

Diseases and injury

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KEY POINTS

- Cancer is Australia's leading broad cause of disease burden (19% of the total), followed by cardiovascular disease (16%) and mental disorders (13%).
- Death rates are falling for many of our major health problems such as cancer, cardiovascular disease, chronic obstructive pulmonary disease, asthma and injuries.
- The rate of heart attacks continues to fall, and survival from them continues to improve.
- Around 1 in 5 Australians aged 16–85 years has a mental disorder at some time in a 12-month period, including 1 in 4 of those aged 16–24 years.
- The prevalence of diabetes continues to increase markedly, having trebled over the last two decades, based on self-reported data.
- The incidence of treated end-stage kidney disease is increasing, with diabetes as the main cause.
- In 2008, chlamydia continued to be the most notified infection in Australia, with over 58,000 new notifications.
- The first influenza pandemic in 40 years occurred in 2009. Children and young adults were disproportionately affected.

Diseases and injury are important components of ill health. They cause much suffering, disability and premature mortality. They also impose significant costs on society through health system use (see chapters 7 and 8), days off work because of illness or caring for people who are ill, and reduced quality of life.

Despite diseases and injury remaining large problems, the situation is improving in many areas. For example, death rates continue to fall for cancer, cardiovascular disease (CVD), chronic lung disease and injury. This is partly because fewer of these problems arise in the first place or arise later in people's lives, and partly because survival is better when they do occur. However, the increases in the number of people with certain diseases—notably diabetes and end-stage kidney disease (ESKD)—is cause for concern.

This chapter covers Australia's main health problems, namely those that cause the greatest overall disability, premature death or both. The combined extent of disability and premature death—known as 'burden of disease'—caused by the conditions covered in this chapter is over three-quarters of the total burden of disease (see Box 4.1 and Section 2.7).

Box 4.1: Burden of disease for conditions described in this chapter

Over three-quarters of Australia's total burden of disease (see Chapter 2) is covered by the conditions described in this chapter. The largest contributions come from cancer, cardiovascular disease and mental disorders.

The conditions vary in whether the burden is mainly because of premature death or years lived with disability or illness. Cancer, cardiovascular disease and injury have over 70% of their burden coming from premature death, whereas asthma, musculoskeletal disease and mental disorders have more than 90% of their burden coming from the disability or illness component.

Projected burden of disease for conditions in this chapter, 2010

Broad cause group	Specific categories	Proportion of burden (per cent)	Fatal component ^(a) (per cent)
Cancer		18.9	83
Cardiovascular disease		16.1	76
Diabetes		6.6	20
Chronic kidney disease ^(b)		n.a.	n.a.
Mental disorders		13.0	7
Neurological and sense disorders	Dementia	4.3	26
Chronic respiratory disease	Chronic obstructive pulmonary disease (COPD)	3.0	57
	Asthma	2.3	8
Musculoskeletal disease		4.4	6
Injury		6.5	75
Infectious diseases		1.7	69
<i>Total in this chapter</i>		76.9	
All diseases		100.0	

n.a. Not available.

(a) Proportion of burden due to premature death, with the remainder being due to years lived with disability.

(b) Chronic kidney disease is not quantified separately in the Burden of Disease study.

Source: AIHW Burden of Disease database.

4.1 Cancer

Cancer is a diverse group of diseases in which some of the body's cells become defective and multiply out of control. They can invade and damage the tissue around them, and can also spread (metastasise) to other parts of the body to cause further damage. The number and types of cancer diagnosed vary notably by age and sex, with young people at considerably less risk of developing cancer than older people. Overall, cancer is projected to remain the leading cause of the burden of disease and injury in Australia in 2010, with four-fifths of cancer's burden being due to premature death. In the decade to 2006, improvements in early detection and treatment have resulted in improved survival and a clear decline in mortality rates for many cancers, despite the overall cancer incidence rate increasing by 4%.

This section describes cancer incidence and mortality for all cancers combined and for National Health Priority Area (NHPA) cancers. The NHPA cancers are colorectal cancer, lung cancer, melanoma of the skin, non-melanoma skin cancer (NMSC), breast cancer in females, cancer of the cervix, prostate cancer and non-Hodgkin lymphoma.

Information on new cases of cancer is collected by state and territory cancer registries, and compiled into the Australian Cancer Database by the Australian Institute of Health and Welfare (AIHW) at the National Cancer Statistics Clearing House (see Box 4.2). Information on screening for cancer is included in Chapter 7.

Box 4.2: Cancer surveillance and monitoring

Registration of all cancers, excluding basal and squamous cell carcinomas of the skin (BCCs and SCCs), is required by law in each of the states and territories, where the data are collated by cancer registries. These registries collect clinical and demographic information about people with newly diagnosed cancer from hospitals, pathologists, cancer specialists, cancer treatment centres and nursing homes.

All state and territory cancer registries have supplied records of new cases of cancer since 1982, excluding BCCs and SCCs, to the National Cancer Statistics Clearing House (NCSCH). The NCSCH is operated by the Australian Institute of Health and Welfare collaboratively with the Australasian Association of Cancer Registries. Both the *Australian Institute of Health and Welfare Act 1987* and the *Privacy Act 1988* provide for the confidentiality of records supplied to the NCSCH.

Incidence

The incidence of cancer is the number of new cases in a given period, usually one year. Excluding the two main types of NMSC (basal and squamous cell carcinomas), 104,592 new cases of cancer (59,058 males and 45,534 females) were diagnosed in Australia in 2006. The corresponding incidence rate of 480 cases per 100,000 persons was higher than the rate of 462 a decade earlier and much higher than the rate of 395 in 1986 (Table 4.1).

Table 4.1: Trends in incidence, selected cancers, 1986 to 2006

Type of cancer	1986	1991	1996	2001	2006
Number of new cases					
All cancers ^(a)	53,888	66,322	79,169	89,777	104,592
NHPA cancers					
Prostate cancer	4,310	6,755	10,304	11,389	17,444
Colorectal cancer	8,018	9,596	10,871	12,702	13,591
Breast cancer in females	6,079	8,042	9,745	11,803	12,614
Melanoma of skin	4,710	5,964	7,819	8,943	10,326
Lung cancer	6,460	7,161	7,799	8,388	9,563
Non-Hodgkin lymphoma	1,815	2,503	3,087	3,517	3,982
Cervical cancer	1,020	1,092	941	739	715
Incidence rate^(b)					
All cancers ^(a)	394.7	432.9	461.6	462.5	480.4
NHPA cancers					
Prostate cancer ^(c)	83.0	110.1	137.6	131.0	170.0
Colorectal cancer	60.1	63.6	64.0	65.4	62.2
Breast cancer in females ^(c)	85.1	100.4	109.3	117.3	112.4
Melanoma of skin	32.8	37.6	44.9	46.1	47.9
Lung cancer	46.6	46.3	45.5	43.2	43.8
Non-Hodgkin lymphoma	13.2	16.2	17.9	18.1	18.3
Cervical cancer ^(c)	14.0	13.2	10.4	7.4	6.6

NHPA National Health Priority Area.

(a) ICD-10 codes C00–C96, D45–D46, D47.1 & D47.3 but excluding basal and squamous cell carcinomas of the skin (part of C44).

(b) Incidence rates, given as number of new cases per 100,000 persons, were age-standardised to the Australian population as at 30 June 2001.

(c) Rates for these cancers use the relevant male or female population numbers in denominators.

Source: AIHW Australian Cancer Database.

The overall cancer incidence rate was higher among males than females. The imbalance was greatest for cancer of the larynx, where the rate for males was 12 times as high as the female rate. This excess rate is probably due to higher male rates of smoking and alcohol consumption in the previous two to three decades.

The situation is that, by the age of 75 years, 1 in 3 Australian males and 1 in 4 females will have been diagnosed with cancer at some stage of their life. The risk by age 85 years increases to 1 in 2 for males and 1 in 3 for females.

It is projected that the number of new cases of cancer in 2010 will be around 115,000, a 10% increase on 2006. Most of the projected increase is because of growth in the population aged 60 years and over. In 2006 the average age at diagnosis was 67 years for males and 64 years for females.

Most common cancers

Among males in 2006, prostate cancer was the most common type of newly diagnosed cancer (excluding BCCs and SCCs), with 17,444 cases diagnosed in that year. The increase in the incidence of prostate cancer in recent years correlates strongly with an increased use

of prostate-specific antigen tests in screening for prostate cancer. Colorectal cancer (7,432 new cases), melanoma (6,051), lung cancer (6,030) and lymphoma (2,518) were the next most commonly diagnosed cancers among males (excluding BCCs and SCCs). Together these five accounted for 67% of all cancers registered in males in 2006.

In 2006, breast cancer (12,614 new cases) was the most commonly registered cancer in females, followed by colorectal cancer (6,159 new cases), melanoma (4,275), lung cancer (3,533) and lymphoma (1,961). These five accounted for 63% of all cancers registered in females in 2006.

Non-melanoma skin cancers

Only two kinds of cancer are not legally notifiable diseases in Australia—basal cell carcinoma of the skin and squamous cell carcinoma of the skin. These are the two most common kinds of NMSC. The national incidence of NMSC is estimated from periodic national household surveys (NCCI 2003; Staples et al. 2006). Based on the most recent survey (in 2002) around 451,000 new cases of NMSC are expected to be diagnosed in 2010 (AIHW & CA 2008).

In 2007, 448 persons died from NMSC in Australia. Although NMSC only accounts for just over 1% of cancer deaths in Australia, about four are diagnosed annually for every one of the other invasive cancers. Around two-thirds of Australians will develop at least one NMSC before the age of 70 years.

It is clear from hospital inpatient data and surveys of general practitioners (GPs) that health service use for NMSCs is increasing. There were an estimated 950,000 GP encounters per year for NMSC between April 2005 and March 2007, representing an increase of 14% from the same period in 1998–2000. There were also 78,000 inpatient hospitalisations with a principal diagnosis of NMSC in the 2006–07 financial year, more than double the figure for 1993–94 (AIHW & CA 2008).

Mortality

Cancer is a major cause of death, accounting for 29% of all deaths in 2007. From the perspective of total numbers, the falling death rate from cancer is being offset by increased population growth in the 65 years and over age group, as this group has the highest rates of cancer incidence and mortality.

In 2007 there were 39,884 deaths from cancer (Table 4.2). Of these, 22,562 were of males (32% of all male deaths) and 17,322 were of females (26% of all female deaths). The average age at death was 72 years for both males and females. It is projected that there will be around 43,700 deaths from cancer in 2010 (AIHW & AACR 2008).

Despite the increase in numbers, however, the age-standardised death rate for cancers overall fell from 209 per 100,000 persons in 1987 to 176 in 2007—a 16% fall over two decades. Among the NHPA cancers, the fall in death rates since 1987 has been highest for cervical cancer, at 60%, where the National Cervical Screening Program using Pap tests has been successful in detecting and treating pre-cancerous abnormalities before they develop into cancer. The death rates have also fallen steadily and substantially for colorectal (43% fall), breast (28%) and lung cancers (17%) (Table 4.2).

Table 4.2: Trends in deaths, selected cancers, 1987 to 2007

Type of cancer	1987	1992	1997	2002	2007
Number of deaths^(a)					
All cancers ^(b)	28,401	32,196	35,112	38,093	39,884
NHPA cancers					
Lung cancer	5,752	6,400	6,588	7,303	7,626
Colorectal cancer	4,120	4,218	4,632	4,584	4,047
Prostate cancer	1,744	2,370	2,446	2,852	2,938
Breast cancer in females	2,258	2,438	2,609	2,698	2,680
Non-Hodgkin lymphoma	953	1,261	1,551	1,528	1,325
Melanoma of skin	792	871	908	1,055	1,279
Non-melanoma skin cancer	215	364	342	407	448
Cervical cancer	336	326	294	227	208
Death rate^(c)					
All cancers ^(b)	209.2	210.4	202.1	191.2	176.1
NHPA cancers					
Lung cancer	41.0	40.8	37.6	36.7	34.0
Colorectal cancer	31.0	27.9	26.8	23.0	17.8
Prostate cancer ^(d)	36.6	41.8	36.8	35.6	31.0
Breast cancer in females ^(d)	30.6	29.4	27.8	25.2	22.1
Non-Hodgkin lymphoma	7.0	8.3	8.9	7.7	5.8
Melanoma of skin	5.7	5.6	5.1	5.3	5.7
Non-melanoma skin cancer	1.7	2.4	2.0	2.0	1.9
Cervical cancer ^(d)	4.4	3.8	3.1	2.1	1.8

NHPA National Health Priority Area.

(a) The number of deaths is given as at the year of registration of death, which in a small percentage of cases is later than the year of occurrence of death.

(b) ICD-10 codes C00–C97, D45–D46, D47.1 & D47.3.

(c) Death rates, given as number of deaths per 100,000 persons, were age-standardised to the Australian population as at 30 June 2001.

(d) Rates for these cancers use the relevant male or female population numbers in denominators.

Source: AIHW National Mortality Database.

Lung cancer was by far the most common cause of cancer death in 2007 (7,626 deaths), and in fact was also the leading cause for both males (4,715) and females (2,911). It has been the leading cause of cancer death for the whole period shown in Table 4.2, with the gap between it and the other causes actually widening. Colorectal cancer had the second highest number of deaths overall in 2007, but with only around half the number of lung cancer deaths. Next came two sex-specific cancers—prostate cancer in males followed by breast cancer in females. These two were the second most common causes of cancer deaths for males and females respectively (ahead of colorectal cancer, which was third in both cases).

The current risk of dying from a cancer before the age of 75 years is 1 in 8 for males and 1 in 12 for females. The risk of dying from cancer before the age of 85 years is double these proportions: 1 in 4 for males and 1 in 6 for females.

Relative survival

Many types of cancer can shorten people's lives, so it is important to know how long those with cancer are surviving with it and whether the length of survival is improving as care and early detection improves. The standard measure of cancer survival is 5-year relative survival. A 5-year relative survival figure of, say, 70% means that a person diagnosed with cancer has a 70% chance of still being alive 5 years after their diagnosis, relative to other Australians of the same sex and age (AIHW et al. 2008).

For cancers as a whole, 5-year relative survival improved markedly from 41% for males diagnosed in 1982–1986 to 58% for those diagnosed in 1998–2004 (Table 4.3). There was a similar improvement for females diagnosed in these periods—from 53% to 64%. In most cases shown below the improvements have been clearly progressive over the years.

Table 4.3: Trends in 5-year relative survival for selected cancers, diagnoses from 1982–1986 to 1998–2004 (per cent)

Type of cancer	1982–1986	1987–1991	1992–1997	1998–2004
Males				
All cancers ^(a)	41.3	45.9	54.8	58.4
Stomach	16.2	18.9	20.5	24.4
Colorectal	47.7	52.0	56.8	61.3
Lung	7.9	9.1	9.7	10.7
Melanoma	82.2	86.3	89.3	89.7
Prostate	57.4	63.2	81.7	85.3
Testicular	90.8	95.0	95.3	96.8
Kidney	45.2	49.8	58.6	65.6
Brain	20.8	19.7	18.7	18.5
Thyroid	79.1	78.3	85.3	87.7
Hodgkin lymphoma	72.0	76.8	81.5	84.8
Non-Hodgkin lymphoma	46.3	48.2	52.3	61.6
Leukaemia	37.9	42.6	43.0	48.2
Females				
All cancers ^(a)	53.2	57.1	60.8	64.1
Stomach	18.2	18.9	22.3	25.3
Colorectal	49.7	53.2	57.4	62.4
Lung	10.5	10.8	12.6	14.0
Melanoma	90.5	92.8	93.9	94.1
Breast	71.8	77.5	83.7	87.8
Uterine	75.6	78.0	80.2	82.1
Cervical	68.3	71.2	73.6	71.8
Ovarian	32.7	35.7	37.9	39.8
Kidney	48.8	52.5	58.7	66.0
Brain	19.9	20.4	18.3	19.4
Thyroid	85.3	89.9	94.3	95.3
Hodgkin lymphoma	71.3	77.5	83.6	85.8
Non-Hodgkin lymphoma	47.6	52.4	54.0	62.6
Leukaemia	37.2	42.9	42.8	47.3

(a) ICD-10 codes C00–C97, D45–D46, D47.1 & D47.3.

Note: Relative survival calculated using the methodology of Dickman (2004).

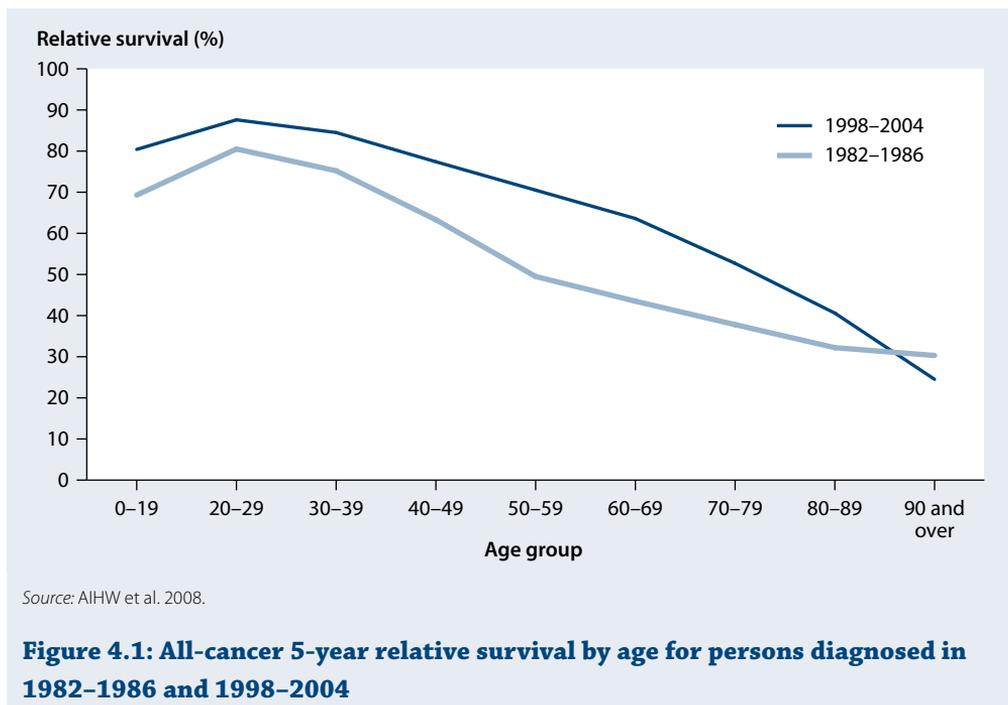
Source: AIHW et al. 2008.

These gains have largely been attributed by the Cancer Council Australia to better diagnostic methods, earlier detection and improvements in treatment. But the gains have not been consistent across all types of cancer. For example, brain cancer has relatively poor survival, and its 5-year relative survival remained between 19% and 21% for the 20 years to 2004 for both males and females. Also, as well as continuing to cause far more deaths than any other cancer, lung cancer still has a poor relative survival that has improved only a little over the previous 20 years—12% for males and females combined for diagnoses in the period 1998–2004. In contrast, early detection through the BreastScreen Australia screening program and improvements in treatment have contributed to the 5-year relative survival for breast cancer in females improving from 72% for those diagnosed in 1982–1986 to 88% for those diagnosed in 1998–2004.

There has also been success with the National Cervical Screening Program (also see Chapter 7). It has achieved improvements in early detection and treatment of pre-cancerous abnormalities, thereby considerably reducing both incidence and resulting mortality from cervical cancer since the early 1990s. Despite this preventive success, however, once cervical cancer has been diagnosed its 5-year relative survival remained at around 70% for the two decades to 2004.

Five-year relative survival for persons diagnosed with cancer in 1998–2004 was highest for those aged 20–29 years, at 88%, and next highest for those aged 30–39 years, at 85% (Figure 4.1). It then continued to decline steadily with age to 25% for those aged 90 years and over.

The greatest gains in survival for persons diagnosed in 1998–2004, compared with those diagnosed in 1982–1986, were in the 50–59 year age group, from 50% to 71%, and in the 60–69 year age group, from 44% to 64%.



Burden of disease

Cancer is projected to be the leading cause of the burden of disease and injury in Australia in 2010, as it has been at least since 2003. It is estimated that it will account for 19% of the total burden, compared with 16% for CVD which is the second leading cause. Four-fifths (83%) of the cancer burden comes from years of life lost due to premature death (YLL) and the remainder from the non-fatal burden of years of life lost due to disability (YLD). (See Chapter 2 for information about the burden of disease generally.)

In 2010 males are expected to account for 53% of the burden from cancer and females 47%. Among males in 2010, the cancers expected to have the highest burden, measured by disability-adjusted life years (DALYs), are lung cancer (56,800 DALYs), prostate cancer (42,500), colorectal cancer (37,800) and melanoma (15,200). Among females the highest burden is expected to be due to breast cancer (61,100 DALYs), lung cancer (41,300), and colorectal cancer (30,300).

4.2 Cardiovascular disease

Despite major gains against CVD over the past 40 years it continues to have a major effect on the health of Australians in terms of prevalence, mortality, morbidity, burden of disease and expenditure. CVD remains Australia's biggest killer, mostly because of the deaths it causes among older people. It is also the second largest contributor to the burden of disease in Australia, after cancer.

The term cardiovascular disease covers all diseases and conditions of the heart and blood vessels (see Box 4.3). Coronary heart disease, stroke, heart failure and peripheral vascular disease are the major contributors to the burden of CVD. Congenital heart and vascular diseases constitute one of the leading causes of death in the first year of life. Rheumatic fever and chronic rheumatic heart disease are a problem among Aboriginal and Torres Strait Islander people.

Box 4.3: Definition of cardiovascular disease

The definition of 'cardiovascular disease' differs between organisations and data collections. In this report, as in other material prepared by the Australian Institute of Health and Welfare (AIHW), the terms 'cardiovascular disease', 'circulatory disease' and 'heart, stroke and vascular diseases' are used interchangeably to convey the same meaning. They include all diseases in Chapter 9 (codes I00–I99) of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM).

It should be noted that the AIHW and the Australian Bureau of Statistics (ABS) use the term 'heart, stroke and vascular diseases' somewhat differently. For the ABS, the term represents a subgroup of 'diseases of the circulatory system' (ABS 2009a).

For the most common forms of CVD, the main underlying causal mechanism is plaque formation, a process marked by abnormal build-ups of fat, cholesterol and other substances in the inner lining of the arteries. Plaque is most serious when it leads to a reduced or blocked blood supply to the heart (causing angina or heart attack) or to the brain (causing a stroke).

The major preventable risk factors for CVD are tobacco smoking, high blood pressure, high blood cholesterol, insufficient physical activity, overweight and obesity, poor nutrition and diabetes. Atrial fibrillation, transient ischaemic attack and a high intake of alcohol also increase the risk of stroke.

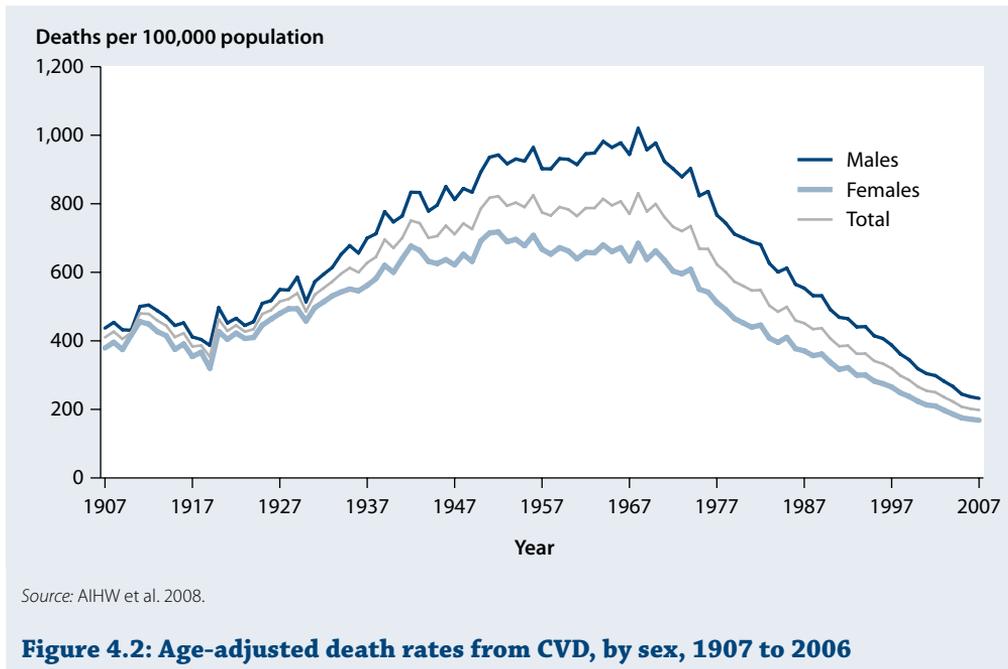
This section provides a brief statistical profile of CVD as a whole, followed by sections on its main component diseases. Information is also presented on the use of health services. CVD in Indigenous Australians is discussed in Chapter 5.

Cardiovascular disease as a whole

In 2007, CVD was recorded as the primary cause of death for 46,623 Australians, accounting for just over a third of all deaths in that year. Half of these deaths (22,727) were due to coronary heart disease, and 8,623 to stroke. Over 78% of the CVD deaths were of people aged 75 years and over, and more than half were female (52.7%).

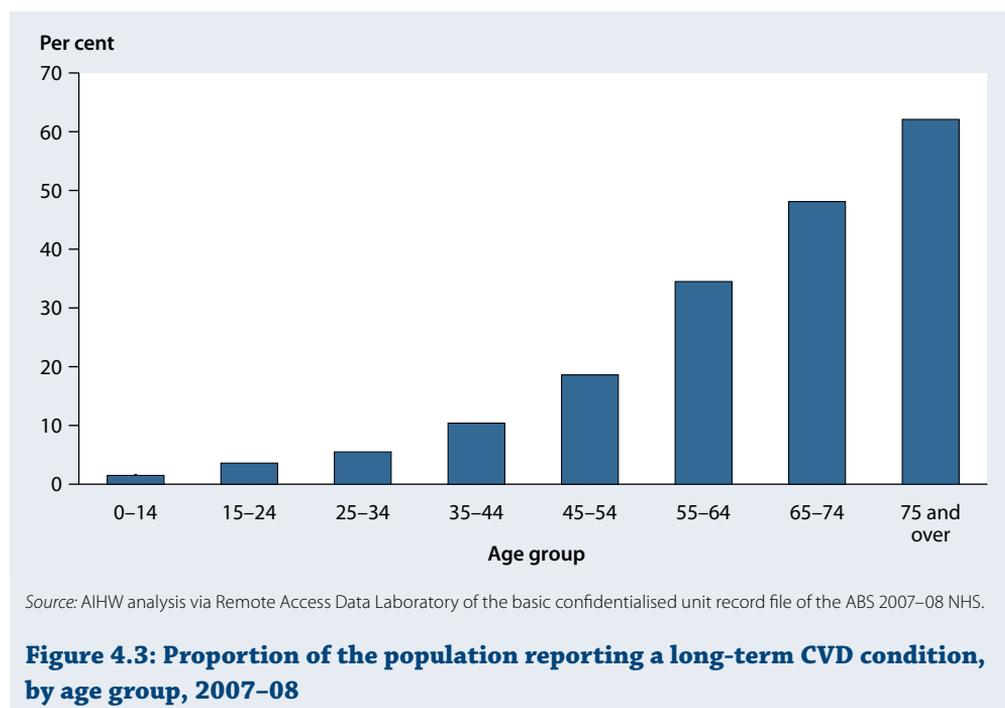
Over the past few decades Australia has achieved major gains in the fight against CVD, due to a combination of improvements in prevention, detection and clinical management. Death rates have fallen considerably from the peak levels seen in the late 1960s and early 1970s, when CVD was responsible for around 60,000 deaths annually, or roughly 55% of all deaths each year. The age-adjusted rate of death from CVD declined from 830.6 per 100,000 population in 1968 to 198.1 per 100,000 in 2007—a 76% fall (Figure 4.2).

If the death rates for CVD had remained at their 1968 peak, the number of deaths due to these diseases in 2006 would have been around 4 times as high as the actual number. In 2006, 187,000 Australian lives would have been lost to CVD rather than the 45,670 actual deaths, representing a saving of over 140,000 lives in that year. By way of comparison, the total number of deaths from any cause in 2006 was 133,739 (AIHW 2009a).

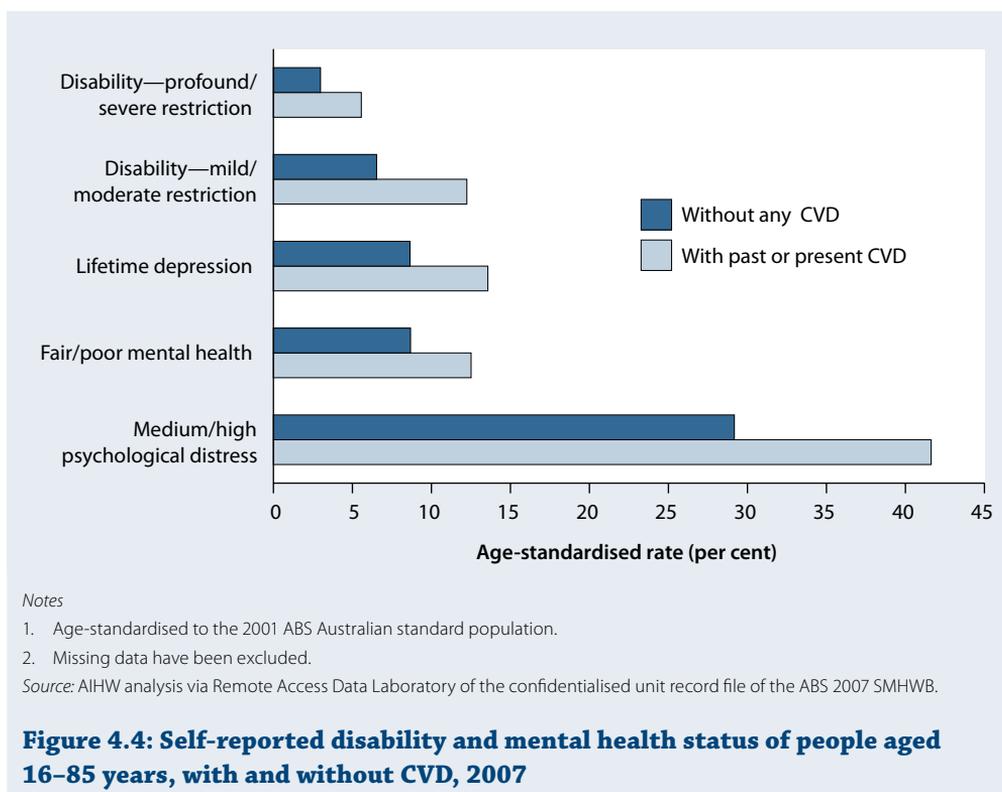


Both males and females have benefited from the decline. However, age-adjusted death rates for CVD among males are still markedly higher than among females (in 2007, 232.1 per 100,000 compared with 168.2). The rates for males reached a higher peak (1,020.1 compared with 717.8 for females) and began to decline later (in the late 1960s compared with the early 1950s) (AIHW 2009b).

