and Alzheimer disease (7%).
- **CKD** was most commonly listed as an associated cause of death for deaths due to CHD (22%), diabetes (8%), heart failure and cardiomyopathy (6%) and other forms of CVD (5%).

CVD was listed as an associated cause of death for 25% of all deaths registered in 2011, diabetes for 7% and CKD for 8%.

Table 5.2: Most common underlying causes of death where cardiovascular disease, diabetes or chronic kidney disease are recorded as associated causes of death, 2011

Associated cause of death	Most common underlying causes of death (per cent of deaths)					Per cent all deaths as associated cause
Cardiovascular disease (CVD)	Dementia and Alzheimer disease (10.8)	Diabetes (9.8)	Chronic obstructive pulmonary disease (COPD) (8.3)	Lung cancer (6.0)	CKD (4.2)	25.3
Diabetes	Coronary heart disease (CHD) (23.8)	Cerebrovascular disease (8.8)	Dementia and Alzheimer (7.4)	Lung cancer (4.5)	COPD (4.1)	7.4
Chronic kidney disease (CKD)	CHD (21.7)	Diabetes (8.6)	Heart failure and cardiomyopathy (6.0)	Other CVD (5.0)	Dementia and Alzheimer disease (4.6)	8.0

- Cardiovascular disease
- Diabetes
- Chronic kidney disease

Source: AIHW National Mortality Database.

Appendix A: Some key CVD, diabetes and CKD milestones in Australia

1943	First modern cardiac surgery, closure of a <i>patent ductus arteriosus</i> , a congenital heart disorder, performed by Sir Benjamin Edye at Royal North Shore Hospital, Sydney
1950	Highest prevalence of adult smoking, at around 70% of males and 30% of females
1951	Cardiac surgery unit established at St Vincent's Hospital, Sydney
1951	Cardiac Society of Australia and New Zealand formed by Sir John Kempson Maddox and colleagues
1957	Dialysis machine first used to treat patients with acute renal failure
1959	National Heart Foundation of Australia formed, with Ralph Reader the first Medical Director
1961	Implantable cardiac pacemaker developed at Royal Melbourne Hospital
1961	Tobacco consumption peaked at 9.7 grams/adult/day
1962	Routine monitoring of acute myocardial infarction (AMI) patients began at Sydney Hospital
1964	Coronary care units introduced in Australian hospitals
1965	Successful kidney transplant, Queen Elizabeth Hospital, Adelaide
1966	Busselton Health Study began, surveying risk factors
1967	Home dialysis introduced
1968	Overall cardiovascular disease (CVD) death rate peaked at 831 per 100,000 population (although the female rate had peaked in 1952). The lifetime risk of dying from CVD was 1 in 3
1968	Heart transplant attempted, St Vincent's Hospital, Sydney
1969	Successful coronary artery bypass graft, St Vincent's Hospital, Sydney
1970	Differential CVD mortality among migrants documented
1971	Decline of AMI incidence in Perth recorded
1973	Beta-blocking drugs introduced to treat hypertension and other heart conditions
1975	Apparent consumption of alcohol peaked at 13.1 litres/adult/year
1975	<i>Life. Be in it</i> physical activity campaign began in Victoria
1976	Paramedic ambulance officers and intensive care ambulances introduced
1978	North Coast Healthy Lifestyle Programme showed significant smoking reduction
1978	Stroke care unit opened at the Austin Hospital, Melbourne

1980	Balloon angioplasty introduced
1980	Study found differences in CVD mortality among occupations
1980	National Heart Foundation Risk Factor Prevalence Survey first undertaken
1983	<i>Quit for Life</i> anti-smoking campaign launched in Sydney
1984	World Health Organization MONItoring trends and determinants of CArdiovascular Disease (WHO MONICA) Project began in Newcastle and Perth
1984	Successful heart transplant, St Vincent's Hospital, Sydney
1986	Successful heart–lung transplant, St Vincent's Hospital, Sydney
1987	Study found differences in CVD mortality among socioeconomic groups
1987	Successful pancreas/kidney transplant, Westmead Hospital, Sydney
1990	Statins introduced to assist in control of blood cholesterol
Early 1990s	Majority of Australians now overweight, with rates increasing
Early 1990s	Widespread use of coronary stents
Early 1990s	Coronary heart disease mortality decline began to slow for younger persons
1996	Cardiovascular health declared a National Health Priority Area
1997	Diabetes declared a National Health Priority Area
2003	Drug-eluting stents introduced
2005	National Chronic Disease Strategy released
2005	<i>Go for 2 & 5</i> national fruit and vegetable campaign launched
2007	One-quarter of children aged 5–17 years now overweight or obese
2009	National Preventative Health Strategy launched
2012	Mandatory plain packaging for cigarettes enacted

Appendix B: Method and definitions

Age-specific rates

Age-specific rates are calculated by dividing the number of cases occurring in a specified age group by the corresponding population in the same age group, expressed as a rate (for example, number per 100,000 persons). Information on the populations used in this report is provided in the section on populations below.

Age-standardised rates

Age-standardisation is a method used to eliminate the effect of differences in population age structures when comparing populations with different age structures, and where age affects the variable being compared. Age-standardisation is used in this report when comparing rates across different periods of time, different geographical areas, different socioeconomic groups, or other populations. The direct method of age-standardisation is used throughout this report.

For most of the age-standardised rates, the standard population used is the Australian estimated resident population as at 30 June 2001. See the section on populations (below) for more information.

Rate ratio

A rate ratio is the ratio of 2 rates or proportions. It is calculated as the rate for the population of interest divided by the rate for the comparison group. It indicates proportionally how much higher the rate for 1 group is compared with another (e.g. 2 times as high). It is a relative measure of effect.

Reporting deaths

Cause of death is coded according to rules set forward in various versions of the International Classification of Diseases (ICD) published by the World Health Organization.

Deaths registered between 1979 and 1996 were coded using a manual process to ICD-9. In 1997, an automated coding system was introduced and, in 1999, a new classification for coding cause of death (ICD-10) was introduced and applied to deaths registered from 1997. Consequently, there was a break in time series for mortality data between 1996 and 1997. To adjust for changes in the coding system, comparability factors for each disease were applied to deaths registered before 1997 (Table B1).

Table B1: Vascular disease comparability factors

Vascular disease	Comparability factor
Cardiovascular disease	1.00
Coronary heart disease	1.01
Stroke	0.83
Diabetes	0.99
type 1	n.a.
type 2	n.a.
Chronic kidney disease	1.03

Since 2007, the ABS has a mortality data revision process with 3 data releases; preliminary, revised and final. This analysis is based on the final versions for years between 2007 and 2009. Deaths registered in 2010 and 2011 are based on the revised and preliminary versions, respectively, and are subject to further revision by the ABS. Data for 2010 have not been adjusted for the additional deaths arising from outstanding registration of deaths in Queensland in 2010.