Based on the 2007–08 National Health Survey (NHS), an estimated 3.4 million Australians (16.5% of the population) had one or more long-term diseases of the circulatory system that year (ABS 2009a). A higher proportion of females in the survey (17.6%) reported having CVD than males (15.3%) and the prevalence increased with age (Figure 4.3). It should be noted that these estimates are based on self-reporting by respondents, and do not include people in institutionalised care (such as hospitals and nursing homes). Therefore, some care should be taken in interpreting the figures in comparison with other surveys and over time.



Similar estimates of the prevalence of CVD (defined as a long-term condition of stroke, heart or circulatory condition) can be derived from the 2007 National Survey of Mental Health and Wellbeing (SMHWB) (ABS 2008). From this survey it is estimated that 3.5 million Australians aged 16–85 years had a long-term chronic condition of CVD that year. As with the NHS, estimates are based on self-reported responses. Of those reporting CVD, 23.1% (corresponding to 800,000 people) reported also having a disability that led to a mild-to-profound restriction to core activities such as self-care, mobility and communication. Compared with those without CVD, and after adjusting for age, those reporting a CVD condition were more likely to report that they had a disability, medium or high levels of psychological distress, fair or poor mental and physical health, depression or a schooling or employment restriction. All these differences were statistically significant (Figure 4.4).



Notes

1. Age-standardised to the 2001 ABS Australian standard population.
2. Missing data have been excluded.

Source: AIHW analysis via Remote Access Data Laboratory of the confidentialised unit record file of the ABS 2007 SMHWB.

Combining both the burden from the extent of its disability and from premature death, CVD is projected to account for 16% of the overall disease burden in Australia in 2010, with coronary heart disease and stroke contributing over four-fifths of this burden. Most of the CVD burden comes from premature death. For 2010, it is estimated that CVD will be responsible for 26% of total YLL in Australia, second only to cancer (34%), and 7% of Australia's total YLD. The CVD burden increases markedly with age, particularly from 60 years onwards.

CVD is the most expensive disease group in Australia in terms of direct health-care expenditure. In 2004–05 it cost \$5.94 billion—11% of overall recurrent health system expenditure that could be allocated to various diseases (AIHW 2008a).

Coronary heart disease

Coronary heart disease (CHD), also known as ischaemic heart disease, is the most common form of heart disease. There are two 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. The chief symptom is a severe and continuous chest pain. In the most serious cases the person can collapse and die if the artery blockage cannot be corrected. Angina is a chronic condition in which short episodes of chest pain can occur periodically when the heart has a temporary deficiency in its blood supply. These episodes of angina occur when one of the heart's arteries is already significantly narrowed by plaque and cannot meet an extra demand for blood flow, such as with exercise or strong emotion.

Estimates of the burden of disease for 2010 indicate that CHD will be the leading specific cause of disease burden overall (9%), ahead of anxiety and depression (7%) and Type 2 diabetes (6%). Over 80% of the CHD burden is due to premature death.

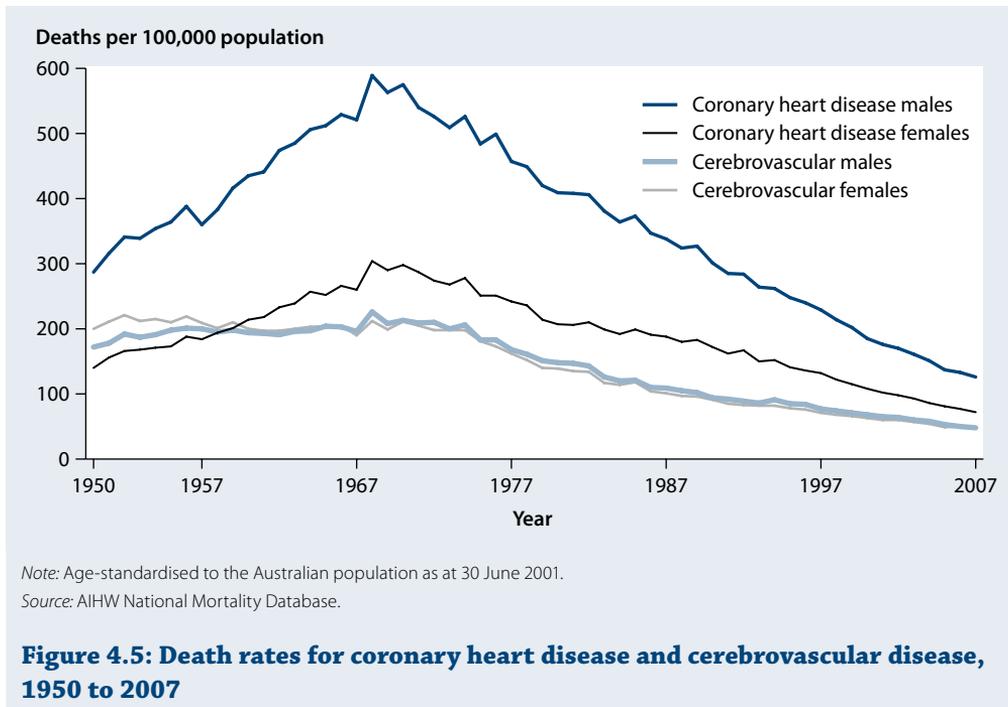
Based on the NHS, an estimated 684,800 Australians had a long-term condition of CHD in 2007–08—353,000 for angina and 449,000 for other ischaemic heart diseases or heart attack—note that a person may report more than one disease. The prevalence of CHD was nearly twice as high for males as for females, at 4.4% and 2.3% respectively. These differences remained after adjusting for differences in age structure.

The prevalence of CHD increases markedly with age. Based on self-reported information in the 2007–08 NHS, around 6.8% of Australians aged 55–64 years had long-term CHD but this increased to 19.9% among those aged 75 years and over.

While there are currently no reliable data on the incidence of CHD in Australia, a proxy measure which counts ‘major coronary events’ (acute myocardial infarctions (AMIs) or heart attacks) can be calculated from CHD deaths and non-fatal AMI hospitalisations (Jamrozik et al. 2001). It is estimated that both the rate of events and the proportion of people dying after a major coronary event have declined over the past decade (see Chapter 9).

CHD is a major cause of disability in Australia as well as of death. In the 2003 Survey of Disability, Ageing and Carers (SDAC), 1.5% of respondents reported one or more disabling conditions associated with CHD, corresponding to about 303,500 Australians. Of these, almost half (49%) needed help or had difficulties with self-care, mobility or communication.

As with CVD overall, death rates from CHD have fallen rapidly since the late 1960s (Figure 4.5). In the latest decade with available data (1998–2007), the age-standardised CHD death rate fell by around 40% for both males and females. These declines are due to both a reduction in heart attacks and better survival after an event.



Despite these gains, CHD remains the largest single cause of death in Australia, accounting for 22,727 deaths (16.5% of all deaths) in 2007. This is mainly due to deaths among older people, with three-quarters of all CHD deaths occurring among those aged 75 years and over, and less than 5% occurring among those aged under 55 years. The male age-standardised CHD death rate in 2007 (126.3 per 100,000 population) was almost 75% higher than the female rate (72.5).

Australia's CHD death rates compare favourably with those of countries such as the United Kingdom, the United States and New Zealand, but they are still almost 3 times as high as in Japan and 2.2 times as high as in France (OECD 2009).

Cerebrovascular disease

Cerebrovascular disease refers to any disorder of the blood vessels supplying the brain and its covering membranes. Most cases of cerebrovascular death are due to stroke. Stroke occurs when a blood vessel to the brain is suddenly blocked by a clot (an ischaemic stroke) or bleeds (a haemorrhagic stroke). This may result in part of the brain dying, leading to a loss of brain function or impairment in a range of activities including movement, thinking and communication, and it may also lead to death. Ischaemic strokes are more common, but haemorrhagic strokes have a higher fatality rate. There can also be temporary strokes (where symptoms disappear within 24 hours), known as transient ischaemic attacks.

This section uses the terms 'cerebrovascular disease' (ICD-10 codes I60–I69) and 'stroke' (ICD-10 codes I60–I64) in their strict meanings as explained above. However, sometimes others have used 'stroke' to mean the wider 'cerebrovascular disease', as shorthand. Thus, the figures presented here may not be comparable to those shown elsewhere.

Cerebrovascular disease is projected to be the sixth leading specific cause of disease burden overall in 2010 (4% of overall burden). Around 70% of the cerebrovascular disease burden comes from premature death.

An estimated 60,000 stroke events occur in Australia every year—one about every 10 minutes (NSF 2010). Most of these (70%) are first-ever strokes (AIHW 2004). Based on self-reported data from the 2003 SDAC, 346,700 Australians in 2003 had had a stroke at some time in their lives. This estimate includes residents in cared accommodation, such as hospitals, hostels and nursing homes, as well as in private dwellings.

The latest estimates of stroke prevalence can be derived from the 2007 SMHWB (ABS 2008). It should be noted when interpreting estimates based on this survey, however, that the scope is smaller than that of the SDAC, being restricted to people aged 16 to 85 years of age and only to residents of private dwellings. This survey indicates that an estimated 322,540 people aged 16–85 years in 2007 had had a stroke at some time. Of those who reported having had a stroke, 72% were aged 60–85 years and almost all the remainder were aged 40–59 years.

Stroke is a significant cause of disability. From the SDAC, about 282,600 persons had a disability in 2003 along with a history of stroke, representing 7% of all people with disability. In about half of these cases, the disability was mainly attributed to the stroke. Stroke survivors with disability were much more likely to have a profound core activity limitation than the average person with disability (AIHW: Senes 2006). This means that the person is unable to achieve, or always needs help with, communication, mobility or self-care.

Estimates from the 2007 SMHWP indicate that 42.5% of people who had had a stroke also had a disability resulting in a mild to profound core activity restriction. As with the SDAC, stroke survivors with a disability were much more likely to report a severe or profound core activity limitation (50.3%) than the average person with disability (29.1%).

Cerebrovascular disease accounted for 11,491 deaths (8.3% of all deaths) in 2007. Stroke (8,623 deaths) and its resulting disorders (2,398) accounted for 96% (11,021) of these deaths. Most of the deaths from cerebrovascular disease (83.9%) occurred among those aged 75 years or over. While a higher number of females died from cerebrovascular disease than males (6,975 compared with 4,516 in 2007), the age-standardised death rate was slightly higher among males (48.4 per 100,000 population compared with 47.6), reflecting the higher death rates for males in most age groups except the very oldest.

As with overall CVD and coronary heart disease, Australia's mortality from cerebrovascular disease has been declining since the early 1970s (Figure 4.5). Age-standardised death rates for cerebrovascular disease fell by 34.2% (males) and 30.3% (females) over the period 1998–2007.

In 2004, cerebrovascular death rates in Australia were low compared with other OECD (Organisation for Economic Co-operation and Development) countries such as Hungary, Portugal, Italy and the United Kingdom, but they were 1.4 times as high as in Switzerland, which had the lowest rates overall, and slightly higher than the rate in the United States (OECD 2009).

Heart failure and cardiomyopathy

Heart failure occurs when the heart functions less effectively in pumping blood around the body. It can result from a variety of diseases and conditions that impair or overload the heart, notably heart attack, high blood pressure, a damaged heart valve or various forms of cardiomyopathy. It usually develops slowly, often over many years. People with mild heart failure may have few symptoms, but in more severe cases it can result in chronic tiredness, reduced capacity for physical activity and shortness of breath.

Cardiomyopathy refers to when the entire heart muscle or a large part of it is weakened due to various causes, which include viral infections and severe alcohol abuse. The heart can become enlarged, thickened or dilated. Symptoms include shortness of breath, fatigue, lethargy, palpitations and sometimes chest pains.

Based on 2007–08 NHS self-reports, 277,800 Australians (1.4% of the population) had heart failure or oedema (swelling, which can be a sign of heart failure when it occurs in the lower legs). Around 64% of those with the disease were females, with a prevalence of 1.7% compared with 1.0% for males. The estimated prevalence of heart failure or oedema increased with age from 2.6% in people aged 55–64 years to 8.2% in those aged 75 years and over.

Heart failure and cardiomyopathy accounted for 4,055 deaths in 2007. However, due to the nature of these diseases, they are more likely to be listed as an associated cause of death rather than an underlying cause (see Section 2.6 for more information about underlying and associated causes of death). In 2007, heart failure or cardiomyopathy was the underlying or associated cause of death in 19,967 cases. Most of these deaths occur among people aged 75 years and over (80.9% where it was as an underlying cause and 83.5% where it was recorded as any cause of death in 2007).

More females than males die of heart failure and cardiomyopathy because they generally live longer than males. However, the age-standardised death rate from these diseases is higher for males than females (99.2 deaths per 100,000 population compared with 72.4 for females, based on combined underlying and associated cause of death). Heart failure occurs frequently as an associated cause when the underlying cause of death is kidney failure, coronary heart disease, diabetes or chronic lower respiratory disease.

In recent years there has been a major decline in mortality from heart failure and cardiomyopathy in Australia. Age-standardised death rates for heart failure as an underlying or associated cause of death fell by 26.0% between 1998 and 2007. The decline was similar for males and females. It is not clear whether this trend reflects a fall in the incidence of heart failure as a result of reduced incidence of coronary heart disease or improved care of people with coronary heart disease, or better management of people with heart failure resulting in reduced case-fatality.

Acute rheumatic fever and chronic rheumatic heart disease

Both acute rheumatic fever and rheumatic heart disease are preventable causes of ill health and death. They are particularly a problem in the Indigenous Australian population of northern and central Australia. Acute rheumatic fever is a delayed complication of untreated throat infection with Group A *Streptococcus* bacteria, but may also follow streptococcal skin sores. The infection and illness occur mainly in children and young adults. Rheumatic heart disease is caused by the long-term damage done to the heart muscle or heart valves by acute rheumatic fever. Acute rheumatic fever is believed to be under-reported, partly because it is difficult to diagnose (AIHW: Field 2004).

In 2007, there were 255 deaths with acute rheumatic fever and rheumatic heart disease recorded as the underlying cause of death. They were mentioned as an associated cause of death on another 399 death certificates. The death rates for Indigenous Australian males and females from rheumatic heart disease are far higher than for other Australians (see Box 5.3).

Use of health services

The treatment and care of people with CVD covers a variety of settings and types of care. This section presents data on the care provided by GPs, hospitalisations and the use of medicines. It should be noted that the type and level of treatment for CVD will depend on a number of factors, including the severity of the disease, patient preferences and their ability to access care, and the capacity of the health system to provide different levels of care.

Visits to general practitioners

GPs play an important role in identifying and managing people at risk of CVD, as well as in treating people living with CVD.

CVD is a major reason for people going to see their GP. Based on a survey of 95,898 GP encounters, collected from 953 GPs in Australia in 2007–08, it was the third most common group of problems managed at GP-patient encounters, behind respiratory diseases and general or unspecified conditions (Britt et al. 2008a). CVD accounted for 11.6% of the problems managed by GPs in 2007–08. Within the CVD group of diseases, the most common problem managed was hypertension (high blood pressure), followed by cardiovascular check-up, coronary heart disease and atrial fibrillation/flutter.

Overall, GPs managed cardiovascular problems at a rate of 17.6 per 100 encounters with their patients in 2007–08. Hypertension (high blood pressure) was the problem most commonly managed overall by GPs in 2007–08, at a rate of 9.9 per 100 encounters. Lipid disorders (abnormal blood levels of cholesterol or related substances) were also a common problem managed by GPs (a rate of 3.4 per 100 encounters).

In 2007–08, the proportion of GP encounters where CVD was managed increased substantially with age, but with some levelling off for the oldest age group. Among females, 79% of encounters involving CVD care were for those aged 55 years or more. Males in the 25–64 year age groups had significantly higher rates of GP encounters for CVD problems than females. There was no significant difference in the other age groups (Table 4.4).

Table 4.4: Cardiovascular disease problem rates, April 2007 to March 2008

Age group (years)	Males		Females	
	Problems per 100 encounters	95% CIs ^(a)	Problems per 100 encounters	95% CIs
18–24	1.81	1.19–2.44	1.71	1.29–2.13
25–34	4.85	4.03–5.67	2.95	2.51–3.4
35–44	11.37	10.16–12.58	6.82	6.11–7.53
45–54	21.88	20.45–23.31	15.63	14.6–16.66
55–64	30.81	29.1–32.52	26.88	25.47–28.29
65–74	37.60	35.8–39.39	35.87	34.16–37.57
75 and over	37.98	36.04–39.91	39.17	37.49–40.85

(a) Confidence intervals (CIs) are computed for a level of certainty of 95% that the estimated rates vary within the limits of these intervals.

Source: AIHW analysis of BEACH survey of general practice.

Between 1998–99 and 2007–08, there were significant increases in the management rate of hypertension (from 8.3 problems managed per 100 GP encounters to 9.9) and lipid disorders (from 2.5 to 3.7) (Britt et al. 2009).

Hospitalisations

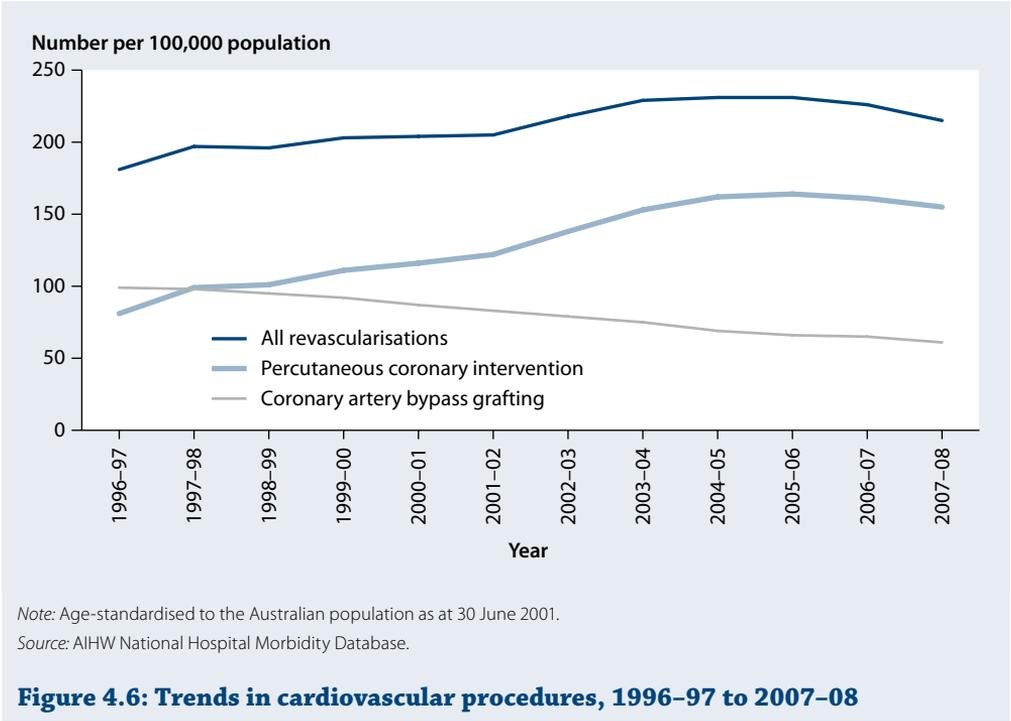
CVD was the principal diagnosis for 475,200 hospitalisations (6.0% of all hospitalisations) in 2007–08. Of these, 34.0% were due to coronary heart disease, 10.4% to heart failure or cardiomyopathy, 7.4% to stroke, 3.1% to transient ischaemic attacks and 0.6% to acute rheumatic fever and chronic rheumatic heart disease. CVD was also recorded as an additional diagnosis in a further 796,500 hospitalisations in that year.

The number and the rate of hospitalisations for CVD increase rapidly with age, with those aged 55 years and over accounting for 78% of hospitalisations. The rate of hospitalisations for CVD is higher for males than females at all ages. The age-standardised rate for males in 2007–08 (2,598 per 100,000 population) was 1.6 times that for females (1,651).

The rate of hospitalisations with CVD as the principal diagnosis has been slowly declining over the past decade. The age-standardised rate declined from 2,337 per 100,000 population in 1998–99 to 2,099 in 2007–08.

Despite this trend in hospitalisations, the number of hospital procedures to diagnose and treat people with CVD has continued to increase. Prominent among these are coronary angiography, percutaneous coronary interventions (PCIs) and coronary artery bypass grafting (CABG). (See Box 4.4 for a description of these procedures.)

Over the period 1996–97 to 2007–08, the rate of PCI procedures almost doubled from 81 to 155 per 100,000 population. In contrast, the rate of CABG procedures declined from 99 to 61 per 100,000 population (Figure 4.6). However, for the first time, the combined rate of these ‘revascularisation’ procedures declined over the period from 2005–06 to 2007–08.



Box 4.4: Main procedures used for coronary heart disease

Coronary angiography (also known as coronary arteriography) gives a picture of the heart's arteries, known as the coronary arteries, to find out if and where the coronary arteries are narrowed or blocked. A catheter is inserted into an artery, usually in the groin, then guided back to the heart, where a special dye is injected into the coronary arteries before X-rays are taken. The resulting X-ray images provide detailed information about the health of the heart and arteries. This is an important diagnostic test that medical professionals use to plan treatment options.

Percutaneous coronary interventions (PCIs) are used to restore adequate blood flow to blocked coronary arteries. There are two types of procedure used: (a) coronary angioplasty without stent; and (b) coronary stenting. In coronary angioplasty a small balloon is placed inside the coronary artery at the place of blockage, then it is opened out to clear the blockage. Coronary stenting is similar but involves stents (expandable mesh tubes) that are inserted into the affected part of the artery, expanded and then left there to keep it open.

Coronary artery bypass grafting (CABG) is a surgical procedure using blood vessel grafts to bypass blockages in the coronary arteries and restore adequate blood flow to the heart muscle. The surgery involves taking a blood vessel from the patient's leg, arm or inner chest and using it to attach to vessels on the outside of the heart in order to bypass a blocked artery.

Use of medicines

Most people with cardiovascular conditions need medicines to treat them—61.9% of the people who reported a cardiovascular condition in the 2007–08 NHS also reported using medicines for it (ABS 2009a).

In 2007–08 there were over 70 million government-subsidised prescriptions for medicines used to prevent or treat CVD, dispensed to over 3.8 million patients. This is an increase of 8.2% in the number dispensed in 2004–05. It should be noted that these figures refer only to those CVD medicines subsidised through the Pharmaceutical Benefits Scheme (PBS) or the Repatriation Pharmaceutical Benefits Scheme (RPBS). Not all patients are eligible to receive a subsidy for all medicines through these schemes. In addition, medicines are available under other schemes (such as the S100 scheme for Indigenous people in remote regions) and other arrangements (such as for admitted patients in hospital).

The most common government-subsidised prescriptions for CVD medicines in 2007–08 were for renin-angiotensin system agents (used to reduce high blood pressure) and lipid-reducing agents (commonly prescribed to control blood cholesterol levels) (Table 4.5). The number of prescriptions for lipid-reducing agents increased by 27.2% between 2004–05 and 2007–08, while prescriptions for antithrombotic medicines (used to prevent or dissolve blood clots) increased by 20.9% (AIHW 2010a).

Table 4.5: Medicines for cardiovascular conditions subsidised through the PBS and RPBS^(a), 2007–08

ATC	Number of patients	Number of prescriptions dispensed
Antithrombotic medicines	1,096,571	7,191,285
Cardiac therapy medicines	569,958	3,531,732
Antihypertensive medicines	173,854	846,068
Diuretic medicines	695,839	2,479,389
Peripheral vasodilators	572	2,633
Beta-blocking agents	838,427	5,854,199
Calcium-channel blocking agents	883,733	7,657,120
Renin-angiotensin system agents (ACE inhibitors)	2,091,499	20,853,697
Serum-lipid-reducing agents	2,310,334	21,853,719
Total	3,843,268 ^(b)	70,269,842

ATC Anatomical Therapeutical Chemical classification.

(a) Excludes those prescriptions and patients with a missing or invalid pin number.

(b) The total is not the sum of each type of medication as patients may be on more than one medication.

Source: AIHW 2010a.

The figures on prescriptions provided above reflect both the large numbers of Australians at risk of or with CVD and the chronic nature of the disease: once people start on these medicines, they usually need to use them for life. However, many people stop taking medicines—in an analysis of adherence to prescribed cardiovascular medicines, 10–25% had discontinued their medicines at 6 months from the start of therapy, rising to 21–47% at 24 months (AIHW: Senes & Penm 2007). The reasons for this may include cost, medicine side effects, treating conditions with no symptoms, patients not understanding their condition or the benefits of treatment, and the complexity of therapy.

4.3 Diabetes

Diabetes mellitus (diabetes) is a chronic condition marked by high levels of glucose in the blood. This condition is caused by the inability to produce insulin (a hormone produced by the pancreas to control blood glucose levels), the insulin that is produced becoming less effective, or both (WHO 1999). Diabetes is on the rise in Australia and across the world, and some authors refer to it as an epidemic (Barr et al. 2006; Colagiuri et al. 2006; Colagiuri et al. 2005). The increase in the number of people with diabetes is thought to be intertwined with Australia's marked increase in the prevalence of obesity (Colagiuri et al. 2006). See Chapter 3 for information on obesity trends.

If left undiagnosed or poorly controlled, diabetes can lead to a range of complications including coronary heart disease, peripheral vascular disease, stroke, diabetic neuropathy (nerve disease), kidney failure, limb amputations and blindness (IDF 2006). Together with these complications, diabetes places a large burden on individuals with the condition, their families and the community (Begg et al. 2007).

There are several types of diabetes with different causes and clinical histories. The three main types are Type 1, Type 2 and gestational diabetes (Box 4.5).

Box 4.5: Main types of diabetes

Type 1 diabetes is an auto-immune condition that mainly occurs in children or young adults, although it can occur at any age. It is marked by the inability to produce any insulin and those affected need insulin replacement for survival. Type 1 diabetes is thought to be triggered by a combination of genetic and environmental factors, and currently there is no known way to prevent the disease. Type 1 accounts for around 10–15% of all diabetes cases.

Type 2 diabetes is the most common form of diabetes, occurring mostly in people aged 50 years and over, and accounting for 85–90% of all cases. Although still uncommon in childhood, Type 2 diabetes is becoming increasingly recognised in that group. People with Type 2 diabetes produce insulin but may not produce enough or cannot use it effectively. Type 2 diabetes may be managed with changes to diet and exercise, oral glucose-lowering drugs, insulin injections or a combination of these.

Gestational diabetes is a form of diabetes that develops during pregnancy in some females. It involves higher blood sugar levels appearing for the first time during pregnancy in females not previously diagnosed with other forms of diabetes. This type of diabetes is short-term and, although it usually disappears after the baby is born, can recur in later pregnancies. Gestational diabetes is also a marker of increased risk of developing Type 2 diabetes later in life. Some cases of gestational diabetes are managed with changes to diet and exercise, and some require insulin treatment.

Risk factors differ by type of diabetes. Type 1 diabetes is believed to be caused by particular biological interactions and exposure to environmental agents among genetically predisposed people (Atkinson & Eisenbarth 2001). For Type 2 diabetes, strong risk factors include age, having a family history of the condition and certain ethnic backgrounds, such as Southern Asian, Middle Eastern, Polynesian, or Aboriginal and Torres Strait Islander. While these risk factors cannot be changed, there are also a number of modifiable risk factors for Type 2 diabetes—notably obesity, physical inactivity and an unhealthy diet (Shaw & Chisholm 2003). Therefore, Type 2 diabetes is highly preventable. The metabolic syndrome—the clustering of a number of risk factors including abdominal obesity, abnormal blood glucose levels, raised blood pressure and abnormal blood lipids—substantially increases the risk of Type 2 diabetes (Chew et al. 2006). The risk factors for gestational diabetes are similar to those for Type 2 diabetes, with females being at higher risk of the condition if they are obese or aged over 30 years when pregnant (Virjee et al. 2001).

Incidence

Because Type 2 diabetes usually has no clear-cut beginning and is often under-diagnosed, it is difficult to estimate how frequently it is arising each year and if this incidence is increasing. However, good information on the incidence of Type 1 diabetes is available from the National Diabetes Register (NDR; see Box 4.6). The register also provides information on other types of diabetes but only for the cases where insulin is used to treat the disease. In 2007, 987 new cases of Type 1 diabetes in children aged under 15 years were recorded (AIHW 2009c). This equates to an annual incidence of 24.2 cases per 100,000 children (around 1 in 4,000) and represents a 30% increase in the rate of new cases compared

with that in 2000 (19.1 per 100,000 population). This increase in the incidence of Type 1 diabetes in Australian children is consistent with international trends (DIAMOND Project Group 2006) as well as with the findings of previous Australian studies (Chong et al. 2007; Haynes et al. 2004; Taplin et al. 2005).

The NDR also records new cases of Type 1 diabetes among adults. In 2007, there were 443 new cases of Type 1 diabetes in people aged 15–24 years, equating to an incidence rate of 15.1 cases per 100,000 population. A further 489 (10.9 cases per 100,000) and 437 (4.6 cases per 100,000 population) occurred in people aged 25–39 years and 40 years and over respectively.

Box 4.6: National Diabetes Register

The National Diabetes Register (NDR) is a confidential database established in 1999 to collect information about new cases of insulin-treated diabetes—that is, all new cases of Type 1 diabetes and all other new cases of individuals needing insulin treatment, whether Type 2, gestational or other types of diabetes. The register is operated by the Australian Institute of Health and Welfare, using data from the National Diabetes Services Scheme and the Australasian Paediatric Endocrine Group.

The NDR holds diabetes-related information on all cases for which the insulin treatment began on or after 1 January 1999, and who have consented to be included. The register aims to cover all new cases of Type 1 diabetes since 1999 because they all require insulin treatment. However, not all Type 2 and gestational diabetes cases require insulin treatment so those that do not are excluded from the register.

For children aged 0–14 years, the NDR receives information about new cases of insulin-treated diabetes from two sources, providing reliable estimates of Type 1 diabetes incidence in this age group, with an estimated coverage rate of 97%. With ethics approval, researchers are able to use the register as an important source for clinical and population studies of the causes, complications and patterns of diabetes.

Of the people who were registered on the NDR between 2000 and 2007, around 69% were found to have Type 2 diabetes and 15% Type 1. At diagnosis, 65% of registrants were aged 45 years or over and 10% were aged under 25 years (AIHW 2009c).

Between 2000 and 2007, an estimated 128,400 Australians began using insulin to treat their Type 2 diabetes. This estimate does not include people with Type 2 diabetes who are not using insulin to manage their diabetes.

Estimates of the incidence of gestational diabetes can be obtained from data on hospitalisations (AIHW: Templeton & Pieris-Caldwell 2008). During 2007–08, about 14,400 (5.0%) of females aged 15–49 years who gave birth in hospital had been diagnosed with gestational diabetes, with more than one-third of cases occurring among females aged 35 years and over. The incidence of gestational diabetes increased by more than 30% between 2000–01 and 2006–07, but the upward trend did not continue through to 2007–08.

Prevalence

There are three main sources of national data for monitoring diabetes prevalence in Australia. The first is the NHS, in which prevalence estimates are based on self-reported information. The second is the National Diabetes Services Scheme (NDSS) database, in which prevalence estimates are based on doctor- or nurse-certified diabetes status for people registering with the scheme. The third national source, the 1999–2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab study), estimated diabetes prevalence from measured blood glucose levels (Dunstan et al. 2001).

Measured data such as those collected in the AusDiab study can be used to estimate the total prevalence of diabetes, which includes those with diagnosed diabetes (also captured in the NHS and NDSS) and those who have not previously been diagnosed with the condition. The accuracy of self-reported data, such as those collected in the NHS, relies on respondents being aware of and accurately reporting their health status, and that of the certified diabetes status data from the NDSS relies on people visiting a doctor and voluntarily registering with the scheme. Undiagnosed cases of diabetes will not be counted in these data sources.

Although they do not capture total diabetes prevalence, the NHS and NDSS, which are updated regularly, provide recent information and are useful for producing trends on the prevalence of diagnosed diabetes in Australia (AIHW 2009d).

It is estimated that over 818,200 persons (4.0% of the population) in 2007–08 had been told by a doctor or nurse that they had diabetes (excluding those with gestational diabetes). The age-standardised rate of 3.8% is an increase from the age-standardised rate reported in the 2004–05 NHS (3.3%). Type 2 diabetes accounted for 88% of all people with diabetes, 10% reported Type 1, and 2% reported they did not know the type. Males had higher rates of diabetes than females (5% and 3% respectively) (ABS 2009b). The prevalence of diagnosed diabetes according to the 2007–08 NDSS is similar at 3.9% (AIHW 2009d).

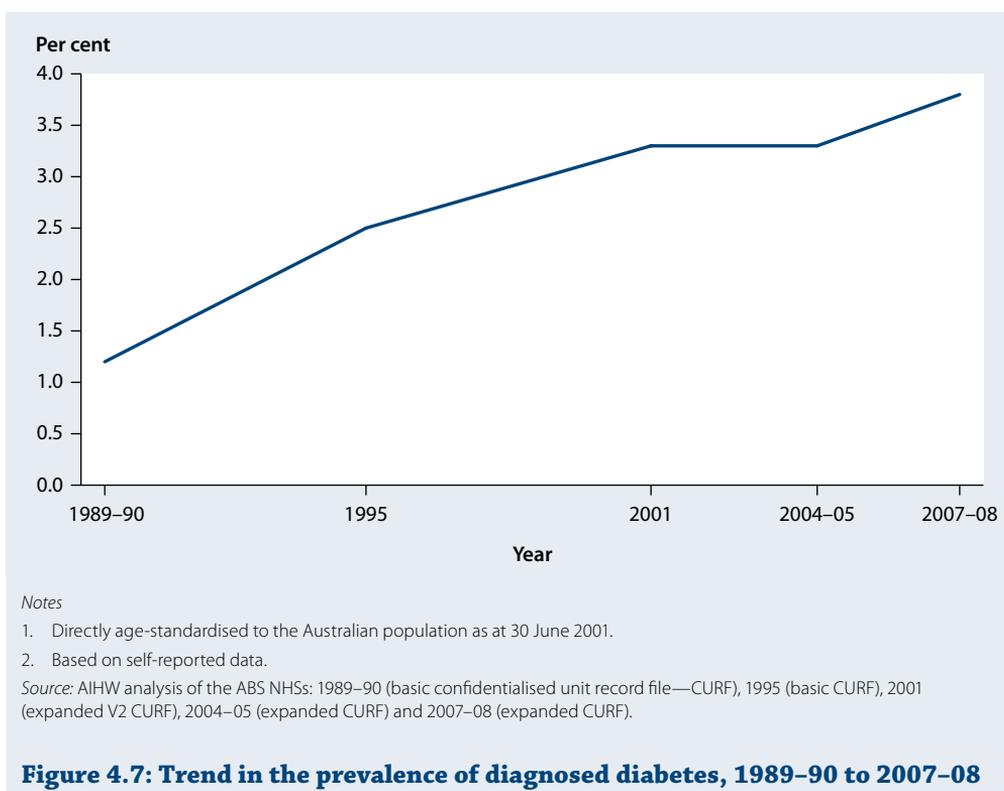
There are no current data available to estimate the prevalence of undiagnosed diabetes, with the most recent data coming from the 1999–2000 AusDiab study.

Population groups

Some population groups are at higher risk of diabetes than the general Australian population. Data from the 2007–08 NHS show that there are higher rates of diabetes reported among Australians born overseas (4.2%), the most socioeconomically disadvantaged fifth of the population (5.9%) and people living in outer regional, remote and very remote areas (4.1%) compared with the general Australian population (4.0%). Estimates from the 2004–05 National Aboriginal and Torres Strait Islander Health Survey showed that the age-standardised prevalence of diabetes among Indigenous Australians was nearly 3 times that of non-Indigenous Australians (11% and 4% respectively) (AIHW 2008b). This can be mostly attributed to Type 2 diabetes.

Trends

The prevalence of diagnosed diabetes based on self-reported information has trebled since 1989–90 (Figure 4.7). In 1989–90, it was estimated that nearly 193,000 (1.3%) Australians had diagnosed diabetes. This increased to more than 818,000 (3.9%) in 2007–08. Although an increase in the incidence of Type 2 diabetes is likely to have played a major role in these trends, rising awareness in the community, better detection and better survival may have also contributed to the increase.



Complications of diabetes

Diabetes complications can arise early in the course of the disease or develop over a number of years. Short-term complications are considered a medical emergency and may lead to coma and death in a short time. These include a condition known as diabetic ketoacidosis that can occur from a severe lack of insulin in those with Type 1 diabetes and another condition called hypoglycaemia (low blood glucose) that is a complication of insulin treatment. There is limited statistical information about short-term complications, although it has been found that 4.6% of Australians with diabetes who attended specialist diabetes services in 2006 had suffered at least one episode of severe hypoglycaemia in the previous 12 months (Flack & Colagiuri 2005).

Long-term complications include disease of the large blood vessels (macrovascular disease) that leads to conditions such as coronary heart disease, stroke and peripheral vascular disease; and disease of the small blood vessels (microvascular disease) that can cause chronic kidney disease (CKD), nerve damage and retinopathy (loss of vision).

Estimates from the 2007-08 NHS show that the prevalence rate of stroke among people with diabetes was 5 times the rate of those without diabetes. The prevalence of heart attack among people with diabetes was more than 10 times the rate among those without diabetes, and the rate of angina was around 3 times as high. Specific eye health problems such as glaucoma, cataract and blindness were also much more commonly reported by people with diabetes than by those without it (12, 16 and 19 times as high respectively).

Type 2 diabetes is the most common cause of severe kidney disease in Australia. In 2007, diabetic nephropathy was the primary reason for 713 Australians (representing 31% of all new cases) starting kidney replacement therapy (dialysis or kidney transplant) (McDonald et al. 2008). Ninety per cent of these cases were Type 2 diabetes. As well as being a cause of severe kidney disease, diabetes often occurs alongside it; that is, the two diseases are comorbid conditions. In 2007, 42% of Australians beginning kidney replacement therapy had diabetes and the majority had Type 2 diabetes (McDonald et al. 2008).

Disability and functioning

It is estimated from the 2003 SDAC that 56% of people with diabetes also had a disability. Of these, 42% had a profound or severe core activity limitation, indicating that they were unable to do, or always/sometimes needed help with, functions such as self-care, mobility and communication. Disability among people with diabetes was more common at older ages: 67% of those with diabetes aged 65 years and over reported a disability compared with 46% of those aged less than 65 years. Twenty-four per cent of people with diabetes and a disability reported that diabetes was the main condition causing their disability.

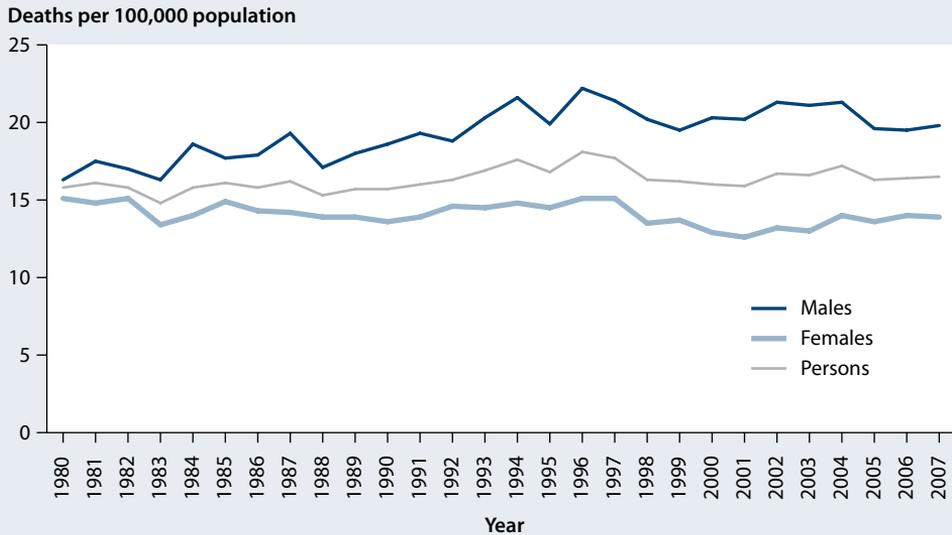
Mortality

A total of 13,101 deaths in Australia in 2007 were caused to some degree by diabetes (9.5% of all deaths). It was listed as the underlying cause of 3,810 deaths (2.8% of all deaths) and as an associated cause in 9,291 deaths (6.7% of all deaths).

Where diabetes was the underlying cause of death, common conditions listed as associated causes included coronary heart disease (in 64% of cases), kidney-related diseases (32%), heart failure (19%) and stroke (17%). When diabetes was listed as an associated cause, coronary heart disease was the most common underlying cause of death (27% of cases), followed by stroke (7%), kidney-related diseases (2%) and heart failure (2%).

Between 1980 and 2007, the age-adjusted death rate from diabetes as an underlying cause increased by 4% from 15.8 to 16.5 per 100,000 population (Figure 4.8). This change was driven by diabetes death rates among males, which increased by 21% over the 27-year period: from 16.3 to 19.8 per 100,000 population. However, most of this increase was in the first half of the period, with rates remaining fairly stable since the mid-1990s. By contrast, the corresponding rate of diabetes deaths among females decreased by 8% over the same period: from 15.1 per 100,000 population in 1980 to 13.9 per 100,000 population in 2007.

The death rate for diabetes increases progressively with age: about 87% of people who died with diabetes as an underlying or associated cause of death in 2007 were aged 65 years or over. Males were more likely to die from diabetes as any cause of death than females, with age-standardised death rates of 78 and 50 per 100,000 respectively.



Note: Directly age-standardised to the Australian population as at 30 June 2001.

Source: AIHW National Mortality Database.

Figure 4.8: Death rates for diabetes as the underlying cause of death, 1980 to 2007

Burden of disease

Using a conservative estimate, diabetes is projected to be the sixth leading cause of burden of disease and injury in Australia in 2010, responsible for nearly 6.6% of the total disease burden. However, this estimate does not include the contribution of diabetes to coronary heart disease and stroke. When these effects are included, the burden attributable to diabetes increased from 5.5% to 8.3% in 2003 (Begg et al. 2007).

Type 2 diabetes is estimated to account for the great majority (94%) of the diabetes burden in 2010. The ranking of Type 2 diabetes as a cause of disease burden has increased over time: from sixth among the 20 leading causes of disease burden for both males and females in 1993 to second for males and third for females in 2010. Type 2 diabetes is projected to be the leading specific cause of disease burden by 2023 for males and second for females.

Use of health services

Diabetes is a complex and long-term condition that requires a variety of health services to manage it. The first aim of diabetes management is to prevent complications, mainly by maintaining normal blood glucose levels. The second is to detect and treat any complications early. This requires frequent attention and monitoring by patients, their doctors and other health professionals.

People with diabetes are therefore more likely than others to consult health professionals or use hospital services. Recent data suggest that the use of health services by those with diabetes is increasing. This may reflect the increasing number with diabetes, but may also reflect better management and increased awareness of the disease and its complications.

Visits to general practitioners

According to the 2007–08 Bettering the Evaluation and Care of Health (BEACH) survey, diabetes was the third most frequently managed chronic condition and represented 2.5% of all problems managed by GPs that year, at a rate of 3.9 per 100 encounters (Britt et al. 2008a). There has been a statistically significant increase in this rate since 1998–99, when the corresponding figure was 2.6 per 100 encounters (Britt et al. 2008b).

In 2007–08, GPs made 6.1 referrals to specialists and 5.3 referrals to allied health professionals for every 100 diabetes problems managed (Britt et al. 2008a). Of all referrals by GPs in this period, one in 200 (0.5%) were to diabetes educators.

Hospitalisations

Diabetes was the principal diagnosis for 92,740 hospitalisations in 2007–08 and an additional diagnosis for 575,511 hospitalisations. These 668,251 diabetes-associated hospitalisations accounted for 8.5% of all hospitalisations in that year. The rates increased with age, with 60% of such hospitalisations occurring among people aged 65 years and over.

Hospitalisation rates involving any diagnosis of diabetes increased by 58% between 2000–01 and 2007–08: from 19 to 30 hospitalisations per 1,000 persons. This increase is also apparent in the proportion of hospitalisations involving diabetes: in 2000–01 diabetes was a diagnosis in 6% of all hospitalisations and by 2007–08 this had risen to 8.5%. This increase is likely to be due to a number of factors, including increasing prevalence, changes in treatment patterns and the ageing of the population. There may also be some changes in how diabetes is recorded in hospital records.

As well as accounting for a large and increasing proportion of total hospitalisations, those involving any diagnosis of diabetes are likely to involve a longer stay in hospital. The average length of stay of diabetes-associated hospitalisations was 4.8 days in 2007–08, considerably longer than the overall average of 3.3 days. When diabetes was the principal diagnosis the average length of stay was 4.2 days, less than the average of 5.7 days when diabetes was an additional diagnosis.

The reasons for hospitalisation among people with diabetes are diverse. Cardiovascular diseases were the most common principal diagnoses for diabetes-related hospitalisations (6%). When diabetes was listed as the principal diagnosis, more than one-third (34%) of the cases were for eye complications of diabetes, followed by multiple complications (13%), and poor diabetes control and kidney complications (each 7%). When diabetes was listed as an additional diagnosis, multiple complications accounted for nearly half (48%) of the diabetes diagnoses.

International comparisons

Among the OECD countries (of which there are currently 30), Australia is estimated to have the seventh lowest prevalence of diabetes in 2010, with an estimated 5.7% of the population aged 20–79 years diagnosed with the condition (IDF 2009). On the other hand, the incidence of Type 1 diabetes among 0–14 year olds in Australia is estimated to be the sixth highest of all these countries, with around 22 new cases per 100,000 in 2010 (IDF 2009).

4.4 Chronic kidney disease

Chronic kidney disease is the occurrence of kidney damage and/or reduced kidney function, lasting at least 3 months. The kidneys continuously filter the bloodstream, clearing waste products and playing a vital role in controlling the body's level of water and various chemicals. They also produce certain essential hormones. CKD is categorised into five stages according to the level of reduced kidney function and evidence of kidney damage (see Box 4.7), such as blood or protein in the urine. Stage 5—end-stage kidney disease (ESKD)—is the most severe form of CKD, where kidney function deteriorates so much that kidney replacement therapy in the form of dialysis or kidney transplant is required to survive.

Many people do not know they have kidney disease because up to 90% of kidney function can be lost before symptoms appear. For this reason it is often called a 'silent killer'. Fortunately, simple tests of a person's urine and blood can identify most cases of CKD when the disease is in its early stages, enabling treatment to prevent or slow down the progression.

Box 4.7: Stages of chronic kidney disease

Stages of chronic kidney disease (CKD) are measured by the glomerular filtration rate (GFR), which is the amount of blood the kidneys clear of waste products in 1 minute. Because GFR cannot be measured directly, current practice is to estimate GFR (eGFR) by applying a formula based on age, gender and creatinine levels in the blood.

Stage 1: Kidney damage with normal kidney function (eGFR \geq 90)

Usually no symptoms but high blood pressure is more frequent than for patients without CKD.

Stage 2: Kidney damage with mild loss in kidney function (eGFR 60–89)

Most patients have no symptoms but high blood pressure is frequent.

Stage 3: Moderate loss of kidney function (eGFR 30–59)

Possibly no symptoms, or may experience an increased need to urinate during the night (nocturia), a mild feeling of being ill and loss of appetite. Common complications include high blood pressure, mineral and bone disorders, anaemia, sleep apnoea, restless legs, cardiovascular disease, malnutrition and depression.

Stage 4: Severe loss of kidney function (eGFR 15–29)

Symptoms are as for stage 3, plus nausea, itching skin, restless legs and shortness of breath. Common complications of this stage are also as for stage 3, along with electrolyte disturbances such as raised blood levels of phosphate and potassium and increased acidity of the blood.

Stage 5: End-stage kidney disease (eGFR $<$ 15 or on dialysis)

Symptoms are as for stage 4. Additional common complications include inflammation of the tissue layers surrounding the heart, bleeding in the gastrointestinal tract, altered brain function and structure, disturbances or structural or functional changes in the peripheral nervous system.

Source: Kidney Health Australia 2007.

CKD is preventable in many cases, with the most modifiable risk factors being tobacco smoking, overweight and obesity, high blood pressure and diabetes. If a person has multiple risk factors this can considerably increase their risk of developing CKD (AIHW 2005a). The leading cause of new cases of ESKD is diabetic nephropathy—a condition where consistently high blood sugar levels damage the blood-filtering capillaries in the kidneys. The next most common causes are glomerulonephritis—inflammation of part of the filtering units of the kidney—and high blood pressure.

CKD contributes considerably to the burden of disease in Australia (see Chapter 2 for an explanation of ‘burden of disease’). It can arise from a number of underlying causes, however, so the burden is often reported under these rather than grouped as CKD. For the year 2003, kidney failure accounted for 5.1% of YLL, 0.3% of YLD, and 2.6% of the total burden of disease (Begg et al. 2007). Any CKD burden not confined to kidney failure cannot currently be separately reported.

Incidence and prevalence

Estimating the incidence and prevalence of CKD and all its stages in Australia is difficult because it often goes undetected until the late stages. However, the incidence and prevalence of treated ESKD can be accurately determined using data from the Australia and New Zealand Dialysis and Transplant Registry (ANZDATA), which compiles data on the number of people receiving kidney replacement therapy (see later section on ‘Treatment of end-stage kidney disease’).

The best way to estimate the total prevalence of CKD is through surveys in which blood and urine are taken for measurement. The most recent national survey that collected such information was the 1999–2000 AusDiab. The study did not collect information that could be used to assess kidney function on two occasions three months apart, so its estimates may include some cases of acute kidney disease. Despite this, it provides the best prevalence estimate of diagnosed and undiagnosed CKD in Australia to date.

The AusDiab study found that a total of 16% of participants had at least one indicator of kidney damage (Atkins et al. 2004; Chadban et al. 2003). Over 1 in 7 (13.4%) Australians aged 25 years or over had some degree of CKD (AIHW 2009e) and more than half of these were in stages 3–5. Highlighting CKD’s relationship with age, 30% of those aged over 65 years had CKD stages 3–5.

Dialysis and transplant, known as kidney replacement therapy, are used to treat people with ESKD. Virtually all patients receiving this treatment are recorded on ANZDATA. Because not all people will be suitable candidates for kidney replacement therapy, and others may choose not to take it up, the numbers presented below will be an underestimate of the incidence and prevalence of ESKD among the whole community.

In 2007, just over 2,300 people began treatment for ESKD. Among these, males outnumbered females at almost twice the rate (13.8 per 100,000 population compared with 7.8 per 100,000 population). The rate of new patients increased with age, being highest among those aged 80–84 years for males (74 per 100,000) and 75–79 for females (35 per 100,000). The average age of patients beginning treatment has steadily and markedly increased over time—from 44.5 years in 1978 to 55.2 years in 1997, and to 60.2 years in 2007 (ANZDATA 1979; Disney et al. 1999; McDonald et al. 2008).

Between 2000 and 2007 the overall incidence of treated ESKD increased by 19%, from 9.2 to 10.6 per 100,000 population; however, most of this increase was between 2004 and 2007 (Figure 4.9). Changes over time in the incidence rate of treated ESKD vary between age groups, with much of the increase occurring in those aged over 65 years (AIHW 2005a). The reasons for this are complex, and the increasing prevalence of diabetes, the high prevalence of blood pressure in the past, and the reduced cardiovascular mortality are all possible contributors. In addition, treatment programs have been increasingly willing to accept older patients (Stewart et al. 2004).

In 2004, diabetic nephropathy became the leading cause of new cases of treated ESKD, overtaking glomerulonephritis (McDonald et al. 2008). Of the new cases of treated ESKD in 2007, the major underlying disease causes were diabetic nephropathy (31%), glomerulonephritis (25%) and high blood pressure (16%). Over the period 2000 to 2007 the number of new cases of ESKD attributed to diabetic nephropathy increased by two-thirds in those aged 55 years and over. Glomerulonephritis remains the major cause of ESKD in those aged less than 55 years (AIHW 2009e).

At the end of 2007, around 9,600 Australians were receiving kidney dialysis, of which 78% were receiving haemodialysis and 22% peritoneal dialysis. There were also just over 7,100 people living with a functioning kidney transplant, of which 615 had been transplanted in 2007 (McDonald et al. 2008).

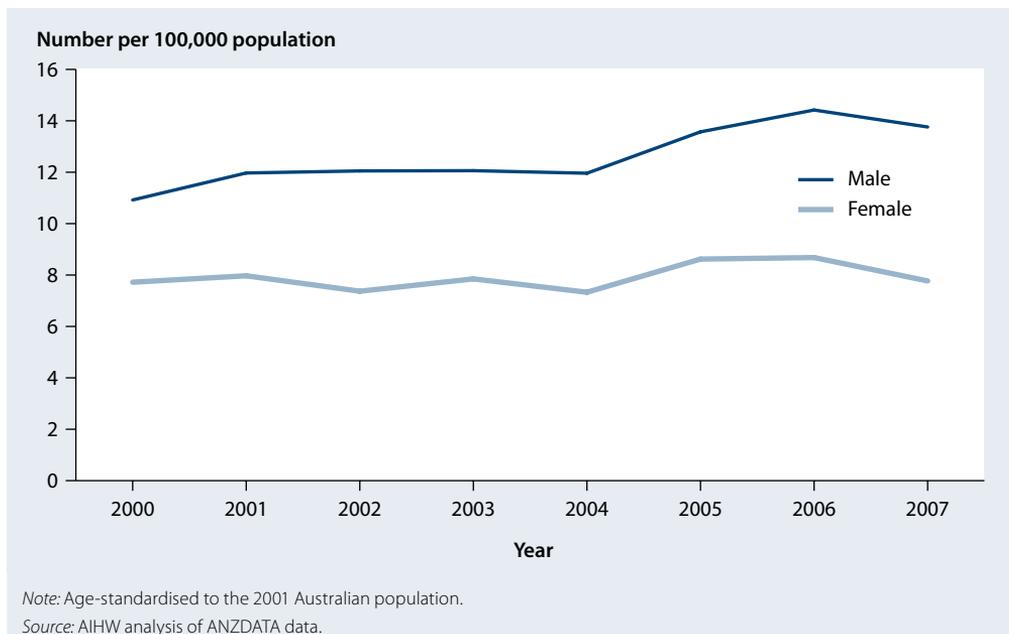
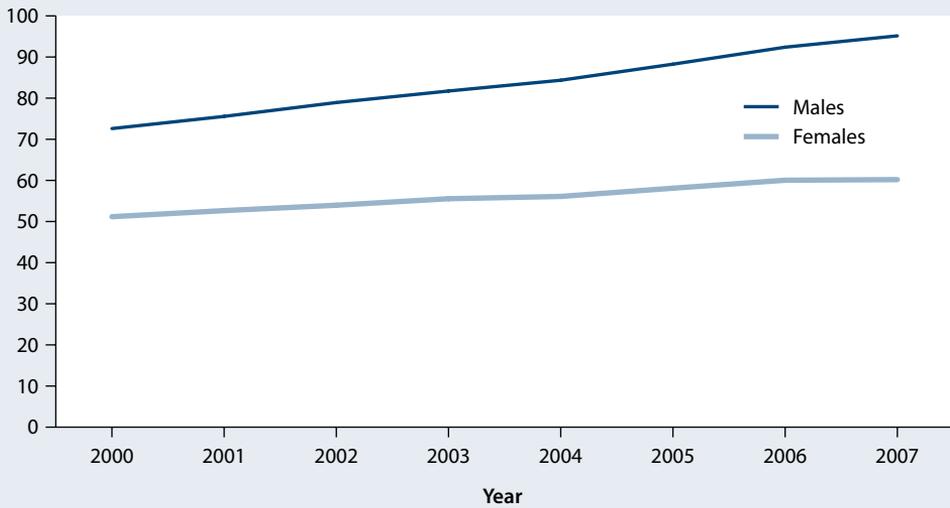


Figure 4.9: Trends in incidence of treated end-stage kidney disease, 2000–2007

The prevalence of people receiving dialysis or with a transplant increased significantly between 2000 and 2007 (Figure 4.10), particularly in males. The increase was 31% for males (from 73 to 95 per 100,000 population) and 19% for females (from 51 to 60 per 100,000). The age profile of people receiving treatment for ESKD highlights the higher prevalence of ESKD in older Australians (Figure 4.11), with the highest population rates being among those aged 65–84 years.

Number per 100,000 population

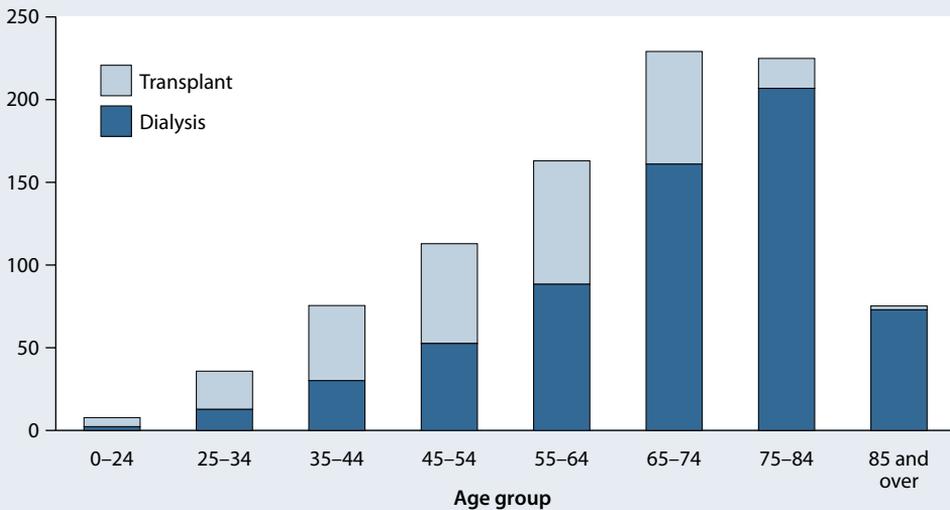


Note: Age-standardised to the 2001 Australian population.

Source: AIHW analysis of ANZDATA data.

Figure 4.10: Trends in prevalence of treated end-stage kidney disease, 2000–2007

Number per 100,000 population



Source: AIHW analysis of ANZDATA data.

Figure 4.11: Prevalence of people on dialysis or living with a functioning transplant, by age group, 2007

Deaths

CKD is a significant contributor to mortality in Australia. Those with the most severe stage of the disease will die within a matter of weeks without dialysis or transplant, and those with earlier stages of the disease are at increased risk of death from other causes such as CVD.

In 2007, CKD was recorded as contributing to over 13,000 (10%) of deaths, with 'chronic kidney failure' and 'unspecified kidney failure' the two leading types of CKD recorded as the underlying or associated cause. CKD was listed as the underlying cause in 23% of these deaths (1,367 male and 1,647 female). CVD and cancer were the two most common causes of death where CKD was recorded as an associated cause. The male and female mortality rates for CKD as the underlying cause of death remained relatively stable between 2000 and 2007.

ANZDATA collects information on the survival of people receiving kidney replacement therapy. For the period 2003–2005, the 3-year survival of patients receiving haemodialysis was 64%, changing little since 1994–1996. Conversely, there was some improvement in the survival of people receiving peritoneal dialysis, increasing from 54% to 64%. For people who have received a kidney transplant, survival outcomes are far more favourable. The most recent 5-year data for those who had a kidney transplant in 2001–2002 show a 90% survival outcome for deceased donor kidney transplants and a 95% survival for live donor kidney transplants. However, at least some of this extra survival is likely to be because patients that are eligible for transplants are healthier on average than others with ESKD (McDonald & Russ 2002).

Comorbidity

CKD often presents in combination with another disease. It can be caused by other diseases or be the cause of them. In particular, CKD is often caused by diabetes and this further increases the risk of cardiovascular events such as heart attacks. A number of risk factors for CKD also apply to other chronic diseases such as CVD and diabetes, and these conditions are in turn also risk factors for CKD.

Data from hospitals and death certificates illustrate this connection (Table 4.6). In 2007–08, 73% of hospital cases where CKD was involved also had a diagnosis of diabetes or CVD, and 42% had a diagnosis of all three. Additionally, 79% of deaths involving CKD in 2007 also had diabetes or CVD listed as a contributing factor, with 17% listing all three. It is important to note that there are some differences in coding practices for diabetes in hospital and mortality data (AIHW: Phillips 2003).

Table 4.6: Comorbidity of chronic kidney disease with cardiovascular disease and diabetes: hospitalisations and deaths (per cent)

	Hospitalisations 2007–08	Deaths 2007
CKD only	26.9	21.3
CKD and CVD (without diabetes)	24.7	58.3
CKD and diabetes (without CVD)	6.6	3.5
CKD, diabetes and CVD	41.8	16.9
Total CKD	100.0	100.0

Sources: AIHW National Hospital Morbidity Database; AIHW National Mortality Database.

Use of health services

Visits to general practitioners

GPs are the usual source of initial assessment and diagnosis of CKD. In 2008–09, CKD problems were managed at a rate of 5 per 1,000 GP encounters. This equates to just over 565,000 Medicare-paid GP consultations across Australia.

Hospitalisations

People with CKD, particularly those with ESKD, often require hospitalisation for treatment and management. The vast majority of hospitalisations are for regular (same-day admission) dialysis, which is the most common reason for hospitalisation in Australia. In 2007–08 there were nearly 987,000 hospitalisations for regular dialysis, 12.5% of all hospitalisations that year.

People with CKD are also hospitalised for other reasons besides dialysis. In 2007–08, there were almost 31,200 hospitalisations where CKD itself, not dialysis, was recorded as the principal diagnosis. In these cases the average length of stay was 4.4 days, above the average across all hospitalisations (excluding same-day admissions) of 3.2 days. Kidney tubulointerstitial diseases were the largest diagnosis group for CKD (7,230 hospitalisations) followed by diabetic nephropathy (6,141 hospitalisations), which also had the longest average length of stay (7.8 days).

Nearly 167,600 hospitalisations occurred in 2007–08 where CKD was recorded as an additional diagnosis. Principal diagnoses recorded for these hospitalisations included CVD (35,498), endocrine, nutritional and metabolic disorders—excluding diabetic nephropathy—(14,334), and respiratory diseases (14,321).