Reporting deaths by geographical location

The geographical unit used for the analysis of cardiovascular mortality rates (Figure 2.6) is the Statistical Area level 3 (SA3), based on the 2011 ABS Australian Statistical Geography Standard (ASGS). These units have populations varying from 30,000 to 130,000 persons.

SA3s are often the functional areas of regional cities and large urban transport and service hubs (ABS 2013c). However, a small number of SA3s were excluded from the analysis, since their population over the period 2009–2011 or the numbers of cardiovascular disease (CVD) deaths were too small to derive a rate. In Figure 2.6, these appear as white areas. Of the 351 SA3s, 21 were excluded because they had a population of fewer than 3,000 inhabitants or fewer than 6 CVD deaths.

Mapping mortality rate by SA3

All SA3s were ranked by their CVD rates and then divided into 5 equal groups (quintiles). The numerical categories of mortality rates were based on the minimum and maximum values for rates in each of the 5 groups. Note that the Cocos Islands, Christmas Island and other migratory territories were excluded from the analysis.

Reporting deaths by area of remoteness

Comparisons of region in this report use the Australian Statistical Geography Standard (ASGS) 2011 Remoteness Structure, developed by the ABS, which groups Australian regions into 6 remoteness areas. The 6 remoteness areas are *Major cities*, *Inner regional*, *Outer regional*, *Remote*, *Very remote* and *Migratory*. These areas are based on ASGS Statistical Area level 1 units and are defined using the Accessibility/Remoteness Index for Australia (ARIA). ARIA is a measure of the remoteness of a location from the services provided by large towns or cities. Accessibility is based on distance to a metropolitan centre. A higher ARIA score denotes a more remote location.

The category *Major cities* includes Australia's capital cities, with the exceptions of Hobart and Darwin, which are classified as *Inner regional*. Populations from *Remote* and *Very Remote* areas were grouped under 1 category of remoteness. The sixth Remoteness Area, *Migratory*, is not used in this publication.

Further information on the ASGS is available on the ABS website at:

<[http://www.abs.gov.au/websitedbs/d3310114.nsf/home/australian+statistical+geography+standard+\(asgs\)](http://www.abs.gov.au/websitedbs/d3310114.nsf/home/australian+statistical+geography+standard+(asgs))>.

Reporting deaths by socioeconomic status

The ABS has constructed a number of socioeconomic indexes to classify areas on the basis of social and economic information collected in the Census of Population and Housing. In this report, the Socio-economic Indexes for Areas (SEIFA) Index of Relative Socio-economic Disadvantage (IRSD) is used. This is derived from social and economic characteristics of the local area such as low income, low educational attainment, high levels of public-sector housing, high unemployment and jobs in relatively unskilled occupations.

Since the IRSD summarises variables that indicate disadvantage, a low score indicates that an area has many low-income families, many people with little training and many people working in unskilled occupations; and this area may be considered as disadvantaged relative to other areas. It is important to understand that a high score reflects a relative lack of disadvantage rather than advantage, and that the IRSD relates to the average disadvantage of all people living in a geographical area and cannot be presumed to apply to all individuals living within the area. As the population of many areas covers a broad range of socioeconomic disadvantage, these measures will generally underestimate the true effect of disadvantage on health.

For analysis, the population was divided into 5 socioeconomic status (SES) groups with roughly equal populations (each around 20% of the total) based on the level of disadvantage of the statistical local area of their usual residence. The first group includes the 20% of the population living in areas with the highest levels of relative disadvantage (low SES), while the last group includes the 20% of the population living in areas with the lowest levels of relative disadvantage (high SES).

The SEIFA IRSD values used in this report are based on the 2011 Census. Further information is available on the ABS website at:

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012011?OpenDocument>>.

Reporting deaths by Aboriginal and Torres Strait Islander status

The ABS has assessed the quality of Indigenous identification in death registration data by state and territory in the Census Data Enhancement Indigenous Mortality Quality Study. This study involved linking Census records with death registration records to examine differences in reporting of Indigenous status across 2 data sets. This assessment indicated that the Indigenous identification rate is 87% or higher in New South Wales, Queensland, Western Australia and the Northern Territory, and about 65% for the remaining jurisdictions. Historically, Indigenous identification in South Australia, Western Australia and the Northern Territory has been of sufficient quality to include in analyses from 1991 onwards. Queensland was included in analysis from 1998 onwards and, in 2010, a decision was made to include data from New South Wales from 2001 onwards. Therefore, analysis of deaths data by Indigenous status between 2009 and 2011 in this report are based on data where the deceased's state of residence was New South Wales, Queensland, Western Australia, South Australia or the Northern Territory. However, as per the ABS recommendations, adjustments were made for any deaths registered in Queensland in 2010 that occurred before 2007. For more detail, please refer to Technical note 3 in *Causes of death, Australia, 2010* (ABS cat. no. 3303.0).

Further information on estimates concerning the Aboriginal and Torres Strait Islander population is available on the ABS website at:

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3238.01991%20to%202021?OpenDocument>>.

Populations used in this report

National populations

The ABS estimated (mid-year) resident population data were used to calculate rates throughout this report. These data were sourced from ABS Australian demographic statistics (Cat. no. 3101.0) as at December 2012. Relevant years and states were selected based on numerator data availability.

Regional populations

Remoteness areas

The population used was derived from the classification of area in the ABS Australian Statistical Geography Standard (ASGS) for the 2011 Census, and its geographical correspondence files for previous years 2009 and 2010.

Link to ASGS file:

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3235.02012?OpenDocument>>

Link to correspondence files between ASGC and ASGS:

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1216.0.15.002July%202011?OpenDocument>>

Statistical Area level 3 (SA3)

SA3s are part of the new ASGS system. They represent areas (with few exceptions) with a population between 30,000 and 130,000 inhabitants. There are about 333 SA3 areas in Australia, aggregated from a total of 2,196 SA2 areas with populations between 3,000 and 25,000 inhabitants.

SA3 populations were derived from the aggregation by sex and age of SA2 populations (ABS 2013c) available on the ABS website at the following link:

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3235.02012?OpenDocument>>.

Socioeconomic status populations

The population by socioeconomic status was derived by the correspondence between the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socioeconomic Disadvantage (IRSD) derived for SA2 geographical area with the population by SA2 level. Populations living in these SA2s were allocated the same index as the area-based index. The SA2 populations were ranked on the value of this IRSD and divided on 5 equal groups (with the same population number). Each group was allocated a number 1 to 5 representing a summary scale of the IRSD into 5 values, the group with the lowest value (1) being the one with the lowest socioeconomic status. Then the results were aggregated to the national level.

Link to SEIFA IRSD data by geographical units (ABS 2013a):

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012011?OpenDocument>>.