Information from ANZDATA shows that the number of patients receiving kidney dialysis has increased since 2000 and trends in hospitalisations for dialysis reflect this. Hospitalisations for CKD that do not involve dialysis have also been increasing. From 2000–01 to 2007–08, hospitalisations where CKD (excluding dialysis) was the principal diagnosis increased by 12% from 125 to 140 per 100,000 people. Hospitalisations where CKD was an additional diagnosis increased by 48% from 515 to 735 per 100,000 people.

Treatment of end-stage kidney disease

Over half (57%) of patients receiving haemodialysis in 2007 did so at specialised dialysis units known as satellite centres (these are still captured in hospital data), while 30% received it at a hospital and the remaining 13% performed haemodialysis at home. Since 2000, the number of people having haemodialysis markedly increased—from 4,670 to 7,536 in 2007. The number using peritoneal dialysis also increased in that period, from 1,739 to 2,106. However, over the same period the proportion using peritoneal dialysis steadily declined from 27% to 22% of the dialysis population, reflecting the larger increase in haemodialysis use.

Transplantation is considered the preferred option for kidney replacement therapy by patients and health-care professionals (Mathew et al. 2005). Kidney transplantation is not a cure for ESKD, however; recipients live with the possibility of chronic rejection and the loss of the donor kidney (CARI 2007).

As at 31 December 2007, around 14% of patients receiving dialysis were on the kidney transplant waiting list. A number of factors can prevent people from being considered for kidney transplantation in Australia. They include age, other health conditions beside CKD,

obesity, smoking, drug and alcohol abuse, or having a history of not taking appropriate medications while on dialysis (Ibels et al. 2009). The rate of organ donation in Australia is low compared with other developed countries, and the largest transplant waiting list by far is for a kidney transplant (ABS 2002a). Once a person is on the kidney transplant waiting list, their average waiting time for a deceased donor is around 3–4 years (Kidney Health Australia 2006). The more time spent on dialysis before transplantation the greater the subsequent risk of dying, and the smaller the survival rate of donor kidneys (CARI 2007).

About 56% of kidney transplants performed in 2007 were from a deceased donor and the great majority (93%) were for people aged under 65 years. Most people (89%) who received a transplant had previously been on dialysis, whereas transplantation was the first mode of replacement therapy for the other 11% (pre-emptive transplants).

Although the number of deceased donor transplants decreased slightly over the 20 years from 1987 to 2007, the number of kidney transplant operations each year increased by more than 50%. This is due to a more than sixfold increase over the period in the number of live donor transplants performed each year.

Prevention and early detection

As with many chronic conditions, a healthy lifestyle is the basis for preventing many types of CKD, as well as being an important part of managing the condition when it occurs. Behaviours such as maintaining a healthy weight, undertaking regular physical activity, eating a healthy diet and not smoking help to prevent CKD, as well as preventing and controlling other conditions such as diabetes and high blood pressure that can cause CKD (Tan & Johnson 2008).

Clinical guidelines recommend that people at increased risk of CKD undergo 12-monthly urine, blood pressure and eGFR testing (Thomas 2007). This includes people who: are aged over 50 years, have diabetes and/or high blood pressure, smoke, are obese, have a family history of kidney disease, or who are of Aboriginal and Torres Strait Islander descent (Kidney Health Australia 2007). Early detection of CKD can slow or prevent its progression to ESKD by providing patients with access to disease-specific and non-specific interventions (Thomas 2007). Once cardiovascular risk factors (hypertension, high cholesterol and so forth) are diagnosed, it is especially important to modify them because CKD is also a cardiovascular risk factor (Tan & Johnson 2008).

4.5 Mental health problems and illnesses

Mental illness comprises a wide spectrum of disorders with varying degrees of severity. Examples include anxiety, depression, bipolar disorders and schizophrenia. The effect of mental illness can be severe on the individuals and families concerned, and its influence is far-reaching for society as a whole. Social problems commonly associated with mental illness include poverty, unemployment or reduced productivity, violence and crime. Those with mental illness often experience human rights problems such as isolation, discrimination and being stigmatised (WHO 2003).

Prevalence

The 2007 SMHWB (see Box 4.8) estimated that 1 in 5 Australians aged between 16 and 85 years experienced one or more of the common mental disorders in the 12 months before the survey. These were mood disorders (such as depression), anxiety disorders and substance use disorders. An additional one-quarter of those surveyed, while not experiencing one of these disorders in the 12 months beforehand, had done so at some time in the past. Thus, 45% of respondents had experienced a mental disorder in their lifetime. This equates to 7,286,600 Australians aged 16 to 85.

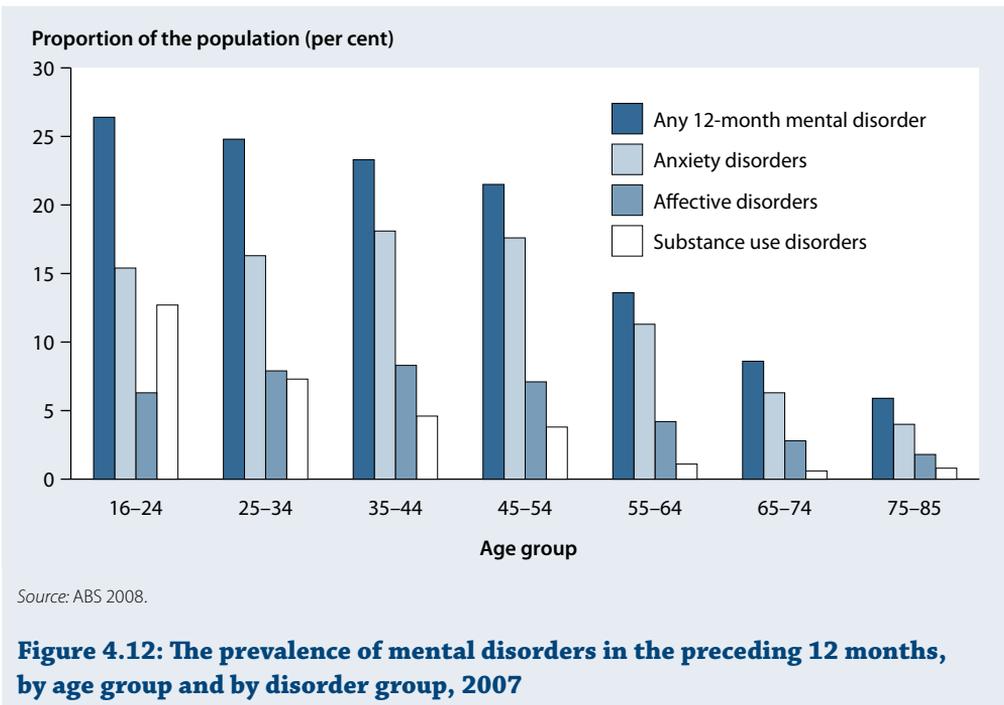
Box 4.8: Measuring the prevalence of mental health problems

Data on the prevalence of mental health problems used in this section come from two main sources:

- The second National Survey of Mental Health and Wellbeing was conducted by the Australian Bureau of Statistics (ABS) in 2007. This survey used the World Mental Health Survey Initiative version of the World Health Organization's Composite International Diagnostic Interview to identify persons aged 16 to 85 with a common ('high prevalence') mental disorder in the categories of affective (mood) disorders, anxiety disorders or substance use disorders. The survey also collected information on psychological distress using the Kessler Psychological Distress Scale-10 (K10). This is based on 10 questions about negative emotional states in the reference period (the 4 weeks before interview). Another measure was 'days out of role', used to assess the effect of mental and physical health conditions on people's ability to function in their day-to-day roles. This measure adds the number of days on which respondents were unable to work or carry out normal activities because of their health and half the number of days on which they had to reduce what they did because of their health.
- The ABS National Health Survey of 2007-08 included two measures of the prevalence of mental health problems. The first was self-reported information about long-term conditions that had been identified by a medical professional. The second was the K10.

Based on the 2007 SMHWB, the most common problems experienced at some time in the 12 months before the survey were anxiety disorders (14% of the population), affective (mood) disorders (6%) and substance use disorders (5%). (Note that some people have experienced more than one of these disorders so the sum of these prevalences is greater than the overall prevalence of 20% cited above.)

More than one-quarter (26%) of the youngest age group (16-24 years) had experienced a mental disorder in the preceding 12 months. Overall prevalence rates decreased as age increased (Figure 4.12). Anxiety disorders were the most common in all age groups. Substance use disorders were the least common, except in the 16-24 years age group where they were ranked second.



Comorbidity of mental disorders

People often experience more than one class of mental disorder at the same time: of those with a mental disorder at some time in the preceding 12 months in the SMHWB, one-quarter experienced two or more classes of disorder. The most common mental comorbidity is having both anxiety and affective disorders, especially for females, with nearly 4% of the females in the 2007 SMHWB experiencing this combination in the preceding 12 months, compared with 2% of males. On the other hand, nearly 2% of males experienced substance use disorders together with either anxiety or affective disorders, compared with 1% of females. Small percentages experienced all three classes of mental disorder in the 12 months before the survey—0.8% for males and 0.6% for females.

Mental disorders were more common among people with one of the chronic physical conditions recognised as NHPAs (diabetes, asthma, heart disease, stroke, cancer and arthritis) than for those without them (28% compared with 18%). This difference was higher for females than for males (Table 4.7).

Table 4.7: Age-standardised prevalence of mental disorders in the preceding 12 months in people with NHPA chronic physical conditions^(a), by sex, 2007

	Males	Females	Persons
	Per cent		
Any NHPA chronic physical condition	22.1	32.9	28.0
No NHPA chronic physical condition	16.4	19.0	17.6
Total population	17.9	22.6	20.3
	Ratio		
Rate ratio ^(b)	1.3	1.7	1.6

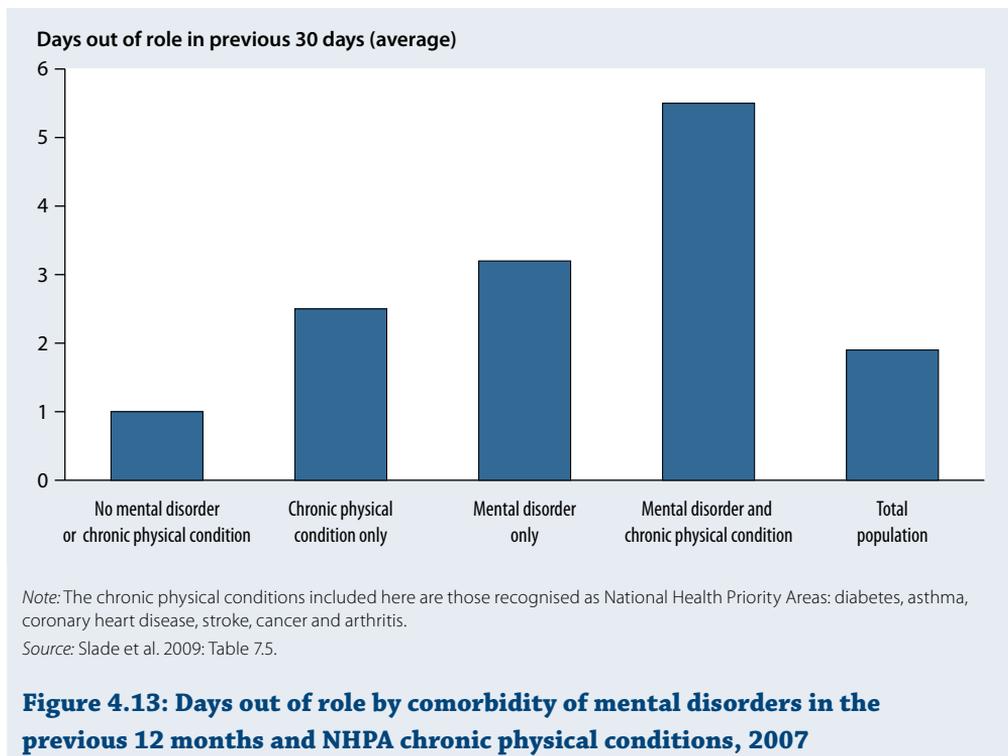
(a) The chronic physical conditions included here are those recognised as National Health Priority Areas: diabetes, asthma, coronary heart disease, stroke, cancer and arthritis.

(b) Ratio of rate for those with an NHPA physical condition to those without one.

Source: Reproduced from Slade et al. 2009: Table 7.4.

Days out of role

Figure 4.13 illustrates the effects of mental disorders and physical conditions on people's ability to function in their day-to-day activities. It shows the information from the 2007 SMHWB on days out of role (Box 4.8), according to whether respondents reported suffering a chronic physical condition, a mental disorder, neither, or both. Having either a physical condition or a mental disorder increased the number of days out of role, but having both greatly increased this effect.



Psychological distress and mental disorders

As would be expected, the 2007 SMHWB respondents with mental disorders in the preceding 12 months were much more likely to have high or very high levels of psychological distress (see Box 4.8) than those with no such disorder—30% compared with 4% (Slade et al. 2009). Those with affective disorders were much more likely to have high or very high psychological distress levels (52%), followed by those with anxiety disorders (33%) and those with substance use disorders (25%).

Based on information in the 2007–08 NHS, an estimated 3.5% of Australians aged 18 years and over had very high levels of psychological distress in that year (Table 4.8). Earlier NHS estimates were similar—3.6% in 2001 and 3.8% in 2004–05.

Table 4.8 shows that the proportion of females with very high levels of distress was significantly higher than for males. The surveys also show that, overall, females are more likely to have psychological distress than males.

Table 4.8: Prevalence of very high psychological distress^(a) in adults, 2001, 2004–05 and 2007–08 National Health Surveys (per cent)

Year	Age group						Total
	18–24	25–34	35–44	45–54	55–64	65 or over	
Males							
2001	2.7	2.1	2.5	3.7	3.6	1.9	2.7
2004–05	3.3	2.3	3.4	4.0	4.6	2.9	3.3
2007–08	1.2*	2.7	2.7	4.0	3.4	2.6*	2.8
Females							
2001	5.4	4.6	4.2	5.5	3.6	3.2	4.4
2004–05	3.5	3.5	5.1	5.5	4.3	3.5	4.3
2007–08	4.3*	4.2	4.0	4.8	4.9	2.8*	4.1
Persons							
2001	4.0	3.4	3.4	4.6	3.6	2.6	3.6
2004–05	3.4	2.9	4.3	4.8	4.4	3.2	3.8
2007–08	2.7	3.4	3.4	4.4	4.2	2.7	3.5

* Estimate has a relative standard error of between 25% and 50% and should be used with caution.

(a) Measured using the Kessler Psychological Distress Scale—10 items (K10). Persons with scores of 30 to 50 are rated as having a very high level of psychological distress on the K10 scale of psychological distress.

Note: Totals are age-standardised to the Australian population as at 30 June 2001.

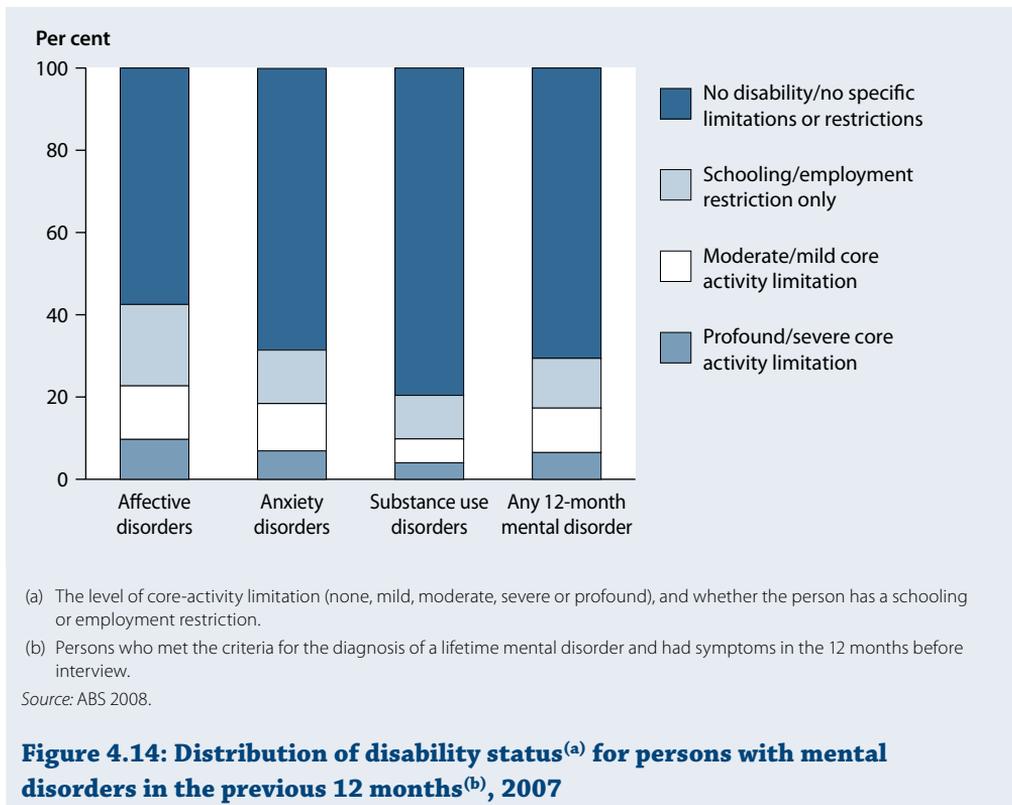
Sources: ABS 2002b; 2006; 2009a.

Psychiatric disability

As suggested by the finding on days out of role, many people with mental health problems are effectively disabled in their day-to-day functions. Based on the 2003 ABS SDAC, the prevalence of psychiatric disabling conditions was estimated at 5.2% of the Australian population in 2003, around 1 million people.

Almost half (48.4%) of those with a psychiatric disability had a severe or profound core activity limitation—that is, they sometimes or always needed help with self-care, mobility or communication activities. The estimated proportion of such females in the population was higher than for males (3.0% and 2.0% respectively).

More recently, the 2007 SMHWB has shown that 6.5% of respondents with a mental disorder in the previous 12 months had a profound or severe core activity limitation and a further 11% had a moderate or mild core activity limitation. Another 12% experienced a schooling or employment restriction. Overall, nearly 30% experienced some degree of limitation or restriction. This equates to a population estimate of 940,000 people having a mental disorder at some time in the previous 12 months together with some degree of functional limitation or restriction—roughly similar to that from the earlier (SDAC) survey, even though the surveys' methods were different. In line with the findings about mental disorder and psychological distress, disability is greatest for those experiencing affective disorders in the previous 12 months (42.5%) and lowest for those experiencing substance use disorders in the previous 12 months (20.4%) (Figure 4.14).

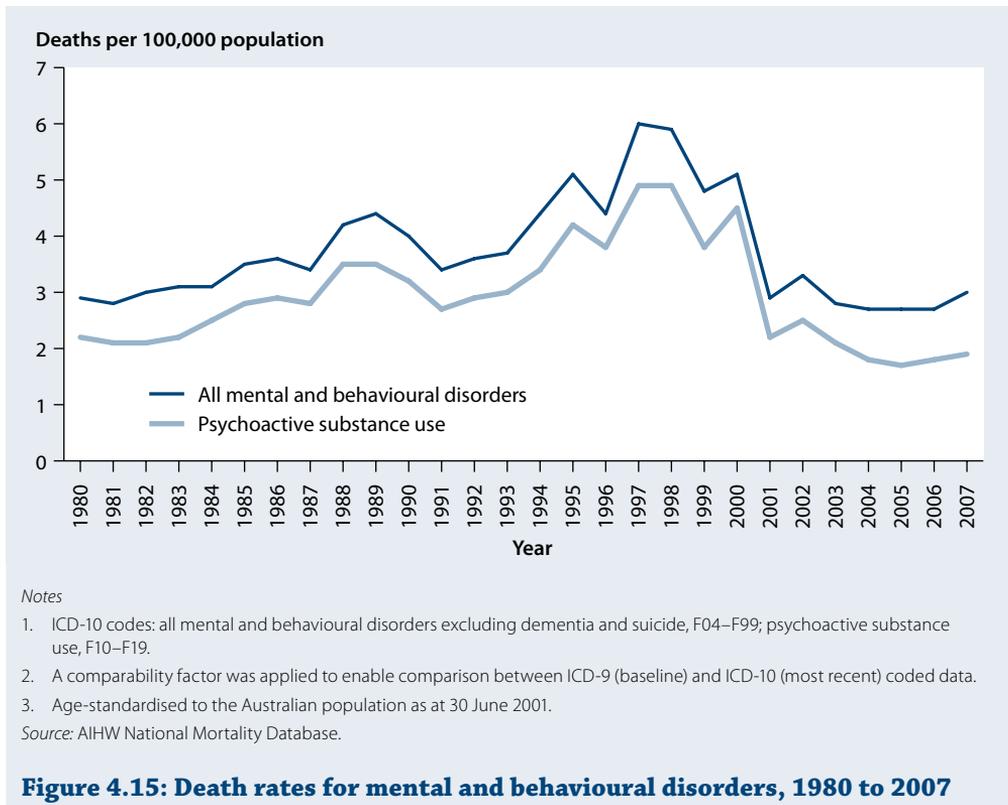


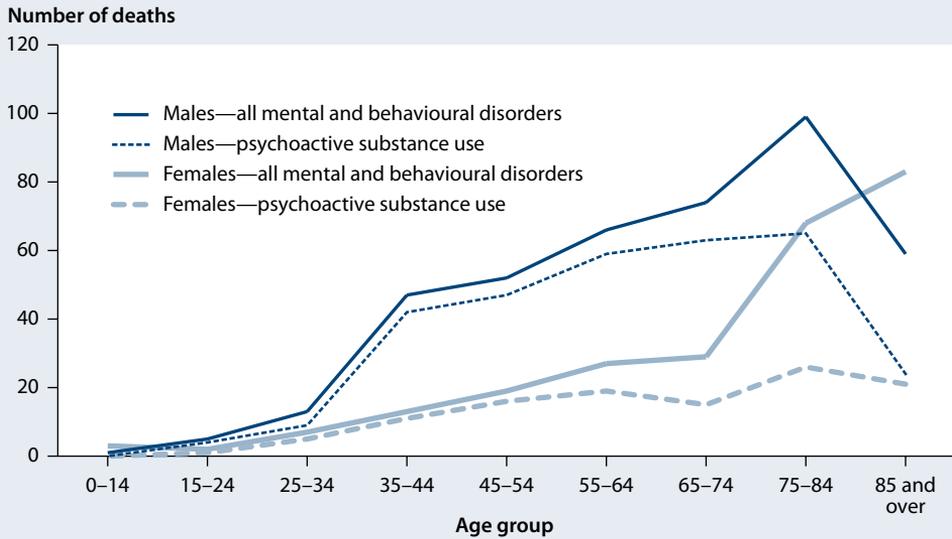
It is clear that mental health problems are a leading cause of disability in Australia. Of the 714,156 Australians receiving the disability support pension as at June 2007, over a quarter (27.3%) had a psychological or psychiatric condition. In line with this, in 2006–07, nearly one in four new claims approved (24% of 62,608) were from those with a psychological or psychiatric condition (FaHCSIA 2009).

Mortality

A mental or behavioural disorder was recorded as the underlying cause of death for 667 deaths in 2007—0.5% of all deaths in that year. These deaths exclude suicide and dementia, which are included in other sections in this chapter (suicides in Section 4.9 and dementia in Section 4.6). The rate appears to have plateaued at a lower level following the peak years of the mid- to late 1990s (Figure 4.15). Most of the deaths with a mental or behavioural disorder as the underlying cause of death were due to the use of psychoactive substances such as alcohol and heroin.

The number of deaths attributed to mental and behavioural disorders in 2007 was much greater overall for males than females, although before the age of 34 years the numbers were similar for both sexes (Figure 4.16). Psychoactive substance use was a prominent underlying cause of death for males aged between 15 and 65 years and accounted for nearly all of the female deaths attributed to mental and behavioural disorders for those aged between 15 and 54 years.





Note: ICD-10 codes: all mental and behavioural disorders, F04–F99; psychoactive substance use, F10–F19.

Source: AIHW National Mortality Database.

Figure 4.16: Deaths from mental and behavioural disorders, by sex and age group, 2007

Use of health services

The 2007 SMHWB estimated that 12% of the population aged 16–85 years had used a health service for a mental health problem in the previous 12 months. This equates to 1.9 million people, of which 63% were female. Females with a mental disorder in the previous 12 months used services at a greater rate than males—41% compared with 28%. Those with affective disorders were more likely to use a service than those with anxiety or substance use disorders. Nearly two-thirds (65%) of people identified by the survey as having symptoms of a mental disorder in the past 12 months did not use a service for mental health problems. Around 90% of these reported that they did not need services (Slade et al. 2009) but, of those who did use them, most (71%) visited a GP. Psychologists were visited by 38% of the service users and 23% consulted a psychiatrist.

4.6 Dementia

Dementia can be described as a general and increasing impairment of brain functions such as memory, understanding and reasoning. It is not a specific disease but a syndrome associated with a range of diseases. Many diseases can cause dementia, the most common being Alzheimer disease. Other common forms include vascular dementia, dementia with Lewy bodies, frontotemporal dementia (including Pick disease) and mixed forms of dementia. Dementia is not a natural part of ageing, although the great majority of people with dementia are older people. While dementia is not often fatal in itself, it is highly disabling and can result in a high need for care in the long term. Among those aged 75 years and over, dementia in Australia is estimated to be the leading cause of the burden of disease and among both males and females in 2010. Across all ages it is the fifth highest specific cause of disease burden, accounting for 4% of the total disease burden.

Although a cure for dementia has not yet been developed, some risk factors for both vascular dementia and Alzheimer disease—such as high blood pressure, smoking and diabetes—can be modified by changes to lifestyle and diet, and by medications where necessary. Alzheimer's Australia recommends engaging in mentally challenging activity, exercise, a balanced diet, and being socially active (Alzheimer's Australia 2009). Even if dementia cannot be prevented in many cases, the aim is to delay its symptoms by preserving and building up mental reserves.

This section provides information about dementia's prevalence and death rates, levels of disability and associated use of health services.

Prevalence

Dementia is rare up to the age of 65 but it then becomes increasingly common with age. When the results of European studies are applied to the Australian population, it can be estimated that, in 2008, less than 2% of Australians aged 65–74 years or over had the condition. The proportion increased fourfold to almost 9% for people aged 75–84. In the oldest age group (85 and over) about one in five (22%) had dementia (Table 4.9). Females have higher dementia rates than males in the older age groups. The difference was greatest in the oldest age group, where an estimated 25% of females had dementia compared with 17% of males. This can partly be explained by females in the oldest group being older on average than males in that group. There was little difference between the sexes in the younger age group (65–74 years), with rates for males only marginally higher (2%) than those for females (1.7%). (For details on incidence rates and future prevalence projections see AIHW 2007a, 2008c.)

Table 4.9: Prevalence of dementia by age and sex, 2008

Age group (years)	Rate (per cent)			Number		
	Males	Females	Persons	Males	Females	Persons
0–64	0.1	0.0	0.1	6,400	3,074	9,474
65–74	2.0	1.7	1.8	14,528	13,082	27,610
75–84	7.4	9.4	8.6	32,142	51,182	83,324
85 and over	16.9	24.8	22.2	20,613	59,695	80,308
<i>Total 65 and over</i>	<i>5.2</i>	<i>8.0</i>	<i>6.8</i>	<i>67,282</i>	<i>123,959</i>	<i>191,241</i>
Total	0.7	1.2	0.9	73,682	127,033	200,716

Source: Derived from aggregated age- and sex-specific rates from a meta-analysis of data from European studies (Lobo et al. 2000; Harvey, Skelton-Robinson et al. 2003). Percentages are of the estimated Australian resident population of that age and sex at 30 June 2008.

Prevalence in residential aged care

Since dementia is often highly disabling, where do people with dementia live? Based on the 2003 SDAC, it is estimated that more people with dementia lived in households (57%) than in cared accommodation (43%) (AIHW 2007a:56). However, nearly all of those living in households had milder dementia. The great majority (91%) of those who were moderately or severely affected required full-time care and lived in cared accommodation (AIHW 2008c:218).

There is now information about the prevalence of dementia and other health conditions among permanent residents of aged care facilities in Australia. The data were collected through an appraisal known as the Aged Care Funding Instrument (ACFI) that was introduced in March 2008. The data show that dementia is a very common condition among these permanent residents. At 30 June 2009, the majority of permanent residents (99%) had had an ACFI, and for 88% there was information about their dementia status. Of this latter group, well over half (59%) had a recorded diagnosis of dementia (Table 4.10). The proportion with dementia was highest in the age group 85 years and over (62%). However, even in the younger age group (65–74 years) almost half (47%) of the residents with information about their dementia status had dementia (Table 4.10). (For a full description of ACFI, see <<http://www.health.gov.au/acfi>>.)

Table 4.10: Dementia or mental illness among permanent aged care residents, 30 June 2009 (per cent)

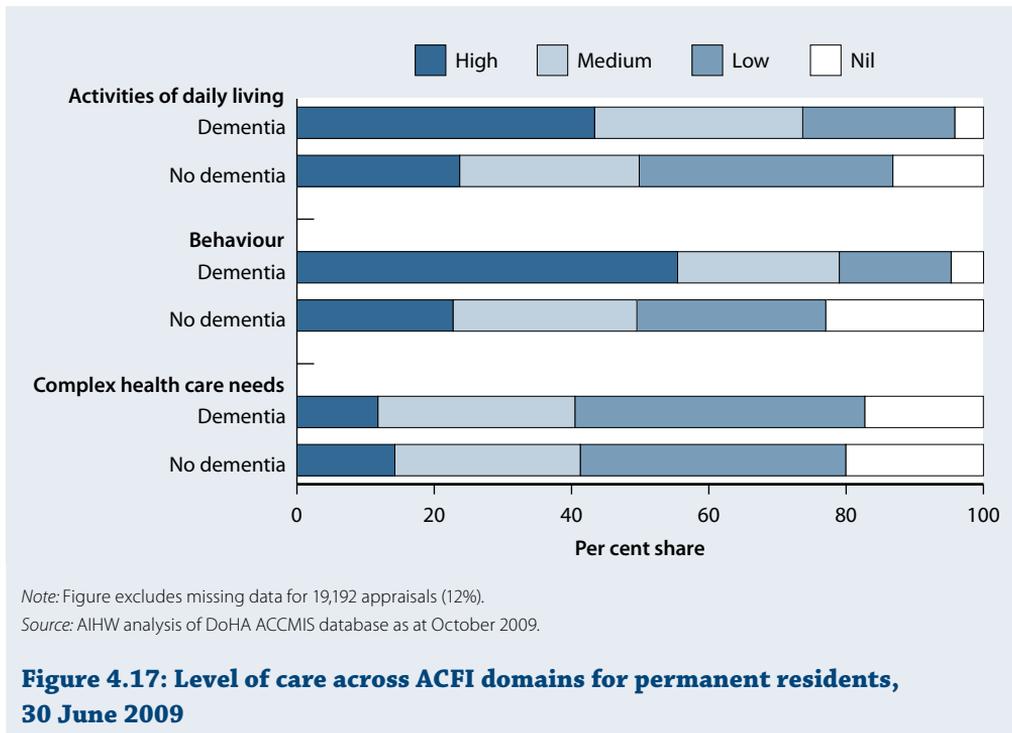
Diagnosis	Age group (years)					Total
	Less than 65	65–74	75–84	85 and over	65 and over	
Dementia and mental illness	17.5	23.2	26.1	22.3	23.7	23.4
Dementia only	12.8	23.9	35.7	39.6	36.8	35.8
<i>Total dementia</i>	<i>30.3</i>	<i>47.0</i>	<i>61.8</i>	<i>62.0</i>	<i>60.5</i>	<i>59.2</i>
Mental illness only	60.4	43.1	26.8	21.5	25.3	26.8
No dementia or mental illness	9.3	9.9	11.4	16.5	14.2	14.0
Total (per cent)	100.0	100.0	100.0	100.0	100.0	100.0
Total (number)	5,801	12,552	44,803	75,146	132,501	138,302

Note: Excludes 19,192 cases with no information on dementia status.

Source: AIHW analysis of DoHA Aged and Community Care Management Information System (ACCMIS) database as at October 2009.

Disability and functioning

Different surveys have been used to estimate the need for care and assistance for those living in aged care facilities and for those living in households. The ACFI is used to appraise aged care residents in three areas: activities of daily living (ADL: needs with nutrition, mobility, personal hygiene, toileting and continence); behaviour (needs in relation to cognitive skills, wandering, verbal behaviour, physical behaviour and depression) and complex health-care needs (needs for medication and complex health care) (DoHA 2008). Residents with dementia needed substantially higher levels of care than residents without dementia (Figure 4.17). Almost 43% of residents with dementia needed high-level care with ADL, compared with 24% for residents without dementia. The corresponding needs for high-level care with behaviour were 55% and 23%. There was little difference in the care requirements in relation to complex health conditions for residents with or without dementia.



Although more people with dementia live in households than in aged care facilities, and although their dementia is usually less severe, it is clear that nearly all of them still need assistance. Based on the 2003 SDAC, an estimated 97% of people with dementia living in households needed assistance with at least one of five personal activities. Health care and mobility were the activities most commonly requiring assistance (applying to 82% and 81% of people respectively), followed by cognition or emotion (77%) and self-care (63%). Communication required the least assistance (42%) (AIHW 2007a:94).

Mortality

Consistent with the prevalence rates, the number of deaths in 2007 with an underlying cause of dementia among those under the age of 65 was very low but increased with age. For the age group 65–74 years there were 23 deaths per 100,000, while the rate for the age group 75–84 years was 10 times as high (233 deaths per 100,000). There was a further almost sixfold increase between this age group and those aged 85 years and over, where there were 1,361 deaths per 100,000. Overall, the age-standardised death rate from dementia for females was 19% higher than that for males (32 compared with 27 deaths per 100,000). The difference was highest among those aged 85 years and over, where the rate for females was over one-third (36%) higher than the rate for males (Table 4.11).

Table 4.11: Deaths with an underlying cause of dementia^(a), 2007^(b)

Age (years)	Males	Females	Persons	Males	Females	Persons
	Number			Number per 100,000		
Less than 65	35	43	78	0.4	0.5	0.4
65–74	180	159	339	25.3	21.4	23.3
75–84	961	1,290	2,251	225.4	238.2	232.5
85 and over	1,239	3,413	4,652	1,098.9	1,489.9	1,360.9
				CDR 23.1	46.3	34.7
Total	2,415	4,905	7,320	ASR 26.8	32.0	30.3

ASR Age-standardised rate.

CDR Crude death rate.

(a) Dementia comprises ICD-10 codes F00–03 and G30 (dementia and Alzheimer disease).

(b) Year of registration. Since 2006, there has been a significant increase in the number of deaths coded to dementia (F01–F03). Updates to the coding instructions in ICD-10 have resulted in the assignment of some deaths shifting from cerebrovascular diseases (I60–I69) to vascular dementia (F01). No changes to ABS coding or query practices were made to 2006 or 2007 data, which would affect the number of deaths coded as dementia.

Source: National Mortality Database.

Use of health services

People with dementia use many health and aged-care services due to the severe nature of the condition. In 2008–09, there were an estimated 647,000 consultations (0.6% of all consultations) where GPs managed dementia. In the same year, the PBS and RPBS together subsidised over 386,000 prescriptions for four drugs used to treat Alzheimer disease. Around 116,000 hospitalisations with a principal or additional diagnosis of dementia in 2007–08 accounted for over 1.6 million hospital bed-days (Table 4.12).

Table 4.12: Services provided for people with dementia, 2008 (number)

Year		With dementia	Total
Health services			
2008–09	GP encounters ^(a)	647,000	113,045,000
2008–09	Pharmaceuticals—dementia specific ^(b)	386,178	n.a.
2007–08	Hospitalisations	116,085	7,873,946
2007–08	Hospital bed-days	1,652,284	25,640,000
Aged care services			
2008–09	Residential aged care residents ^(c)	81,940	138,302
2007–08	ACAP assessments	54,726	199,795
2008	Clients with community care packages ^(d)	5,287	40,284

n.a. Not available.

(a) Based on 5.72 dementia problems managed per 1,000 encounters from the BEACH survey; an extrapolation to Medicare-claimed GP consultations in 2008–09 provides the number of GP encounters for dementia (including senile and Alzheimer disease).

(b) PBS/RPBS data includes three anticholinesterase (donepezil hydrochloride, galantamine hydrobromide and rivastigmine hydrogen tartrate) and the NMDA receptor antagonist drug memantine.

(c) Residential aged care services exclude 19,192 missing cases.

(d) Comprises CACP, EACH and EACHD community care packages.

Sources: 2008–09 BEACH survey of general practice; PBS/RPBS; AIHW National Hospital Morbidity Database; AIHW analysis of ACCMIS database; unpublished data from DoHA.

In 2008, over one-quarter (27%) of assessments conducted by Aged Care Assessment Teams were for people with dementia. For the three Commonwealth-funded community aged care programs—Community Aged Care Packages, Extended Aged Care At Home and Extended Aged Care At Home Dementia—over three-quarters (84%) of care recipients needed assistance with tasks requiring memory and/or organisational skills, or in managing behavioural problems. Almost half of this group (47% or 5,287 care recipients) stated that the reason was diagnosed dementia or a related condition (Table 4.12).

4.7 Respiratory diseases

This section deals with two main forms of respiratory disease—chronic obstructive pulmonary disease (COPD) and asthma. Both are major causes of disability in Australia and COPD is also a major cause of death.

Chronic obstructive pulmonary disease

COPD is a serious, progressive and disabling disease in which destruction of lung tissue and narrowing of the air passages obstructs oxygen and carbon dioxide exchange, causing chronic shortness of breath. A person with COPD is progressively more prone to severe episodes of shortness of breath and coughing. Severe episodes can be life-threatening.

A variety of processes may lead to COPD. The most notable—emphysema—is the destruction of the lung parts known as alveoli, where the oxygen exchange between air and blood takes place. Emphysema occurs when inhaled irritants stimulate enzymes that destroy lung tissue. Many people with COPD make too much mucus, so they produce a lot of phlegm and have a long-term cough (chronic bronchitis). Chronic bronchitis, emphysema, scarring and narrowing of the airways often coexist as part of COPD. With these conditions, the lungs lose their function, becoming less able to move air in and out, and less able to take oxygen into the body.

Tobacco is by far the main inhaled substance leading to COPD. However, other fumes, dust and infectious organisms may contribute to the risk of the disease or may worsen symptoms either alone or with smoking. These can include environmental tobacco smoke (passive smoking), indoor and outdoor air pollution, occupational dusts and chemicals, and respiratory infections such as influenza or pneumonia.

The proportion of the total burden of disease and injury attributed to COPD in 2010 in Australia is estimated to be 3.0% (3.1% among males and 2.9% among females). This is composed of about 57% fatal burden (YLL) and 43% non-fatal burden (YLD). Males account for only a slightly higher proportion of the COPD burden (53%) than females (47%). The proportion of total burden and injury attributed to COPD is projected to fall to 2.5% by 2023. See Chapter 2 for details of the burden of disease and how it is estimated.

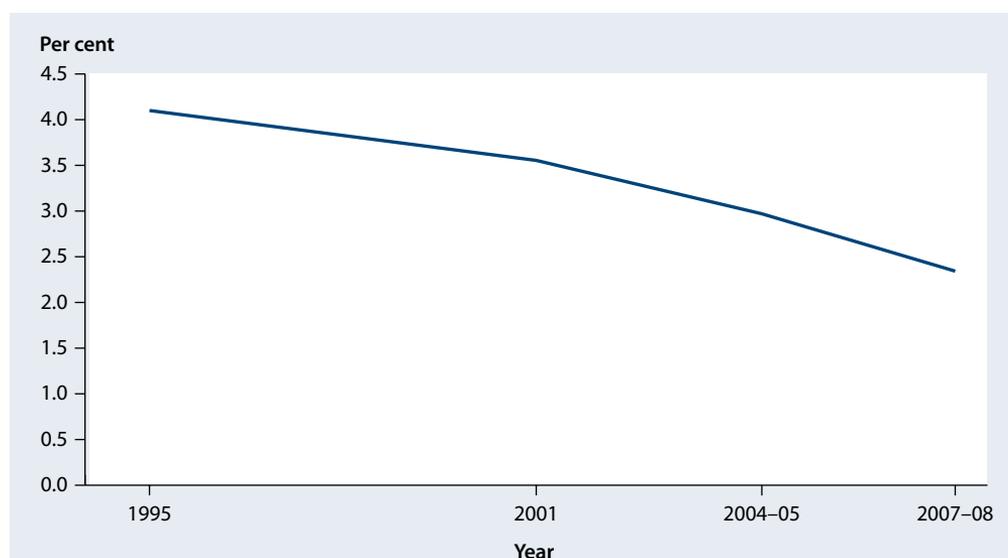
Prevalence

Estimates of COPD prevalence differ according to the estimation method used. The most important difference is whether the estimate is based on self-report, diagnosis by doctor, X-rays or clinical measures of lung function (spirometry).

An estimated 490,000 Australians (2.3% of the population) have emphysema or bronchitis, based on self-reported information in the 2007–08 NHS. This estimate is used as a guide to the prevalence of COPD but is considered an underestimate because the symptoms overlap with those of other respiratory conditions, such as asthma. A diagnosis of asthma,

for example, may mask COPD. Also, COPD is not usually diagnosed until its progression is substantial and it restricts a person's daily activities. COPD and asthma have common clinical features and can initially be difficult to distinguish. Lung function in asthma is considered largely reversible, meaning that medication can open the person's air passages and reverse the shortness of breath. With COPD, however, the function is considered poorly reversible. Without lung function testing it can be difficult to distinguish the two diseases in people who are entering middle age or later years. This means there is almost always a degree of uncertainty with prevalence estimates that are not based on this distinction.

Based on the NHS, the trend for the prevalence of emphysema and bronchitis has been downwards since 1995 (Figure 4.18). In 1995, the estimated proportion of the Australian population with emphysema or bronchitis was 4.1%, whereas in 2007–08 it was 2.3%. The fall has been consistent over that time and it is in line with falls in COPD hospitalisations, in COPD deaths and in smoking rates.



Note: Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the 1995, 2001, 2004–05 and 2007–08 National Health Surveys.

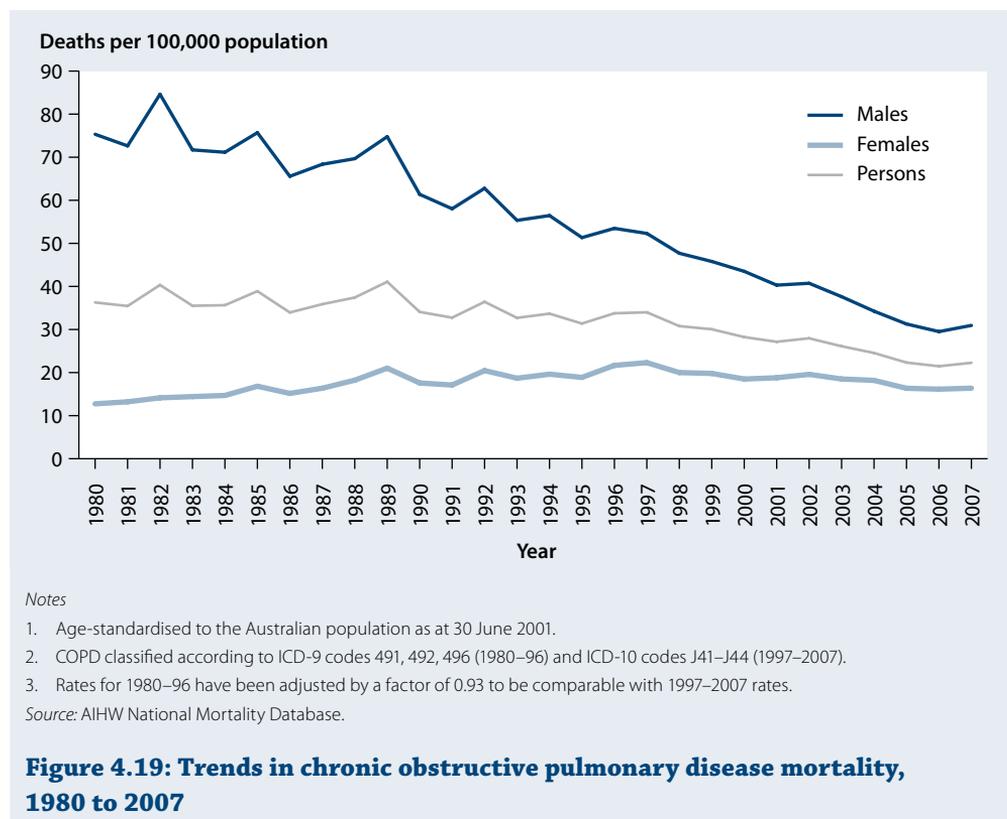
Figure 4.18: Trend in prevalence of emphysema and bronchitis, 1995 to 2007–08

When people in south-eastern Sydney were included in an international comparison study, the estimated prevalence of clinically significant COPD among adults aged 40 years and over was 9.3% (Buist et al. 2007)—almost 3 times the NHS-based estimate. However, this study included only people aged 40 years and over, whereas the NHS estimate is for all ages, and south-eastern Sydney may not represent Australia as a whole.

Deaths

COPD is a significant cause of death in Australia, being recorded as the underlying cause of 5,152 deaths (4% of all deaths) in 2007. It was listed as an associated cause in another 7,336 deaths, most often with circulatory diseases or respiratory cancers as the underlying cause. The number of deaths per 100,000 population where COPD was an underlying cause was much higher among males (31) than females (16) in 2007.

Where COPD was the underlying cause, deaths of males per 100,000 population had fallen fairly consistently over the last 25 years. For females, the rate rose a little until 1997, after which it fell towards its 1981 level (Figure 4.19).



Disability and functioning

The shortness of breath experienced by people with COPD can be disabling as it can interrupt daily activity, sleep patterns and the ability to exercise. Within 7 to 8 years of diagnosis, most people with COPD become incapable of productive work (the diagnosis often being made late in the disease’s course).

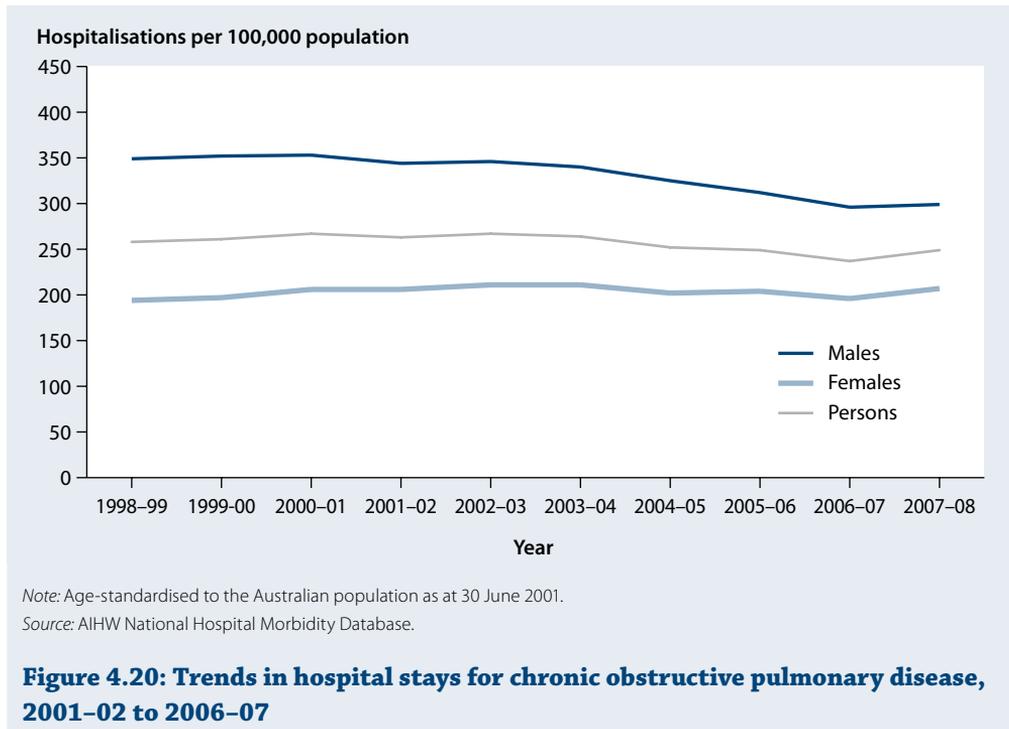
Estimates from the 2003 SDAC are that about 34% of those reporting emphysema and bronchitis had some disability due to the conditions and about 12% had a severe or profound disability. Disability was twice as common in males as females and more prominent in older age groups.

Use of health services

People with COPD may require hospital care when symptoms worsen, disability increases or the symptoms become life-threatening. In 2007–08 there were 59,427 hospitalisations (1% of all hospitalisations) for COPD as the principal diagnosis. The average length of stay (6.9 days) was over twice the average of all hospital stays in the year (3.3 days). The great majority (86%) of these COPD hospitalisations began with an emergency admission. Hospitalisation for COPD occurs mainly among older Australians with a smoking history, with people aged 65 years or over accounting for 76% of stays.

In terms of both the number of hospitalisations and the average length of time spent in hospital, COPD accounts for considerable health-care resources. The estimated direct expenditure allocated to COPD for 2004–05 was \$548.7 million, 61% being for hospitalisations.

Males are more likely than females to be hospitalised for COPD. However, the age-standardised hospitalisation rate for males has fallen over the last 10 years while the female rate has stayed relatively stable. The male and female rate rose between 2006–07 and 2007–08 (Figure 4.20).



Published estimates from the 2007–08 BEACH survey found that COPD was managed in less than 1% of encounters in general practice (Britt et al. 2008a); however, this estimate does not include chronic bronchitis.

Prevention

About 74% of COPD deaths in Australia in 2003 could be attributed to tobacco smoke (Begg et al. 2007), and the global estimate is 82% (Zaher et al. 2004).

Reducing tobacco use is the most effective strategy for reducing the burden of COPD, and early diagnosis and management of COPD is also important. Australia's national tobacco strategy includes preventing the uptake of smoking and encouraging smokers to quit. International and Australian guidelines encourage clear, consistent and repeated non-smoking messages, smoke-free homes and smoke-free schools, public places and work environments.

Australia's clinical guidelines for the management of COPD (the 'COPDX plan') includes primary prevention of smoking, improving rates of smoking cessation and early detection of airflow limitation. For primary health-care professionals, the plan's key management

components are: **C**onfirm diagnosis, **O**ptimise function, **P**revent deterioration, **D**evelop self-management plans and prevent **eX**acerbations (McKenzie et al. 2007).

International comparisons

Australia tends to be on a par with, or compare rather poorly with, other countries in measures of COPD, although its falling smoking rates may improve its ranking in the future. An international survey of people aged 20–44 years ranked Australia fourth highest out of 16 high-income countries in the prevalence of ‘moderate to severe COPD’, third in the prevalence of ‘mild’ COPD but 16th (the lowest) in the prevalence of those considered ‘at risk’ of COPD (some chronic symptoms but no airflow obstruction) (de Marco et al. 2004).

Another international study found the global prevalence of clinically significant COPD among people age 40 years and over was 10.1% (Buist et al. 2007), with the rate of the Australian sample, at 9.3%, being slightly lower.

Asthma

Asthma is a common chronic inflammatory lung condition. It causes episodes of wheezing, breathlessness and chest tightness due to widespread narrowing of the airways. Asthma affects people of all ages and has a substantial effect on the community, particularly among children. Among those with the condition, the episodes can be triggered by a wide range of exposures. These include viral infections, exercise, air pollutants, tobacco smoke or specific allergens such as house dust mites, pollens, mould spores, animal danders and occupational allergens. The symptoms of asthma are usually reversible, either spontaneously or with treatment.

Although the underlying causes of asthma are still not well understood, there is evidence that environmental and lifestyle factors, as well as genetic factors such as an allergic tendency, may increase the risk of developing asthma.

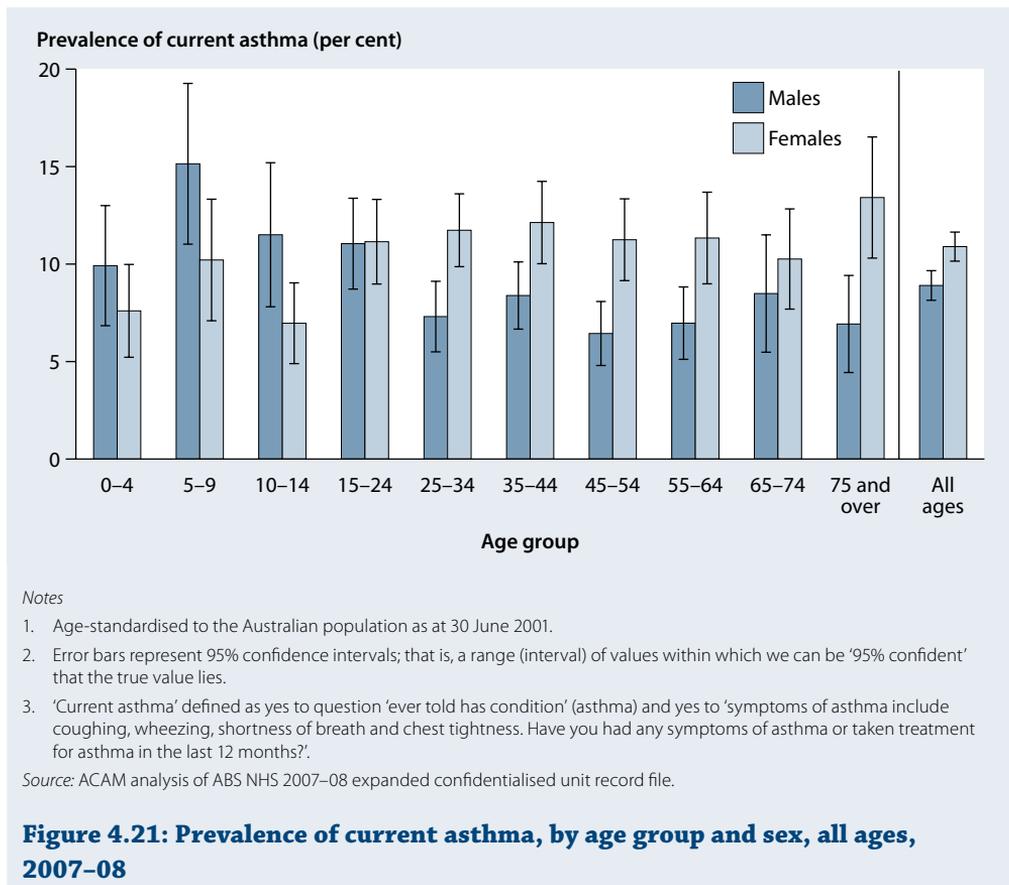
Prevalence and incidence

Important changes in the prevalence of asthma have been noted over the past 20–30 years. During the 1980s and early 1990s there was a substantial worldwide increase in the prevalence, particularly in children. However, in recent years this trend appears to have plateaued (Asher et al. 2006; Eder et al. 2006) and may even have reversed in children. Although Australia still has a high asthma prevalence by international standards (ACAM 2005), national data show a recent decrease in prevalence among children and young adults, consistent with worldwide trends. Among those aged under 35 years, the prevalence of asthma fell significantly from 14.0% to 11.4% between 2001 and 2004–05. However, in the same period, there was no change in the prevalence of asthma among people aged 35 years and over. A further consequence of these changes is that the difference in the prevalence of asthma between children and adults, which was quite marked in the 1980s and 1990s, is much less apparent now. Based on more recent self-reported data from the NHS (using a slightly different definition of current asthma), an estimated 10.0% of the Australian population had current asthma in 2007–08.

Among those aged under 15 years, the prevalence of asthma is higher for males than females but, among those aged 15 years and over, the reverse is true (Figure 4.21). Overall, females had a significantly higher prevalence of current asthma (10.9%) than males (8.9%) in 2007–08, although the highest prevalence occurred in males aged 5–9 years (15.1%).

Development of asthma in young children

Data from the Longitudinal Study of Australian Children showed that almost 17% of infants experience asthma or wheeze within the first 3 years of life (ACAM 2009). However, not all wheeze qualifies as asthma, and by the age of 2–3 years the incidence of wheeze, at 15.4%, was more than double that of asthma (6.4%). One-fifth (21%) of children had been diagnosed with asthma by the age of 4–5 years. Among the remaining 79% of children with no asthma diagnosis by age 4–5 years, 4% per year went on to be diagnosed with the condition over the next 2 years.



Quality of life

Asthma can affect people's quality of life in a number of ways, by interfering with their sleep and attendance at school or work. People with asthma of all ages and both sexes rate their general health less favourably than people without the disease (ACAM 2007, 2008). For example, in the 2007–08 NHS, 25.0% of adults with current asthma rated their health as only 'fair' or 'poor' compared with 13.8% of adults without asthma. Those with asthma also report much higher levels of psychological distress than those without asthma. In 2007–08, 19.9% of adults aged 18 years and over with asthma had high/very high psychological distress compared with 11.1% of those without asthma.

Children with asthma are more likely than other children to have disturbed sleep. Moderate to severe sleep disturbance was 44% more prevalent among children with wheeze or asthma at age 4–5 years, compared with those without wheeze or asthma at the same age (ACAM 2009). Furthermore, 11% of sleep disturbance was attributed to wheeze or asthma at age 4–5 years. Sleep disturbance is an important problem attributable to asthma in children (Martin 1990; Miller & Strunk 1989) and is strongly associated with increased absenteeism from school (Diette et al. 2000; Silverstein et al. 2001). Children who had asthma or wheeze at age 4–5 years have been shown to have more days absent from school when they reach age 6–7 years than children without asthma or wheeze (ACAM 2009).

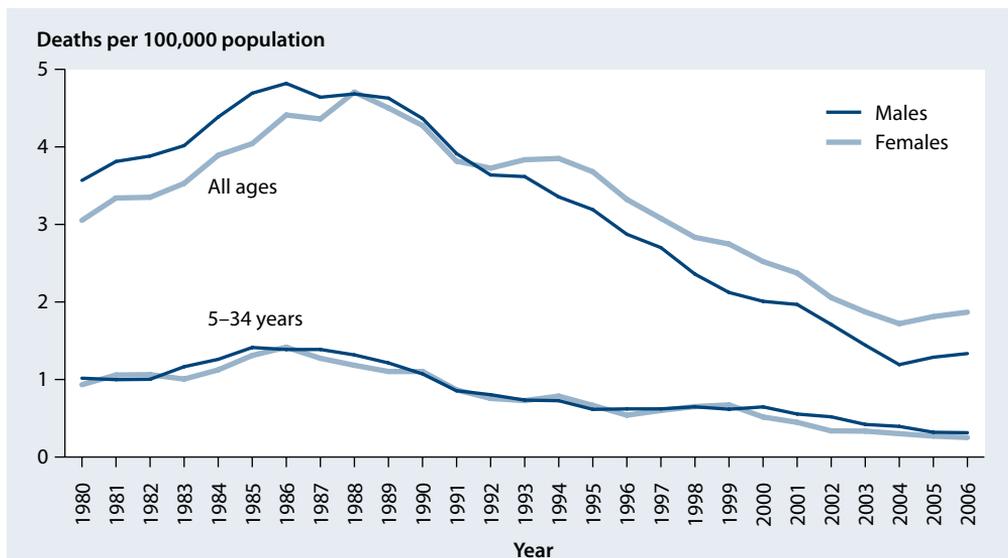
Deaths

Asthma death rates in Australia are high by international standards, although asthma is not a leading cause of mortality. In 2007, asthma was certified as the underlying cause of 385 deaths. This corresponds to an asthma mortality rate of 1.67 (95% CI 1.51–1.85) per 100,000 population, representing 0.28% of all deaths.

Since the peak in deaths from asthma in the late 1980s, the mortality rate has fallen by about 70%. Overall, the rate is higher in females than males.

There are challenges in attributing deaths to asthma. In older people, diagnosing respiratory problems is often complex and there can be misclassification between asthma and other diseases, especially COPD. For this reason, the age group of 5–34 years is usually chosen for examining time trends and making international comparisons.

Since the mid- to late 1980s, there has been a substantial decline in deaths attributed to asthma in 5–34 year olds—in fact, the death rates have fallen by more than 85% (Figure 4.22).



Notes

1. Age-standardised to the Australian population as at June 2001.
2. Asthma classified according to ICD-9 code 493 and ICD-10 codes J45–J46.
3. Deaths coded to ICD-9 (1979–1997) were converted to ICD-10 using the following conversion: ages 0–34 years, no conversion; 35–64 years, converted by a factor of 0.84; 65 years and over, converted by a factor of 0.68.

Source: AIHW National Mortality Database.