Link to population data by geographical unit (ABS 2013c):

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3235.02012?OpenDocument>>.

Aboriginal and Torres Strait Islander populations

For Indigenous comparisons, the ABS Aboriginal and Torres Strait Islander estimated populations were used, based on the 2011 Census of Population and Housing (ABS 2014c). This report includes the Indigenous and non-Indigenous population of 5 states and territories: New South Wales, Queensland, Western Australia, South Australia and the Northern Territory:

<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3238.02001%20to%202026?OpenDocument>>.

Non-Indigenous estimates have been calculated from non-recast estimated resident populations based on the 2011 Census (ABS 2014a).

Appendix C: Disease classifications

Cause of death is coded according to rules set forward in various versions of the International Classification of Diseases (ICD) published by the World Health Organization. The relevant codes for deaths during the period covered by this report are provided in Table C1.

Table C1: ICD codes for vascular and chronic disease groups

Conditions	ICD-9 codes	ICD-10 codes
Cardiovascular disease	390–459	I00–I99
Coronary heart disease	410–414	I20–I25
Acute myocardial infarction	410	I21
Angina	413	I20
Cerebrovascular disease	430–438	I60–I69
Stroke	430–434, 436	I60–I64
Heart failure and cardiomyopathy		I50, I25.5, I42.0, I42.5–I42.9, I43
Peripheral vascular disease		I70–I74
Hypertensive disease		I10–I15
Acute rheumatic fever and rheumatic heart disease		I00–I09
Congenital heart disease		Q20–Q28
Diabetes	250	E10–E11, E13–E14, O24.0–O24.4, O24.9
Type 1 diabetes		E10
Type 2 diabetes		E11
Chronic kidney disease	250.3, 403, 404, 580–583, 585–589, 590.0, 590.2–590.9, 593.0, 593.1, 593.3, 750–753.4	B52, D59.3, N00–N07, N11–N12, N14–N15, N18–N19, N25–N28, N39.1–N39.2, Q60–Q63, T82.4, T86.1, E10.2, E11.2, E12.2, E13.2, E14.2, E85.1, I12–I13, I15.0–I15.1
Diabetic nephropathy		E10.2, E11.2, E12.2, E13.2, E14.2
Hypertensive kidney disease		I12, I13, I15.0, I15.1
Kidney tubulo-interstitial diseases		N00–N07
Chronic kidney failure		N11, N12, N14, N15
Unspecified kidney failure		N18
Other disorders of the kidney and ureter		N19
Congenital malformation of the kidney and ureter		N25–N28, N39, E85.1, D59.3, B52.0
Complications related to dialysis and kidney transplant		T82.4, T86.1

Appendix D: Data sources

The mortality data used in this report were provided by the Registries of Births, Deaths and Marriages, the Coroners and the National Coroners Information System and coded by the Australian Bureau of Statistics (ABS). These data are maintained at the Australian Institute of Health and Welfare (AIHW) in the National Mortality Database.

Registration of deaths is the responsibility of the state and territory Registrars of Births, Deaths and Marriages.

Deaths registered in 2010 that occurred before 2007 for usual residents of Queensland were excluded from the 2010 year of registration data as recommended by the ABS. This is to minimise the impact of late registration of deaths due to recent changes in the timeliness of death registrations in Queensland. For more detail about the issue and the adjustments, please refer to the ABS Technical Note 3 in *Causes of death, Australia, 2012* (ABS cat. no. 3303.0) (ABS 2012b):

<<http://www.abs.gov.au/Ausstats/abs@.nsf/0/D4A300EE1E04AA43CA2576E800156A24?OpenDocument>>

and ABS Quality declaration summary for *Deaths, Australia, 2010* (ABS cat. no. 3302.0):

<<http://www.abs.gov.au/Ausstats/abs@.nsf/0/E6A33E9F81491381CA257AAF0013D786?OpenDocument>>.

Since 2007, ABS has put in place a mortality data revision process that supplies up to 3 levels of data releases; preliminary, revised and final. This analysis is based on the final versions for the years prior to 2010, the revised version for 2010 and the preliminary version for 2011, these being the most recent available data at time of production.

The data quality statements underpinning the Australian Institute of Health and Welfare (AIHW) National Mortality Database can be found in the following Australian Bureau of Statistics (ABS) publications:

ABS quality declaration summary for *Causes of death, Australia, 2012* (ABS cat. no. 3303.0)

<<http://www.abs.gov.au/Ausstats/abs@.nsf/0/D4A300EE1E04AA43CA2576E800156A24?OpenDocument>>

and the quality declaration summary for *Deaths, Australia, 2011* (ABS cat. no. 3302.0) at:

<<http://www.abs.gov.au/Ausstats/abs@.nsf/0/9FD0E6AAA0BB3388CA25750B000E3CF5?OpenDocument>>.

Appendix E: Detailed statistical tables

Table E1: Cardiovascular disease death rates

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<25	1.3	1.2	1.3
	25–34	6.9	4.2	5.5
	35–44	23.0	8.2	15.6
	45–54	64.0	26.4	45.0
	55–64	163.9	52.4	107.8
	65–74	398.5	195.9	296.1
	75–84	1,510.1	1,022.4	1,240.9
	85 and over	5,897.8	5,712.6	5,776.4
	<i>Age-standardised rate</i>	<i>201.9</i>	<i>144.8</i>	<i>171.6</i>
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	238.2	163.9	198.8
	Group 2	215.8	159.2	186.3
	Group 3	185.2	132.4	157.4
	Group 4	146.1	106.3	125.1
	Group 5 (highest SES)	133.9	108.1	121.1
	<i>Rate ratio (lowest/highest)</i>	<i>1.8</i>	<i>1.5</i>	<i>1.6</i>
2009–2011	Remoteness			
	Major cities	196.1	142.0	167.1
	Inner regional	229.0	164.4	194.6
	Outer regional	233.5	175.9	204.9
	Remote and very remote	253.8	188.2	223.8
	<i>Rate ratio (Remote and very remote/Major cities)</i>	<i>1.3</i>	<i>1.3</i>	<i>1.3</i>
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	285.8	211.8	245.4
	Non-Indigenous	209.1	176.9	192.9
	<i>Rate ratio (Indigenous/non-Indigenous)</i>	<i>1.4</i>	<i>1.2</i>	<i>1.3</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E2: Coronary heart disease death rates

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<25	—	—	—
	25–34	2.8	0.8	1.8
	35–44	12.6	2.2	7.4
	45–54	41.9	9.5	25.6
	55–64	105.1	24.1	64.4
	65–74	232.0	81.8	156.1
	75–84	774.4	409.1	572.7
	85 and over	2,956.8	2,386.4	2,583.0
	<i>Age-standardised rate</i>	<i>107.5</i>	<i>59.3</i>	<i>81.2</i>
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	130.4	67.9	97.0
	Group 2	114.7	64.2	87.9
	Group 3	101.4	54.9	76.2
	Group 4	76.6	44.8	59.7
	Group 5 (highest SES)	67.8	42.5	54.2
	<i>Rate ratio (lowest/highest)</i>	<i>1.9</i>	<i>1.6</i>	<i>1.8</i>
2009–2011	Remoteness			
	Major cities	105.4	60.1	80.4
	Inner regional	123.4	68.6	93.5
	Outer regional	126.0	71.3	97.5
	Remote and very remote	140.7	70.3	101.1
	<i>Rate ratio (Remote and very remote/Major cities)</i>	<i>1.3</i>	<i>1.2</i>	<i>1.3</i>
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	168.1	93.4	126.8
	Non-Indigenous	112.1	74.5	92.1
		<i>Rate ratio (Indigenous/non-Indigenous)</i>	<i>1.5</i>	<i>1.3</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E3: Stroke death rates

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<25	—	—	—
	25–34	0.8	0.8	0.8
	35–44	2.6	2.0	2.3
	45–54	7.1	7.3	7.2
	55–64	19.2	11.3	15.3
	65–74	56.3	43.2	49.7
	75–84	267.5	252.6	259.3
	85 and over	990.2	1,244.8	1,157.1
	<i>Age-standardised rate</i>	32.3	33.0	33.1
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	35.6	35.8	36.1
	Group 2	33.3	36.5	35.5
	Group 3	30.0	28.9	29.7
	Group 4	24.1	25.0	24.9
	Group 5 (highest SES)	22.6	26.1	25.2
	<i>Rate ratio (lowest/highest)</i>	1.6	1.4	1.4
2009–2011	Remoteness			
	Major cities	31.3	30.9	31.5
	Inner regional	33.8	35.5	35.3
	Outer regional	33.0	36.7	35.4
	Remote and very remote	32.9	38.2	36.4
	<i>Rate ratio (Remote and very remote/Major cities)</i>	1.1	1.2	1.2
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	33.1	33.0	33.0
	Non-Indigenous	14.9	15.5	15.3
		<i>Rate ratio (Indigenous/non-Indigenous)</i>	2.2	2.1

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E4: Other cardiovascular disease death rates

Year(s)	Age group (years)	Deaths per 100,000 population		
		Males	Females	Persons
Heart failure and cardiomyopathy				
2011	<25	0.2	0.3	0.3
	25–34	1.3	0.8	1.1
	35–44	1.9	0.5	1.2
	45–54	4.3	1.4	2.8
	55–64	14.2	4.4	9.3
	65–74	36.1	14.5	25.1
	75–84	146.6	85.5	112.8
	85 and over	612.6	558.0	576.8
	<i>Age-standardised rate^(a)</i>	<i>19.6</i>	<i>13.1</i>	<i>16.0</i>
	<i>Deaths (number)</i>	<i>2,116</i>	<i>2,181</i>	<i>4,297</i>
Peripheral vascular diseases				
2011	<25	—	—	—
	25–34	0.2	0.2	0.2
	35–44	0.5	0.3	0.4
	45–54	2.4	0.9	1.6
	55–64	6.4	1.6	4.0
	65–74	22.2	10.9	16.5
	75–84	78.6	43.5	59.3
	85 and over	254.5	183.0	207.6
	<i>Age-standardised rate^(a)</i>	<i>9.5</i>	<i>5.4</i>	<i>7.2</i>
	<i>Deaths (number)</i>	<i>1,031</i>	<i>863</i>	<i>1,894</i>
Hypertensive disease				
2011	<25	—	—	—
	25–34	0.1	—	—
	35–44	0.3	0.4	0.4
	45–54	0.7	0.5	0.6
	55–64	2.6	1.7	2.1
	65–74	7.8	6.7	7.3
	75–84	38.3	41.9	40.3
	85 and over	223.6	330.8	293.9
	<i>Age-standardised rate^(a)</i>	<i>5.7</i>	<i>7.0</i>	<i>6.6</i>
	<i>Deaths (number)</i>	<i>601</i>	<i>1,201</i>	<i>1,802</i>

(continued)

Table E4 (continued): Other cardiovascular disease death rates

Year(s)	Population subgroup ^(b)	Deaths per 100,000 population		
		Males	Females	Persons
Acute rheumatic fever and rheumatic heart disease				
2011	Age group (years)			
	<25	0.1	0.1	0.1
	25–34	0.1	0.2	0.1
	35–44	0.0	0.1	0.1
	45–54	0.3	0.6	0.4
	55–64	1.0	1.2	1.1
	65–74	2.3	5.2	3.7
	75–84	10.2	11.9	11.2
	85 and over	29.5	34.0	32.5
	<i>Age-standardised rate^(a)</i>	<i>1.2</i>	<i>1.7</i>	<i>1.4</i>
	<i>Deaths (number)</i>	<i>126</i>	<i>236</i>	<i>362</i>
2011	Aboriginal and Torres Strait Islander status^{(a)(c)(d)(e)}			
	Indigenous	—	—	4.3
	Non-Indigenous	—	—	1.3
	<i>Rate ratio (Indigenous/Non-Indigenous)</i>	—	—	<i>3.0</i>
Congenital heart disease				
2011	Age group (years)			
	<1	18.8	10.6	14.8
	1–24	0.3	0.4	0.4
	25–34	0.2	0.3	0.3
	35–44	0.4	0.1	0.3
	45–54	0.7	0.5	0.6
	55–64	0.3	0.2	0.3
	65–74	0.5	0.4	0.4
	75–84	0.4	0.7	0.6
	85 and over	—	3.4	2.2
	<i>Age-standardised rate^(a)</i>	<i>0.8</i>	<i>0.6</i>	<i>0.7</i>
	<i>Deaths (number)</i>	<i>90</i>	<i>75</i>	<i>165</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths are based on preliminary data and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E5: Diabetes death rates

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<45	0.6	0.4	0.5
	45–54	6.2	3.9	5.4
	55–64	16.1	8.2	12.1
	65–74	56.4	33.5	44.8
	75–84	171.9	108.4	136.9
	85 and over	430.7	360.6	384.8
	<i>Age-standardised rate</i>	<i>19.9</i>	<i>13.4</i>	<i>16.3</i>
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	26.4	18.2	22.0
	Group 2	22.1	15.7	18.6
	Group 3	17.0	11.9	14.2
	Group 4	13.4	8.9	10.9
	Group 5 (highest SES)	11.5	6.7	8.8
	<i>Rate ratio (lowest/highest)</i>	<i>2.3</i>	<i>2.7</i>	<i>2.5</i>
2009–2011	Remoteness			
	Major cities	17.9	12.1	14.7
	Inner regional	20.9	14.6	17.5
	Outer regional	25.4	18.0	21.4
	Remote and very remote	44.7	43.1	44.1
	<i>Rate ratio (Remote and very remote/Major cities)</i>	<i>2.5</i>	<i>3.6</i>	<i>3.0</i>
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	62.2	55.6	58.3
	Non-Indigenous	22.7	21.1	21.9
	<i>Rate ratio (Indigenous/non-Indigenous)</i>	<i>2.7</i>	<i>2.6</i>	<i>2.7</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E6: Diabetes death rates as underlying or associated cause of death