Figure 4.22: Trends in asthma mortality, 3-year moving average, 1979 to 2007

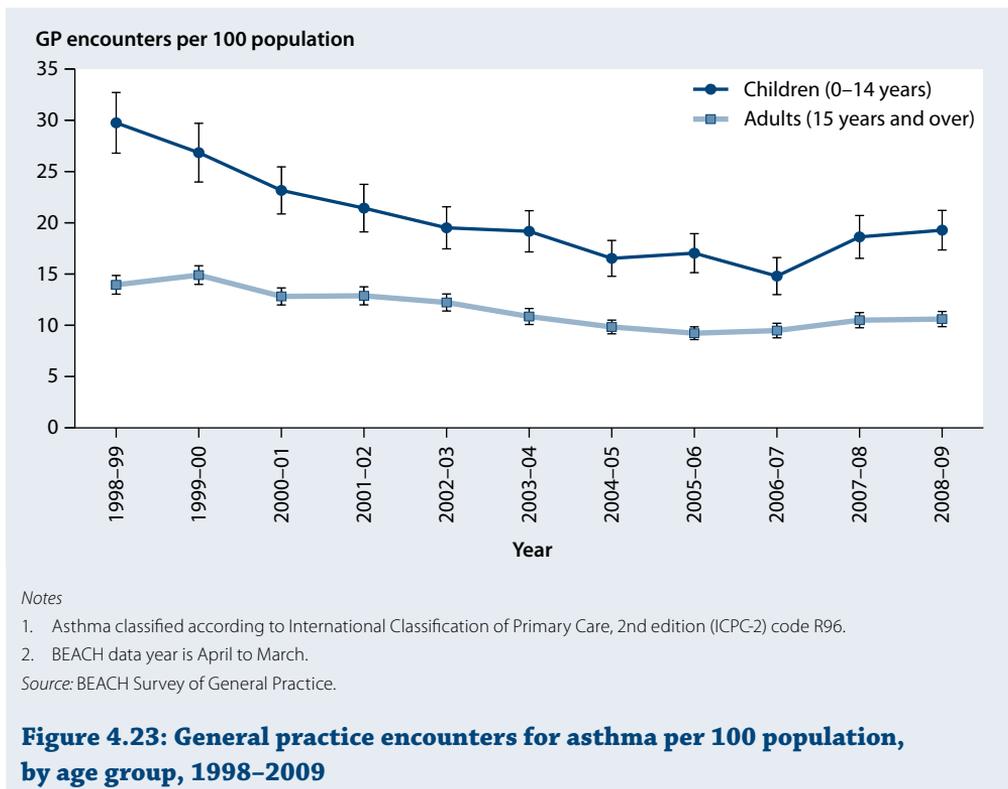
Burden of disease

It is estimated that, in 2010, asthma will be the 10th leading contributor to the overall burden of disease in Australia, accounting for 2.3% of the total number of DALYs (see Chapter 2 for an explanation of DALYs). In that year, 66,000 years of healthy life are estimated to be lost due to asthma. The great majority (92%) of DALYs due to asthma arise from YLD caused by the condition. Asthma is estimated to be the leading cause of burden of disease among children aged 0 to 14 years in 2010, contributing 37,700 DALYs (18.4% of total DALYs in that age group). Furthermore, chronic respiratory disease, which includes asthma, was the fourth leading contributor to the Indigenous health gap in the burden of non-communicable conditions during 2003. It accounted for 9% of the gap, behind CVD (23%), diabetes (12%) and mental disorders (12%). Overall, it is predicted that asthma will continue to rank as one of the major causes of disease burden in Australia for the next two decades, particularly among females.

Use of health services

Visits to general practitioners

GPs play a central role in managing asthma in the community, which includes assessment, prescribing regular medications, education and review, as well as managing acute episodes. Data from the BEACH surveys of general practice show that the rate of GP encounters for asthma decreased steadily between 1998–99 and 2006–07, particularly among children, but may have begun to rise since 2006–07 (Figure 4.23).



Hospitalisations

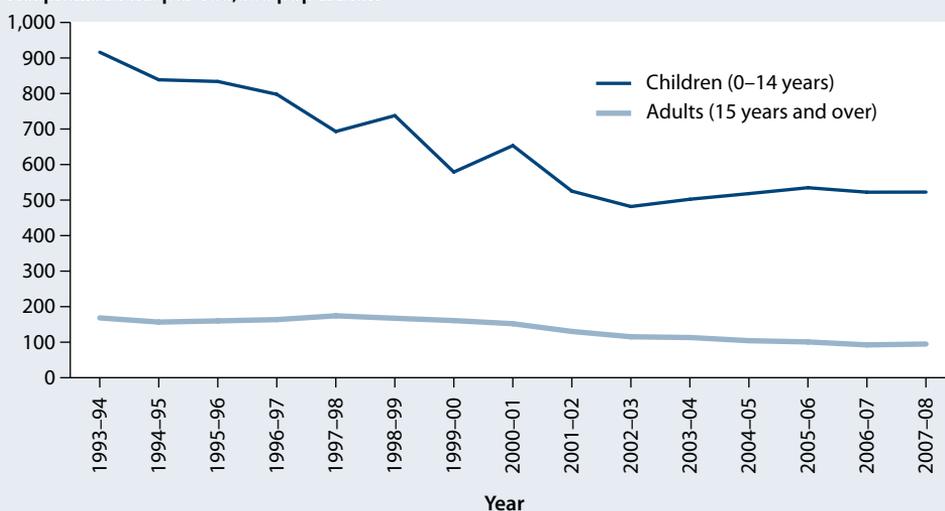
Hospitalisation for asthma is required when flare-ups or ‘attacks’ are life-threatening or when they cannot be managed at home. In 2007–08, there were 37,492 hospitalisations with a principal diagnosis of asthma in Australia, representing close to 1 in 200 of all hospitalisations during that year.

Between 1993 and 2002, there was a substantial fall in the rate of hospitalisations for asthma in both children and adults although, since about 2002–03, the rates for children appear to have levelled or increased a little (Figure 4.24). When comparing hospitalisation rates in 2007–08 with those in 1993–94, it can be seen that those in the recent period were 43% lower among children aged under 15 years and 44% lower among people aged 15 years and over. However, children still have high rates of hospitalisation for asthma compared with adults.

Peaks in asthma hospitalisation rates occur during winter among adults, whereas the rate among children is highest in February and May. A broadly similar seasonal pattern is observed in emergency department attendances.

Boys have higher rates of hospitalisations for asthma than girls. However, from the age of 14 years onwards, this trend is reversed and females have the higher rate. These patterns are consistent with those observed for asthma prevalence and the rate of GP encounters for asthma.

Hospitalisations per 100,000 population



Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Asthma classified according to ICD-9-CM code 493 and ICD-10-AM codes J45-J46.
3. Hospitalisations coded to ICD-9-CM (1993 to 1997) were converted to ICD-10-AM using the following conversion: ages 0-34 years, no conversion; 35-64 years, converted by a factor of 0.64; 65 years and over, converted by a factor of 0.53.
4. Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded.

Sources: AIHW National Hospital Morbidity Database.

Figure 4.24: Trends in hospitalisations for asthma, by age group, 1993-94 to 2007-08

Prevention

There is currently no cure for asthma, although the condition can be effectively managed. Key elements in that management include a written asthma action plan and regular use of medications that control the disease and prevent flare-ups. However, evidence suggests that the uptake of these strategies has not been optimal among those who could benefit most. In the 2004–05 NHS, only 18.5% of people with asthma who were aged 5 years or over reported using inhaled ‘preventer’ medicines in the preceding 2 weeks, despite national recommendations that they be used daily for most people with asthma (ACAM 2007). More recently, data from the ABS 2007–08 NHS showed that less than one-quarter (20.4%) of Australians with asthma reported having a written asthma action plan.

International comparisons

The prevalence of asthma is relatively high in Australia by international standards and the reasons for this are unknown. In the 2002 phase of the International Study of Asthma and Allergies in Childhood (ISAAC), the prevalence of wheeze in the last 12 months among those aged 6–7 years ranged from 2.4% to 37.6% across countries, and was highest among centres in New Zealand, the United Kingdom, Australia and Latin America (Pearce et al. 2007). The ISAAC study has shown a general decline in the prevalence of asthma symptoms in English-speaking countries. In Australia, the prevalence of recent wheeze decreased by 0.8% per year between 1993 and 2002.

Mortality rates due to asthma in Australia are also relatively high by international standards and are similar to those reported for the United States, the United Kingdom and New Zealand (ACAM 2008). Numerous other countries have lower rates of asthma mortality, such as Japan, France, Germany, Spain and Poland.

4.8 Arthritis and other musculoskeletal conditions

Arthritis and musculoskeletal conditions are very common in Australia and they are responsible for much pain and disability. They place significant burdens on the community, both economic and personal, through the need for hospital and primary care services, disruptions to daily life and lost productivity (AIHW 2005b).

Arthritis is marked by inflammation of the joints, causing pain, stiffness, deformity and disability. Other musculoskeletal conditions, such as osteoporosis, back pain and gout, affect the bones, muscles and their attachments to each other. There are more than 150 forms of arthritis and musculoskeletal conditions, and their causes include overuse of joints, congenital anomalies, metabolic or biochemical abnormalities, infections, inflammatory conditions, trauma and cancer. These conditions result in few deaths but can cause significant pain and disability, severely limiting a person’s ability to perform everyday tasks at home and work.

Arthritis and musculoskeletal conditions were declared an NHPA in 2002. Initially the focus was on osteoarthritis, rheumatoid arthritis and osteoporosis; juvenile arthritis was added in 2006. The four conditions are described in Box 4.9.

Box 4.9: Focus conditions under the arthritis and musculoskeletal conditions National Health Priority Area

Osteoarthritis: A degenerative joint condition that mostly affects the hands, spine and weight-bearing joints such as hips, knees and ankles. Its main feature is the breakdown of the cartilage that overlies the ends of the bones in the joint. Osteoarthritis disrupts the normal functioning of the joint and can lead to pain, stiffness and activity limitation.

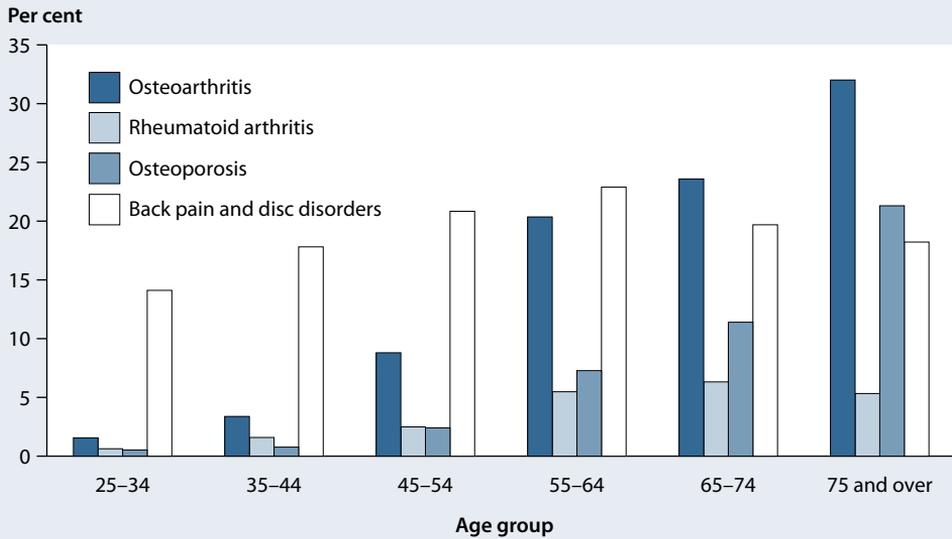
Rheumatoid arthritis: A chronic auto-immune disease marked by inflammation of the joints, most often affecting the hand joints in a symmetrical fashion. The immune system attacks the tissues lining the joints, causing pain, swelling and stiffness. Over time there is progressive and irreversible joint damage, which may result in deformities and severe disability. Rheumatoid arthritis can also lead to problems with the heart, lungs, nerves and eyes.

Juvenile arthritis: A common term used for arthritis occurring in children under the age of 16 years. The condition typically has an unpredictable pattern of disease activity, with periods of remission followed by a resurgence of signs and symptoms (known as 'flare-ups'). The main symptoms are swelling, pain and stiffness in the affected joints. Juvenile arthritis may affect children's growth and skeletal maturity, causing long-term disability and affecting their participation in activities such as sport.

Osteoporosis: The thinning and weakening of bones that often occurs with age, increasing the risk of fracture. Fractures after minimal trauma, such as minor bumps or falls from a standing height, are a hallmark of osteoporosis.

Prevalence

Based on self-reports in the 2007–08 NHS, more than 6.3 million Australians (31%) have arthritis or some other musculoskeletal condition. Arthritis affects over 3.1 million people (15%), with osteoarthritis (1.6 million; 8%) being the most common type. Rheumatoid arthritis, the next most common type, is estimated to affect 429,000 Australians (2%). Both of these conditions are more common among females than males. The prevalence of rheumatoid arthritis is highest among those aged 65–74 years, whereas the prevalence of osteoarthritis increases with age (Figure 4.25).



Source: ABS 2009b.

Figure 4.25: Prevalence of common musculoskeletal conditions, by age group, 2007-08

Back pain, back problems and disc disorders are also very common in Australia, affecting around 2.8 million people (14%). These problems are most prevalent among those aged 55-64 years, and are more commonly reported by males.

Information from the 2007-08 NHS suggests that almost 700,000 Australians (3%) have been diagnosed with osteoporosis. Most of these cases occur after the age of 55, and 82% of those reporting a diagnosis of the condition are females. However, because osteoporosis has no symptoms, it is often not diagnosed until a fracture occurs. Data about diagnosed cases are believed to underestimate the actual prevalence of the condition.

Disability and functioning

Arthritis and musculoskeletal conditions are significant causes of disability. According to the 2003 SDAC, around 1.2 million Australians (6.3%, or almost 1 in 3 people with disability) had a disability due to these conditions.

Arthritis and musculoskeletal conditions are responsible for significant activity limitation over time, but the type of limitation experienced varies with the type and severity of the condition (Box 4.10). For example, people with rheumatoid arthritis are at high risk of work disability as soon as their symptoms occur (Wolfe & Hawley 1998). In contrast, osteoarthritis usually develops more gradually and does not tend to limit people's activities until they are retired or close to doing so.

Box 4.10: Musculoskeletal conditions and disability

Osteoarthritis: The type of activity that a person with osteoarthritis finds difficult depends upon which joints are affected. Hand and arm problems may lead to a need for help with self-care tasks involving personal hygiene, dressing or other household chores. When the hip or knee is affected, mobility can be restricted, making tasks such as going up and down stairs, rising from a chair or bed, and walking very painful and difficult.

Rheumatoid arthritis: Deterioration in physical functioning can occur rapidly in the first couple of years after diagnosis. As with osteoarthritis, specific limitations depend upon the joints affected. In rheumatoid arthritis, however, multiple joints are often involved, resulting in a greater range of restrictions. Being unable to perform common tasks can lead to high levels of anxiety and depression. A loss of positive body image due to joint deformities can also further reduce a person's wellbeing.

Juvenile arthritis: The condition can interrupt a child's daily activities, such as attending school and participating in play or exercise. They might find it difficult to sit on the floor, hold pens and pencils, carry books and open their lunch box. Pain and functional limitations can also prevent children with arthritis from participating in sport, and the physical appearance of swollen and deformed joints can affect their psychosocial wellbeing. In some cases this can result in social isolation and poor social development, which may lead to problems with employment, social interaction and personal relationships in adulthood.

Osteoporosis: Disability in osteoporosis is usually related to fractures, and may be short-term or ongoing. The site and severity of the fracture will determine how a person's functioning may be limited, even for long periods, well after the fracture has been treated. Wrist and forearm fractures may affect the ability to write or type, prepare meals, perform personal care tasks and manage household chores. Fractures of the spine and hip usually affect mobility, making activities such as walking, bending, lifting, pulling or pushing difficult. Hip fractures, in particular, often lead to a marked loss of independence, and this reduces wellbeing.

Deaths

Arthritis and musculoskeletal conditions are not the underlying cause of many deaths. Almost 1,100 deaths (0.8% of all deaths) were recorded in 2007 with one of these conditions as the underlying cause. The most common causes of death were osteoporosis (240 deaths) and rheumatoid arthritis (159). Rheumatoid arthritis was much more likely to be recorded as an associated cause of death (646 cases) than as the underlying cause.

The risk of death increases after most types of osteoporotic fractures, but particularly hip fractures. There were more than 1,400 deaths in 2007 where hip fracture was recorded as an associated cause of death.

Burden of disease

Arthritis and musculoskeletal conditions are estimated to account for only 0.6% of Australia's YLL in 2010. However, they are estimated to be responsible for 7.7% of Australia's YLD. Including both deaths and disability, measured in terms of DALYs, they are expected to account for around 4% of the national disease burden in 2010.

Use of health services

Arthritis and musculoskeletal conditions are treated in a variety of settings, including primary care, hospital and allied health services. Most of these conditions are effectively managed by GPs, who provide initial diagnosis, relevant referrals, therapies such as medication and advice on self-management. Specialists help with confirming the diagnosis and prescribing more specialised drugs or other treatments, especially for rheumatoid arthritis. Hospital services provide surgical intervention or more specialised treatment. Allied health-care professionals, such as physiotherapists and occupational therapists, help to manage pain and maximise physical functioning.

Information about services provided by GPs and hospitals is presented below. Although allied health care and specialist services are integral to the management of musculoskeletal conditions, little information about the use of these services is currently available.

Visits to general practitioners

Musculoskeletal conditions were the fourth most commonly managed problem by GPs in 2007–08, accounting for 11.4% of all problems managed (Britt et al. 2008a). About three osteoarthritis problems were managed per 100 encounters with a GP (more than one problem can be managed at each encounter) and this equates to almost 3 million Medicare-paid GP consultations a year. Osteoporosis was managed at 1 per 100 encounters in 2007–08, equating to around 1 million Medicare-paid GP consultations. Rheumatoid arthritis was managed at half this frequency (Britt et al. 2009).

Hospitalisations

Hospitalisations for arthritis and musculoskeletal conditions are much less frequent than GP visits, and usually occur when surgical intervention is required. In 2007–08 there were more than 421,000 hospitalisations with the principal diagnosis of musculoskeletal conditions, of which 86,000 were for osteoarthritis and almost 8,000 for rheumatoid arthritis.

Although osteoporosis is not often listed as the main diagnosis in a hospitalisation, this is because most hospitalisations for osteoporosis involve a minimal trauma fracture. These cases are generally given the principal diagnosis of fracture (not osteoporosis), with the 'external cause' code indicating a minimal trauma event. There were almost 82,000 hospitalisations for minimal trauma fractures in 2007–08.

Surgical procedures

Advances in surgical procedures have provided more effective ways of managing the pain and disability associated with arthritis and musculoskeletal conditions. Joint replacement surgery (arthroplasty, usually of the knee or hip) is considered a cost-effective intervention for severe osteoarthritis, as it reduces pain and disability, and restores some patients to near-normal function (Bachmeier et al. 2001). The fractures resulting from osteoporosis often require hospital care and treatment. Procedures such as partial joint replacement and the use of pins, screws and plates can help to strengthen and realign broken bones. These procedures can restore varying degrees of function, ultimately improving quality of life.

In 2007–08, more than 488,000 surgical procedures were performed in hospitalisations with the principal diagnosis of arthritis and musculoskeletal conditions. Of these, 100,000 were for a principal diagnosis of osteoarthritis, almost 4,000 for rheumatoid arthritis, and a further 64,000 for minimal trauma fracture. (More than one procedure may be performed in each hospitalisation.)

Joint replacements were the most common surgical procedures performed for osteoarthritis and rheumatoid arthritis. For example, about 26% of hospitalisations for osteoarthritis involved a total knee replacement in 2007–08 (Table 4.13). Other common surgical procedures included arthroscopy (using a special camera to look inside a joint) and arthrodesis (fusing together the bones within a joint).

Table 4.13: Common surgical procedures for arthritis and musculoskeletal conditions, 2007–08

Principal diagnosis	Type of procedure	Number	Per cent ^(a)
Osteoarthritis	Total arthroplasty of knee, unilateral	25,970	25.8
	Total arthroplasty of hip, unilateral	18,847	18.8
	Arthroscopic meniscectomy of knee with debridement, osteoplasty or chondroplasty	9,316	9.2
	Hemiarthroplasty of knee	2,868	2.9
	Arthroscopic chondroplasty of knee	2,056	2.1
	Other	41,347	41.2
<i>Total</i>		<i>100,404</i>	<i>100.0</i>
Rheumatoid arthritis	Total arthroplasty of knee, unilateral	330	8.6
	Total arthroplasty of hip, unilateral	164	4.3
	Arthrodesis of 1st metatarsophalangeal joint	143	3.7
	Excision of lesion of soft tissue, not elsewhere classified	123	3.2
	Administration of agent into joint or other synovial cavity, not elsewhere classified	106	2.8
	Other	2,968	77.4
<i>Total</i>		<i>3,834</i>	<i>100.0</i>
Minimal trauma fracture	Internal fixation of fracture of trochanteric or subcapital femur	9,113	14.2
	Closed reduction of fracture of distal radius	5,992	9.3
	Hemiarthroplasty of femur	4,497	7.0
	Open reduction of fracture of distal radius, with internal fixation	3,279	5.2
	Open reduction of fracture of ankle with internal fixation of diastasis, fibula or malleolus	2,316	3.6
	Other	38,991	60.7
<i>Total</i>		<i>64,188</i>	<i>100.0</i>

(a) Per cent based on total number of hospitalisations with that principal diagnosis (86,141 for osteoarthritis; 7,809 for rheumatoid arthritis; and 81,875 for minimal trauma fractures).

Note: Procedures have only been counted once per hospitalisation, although they may be performed more than once.

Source: AIHW National Hospital Morbidity Database.

Non-surgical procedures

Almost 784,000 non-surgical procedures were also listed in hospitalisations with the principal diagnosis of arthritis and musculoskeletal conditions in 2007–08. The most common procedures included allied health interventions (such as physiotherapy and occupational therapy) and the administration of medications.

Prevention

The effects of arthritis and musculoskeletal conditions can be reduced through early intervention and appropriate long-term management. Over the past couple of decades there have been some encouraging advances in understanding the risk factors, causes and progression of these conditions, and in developing medications and other therapies to prevent and manage them. Although musculoskeletal conditions such as rheumatoid and juvenile arthritis cannot yet be prevented, others, such as osteoarthritis and osteoporosis, can be prevented or can at least have their onset delayed.

Preventing obesity, avoiding joint trauma and modifying work-related joint stress through ergonomic approaches are recommended for preventing osteoarthritis. Keeping physically active, maintaining a healthy weight, and increasing the intake of substances such as vitamin D and calcium are the keys to preventing osteoporosis.

Arthritis in children

Arthritis is most common in the older age groups, but it also affects young people. Juvenile arthritis, also known as juvenile rheumatoid arthritis or juvenile chronic arthritis, is the term used for arthritis of unknown cause that begins before the 16th birthday and lasts at least 6 weeks. There are several different forms of juvenile arthritis and they are estimated to have affected about 4,600 Australian children in 2004–05 (AIHW 2008d).

As with arthritis in adults, the main symptoms of juvenile arthritis are pain, swelling and stiffness in the joints. Joint stiffness is usually common after rest or decreased activity, and there is often weakness in muscles and other soft tissues around the joints involved. However, juvenile arthritis is not a 'mini-version' of adult arthritis. Although some forms of arthritis that affect children are also found in adults, other forms are found almost exclusively in children.

Juvenile arthritis is highly diverse in its features. Many children are affected in only one or a few joints, whereas others have arthritis in multiple joints. Some children are also affected in areas other than joints—eyes, skin and other body tissues. In some cases, the symptoms may alter over the course of the disease.

Because the disease affects children in the prime of their growth and development, it may lead to activity limitations and physical deformities early in life (see Box 4.10). Although remission is common, the disease can continue or recur throughout adulthood and result in complications over time, thus increasing the need for health services in the long term.

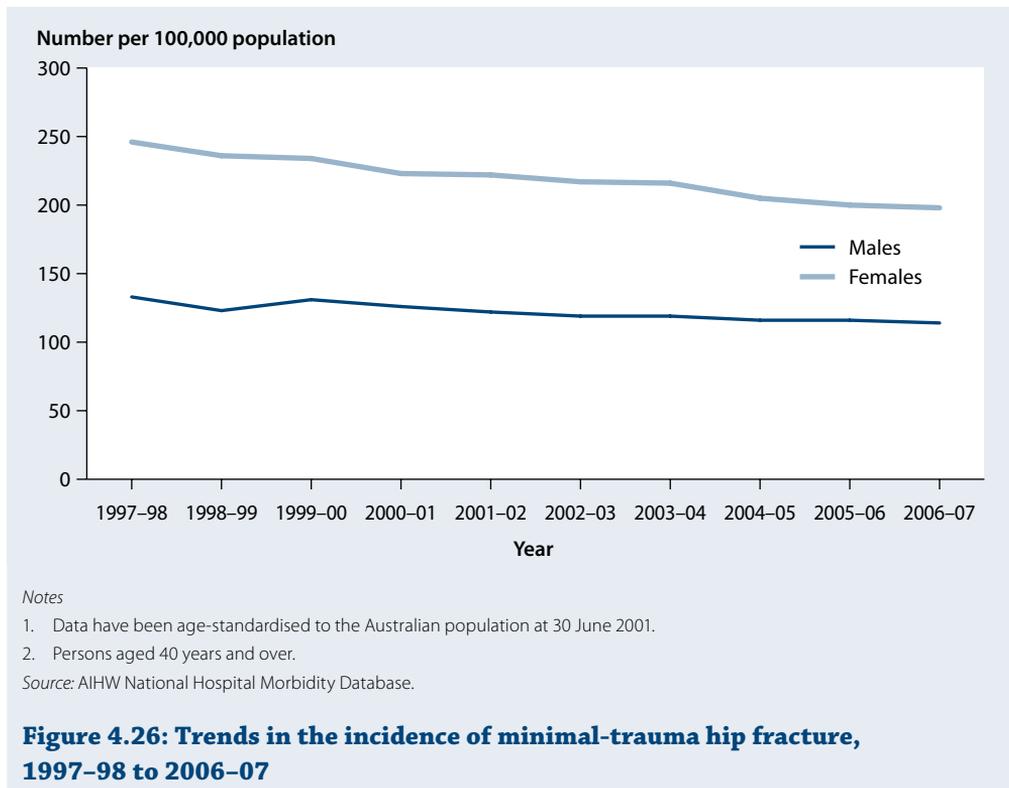
There are no well-recognised management strategies that consistently achieve the best results for juvenile arthritis. A multidisciplinary approach is usually needed to enable normal childhood activities, support proper growth and development, and reduce joint erosion and disability.

Hip fractures from minimal trauma

Unlike most other musculoskeletal conditions, osteoporosis has no obvious signs of development and is often only diagnosed after a fracture following minimal trauma has occurred, such as when a person falls from a standing position. Fractures due to osteoporosis can occur anywhere in the body, but are more likely to occur in the hips, spine, wrists, pelvis and forearms. Of these, hip fractures often have the most severe consequences in terms of ongoing pain, disability and mortality.

A hip fracture is a break that occurs at the top of the thigh bone (femur), near the hip. It is estimated that every day 40 Australians break their hips following minimal trauma (AIHW 2010b). These fractures are a substantial burden on society and the health system, and considerable resources have been dedicated to reducing this burden through raising awareness of the risks for fractures and subsidising services for diagnosing and managing osteoporosis.

The incidence of minimal-trauma hip fracture in Australia is declining, with the age-adjusted rates for males falling by 14% and for females by 20% between 1997–98 and 2006–07 (Figure 4.26) (AIHW 2009f). This trend may help offset the expected increase in the absolute number of hip fractures resulting from population ageing over time.



4.9 Injury

Injury has a major, but often preventable, influence on Australia's health. It affects Australians of all ages and is the greatest cause of death in the first half of life. It leaves many with serious disability or long-term conditions. Injury is estimated to account for 6.5% of the burden of disease in 2010. For these reasons, injury prevention and control was declared an NHPA and is the subject of three national prevention plans: the National Injury Prevention and Safety Promotion Plan: 2004–2014 (NPHP 2005a), National Falls Prevention for Older People Plan: 2004 Onwards (NPHP 2004) and the National Aboriginal and Torres Strait Islander Safety Promotion Strategy (NPHP 2005b). This section describes fatal and serious non-fatal (hospitalised) injury and poisoning in Australia. Injury of Aboriginal and Torres Strait Islander people is covered in Chapter 5.

Hospitalised injury

Hospitalisation data provide an indication of the incidence of the more severe injuries. Injury accounted for over 1 in 20 of all hospitalisations in Australia in 2007–08, with almost 426,000 injury hospitalisations that year. Table 4.14 shows this and also provides estimates of the number of people hospitalised (a lower number, because some injuries result in more than one episode in hospital), along with several other summary measures.

Incidence rates of serious injury are higher for males than females, both overall and for most types of injury. However, the average length of stay is longer for females than males, reflecting the large number of older females hospitalised for hip fractures (see ‘Fall-related injury’ later in this section).

Table 4.14: Hospitalisations due to injury and poisoning^(a), 2007–08

Measure	Males	Females	Persons ^(b)
<i>Hospitalisations</i>			
Hospitalisations due to injury and poisoning ^(a)	248,590	177,352	425,949
Hospitalisations due to all causes	3,724,423	4,149,381	7,873,946
Injury hospitalisations as proportion of all hospitalisations (%)	6.7	4.3	5.4
<i>Cases</i>			
Estimated number of hospitalised injury cases ^(c)	230,676	163,823	394,505
Crude rate (per 100,000 population)	2,134	1,507	1,819
Adjusted rate (per 100,000 population) ^(d)	2,156.0	1,400.3	1,793.8
Number of patient days	771,056	830,410	1,601,483
Average patient days per case	3.3	5.1	4.1
Number of high-threat-to life cases ^(e)	39,854	43,360	83,214

(a) Includes cases where the principal diagnosis was coded to ICD-10-AM S00–T75 or T79.

(b) Includes cases where sex is missing or indeterminate.

(c) Omits inward transfers from acute hospitals.

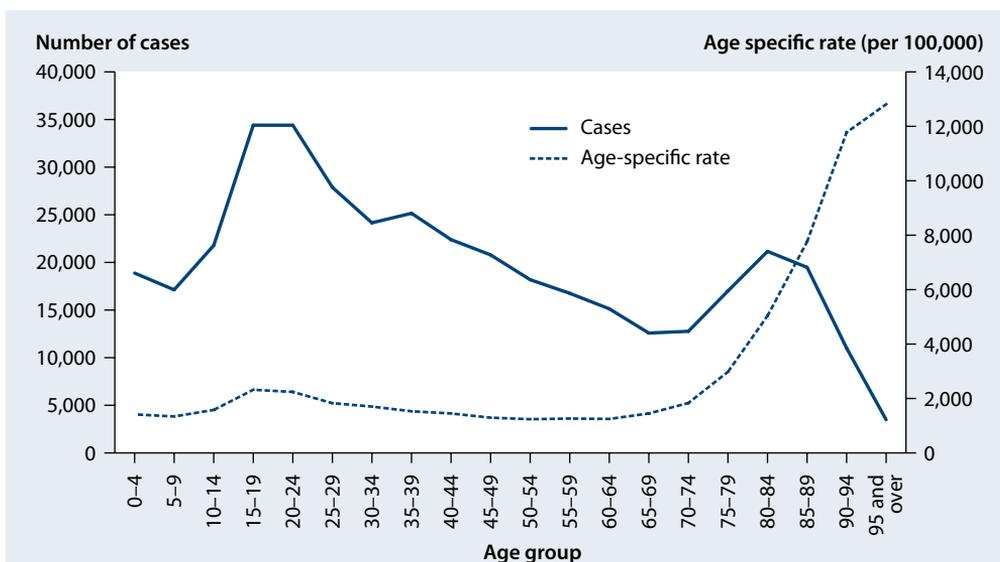
(d) Adjusted by direct standardisation to the Australian estimated resident population at 30th June 2001.

(e) ICD-based Injury Severity Score < 0.941 (weights according to the method of Stephenson et al. 2003).

Source: AIHW National Morbidity Database.

High threat-to-life cases are defined here as those with an International Classification of Diseases-based injury severity score (ICISS) of less than 0.941 (Stephenson et al. 2004). Injury of this severity is likely to have a large effect on the patient, often with persisting problems and ongoing need for health-care services. The number of high threat-to-life cases has increased over time and accounted for 21% of all hospitalised injury cases in 2007–08 (17% of the male cases, 26% of the female) and 54% of injury patient days in 2007–08.