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<25	0.3	0.2	0.3
	25–34	1.2	1.1	1.2
	35–44	4.7	2.3	3.5
	45–54	19.2	11.8	15.5
	55–64	65.4	30.6	47.9
	65–74	215.4	115.2	164.8
	75–84	656.2	400.6	515.1
	85 and over	1,598.5	1,169.6	1,317.4
	<i>Age-standardised rate</i>	74.7	45.8	58.7
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	97.9	61.4	78.0
	Group 2	81.9	53.2	66.2
	Group 3	66.0	40.3	51.8
	Group 4	51.1	30.9	39.8
	Group 5 (highest SES)	41.3	24.2	31.8
	<i>Rate ratio (lowest/highest)</i>	2.4	2.5	2.5
2009–2011	Remoteness			
	Major cities	69.3	24.4	54.3
	Inner regional	76.9	47.8	60.8
	Outer regional	88.2	58.4	62.1
	Remote and very remote	117.3	102.4	110.1
	<i>Rate ratio (Remote and very remote/Major cities)</i>	1.7	4.2	2.0
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	202.1	185.2	192.3
	Non-Indigenous	73.7	48.9	60.2
	<i>Rate ratio (Indigenous/non-Indigenous)</i>	2.7	3.8	3.2

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E7: Type 2 diabetes death rates

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<45	0.1	0.1	0.1
	45–54	1.8	1.0	1.4
	55–64	6.8	2.6	4.7
	65–74	23.2	14.6	18.9
	75–84	69.9	50.1	59.0
	85 and over	184.1	173.5	177.2
	<i>Age-standardised rate</i>	<i>8.1</i>	<i>5.9</i>	<i>6.9</i>
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	10.9	7.9	9.4
	Group 2	8.3	6.4	7.4
	Group 3	7.4	5.7	6.5
	Group 4	5.6	4.1	4.8
	Group 5 (highest SES)	4.1	3.0	3.5
	<i>Rate ratio (lowest/highest)</i>	<i>2.7</i>	<i>2.6</i>	<i>2.7</i>
2009–2011	Remoteness			
	Major cities	17.9	12.1	14.7
	Inner regional	20.9	14.6	17.5
	Outer regional	25.4	18.0	21.4
	Remote and very remote	44.7	43.1	44.1
	<i>Rate ratio (Remote and very remote/Major cities)</i>	<i>2.5</i>	<i>3.6</i>	<i>3.0</i>
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	9.8	10.3	10.1
	Non-Indigenous	2.6	1.8	2.2
	<i>Rate ratio (Indigenous/non-Indigenous)</i>	<i>3.8</i>	<i>5.6</i>	<i>4.6</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E8: Type 1 diabetes death rates

Year(s)	Population subgroup	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<45	0.2	0.1	0.2
	45–54	0.9	1.0	1.0
	55–64	1.4	0.8	1.1
	65–74	5.3	3.3	4.3
	75–84	13.8	9.6	11.5
	85 and over	26.6	24.2	25.0
	<i>Age-standardised rate^(a)</i>	<i>1.7</i>	<i>1.3</i>	<i>1.5</i>

(a) Age-standardised to the 2001 Australian population.

Source: AIHW National Mortality Database.

Table E9: Chronic kidney disease death rates

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<55	0.5	0.6	0.5
	55–64	5.7	4.3	5.0
	65–74	21.5	18.2	19.9
	75–84	110.0	75.9	91.2
	85 and over	476.0	353.5	395.7
	<i>Age-standardised rate</i>	<i>13.7</i>	<i>10.1</i>	<i>11.5</i>
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	16.0	13.3	14.5
	Group 2	14.8	10.4	12.1
	Group 3	11.4	9.6	10.3
	Group 4	10.0	6.6	8.0
	Group 5 (highest SES)	9.7	6.8	7.9
	<i>Rate ratio (lowest/highest)</i>	<i>1.6</i>	<i>2.0</i>	<i>1.8</i>
2009–2011	Remoteness			
	Major cities	13.6	10.1	11.6
	Inner regional	14.3	11.0	12.4
	Outer regional	14.0	13.4	13.7
	Remote and very remote	20.0	26.9	23.2
	<i>Rate ratio (Remote and very remote/Major cities)</i>	<i>1.5</i>	<i>2.7</i>	<i>2.0</i>
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	28.2	39.8	34.8
	Non-Indigenous	13.0	11.6	12.2
	<i>Rate ratio (Indigenous/non-Indigenous)</i>	<i>2.2</i>	<i>3.4</i>	<i>2.8</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Table E10: Chronic kidney disease death rates as underlying or associated cause of death

Year(s)	Population subgroup ^{(a)(b)}	Deaths per 100,000 population		
		Males	Females	Persons
2011	Age group (years)			
	<55	3.2	2.5	2.9
	55–64	35.7	23.2	29.4
	65–74	137.1	83.5	110.0
	75–84	607.2	345.2	462.5
	85 and over	2,362.8	1,452.0	1,765.8
	<i>Age-standardised rate</i>	<i>73.6</i>	<i>44.1</i>	<i>56.2</i>
2011	Socioeconomic status (SES) group			
	Group 1 (lowest SES)	86.2	54.6	68.0
	Group 2	76.4	46.8	59.0
	Group 3	63.6	40.2	49.8
	Group 4	55.9	32.3	42.1
	Group 5 (highest SES)	50.7	29.2	37.8
	<i>Rate ratio (lowest/highest)</i>	<i>1.7</i>	<i>1.9</i>	<i>1.8</i>
2009–2011	Remoteness			
	Major cities	72.5	42.4	54.6
	Inner regional	73.0	45.1	56.8
	Outer regional	74.4	52.2	61.9
	Remote and very remote	101.7	89.9	94.1
	<i>Rate ratio (Remote and very remote/Major cities)</i>	<i>1.4</i>	<i>2.1</i>	<i>1.7</i>
2009–2011	Aboriginal and Torres Straits Islander status^{(c)(d)(e)}			
	Indigenous	149.8	137.3	142.2
	Non-Indigenous	72.3	49.2	59.4
	<i>Rate ratio (Indigenous/non-Indigenous)</i>	<i>2.1</i>	<i>2.8</i>	<i>2.4</i>

(a) Age-standardised to the 2001 Australian population.

(b) Deaths for 2010 and 2011 are based on revised and preliminary data, respectively, and are subject to further revision.