The incidence of injury varies with age, with cases being most numerous for teenagers and young adults (Figure 4.27). There is also a peak in rates at this age, but the highest rates are in the oldest age groups. The rate of hospitalised injury at ages 90 years and over was more than 11,000 per 100,000 persons, slightly more than 1 hospitalisation for injury for every 10 people at these ages during 2007–08. This high rate is almost entirely due to injury from unintentional falls (see ‘Fall-related injury’ below).



(a) Includes cases where the principal diagnosis was coded to ICD-10-AM S00–T75 or T79.

Source: AIHW National Morbidity Database.

Figure 4.27: Hospitalisations due to injury and poisoning^(a), 2007–08: number of cases and rates, by age group

The rate of hospitalised injury for males is greater than for females in every age-group below the age of 65 years. This is largely due to transport injury (mainly road crashes) and interpersonal violence. At ages older than 65 years the female rate exceeds the male rate, due mainly to injury from unintentional falls.

A standard method of classifying injury incidents is based on whether or not they are deliberately inflicted (for example unintentional, self-inflicted or assault) and the mechanism of injury (for example falling, poisoning or drowning). Table 4.15 summarises the types of external causes among injury cases admitted to hospital in 2007–08. The great majority (86%) of injury cases were unintentional—that is, the injuries were not caused deliberately. Falls and transportation (mostly motor vehicles) were common external causes of injury (51% of all hospitalised injury cases), and accounted for more than three-quarters of high threat-to-life cases (79%).

The age-standardised rate of fall-related hospitalisations increased from 618.5 per 100,000 in 2005–06 to 654.1 per 100,000 in 2007–08. This is particularly noteworthy in the high threat-to-life cases and reflects the reported increases in falls hospitalisations in older people over the past 6 years (Bradley & Pointer 2009).

Table 4.15: Hospitalisation due to injury and poisoning^(a), by external cause groups, 2007–08

External cause of injury ^(b)	All cases			High threat-to-life ^(c)			Per cent within type
	Number	Per cent of total	Rate ^(d)	Number	Per cent of total	Rate ^(d)	
Unintentional							
Transportation	53,587	14	253.7	13,616	16	63.6	25
Drowning & submersion	450	0	2.2	399	0	1.9	89
Poisoning, pharmaceuticals	6,552	2	30.8	792	1	3.5	12
Poisoning, other substances	2,261	1	10.6	228	0	1.0	10
Falls	145,675	37	654.1	51,840	62	222.0	36
Fires/burns/scalds	5,811	1	27.6	1,004	1	4.7	17
Other unintentional	125,466	32	590.8	8,083	10	36.4	6
Intentional							
Self-inflicted	23,870	6	113.4	1,851	2	8.6	8
Inflicted by another person	23,315	6	111.1	4,451	5	21.2	19
Undetermined intent							
Other & missing	2,416	1	11.0	581	1	2.6	24
Total	394,505	100	1,829.4	83,214	100	367.2	21

(a) Includes cases where the principal diagnosis was coded to ICD-10-AM S00–T75 or T79.

(b) ICD-10-AM External Cause codes aggregated as in Berry & Harrison 2007.

(c) ICD-based Injury Severity Score < 0.941 (weights from Stephenson et al. 2003).

(d) The number of cases per 100,000 persons, directly standardised to the Australian estimated resident population at 30 June 2001.

Source: AIHW National Morbidity Database.

Disability and chronic injury

The nature and severity of an injury will determine the likelihood and degree of long-term disability and impairment for an individual. For minor injuries recovery is usually quick, typically resolving within days or weeks. More serious injuries can have major effects, resulting in the need for lifetime care and support. These most serious cases are sometimes described as catastrophic injuries, for example persisting spinal cord injury and severe traumatic brain injury (TBI).

Each year in Australia, about 300 new cases of spinal cord injury from traumatic causes are added to an estimated prevalent population of those with spinal cord injury of about 9,000 (AIHW: Cripps, 2007). Based on 2005 cost estimates (Walsh et al. 2005), the ongoing costs associated with the long-term care of all these people are estimated to be nearly \$500 million per year.

In 2007–08 there were 15,432 cases of primary hospitalised TBI (see Helps et al. 2008 for inclusion criteria). The highest proportion of all primary hospitalised TBI occurred in 15–24 year olds, accounting for 22% (3,387) of all cases. Nearly 70% occurred in males. Cases of TBI can vary in terms of their threat to life but it is important to note that even those that have a low threat to life can have lifelong consequences for the individual.

Other injuries, such as burns, fractures and back injuries, can also have profound effects on long-term health and wellbeing. The results of the NHS suggest that in 2007–08 about 2.4 million Australians had a long-term condition due to an injury (ABS 2009b).

Deaths

Almost 7.4% of all deaths occurring in Australia in 2005–06 resulted from an injury (or external cause of injury), about 27 per day (Table 4.16). (See Box 4.11 for information on the special way that injury deaths are counted.) The overall injury death rate (age-standardised) for males was over twice that of females. During the first year of life, congenital and perinatal conditions were the most common cause of death, but injury was the most common cause of death from early childhood through to middle age. In 2005–06, nearly half (49%) of all deaths of persons aged 1–44 years were due to injury.

Table 4.16: Injury deaths: numbers, proportions and rates, 2005–06

Measure	Males	Females	Persons
Number of deaths ^(a)	6,115	3,805	9,920
Proportion of all deaths	8.9%	5.8%	7.4%
Crude rate per 100,000 population	59.8	36.8	48.2
Adjusted rate per 100,000 population ^(b)	63.3	30.7	46.5

(a) Deaths occurring during 2004–05 for which the underlying cause of death was coded to ICD-10 V01–Y36, Y85–Y86, Y89 or any multiple cause of death coded to ICD-10 S00–T75, T79. The method follows Henley et al. 2007.

(b) Adjusted by direct standardisation to the Australian population in June 2001; the rate is given as the number of cases per 100,000 persons.

Source: AIHW National Mortality Database.

Of the 9,920 injury-related deaths in 2005–06, 77% (7,655 deaths) had an injury coded as the underlying cause of death while the remaining 23% (2,265) had injury coded as an associated cause of death. Rates for individual external causes of injury are not shown here due to data quality issues (see 'Data quality' later in this section). It should also be noted that the figure of 9,920 may be a slight underestimate of the true number of injury-related deaths due to the presence of several hundred cases coded to ill-defined and unknown causes of death. How many of these cases were due to injury is not known, but previous research suggests that the number is likely to be relatively small.

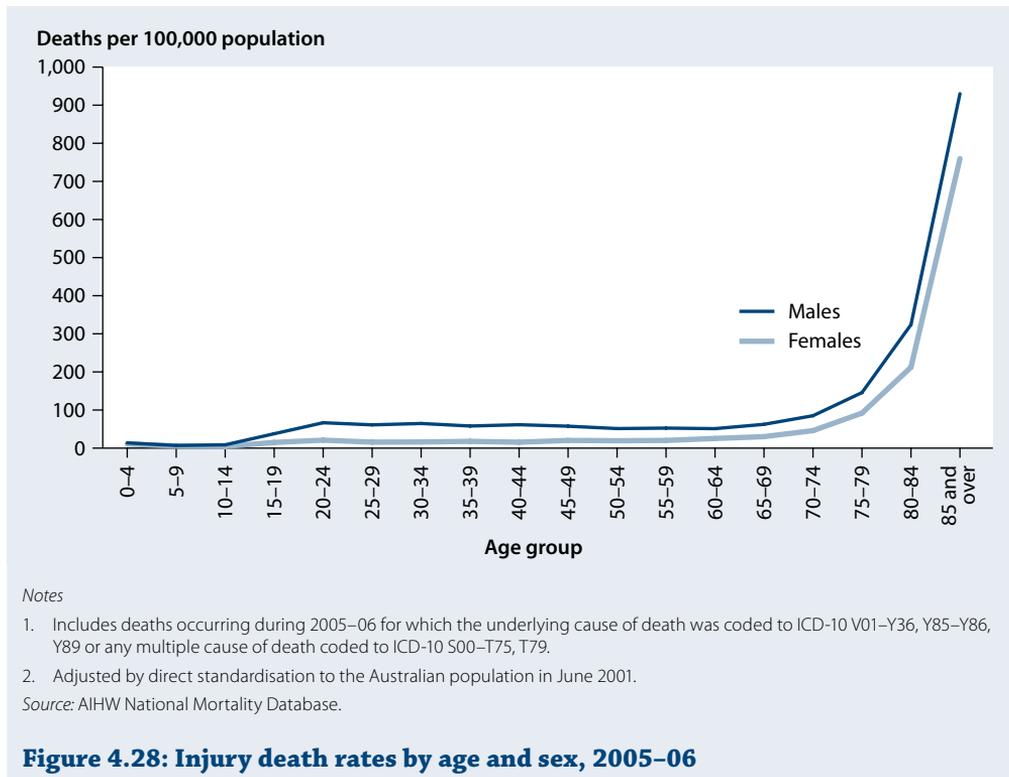
Box 4.11: Counting injury deaths

Injury deaths reported here follow the method which takes account of multiple causes of death described in Henley et al. (2007). This method includes a death as an injury death if:

- the underlying cause of death was coded to ICD-10 V01–Y36, Y85–Y8, or Y89, or
- there is any cause of death coded to ICD-10 S00–T75 or T79.

By counting injury deaths in this way we obtain a more complete count than the previous method based solely on the underlying cause of death being an external cause. Note that this new method does not include complications of surgical and medical care (Henley et al. 2007). The method used here is not comparable to that used for the diseases covered in this chapter of *Australia's health*, but is the method used in *Australia's health 2008* to count injury deaths. The previous method results in a figure of about 8,000 injury deaths in 2005, compared with the almost 10,000 injury deaths obtained using the method adopted in this section.

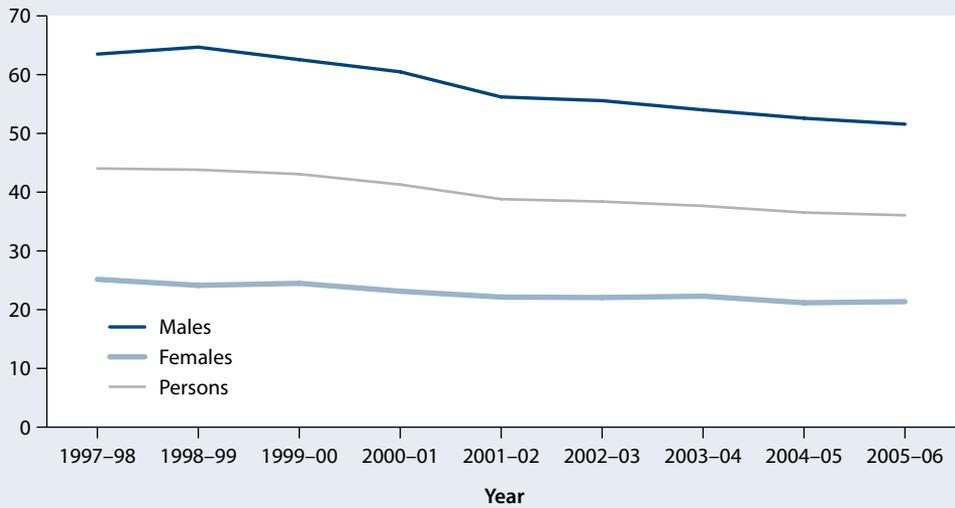
Injury death rates are low in childhood compared with other ages (Figure 4.28). However, mortality from all causes is low in this age group, and injury accounted for about 40% of all deaths between the ages of 1 and 14 years in 2005–06.



Trends in mortality

Overall injury mortality has declined in recent years (Figure 4.29), especially among younger age groups (Figure 4.30). In the period from 1997–98 to 2005–06, there was an encouraging decline of almost 40% in death rates for those aged 15–24 years, while for those aged 0–14 years and 25–44 years, mortality rates fell by 30% and 33% respectively. For those aged 65 years and over, rates declined from 1997–98 to 2000–01 before rising again to a rate in 2005–06 similar to that in 1997–98. Trends in rates for individual external causes of injury are not shown here due to data quality problems (see Box 4.12).

Deaths per 100,000 population



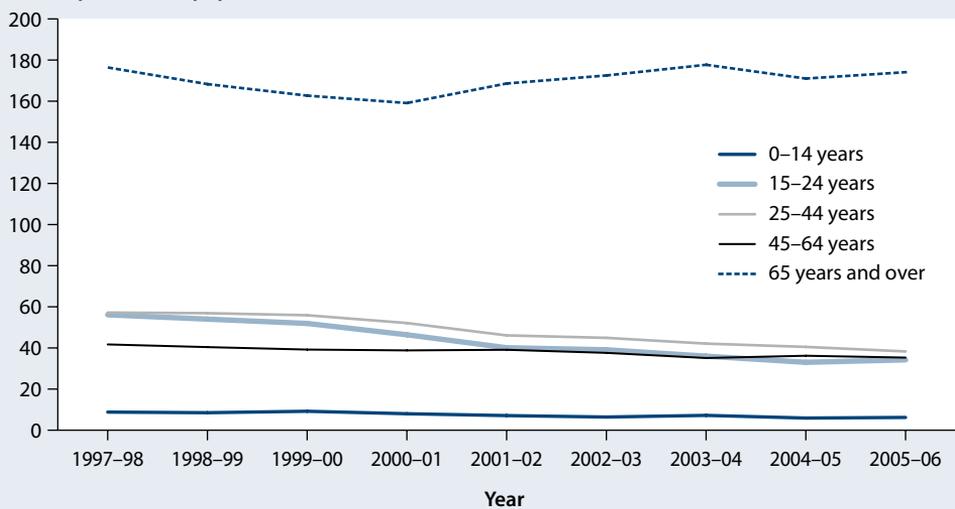
Notes

1. Includes deaths (based on year of death) occurring from 1997-98 to 2005-06 for which the underlying cause of death was coded to ICD-10 V01-Y36, Y85-Y86, Y89 or any multiple cause of death coded to ICD-10 S00-T75, T79.
2. Adjusted by direct standardisation to the Australian population in June 2001.

Source: AIHW National Mortality Database.

Figure 4.29: Injury death rates by sex, 1997-98 to 2005-06

Deaths per 100,000 population



Notes

1. Includes deaths (based on year of death) occurring from 1997-98 to 2005-06 for which the underlying cause of death was coded to ICD-10 V01-Y36, Y85-Y86, Y89 or any multiple cause of death coded to ICD-10 S00-T75, T79.
2. Adjusted by direct standardisation to the Australian population in June 2001.

Source: AIHW National Mortality Database.

Figure 4.30: Injury death rates by age group, 1997-98 to 2005-06

Box 4.12: Changes affecting timing and interpretation of injury deaths data in Australia

Interpreting rates and trends of injury mortality in Australia for recent years is complicated by classification issues, which have resulted in underestimation of some and overestimation of other external causes of injury in Australian Bureau of Statistics (ABS) mortality data. Investigations of how this occurred and revised estimates for part of the period have been presented elsewhere (Harrison et al. 2009; Henley & Harrison 2009). Underestimation has chiefly affected statistics on suicides and homicides, and also road deaths to some extent. Overestimation has occurred for deaths recorded as unintentional and due to mechanisms that are common among suicides and homicides—chiefly poisoning, hanging and strangulation, and firearm discharge (Henley & Harrison 2009). The main cause of the problem was a mismatch between the time to completion of processing of some coroners' cases and the ABS's schedule for producing annual files of cause of death data (Harrison et al. 2009).

Beginning with the deaths registered in 2007, the ABS has introduced a revised way of treating information from coroners' cases that are still incomplete when the ABS is due to release its cause data for deaths in a given year. The relevant cases will be assigned a cause of death code based on the level of detail available on the cause, mechanism and intent of the death. The ABS will review their coding of these deaths periodically and it will be changed if indicated by information that becomes available when the coroner's case has closed.

In future, therefore, the ABS will be releasing several versions of cause-of-death data for deaths registered in a particular year. The first release of ABS cause-of-death data (for example, 2007 registrations as released in 2009) shows a large number of cases assigned to 'undetermined intent' codes (see table on next page) (ABS 2009c). The counts for transport-related deaths, suicides and homicides are all lower than expected. However, most of these cases will be re-allocated in future ABS releases of cause data for 2007. Cases initially allocated to *Hanging, strangulation and suffocation, undetermined intent (Y20)* and many allocated to *Poisoning, undetermined intent (Y10–Y19)* are likely to be reassigned to intentional self-harm codes when final information is available. Similarly, most cases allocated to *Firearm discharge, undetermined intent (Y22–Y24)* and *Contact with sharp object, undetermined intent (Y28)* are likely to be reassigned to assault or intentional self-harm, and most cases first allocated to *Crashing of motor vehicle, undetermined intent (Y32)* will probably be assigned to unintentional transport-related codes.

Selected external causes of injury, Australia 2007

External cause of injury (ICD-10 code)	Count ^(a)
Transport accidents (V01–V99)	1,372
Unintentional Poisoning (X40–X49)	805
Intentional self-harm (X60–X84)	1,977
Assault (X85–Y09)	168
Event of undetermined intent (Y10–Y34)	1,154
Poisoning, undetermined intent (Y10–Y19)	331
Hanging, strangulation and suffocation, undetermined intent (Y20)	166
Drowning and submersion, undetermined intent (Y21)	40
Firearm discharge, undetermined intent (Y22–Y24)	28
Contact with sharp object, undetermined intent (Y28)	19
Crashing of motor vehicle, undetermined intent (Y32)	110
Other specified events, undetermined intent (Y33)	114
Unspecified event, undetermined intent (Y34)	260

(a) Counts derived by including multiple cause of death codes along with underlying cause of death codes.

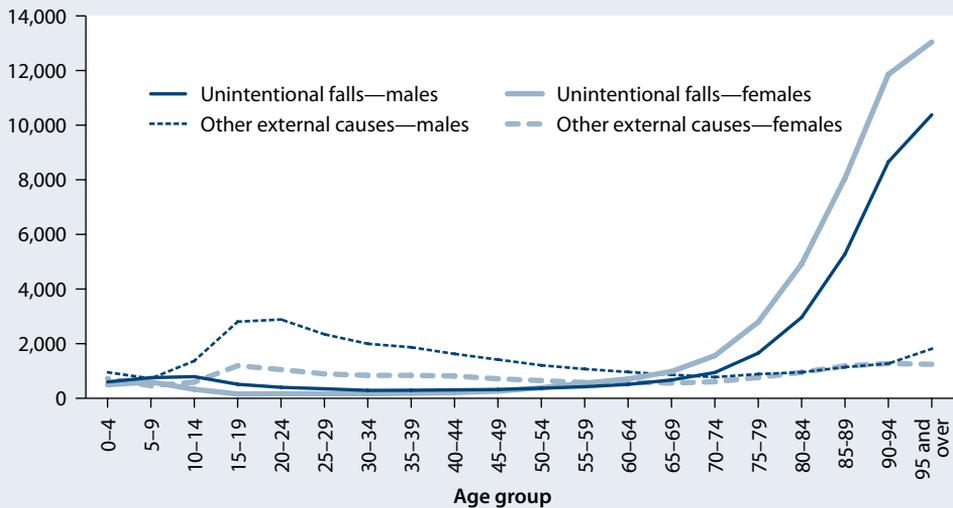
Source: ABS 2009d.

Fall-related injury

Falls account for about one-third of all hospitalised injury cases and one-fifth of all fatal injury in Australia. The overall age-standardised rate of injurious falls requiring hospitalisation in 2007–08 was 654 per 100,000 population. The rate increased rapidly with age; for Australians aged 65 years and over the rate was 2,516 per 100,000. At ages 85 years and over, unintentional falls accounted for about 7 times the number of injury incidents attributed to all other external causes combined. Unlike most other types of external cause, rates of hospitalisation due to falls were higher for older females than older males (Figure 4.31). Deaths following falls also rise rapidly with age, especially after about 70 years of age.

Falls by older people commonly result in a fracture, often a hip fracture. Three in 10 hospitalised fall-related injuries for older Australians in 2007–08 involved the hip or thigh and three-quarters of these were fractures of the neck of the femur. Head injuries due to a fall were also common, particularly for males. Most injurious falls are due to slips, trips and stumbles and other falls on the same level (53% of injurious falls for people aged 65 years and over in 2007–08). Seven out of 10 falls resulting in hospitalisation of older people in 2007–08 occurred either in the home or in aged care facilities. Rates of injurious falls in aged care facilities have been found to be higher than those in the home.

Number per 100,000 population



(a) Includes cases where principal diagnosis was coded to ICD-10-AM S00–T75 or T79 and first external cause was coded to V01–Y89.

Source: AIHW National Morbidity Database.

Figure 4.31: Hospitalisation due to injury and poisoning^(a), 2007–08: age-specific rates by sex; unintentional falls and all other external causes of injury

Injurious falls by older people place a heavy burden on the hospital system because they are numerous and cases have a long average stay in hospital. These cases often require a period of rehabilitation after acute care. Injurious falls may also have a considerable impact on quality of life, often reducing independence and hastening admission to residential care (Tinetti & Williams 1997, 1998). Serious falls also significantly contribute to premature mortality (Keene et al. 1993; Sattin 1992). A method of analysing data that included acute and follow-up care in hospital led to an estimate that the average total hospital stay due to an injurious fall by an older person was 16 days in 2007–08.

The direct cost of fall-related acute episodes of care for Australians aged 65 and over in 2006–07 was estimated to be \$600 million. The total hospital cost is likely to be considerably higher than this, because episodes of care classified as rehabilitation and certain other types could not be accounted for in this estimate.

4.10 Infectious diseases

The term ‘infectious disease’ refers to an illness, fever or rash due to harmful organisms (mostly micro-organisms) or their toxic products. Generally acute in nature, infectious diseases are large causes of illness, disability and death in many parts of the world. From a public health perspective, their distinctive feature is that some can occur in outbreaks that affect many people, especially if they can spread rapidly through human-to-human contact.

In Australia and similar developed countries, infectious diseases are not among the leading contributors to the burden of disease. With improved sanitation, the introduction of antibiotics and immunisation programs, the effects of infectious diseases on Australia’s health have reduced markedly over the last century.

Yet the burden of infectious diseases continues to be significant in Australia: infections and immunisations account for about 7% of all GP consultations (Britt et al. 2005). Around 3–4% of deaths annually are attributed to infection (AIHW 2009a), as are a similar percentage of hospitalisations, including pneumonia, urinary tract infections and gastrointestinal infections (AIHW 2007b). Also, the potential for serious outbreaks continues to present a challenge in public health and requires planning and constant vigilance.

Health departments continue to respond to outbreaks and to monitor trends for certain important infections. The infections chosen for surveillance usually meet at least one of the following criteria:

- They have a high risk of death, especially if this includes young and otherwise healthy people.
- They are highly contagious.
- They have not been seen until recently, for example severe acute respiratory syndrome (SARS) and avian influenza.
- They are not established in Australia.
- They are vaccine-preventable.
- They are related to lifestyle factors, for example sexual activity or injecting drug use.
- They arise from contaminated food.
- They can be used for bioterrorism.
- They require worldwide monitoring, even though they are not so relevant to Australia, for example cholera.

There are three main data sources used in this section, as outlined in Box 4.13. The section begins with a very brief overview of infectious diseases as a whole, then provides information on a series of diseases of interest.

Box 4.13: Infectious diseases data

Three main data sources are used in this section:

- The incidence of infectious diseases is largely based on information from the National Notifiable Diseases Surveillance System, compiled by the Office of Health Protection in the Australian Government Department of Health and Ageing from data supplied by the states and territories. A disease may be made notifiable to jurisdictional health authorities depending on its significance to public health. Each state or territory has specific requirements under its public health legislation for notification by medical practitioners, laboratories and hospitals. Data for the most recent year (2009) are provisional and may not be complete, as they can change retrospectively.
- Information on the number of deaths from infectious diseases has come from the Australian Institute of Health and Welfare (AIHW) National Mortality Database.
- Information on hospitalisations for infectious diseases has come from the AIHW's National Hospital Database.

In this section, only deaths and hospitalisations coded to the 'certain infectious and parasitic diseases' chapter (ICD-10 and ICD-10-AM codes A00–B99) have been included. This is consistent with the method used for *Australia's health 2008*.

Overview

Incidence

Infectious diseases remain relatively common. Although there are no data on the incidence of infectious disease overall, some of these diseases are notifiable, meaning that the law requires them to be notified to government health authorities. A selection of the main notifiable diseases is included in Table 4.17. Among this group of diseases, chlamydia infection was the most common with over 62,000 notifications. Other leading notifiable diseases were campylobacteriosis (a gastrointestinal disease), hepatitis C infection, pertussis (whooping cough) and laboratory-confirmed influenza.

Table 4.17: Selected nationally notifiable diseases, 2009

Disease	Notifications	Number per 100,000
Vaccine-preventable diseases		
Meningococcal disease (invasive)	259	1.3
Pneumococcal disease (invasive)	1,555	7.1
Pertussis (whooping cough)	29,208	133.5
Mumps	163	0.7
Influenza (laboratory-confirmed)	45,031	205.9
Mosquito-borne diseases		
Barmah Forest virus infection	1,488	6.8
Ross River virus infection	4,757	21.7
Malaria	531	2.4
Dengue	1,398	6.4
Sexually transmissible infections		
HIV ^(a)	995	4.6
Syphilis ^(b)	2,835	12.9
Gonococcal infection	8,072	36.9
Chlamydial infection	62,686	286.6
Hepatitis		
Hepatitis B ^(c)	7,967	36.4
Hepatitis C ^(c)	12,984	59.4
Gastrointestinal diseases		
Campylobacteriosis ^(d)	15,826	107.1
Salmonellosis (nec)	9,517	43.5
Tuberculosis	1,300	5.9

nec Not elsewhere classified.

(a) 2008.

(b) includes all syphilis categories (see Table S22 .

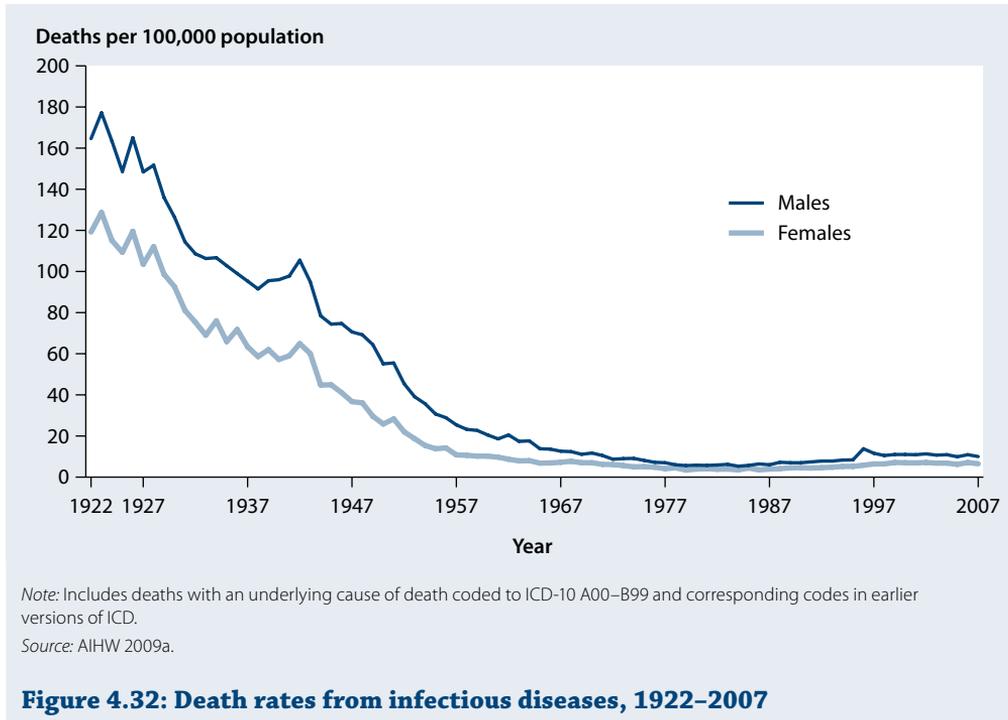
(c) Includes incident and unspecified cases.

(d) Notified as 'foodborne disease' or 'gastroenteritis in an institution' in New South Wales.

Sources: NCHECR 2009; NNDSS 2009.

Mortality

Deaths from infectious diseases have declined dramatically since the early part of the last century (Figure 4.32). In 1922, they accounted for 15% of all deaths, but by 2007 they accounted for a little over 1%. In 2007, there were just over 1,800 infectious diseases deaths, a death rate of 8.1 per 100,000 (age-standardised). Septicaemia (blood poisoning) accounted for the largest proportion of these (1,105 deaths), and the next most common was 'sequelae of infectious and parasitic diseases' (176 deaths).



Burden of disease

The infectious diseases group is estimated to be a relatively small contributor to the burden of disease in 2010, accounting for 1.7% of the total burden. Most of the burden (69%) was because of premature death rather than years lived with disability.

Hospitalisations

Over 91,000 hospitalisations in 2007–08 were attributed to infectious diseases (ICD-10-AM codes A00–B99 as the principal diagnosis), a figure that has remained fairly steady in recent years. Intestinal infectious diseases were the largest group (38%). The largest number of admissions was for children, particularly those aged under 5 years.

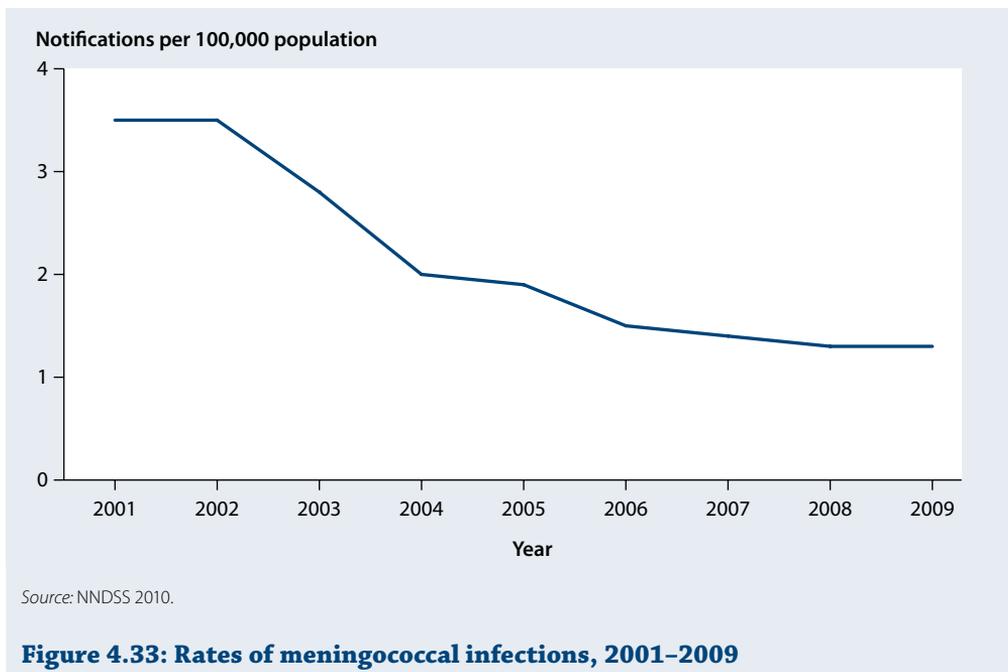
Vaccine-preventable infections

Immunisation has had a dramatic influence on rates of illness and death from a wide variety of infections. This section focuses on a selected number of infections for which childhood immunisation programs exist, namely invasive meningococcal disease, invasive pneumococcal disease (IPD), pertussis and mumps.