(c) The analysis by Indigenous status includes data from NSW, Qld, WA, SA and NT only.

(d) These data have been adjusted for the additional deaths arising from outstanding registrations of deaths in Queensland in 2010. For more detail, please refer to Technical note 3 in Causes of death, Australia, 2010 (ABS cat. no. 3303.0).

(e) Excludes deaths with no stated information on Aboriginal and Torres Strait Islander status.

Source: AIHW National Mortality Database.

Glossary

Aboriginal or Torres Strait Islander: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander.

acute myocardial infarction (AMI): Term commonly used to mean a heart attack, but more correctly refers only to those heart attacks that have caused some death of heart muscle.

age standardisation: A method of removing the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, then the disease rates that would have occurred with that structure are then calculated and compared.

angina: Temporary chest pain or discomfort when the heart's own blood supply is inadequate to meet extra needs, as can occur during exercise. See also *cardiovascular disease*.

associated cause(s) of death: All causes listed on the death certificate other than the underlying cause of death. They include the immediate cause, any intervening causes and conditions that contributed to the death but were not related to the disease or condition causing the death. See also *cause of death*.

blood cholesterol: Fatty substance produced by the liver and carried by the blood to supply the rest of the body. Its natural function is to supply material for cell walls and for steroid hormones, but if levels become too high, this can lead to atherosclerosis and heart disease.

blood pressure: The force exerted by the blood on the walls of the arteries as it is pumped around the body by the heart. It is written, for example, as 134/70 mmHg, where the upper number is the systolic pressure (the maximum force against the arteries as the heart muscle contracts to pump the blood out) and the lower number is the diastolic pressure (the minimum force against the arteries as the heart relaxes and fills again with blood). Levels of blood pressure can vary greatly from person to person and from moment to moment in the same person. See also *high blood pressure/hypertension*.

body mass index (BMI): The most commonly used method of assessing whether a person is of normal weight, underweight, overweight or obese. It is calculated by dividing the person's weight (in kilograms) by their height (in metres) squared; that is, $\text{kg} \div \text{m}^2$. For both men and women, underweight is a BMI below 18.5, acceptable weight is from 18.5 to less than 25, overweight is 25 and above (includes obese), and obese is 30 and over. Sometimes overweight and obese is combined, and is defined as a BMI of 25 and over.

cardiomyopathy: A condition in which there is direct and widespread damage to the heart muscle, weakening it. It can be due to various causes, such as viral infections and severe alcohol abuse, leading to an enlarged, thickened and dilated heart as well as heart failure.

cardiovascular disease (CVD): Any disease of the circulatory system, namely the heart (cardio) or blood vessels (vascular). Includes heart attack, angina, stroke, heart failure and peripheral vascular disease. CVD is also known as circulatory disease.

cause of death: The causes of death entered on the Medical Certificate of Cause of Death are all diseases, morbid conditions or injuries that either resulted in or contributed to death, and the circumstances of the accident or violence that produced any such injuries. Causes of death are commonly reported by the *underlying cause of death*. See also *associated cause(s) of death*.

cerebrovascular disease: Any disorder of the blood vessels supplying the brain or its covering membranes. A notable and major form of cerebrovascular disease is *stroke*.

chronic disease: Term applied to a diverse group of diseases, such as heart disease, cancer and arthritis, that tend to be long-lasting and persistent in their symptoms or development. Although these features also apply to some communicable diseases, the term is usually confined to non-communicable diseases.

comorbidity: When a person has 2 or more health problems at the same time.

congenital: A condition that is recognised at birth, or that is believed to have been present since birth, including conditions that are inherited or caused by environmental factors.

coronary artery bypass graft: Surgical procedure using blood vessel grafts to bypass blockages in the coronary arteries and restore adequate blood flow to the heart muscle.

coronary artery disease: Disease of the coronary arteries, typically meaning atherosclerosis. When this leads to symptoms such as chest pain, the result is known as *coronary heart disease*.

coronary heart disease (CHD): Disease due to blockages in the heart's own (coronary) arteries, expressed as *angina* or a *heart attack*. Also known as ischaemic heart disease.

diabetes (diabetes mellitus): A chronic condition in which the body cannot properly use its main energy source, the sugar glucose. This is due to a relative or absolute deficiency in insulin, a hormone that is produced by the pancreas and helps glucose enter the body's cells from the bloodstream and then be processed by them. Diabetes is marked by an abnormal build-up of glucose in the blood, and it can have serious short- and long-term effects. For the 3 main types of diabetes, see *type 1 diabetes*, *type 2 diabetes* and *gestational diabetes*.

diabetic nephropathy: Disease of the capillaries of the *glomeruli* resulting from diabetes.

gestational diabetes: A form of diabetes that is first diagnosed during pregnancy (gestation). It may disappear after pregnancy but signals a high risk of diabetes occurring later on.

glomeruli: Part of the basic filtering unit of the kidney, the nephrons.

heart attack: Life-threatening emergency that occurs when a vessel supplying blood to the heart muscle is suddenly blocked completely by a blood clot. The medical term commonly used for a heart attack is *acute myocardial infarction*.

heart failure: When the heart functions less effectively in pumping blood around the body. It can result from a wide variety of diseases and conditions that can impair or overload the heart, such as *heart attack*, other conditions that damage the heart muscle directly (see *cardiomyopathy*), *high blood pressure* or a damaged heart valve.

high blood pressure/hypertension: The definition of high blood pressure (also known as hypertension) can vary but a well-accepted one is from the World Health Organization: a systolic blood pressure of 140 mmHg or more or a diastolic blood pressure of 90 mmHg or more, or [the person is] receiving medication for high blood pressure. Also see *blood pressure*.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander.

International Classification of Diseases (ICD): The World Health Organization's internationally accepted classification of death and disease. The 10th Revision (ICD-10) is currently in use.

morbidity: refers to ill health in an individual and to levels of ill health in a population or group.

obesity: Marked degree of overweight, defined for population studies as a *body mass index* of 30 or over. See also *overweight*.

overweight: Defined for the purpose of population studies as a *body mass index* of 25 or over. See also *obesity*.

peripheral vascular disease: Characterised by pain in the extremities, often the legs, due to an inadequate blood supply to them.

premature mortality: Refers to deaths that occur at a younger age than expected. The expected age at death can be determined by life expectancy, for example, or by setting an arbitrary age.

rheumatic fever: An acute, serious disease that affects mainly children and young adults and can damage the heart valves, the heart muscle and its lining, the joints and the brain. It is brought on by a reaction to a throat infection by a particular bacterium. Now very rare in the non-Indigenous population, it is still at unacceptably high levels among Indigenous Australians living in remote areas. See also *rheumatic heart disease*.

rheumatic heart disease: Chronic disease from damaged heart valves caused by earlier attack(s) of rheumatic fever.

risk factor: Any factor that represents a greater risk of a health disorder or other unwanted condition or event. Some risk factors are regarded as causes of disease, others not necessarily so. Along with their opposites, protective factors, risk factors are known as determinants.

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.

type 1 diabetes: A form of diabetes mostly arising among children or younger adults, marked by a complete lack of insulin and needing insulin replacement for survival.

type 2 diabetes: The most common form of diabetes, occurring mostly in people aged 40 years and over, and marked by reduced or less effective insulin.

underlying cause of death: The disease or injury that initiated the train of events leading directly to death, or the circumstances of the accidents or violence that produced the fatal injury. See also *cause of death* and *associated cause(s) of death*.

References

- ABS (Australian Bureau of Statistics) 2011. Australian Standard Geographical Classification (ASGC) correspondences, July 2011. ABS cat. no. 1216.0.15.002. Canberra: ABS.
- ABS 2012. Australian demographic statistics, September 2011. ABS cat. no. 3101.0. Canberra: ABS.
- ABS 2013a. Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2011. ABS cat. no. 2033.0.55.001. Canberra: ABS.
- ABS 2013b. Population by age and sex, regions of Australia, 2012. ABS cat. no. 3235.0. Canberra: ABS.
- ABS 2013c. Deaths, Australia, 2012. ABS cat. no. 3302.0. Canberra: ABS.
- ABS 2014a. Australian demographic statistics, December 2013. ABS cat. no. 3101.0. Canberra: ABS.
- ABS 2014b. Causes of death, Australia, 2012. ABS cat. no. 3303.0. Canberra: ABS.
- ABS 2014c. Estimates and projections, Aboriginal and Torres Strait Islander Australians, 2001 to 2026. ABS cat. no. 3238.0. Canberra: ABS.
- AIHW (Australian Institute of Health and Welfare) (2007). Rural, regional and remote health: a study on mortality (2nd edition). Rural health series no. 8. Cat. no. PHE 95. Canberra: AIHW.
- AIHW 2009. Impact of falling cardiovascular disease death rates: deaths delayed and years of life extended. Bulletin no. 70. Cat. no. AUS 113. Canberra: AIHW.
- AIHW 2010. Cardiovascular disease mortality: trends at different ages. Cardiovascular disease series no. 31. Cat. no. CVD 47. Canberra: AIHW.
- AIHW 2011. End-stage kidney disease in Australia: total incidence, 2003–2007. Cat. no. PHE 143. Canberra: AIHW.
- AIHW 2012. Multiple causes of death: an analysis of all natural and selected chronic disease causes of death 1997–2007. AIHW bulletin no. 105. Cat. no. AUS 159. Canberra: AIHW.
- AIHW 2013a. Rheumatic heart disease and acute rheumatic fever in Australia: 1996–2012. Cardiovascular disease series no. 36. Cat. no. CVD 60. Canberra: AIHW.
- AIHW 2013b. Stroke and its management in Australia: an update. Cardiovascular disease series no. 37. Cat. no. CVD 61. Canberra: AIHW.
- AIHW 2013c. GRIM (General Record of Incidence of Mortality) Books 2011: all circulatory diseases. Canberra: AIHW.
- AIHW 2014a. Australia's health 2014. Australia's health series no. 14. Cat. no. AUS 178. Canberra: AIHW.
- AIHW 2014b. Trends in coronary heart disease mortality: age groups and populations. Cardiovascular disease series no. 38. Cat. no. CVD 67. Canberra: AIHW.
- AIHW, forthcoming 2015. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors. Canberra: AIHW.
- AIHW: Waters AM & Moon L 2006. Socioeconomic inequalities in cardiovascular disease in Australia: current picture and trends since the 1990s. Bulletin no. 37. Cat. no. AUS 74. Canberra: AIHW.
- Bajekal M, Scholes S, Love H, Hawkins N, O'Flaherty M, Raine R et al. 2012. Analysing recent socioeconomic trends in coronary heart disease mortality in England, 2000–2007: a population modelling study. PLOS Medicine 9:e1001237-e.

- Briffa T, Hickling S, Knuimen M, Hobbs M, Hung J, Sanfilippo FM et al. 2009. Long term survival after evidence-based treatment of acute myocardial infarction and revascularisation: follow-up of population based Perth MONICA cohort 1984–2005. *British Medical Journal* 338:b36.
- Ford ES & Capewell S 2011. Proportion of the decline in cardiovascular mortality disease due to prevention versus treatment: public health versus clinical care. *Annual Review of Public Health* 32:5–22.
- IDF (International Diabetes Federation) 2013. *IDF diabetes atlas*. 6th edn. Brussels: IDF.
- Leyden JM, Kleinig TJ, Newbury J, Castle S, Cranefield RN, Anderson CS et al. 2013. Adelaide Stroke Incidence Study: declining stroke rates but many preventable cardioembolic strokes. *Stroke* 44:1226–31.
- Li SQ, Cass A & Cunningham J 2003. Cause of death in patients with end-stage renal disease: assessing concordance of death certificates with registry reports. *Australian and New Zealand Journal of Public Health* 27:419–24.
- Lu TH, Hsu PY, Bjorkenstam B & Anderson RN 2006. Certifying diabetes-related cause-of-death: a comparison of inappropriate certification statements in Sweden, Taiwan and the USA. *Diabetologia* 49:2878–81.
- Marsden DL, Spratt NJ, Walker R, Barker D, Attia J, Pollack M et al. 2010. Trends in stroke attack rates and case fatality in the Hunter region, Australia 1996–2008. *Cerebrovascular Diseases* 30:500–7.
- Mathers C, Ma Fat D, Inoue M, Rao C & Lopez AD 2005. Counting the dead and what they died from: an assessment of the global status of cause of death data. *Bulletin of the World Health Organization* 83:171–7.
- OECD (Organisation for Economic Co-operation and Development) 2013. *Health at a glance 2013: OECD indicators*. Paris: OECD Publishing.
- Sparke C, Moon L, Green F, Mathew T, Cass A, Chadban S et al. 2013. Estimating the total incidence of kidney failure in Australia including individuals who are not treated by dialysis or transplantation. *American Journal of Kidney Disease* 61:413–9.
- Taylor R, Dobson A & Mirzaei M 2006. Contribution of changes in risk factors to the decline of coronary heart disease mortality in Australia over three decades. *European Journal of Cardiovascular Prevention and Rehabilitation* 13:760–8.
- Venkat Narayan KM, Williams D, Gregg EW & Cowie CC (eds) 2010. *Diabetes public health: from data to policy*. New York: Oxford University Press.
- Whittall DE, Glatthaar C, Knuiman MW & Welborn TA 1990. Deaths from diabetes are under-reported in national mortality statistics. *Medical Journal of Australia* 152:598–600.
- Wijeyesundera HC, Machado M, Farahati F, Wang X, Witteman W, van der Velde G et al. 2010. Association of temporal trends in risk factors and treatment uptake with coronary heart disease heart disease mortality, 1994 to 2005. *Journal of the American Medical Association* 303:1841–7.

List of tables

Table 4.1: Deaths with chronic kidney disease as the underlying or associated cause of death, 2011....	34
Table 5.1: Most common associated causes of death where cardiovascular disease, diabetes or chronic kidney disease are the underlying cause of death, 2011	42
Table 5.2: Most common underlying causes of death where cardiovascular disease, diabetes or chronic kidney disease are recorded as associated causes of death, 2011	43
Table B1: Vascular disease comparability factors	46
Table C1: ICD codes for vascular and chronic disease groups.....	51
Table E1: Cardiovascular disease death rates.....	53
Table E2: Coronary heart disease death rates.....	54
Table E3: Stroke death rates	55
Table E4: Other cardiovascular disease death rates	56
Table E5: Diabetes death rates	58
Table E6: Diabetes death rates as underlying or associated cause of death.....	59
Table E7: Type 2 diabetes death rates.....	60
Table E8: Type 1 diabetes death rates.....	61
Table E9: Chronic kidney disease death rates	62
Table E10: Chronic kidney disease death rates as underlying or associated cause of death.....	63

List of figures

Figure 2.1: Deaths in Australia, by disease group, 2011	3
Figure 2.2: Major causes of cardiovascular disease death, 2011	4
Figure 2.3: Long-term trends in cardiovascular disease death rates, by sex, 1907–2011	5
Figure 2.4: Cardiovascular disease death rates, by age and sex, 2011	6
Figure 2.5: Cardiovascular disease death rates, by remoteness and sex, 2009–2011	7
Figure 2.6: Cardiovascular disease death rates, Australia and capital cities, 2009–2011	8
Figure 2.7: Cardiovascular disease death rates, by socioeconomic status and sex, 2011.....	9
Figure 2.8: Deaths with cardiovascular disease as the underlying cause of death, by Indigenous status and sex, 2009–2011	10
Figure 2.9: Cardiovascular disease death rates, selected OECD countries, 2011 or nearest year.....	11
Figure 2.10: Trends in coronary heart disease death rates, by sex, 1981–2011	13
Figure 2.11: Coronary heart disease death rates, by age and sex, 2011	13
Figure 2.12: Age-specific coronary heart disease death rates, 1981–2011	14
Figure 2.13: Coronary heart disease death rates, by remoteness and sex, 2009–2011	15
Figure 2.14: Coronary heart disease death rates, by socioeconomic status and sex, 2011	16
Figure 2.15: Deaths with coronary heart disease as the underlying cause of death, by Indigenous status and sex, 2009–2011	16
Figure 2.16: Coronary heart disease death rates, selected OECD countries, 2011 or nearest year	17
Figure 2.17: Trends in stroke death rates, by sex, 1981–2011	19
Figure 2.18: Stroke death rates, by age and sex, 2011	19
Figure 2.19: Age-specific stroke death rates, 1981–2011	20
Figure 2.20: Stroke death rates, by remoteness and sex, 2009–2011	21
Figure 2.21: Stroke death rates, by socioeconomic status and sex, 2011	21
Figure 2.22: Deaths with stroke as the underlying cause of death, by Indigenous status and sex, 2009–2011	22
Figure 2.23: Cerebrovascular disease death rates, selected OECD countries, 2011 or nearest year.....	23
Figure 3.1: Death rates with diabetes as the underlying cause of death, by sex, 1981 to 2011	25
Figure 3.2: Death rates with diabetes as the underlying or associated cause of death, by sex, 1997 to 2011	26
Figure 3.3: Deaths with diabetes as the underlying cause of death, by age and sex, 2011	27

Figure 3.4: Deaths with type 2 and type 1 diabetes as an underlying cause of death, by age and sex, 2011	27
Figure 3.5: Deaths with diabetes as the underlying or associated cause of death, by age and sex, 2011	28
Figure 3.6: Deaths with diabetes as the underlying or associated cause of death, by remoteness and sex, 2009–2011	29
Figure 3.7: Deaths with diabetes as the underlying or associated cause of death, by socioeconomic status and sex, 2011	30
Figure 3.8: Deaths with diabetes as the underlying or associated cause of death, by Indigenous status and sex, 2009–2011	31
Figure 3.9: Diabetes death rates, selected OECD countries, 2011 or nearest year	32
Figure 4.1: Death rates with CKD as the underlying cause of death, by sex, 1981–2011	34
Figure 4.2: Death rates with CKD as the underlying or associated cause of death, by sex, 1997–2011	35
Figure 4.3: Deaths with CKD as the underlying or associated cause of death, by age and sex, 2011 ...	36
Figure 4.4: Deaths with CKD as the underlying or associated cause of death, by remoteness and sex, 2009–2011	37
Figure 4.5: Deaths with CKD as the underlying or associated cause of death, by socioeconomic status and sex, 2011	37
Figure 4.6: Deaths with chronic kidney disease as the underlying or associated cause of death, by Indigenous status and sex, 2009–2011	38
Figure 5.1: Contribution of CVD, diabetes and CKD to total death rate, 1981–2011	40
Figure 5.2: Deaths with cardiovascular disease, diabetes, and chronic kidney disease listed as any cause of death, 2011	41

Related publications

Now available

AIHW (Australian Institute of Health and Welfare) 2008. Diabetes: Australian facts 2008. Diabetes series no. 8. Cat. no. CVD 40. Canberra: AIHW.

AIHW 2009. An overview of chronic kidney disease in Australia, 2009. Cat. no. PHE 111. Canberra: AIHW.

AIHW 2011. Cardiovascular disease: Australian facts 2011. Cardiovascular disease series no. 35. Cat. no. CVD 53. Canberra: AIHW.

AIHW 2012. Multiple causes of death in Australia: an analysis of all natural and selected chronic disease causes of death 1997–2007. AIHW bulletin no. 105. Cat. no. AUS 159. Canberra: AIHW.

Forthcoming

AIHW 2014. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: prevalence and incidence.

AIHW 2014. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: morbidity.

AIHW 2015. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors.

AIHW 2015. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: Indigenous Australians.

risk factors
chronic kidney disease
cardiovascular disease
diabetes
stroke

Cardiovascular disease, diabetes and chronic kidney disease—Australian facts is a series of 5 reports by the National Centre for Monitoring Vascular Diseases at the Australian Institute of Health and Welfare that describe the combined burden of cardiovascular disease (including coronary heart disease and stroke), diabetes and chronic kidney disease.

This report on **Mortality** presents up-to-date statistics as well as trends on deaths from these chronic diseases. It examines age and sex characteristics, and variations across population groups, including among Aboriginal and Torres Strait Islander people, by geographical location, and by socioeconomic disadvantage.