Invasive meningococcal disease

This bacterial infection is caused by *Neisseria meningitidis* (also known as ‘meningococcus’). It is one of the highest profile infections in Australia because of the rapid and serious way it can attack children and young adults. Infection is usually most common in children aged under 5 years and those aged 15–24 years (Senanayake 2007:230). Around 10% of those infected die (Rosenstein et al. 2001), which is a high rate for an acute infection.

Notification rates for infections due to meningococcal disease in Australia have been falling in recent years (Figure 4.33). This may be partly attributed to a nationally funded immunisation program to vaccinate against the C strain of meningococcus. Certainly, in 2008, only 7% (21 of the 286 cases) of notified meningococcal infections were caused by the C strain, with almost 77% being caused by the B strain. In addition, there were a reduced number of cases due to the C strain in people aged 25 years or more, suggesting that there is ‘herd immunity’—the phenomenon where unvaccinated groups benefit from others having been vaccinated (Australian Meningococcal Surveillance Programme 2009).

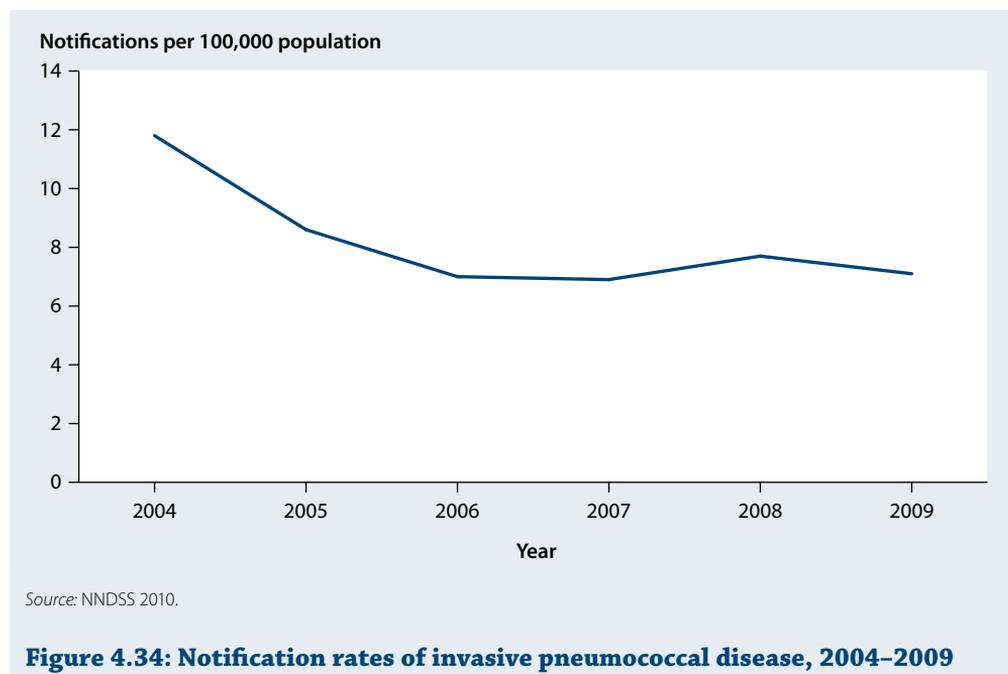


Invasive pneumococcal disease

IPD is due to a bacterium called *Streptococcus pneumoniae* (also known as ‘pneumococcus’). An individual can be classified as having IPD only if pneumococcus is isolated from a so-called sterile site. Blood, spinal fluid and fluid from around the lung are examples of sterile sites; therefore, middle ear and chest infections due to pneumococcus are not included in the notifications for IPD since they are not classified as sterile sites.

Rates of IPD tend to be largest at the extremes of age, namely in children under 2 years and the very elderly (McIntyre et al. 2000). Also, indigenous populations in many countries are at higher risk of IPD than non-indigenous populations. Australia is no exception, with Indigenous rates of IPD 4.3 times as high as in other Australians (Roche 2008a).

The introduction of a new vaccine in the last decade has changed the disease patterns of IPD. Before January 2005, only certain at-risk children were eligible for free IPD immunisation. However, from then the Australian Government expanded its program to fund vaccination for all infants and children and all adults aged 65 years or over (Roche et al. 2008a). Since these changes there has been an overall reduction in notification rates of IPD (Figure 4.34), including among age groups which are not covered by the vaccination program (NNDSS 2009)—most probably due to herd immunity.



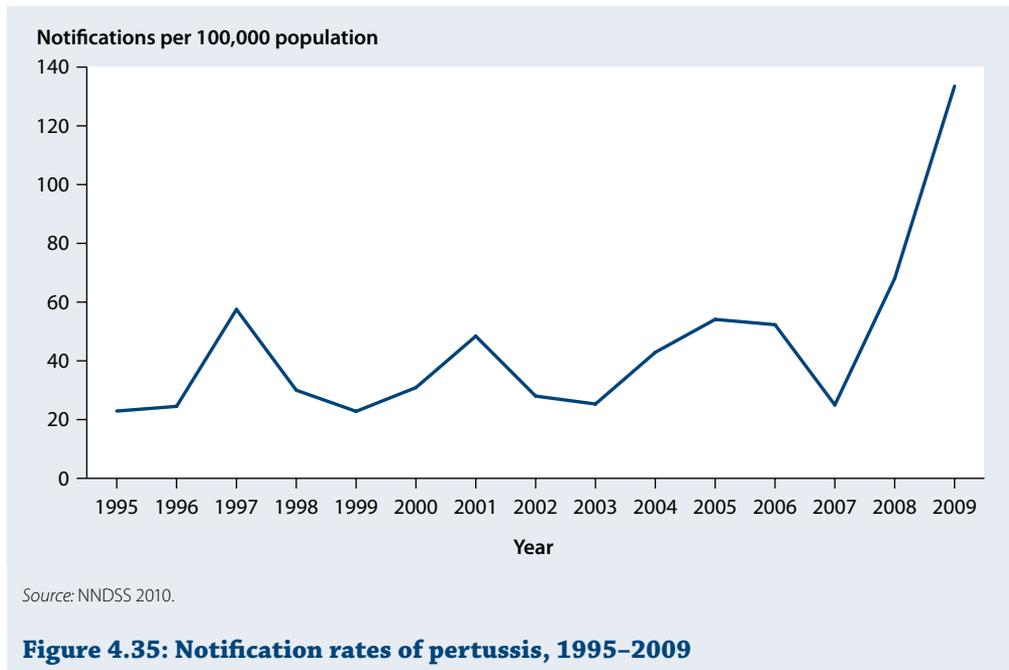
Pertussis (whooping cough)

Pertussis is an infection caused by the bacterium *Bordetella pertussis*. It is best known for its chronic cough and severe coughing fits that can be life-threatening, particularly in infants. There is typically a background rate of cases interrupted by an epidemic peak every 4 years or so (Figure 4.35) (Cherry 2005; NNDSS 2009).

Despite global immunisation programs, pertussis remains a significant problem in both developing and developed nations (WHO 2005). This includes Australia, where pertussis is the most commonly notified vaccine-preventable infection. Since vaccination began among children in Australia, there has been a shift upwards in the age distribution of pertussis, with almost 90% of notifications since 2003 occurring in those aged over 10 years and around half in those aged 20–59 years.

In 2008 and 2009, there was a sharp increase in notification rates for pertussis (Figure 4.35). In addition, there was a large increase in the proportion of young children infected: those aged from 0–4 years accounted for 11% and 15% of pertussis cases in 2008 and 2009 respectively, whereas they only made up around 3–8% of cases in the preceding 5 years (NNDSS 2009). The increased notification rate in the 0–4 year age group is important because susceptible infants are those most likely to die from the infection (Brotherton et al. 2004). However, the increased proportion of young children identified with pertussis

may not necessarily be due to increased levels of infection. It is likely that better tests for pertussis and more testing of sick children means that more young children are being identified with pertussis than previously.

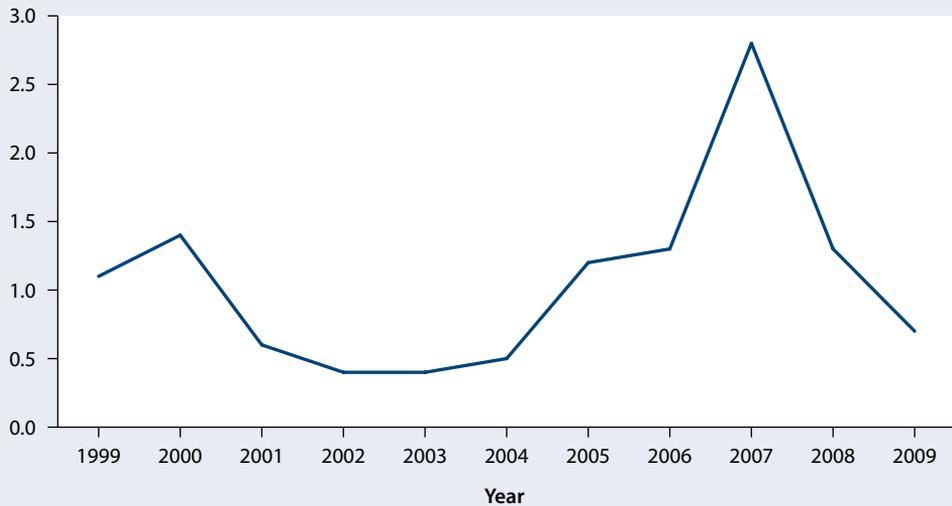


Mumps

Mumps is a vaccine-preventable viral disease that has experienced a resurgence. It causes swelling of the salivary glands in the face and can lead to a variety of complications such as meningitis, inflammation of the testicles in post-pubertal males, and pancreatitis. In susceptible populations it is a highly infectious disease (WHO 2007).

Notification rates of mumps had been increasing in Australia in recent years although there has been a decline over the last 2 years (Figure 4.36). In addition, whereas mumps was traditionally an infection of mainly young children, it now also affects adolescents and adults (NNDSS 2009). This is probably due to a combination of vaccine failure in childhood (especially in those who received only one dose of vaccine) and adults having waning immunity from the immunisation they had when children (Cohen et al. 2007; Harling et al. 2005).

Notifications per 100,000 population



Source: NNDSS 2010.

Figure 4.36: Notification rates of mumps, 1999–2009

Influenza

Influenza is a common viral respiratory infection that affects many people around the world each year. The classical infection consists of fevers, generalised muscle aches, headache, cough and sore throat. This combination of symptoms is also called an ‘influenza-like illness’ or ‘ILI’, since other viruses or bacteria can produce a similar sickness. The most serious complication of influenza is pneumonia, which can be due to the influenza virus itself or a secondary bacterial infection. More details about influenza are provided in Box 4.14.

Box 4.14: Influenza characteristics and vaccination

Not all influenza viruses are the same—they are distinguished in different ways. First, they can be classed as influenza A, B or C. Influenza B and C are exclusively human viruses, whereas influenza A can also be found in aquatic birds and other mammals besides humans. Influenza A viruses can then be further subdivided into ‘H’ and ‘N’ strains, based on two of their proteins (Zambon 1999). For example, avian influenza (‘bird flu’) is the influenza A strain H5N1.

Influenza tends to be a seasonal illness in temperate climates where it usually occurs from June to September in southern hemisphere countries (such as Australia) and December to April in the northern hemisphere. It can occur throughout the year in tropical countries (Li et al. 2005). The annual seasonal influenza epidemics are due to small changes in the virus (antigenic drift), but epidemics can occur when a new virus subtype emerges (antigenic shift). The problem with antigenic shift is that the human population has no underlying immunity to the new virus;

(continued)

Box 4.14 (continued): Influenza characteristics and vaccination

therefore, worldwide epidemics (known as pandemics) can result. There have been four influenza pandemics since the beginning of the 20th century: 1918 (H1N1), 1957 (H2N2), 1968 (H3N2) and 2009 (H1N1).

Influenza vaccines need to be given just before the influenza season. Since the viruses continually mutate, a new influenza vaccine has to be given every year. The vaccine usually covers three strains of influenza: two A strains and one B strain (NHMRC 2008).

Pandemic (H1N1) 2009 ('swine flu')

In 2009, the world experienced its first influenza pandemic since 1968. The infection became known as 'swine flu' because it developed from a reassortment of influenza viruses from pigs, birds and humans. The first two recognised cases occurred in children in California. However, it soon became apparent that a large pre-existing outbreak of respiratory illness in neighbouring Mexico was also due to the same virus.

Being a new virus increased both the likelihood of transmission and the lethal potential of H1N1 because of a lack of immunity in the population. Furthermore, it had become capable of sustained human-to-human transmission, which had happened only rarely with avian influenza H5N1 ('bird flu') (Senanayake 2009a). Despite being a new virus, swine flu did not affect all age groups equally. The highest rates of infection were in children and young adults, with rates tailing off in the older age groups. This is different from a standard influenza year such as 2008, where peaks of infection tend to occur in very young children and the elderly with lower rates in young adults (Figure 4.37). The reason for the lower rates of pandemic (H1N1) 2009 influenza infection in older age groups is thought to be due to pre-existing immunity. Even though the virus is new, many other strains of H1N1 have caused influenza in the past, so people exposed to those older H1N1 strains would have developed an immunity that has provided cross-immunity to the 2009 H1N1 strain. This has been supported by finding cross-reactive antibodies in blood from people of different age groups (Senanayake 2009b).

By late October 2009, the outbreak had affected most countries around the world, with the World Health Organization reporting over 440,000 notified cases worldwide (WHO 2009). However, this figure is likely to be a gross underestimate since most people with pandemic (H1N1) 2009 were not being tested (WHO 2009). Australia featured prominently early in the outbreak because the virus emerged just before our winter, which is the start of our usual influenza season—presumably providing the ideal conditions for the virus to spread. By mid-January 2010, the Department of Health and Ageing had reported 53,302 confirmed cases of pandemic (H1N1) 2009 in Australia (NNDSS 2010). In fact, the number of laboratory-confirmed cases of influenza in 2009 (including the pandemic strain and all others) far exceeded figures from previous years (Figure 4.38). This may be due to a genuinely large rise in influenza circulating in the community in 2009, a rise in testing, or both.

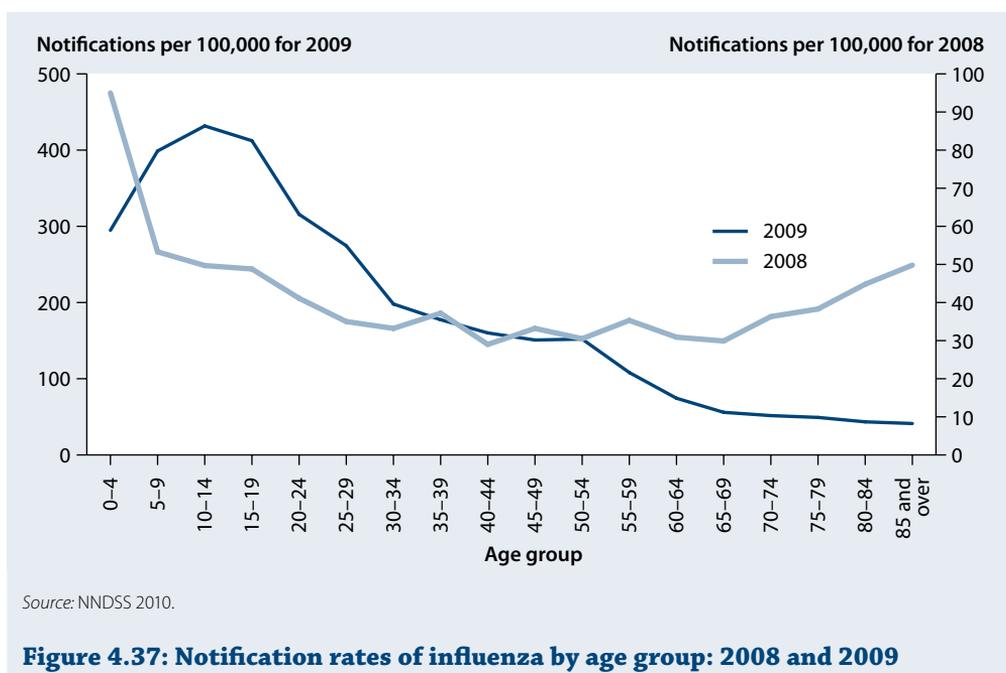


Figure 4.37: Notification rates of influenza by age group: 2008 and 2009

Of the 37,149 cases of pandemic (H1N1) 2009 influenza, confirmed by 23 October 2009, 4,833 were hospitalised and 186 died—1 in 200 among the confirmed cases. Of these deaths, 3 (2%) had occurred in pregnant females and 24 (13%) in Indigenous people (DoHA 2009). Indeed, while most people suffered a mild illness and recovered by themselves, many experienced moderate or severe illness. Groups at risk of severe infection included pregnant females and those with chronic lung disease, heart disease, obesity, diabetes, autoimmune disease or an impaired immune system (Senanayake 2009b). However, more than 30% of those who died had no known pre-existing illness or chronic health conditions.

Data from intensive care units (ICUs) throughout Australia and New Zealand found that 722 patients were admitted to an ICU between 1 June and 1 August 2009 with a confirmed diagnosis of pandemic (H1N1) 2009. Most of these ICU patients had the risk factors discussed previously but it is worth noting that one-third of them were young and middle-aged people with none of these risk factors. Over 9% were pregnant females (compared with pregnant females making up 1% of the general population), nearly 30% were severely obese (compared with around 5% in the general population), and over 9% were Aboriginal or Torres Strait Islanders (compared with 2.5% in the general population) (The ANZIC Influenza Investigators 2009).

The new virus was initially sensitive to two antiviral medications commonly used against influenza (oseltamivir and zanamivir), although resistance to oseltamivir sporadically developed in a small number of cases in a few countries.

Soon after the outbreak first appeared, vaccine development began in earnest. By October 2009, Australia was one of the first countries to begin its national vaccination program against pandemic (H1N1) swine flu. This corresponded to autumn in the northern hemisphere, where increased flu activity due to the pandemic (H1N1) 2009 virus was expected.

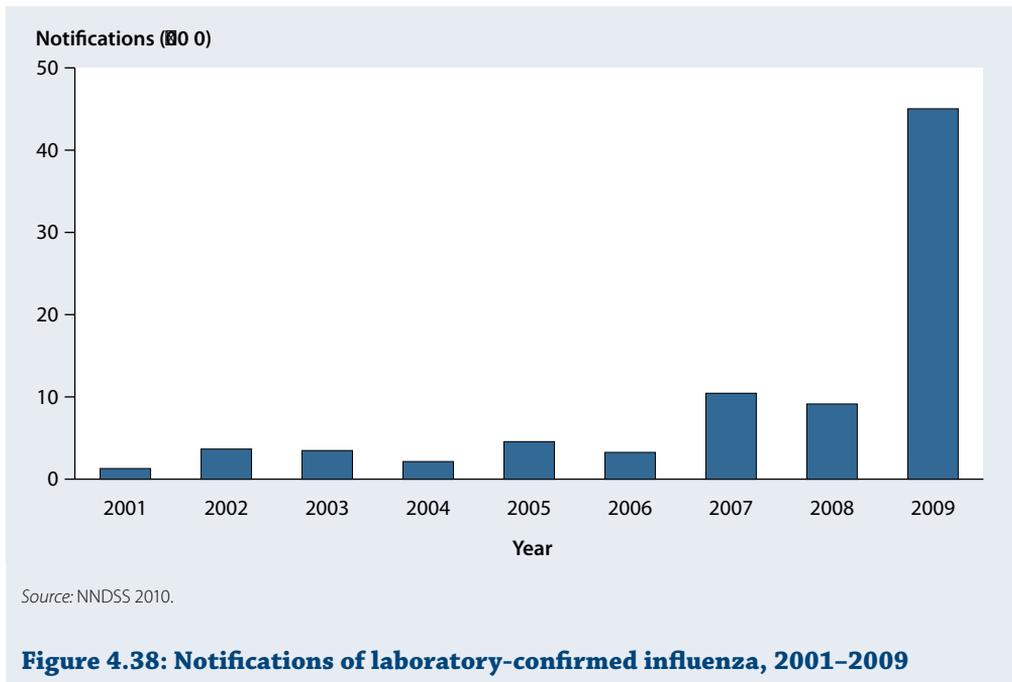


Figure 4.38: Notifications of laboratory-confirmed influenza, 2001–2009

Hendra virus

Hendra is a virus that is found in fruit bats and is named after a suburb in Brisbane where the virus was first isolated during an outbreak (ProMED 2009). On rare occasions it can be transmitted to horses from bats and to humans from horses, potentially leading to fatal illnesses in both horses and humans. Since 1994, there have been 13 episodes of transmission from bats to horses (Animal Health Australia 2009) with around a handful of episodes also involving horse-to-human transmission. No cases of human-to-human or bat-to-human transmission have been described (Field 2009). In 2008, a veterinary worker died from an outbreak of Hendra virus, and in 2009 an outbreak near Rockhampton infected both horses and humans, resulting in the death of another veterinary worker (ProMED 2008, ProMED 2009).

Mosquito-borne infections

Australia has numerous notifiable mosquito-borne infections including:

- infections acquired only within Australia (such as Ross River virus and Barmah Forest virus)
- infections usually acquired only overseas (malaria)
- infections that could have been acquired in either location (such as Japanese encephalitis and dengue).

Barmah Forest virus and Ross River virus

Barmah Forest virus and Ross River virus come from a family of viruses called alphaviruses. They are transmitted to humans by a variety of species of mosquito. Both viruses typically cause an illness with fevers, rash and joint pains. Despite their geographical names, cases

have now been reported throughout Australia for both infections, with most notifications being from Queensland and New South Wales (Fitzsimmons et al. 2009; NNDSS 2009). The notification rates for both infections have fluctuated over the last few years (Figure 4.39).

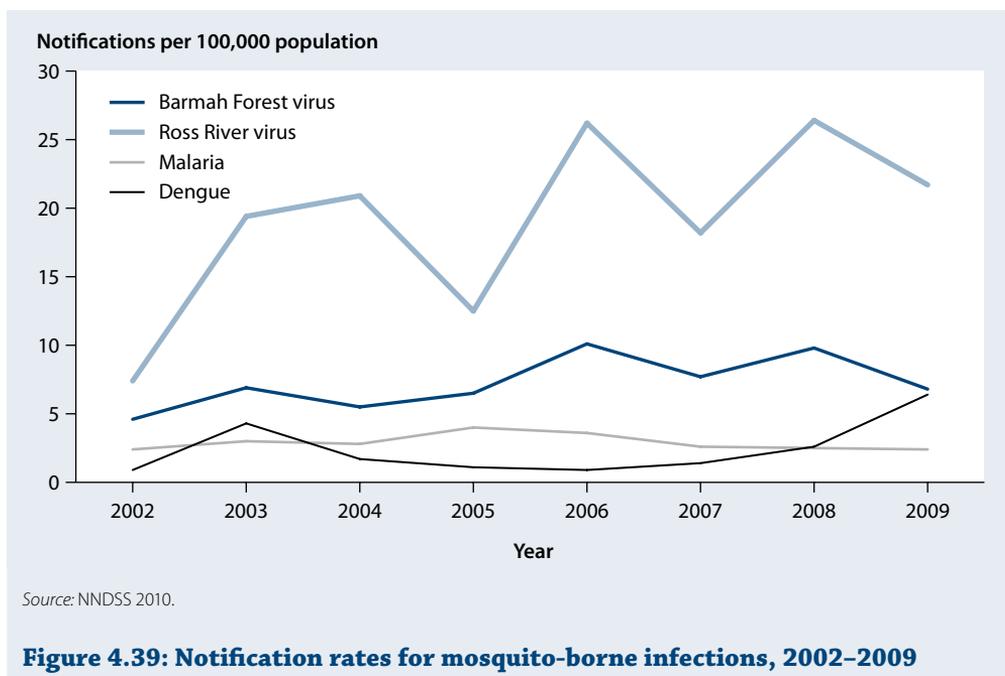


Figure 4.39: Notification rates for mosquito-borne infections, 2002–2009

Malaria

Malaria is a parasitic infection transmitted by the female *Anopheles* mosquito. Although hundreds of cases are reported in Australia every year, these cases have almost certainly been acquired overseas. Malaria commonly causes fevers within 2 weeks of being infected, although some people become unwell many months after being bitten. Even people who take all their required medication during their travel can still be infected. One species of the malaria parasite can kill humans quickly if untreated, especially when it spreads to the brain ('cerebral malaria'). Until recently, only four strains of malaria had been associated with infection in humans. Recently a fifth such strain was identified in some parts of Asia—*Plasmodium knowlesi* (Luchavez et al. 2008). The Australian data show relatively stable rates (Figure 4.39).

Dengue

North Queensland experienced an unprecedented outbreak of dengue from late 2008 to mid-2009. Dengue is a viral infection transmitted by the day-feeding *Aedes* mosquito. People with dengue usually complain of fevers, rash, headache and muscle aches in the neck and back that can be very severe. The disease is a global problem, and is responsible for tens of millions of cases per year. Currently, Australian outbreaks are typically confined to those areas of Queensland in which the *Aedes* mosquito resides. There are four different types of dengue virus (DENV-1 to 4) and infection with one type does not protect from future infections with others. In fact, infection with another strain of dengue virus in people who have had dengue previously can lead to far more severe and even life-threatening illnesses (dengue haemorrhagic fever and dengue shock syndrome) (Senanayake 2006).

The dengue outbreak in north Queensland was remarkable for a number of reasons. First, it was a very large outbreak with just over 1,000 cases confirmed between November 2008 and June 2009 compared with a similar number of confirmed cases over the nine years between 2000 and 2008. Second, the dominant strain was the highly virulent DENV-3 imported by a Cairns resident returning from Indonesia. This particular strain had a shorter incubation period in both mosquitoes and humans, allowing it to be transmitted more quickly. This made it harder for public health workers to keep track of the growing number of cases. Furthermore, despite the DENV-3 strain being the dominant dengue virus, all four strains of dengue were circulating at the time. In addition to all these viral factors, it has been suggested the *Aedes* mosquito transmitting the virus also fuelled the outbreak by developing resistance to pesticides that had been effective previously. Another unique feature of the outbreak was the large number of imported cases of active dengue in 2009 (18 cases) (Ritchie 2009).

Sexually transmissible infections

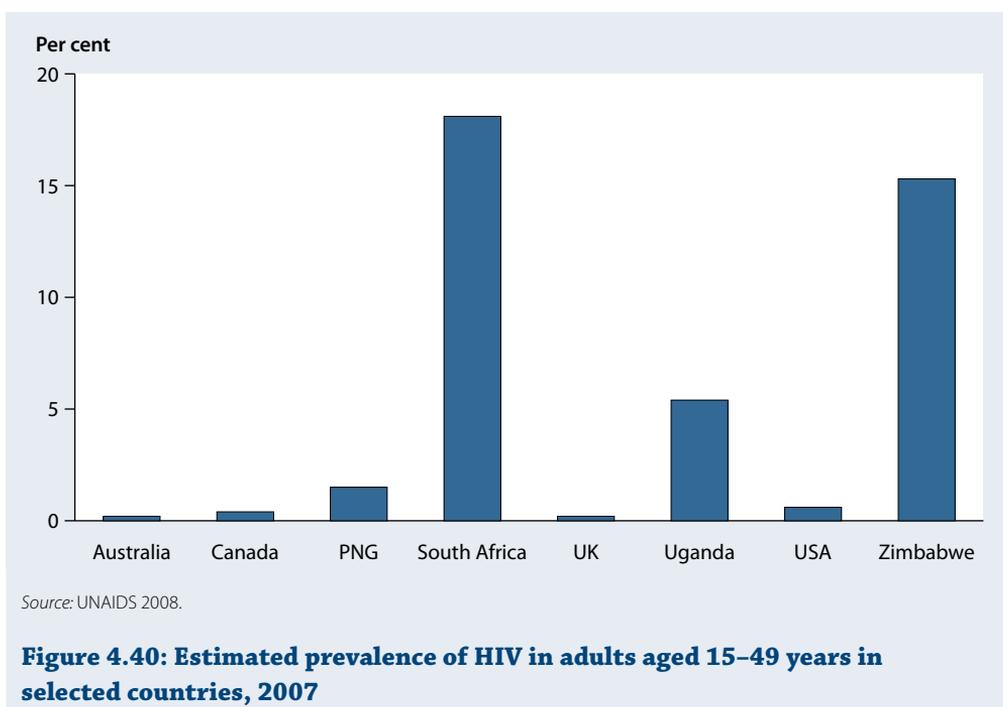
Human immunodeficiency virus

Human immunodeficiency virus (HIV) can be transmitted by sexual contact with an infected person, through infected blood products, to the foetus during pregnancy and to infants through breastfeeding by an infected mother. Those infected can remain well for many years without treatment but are still able to infect others. In most untreated cases, the virus will progressively damage their immune system over many years until they become susceptible to a number of serious infections and cancers. This stage is known as the acquired immune deficiency syndrome (AIDS).

Infection with HIV cannot be cured and there is no vaccine to prevent it, although research into a vaccine continues. However, a wider variety of more effective antiviral medications has allowed people with HIV to lead relatively normal lives. It has become a disease that many more people now live with rather than die from, as they previously did.

At the end of 2008 there had been 28,330 diagnoses of HIV infections and 10,348 diagnoses of AIDS in Australia since notifications began here (NCHECR 2009). Between 1988 and the end of 2006, there were nearly 5,000 deaths where AIDS or HIV was the underlying cause (AIHW 2009a). Although HIV continues to be a global problem, Australia has maintained a very low prevalence of the infection compared with other countries (Figure 4.40).

The annual number of new HIV cases in Australia has remained fairly constant (around 900–1,000 cases) from 2004 to 2008. The number of AIDS notifications in the latest 3 years declined despite the steady number of new HIV cases, presumably reflecting the effectiveness of the antiviral medications. Most notifications of HIV came from New South Wales, followed by Victoria and Queensland. Overall, the great majority of notifications continue to be among men who have sex with men (69%), with females accounting for about 15% of notifications in 2008. Around 25% of HIV notifications from 2004 to 2008 have been attributed to heterosexual contact. Of people diagnosed with HIV associated with heterosexual contact in the last 5 years, 59% either came from a high-prevalence country or had a sexual partner from a high-prevalence country (NCHECR 2009).



Syphilis

Syphilis is a complex sexually transmissible infection due to an organism known as *Treponema pallidum*. It responds well to penicillin but untreated it becomes a chronic disease with a variable course and long latent (symptom-free) periods. Its most serious expressions are tertiary (third-stage) syphilis and congenital syphilis, where a child is infected by its mother during pregnancy. In a proportion of untreated cases, tertiary syphilis can arise about 10 or more years after the original infection, with serious damage to the brain, other parts of the nervous system, and the cardiovascular system. Congenital syphilis is a serious condition that can result in a variety of problems for the child from birth or much later in life.

In Australia, there has been a resurgence of infectious syphilis, particularly among men who have sex with men. Risk factors probably include an increase in unprotected sexual practices, being HIV-positive, having more partners and using more recreational drugs (Botham et al. 2006; Jin et al. 2005). The increase in notifications has been part of a wider pattern in the developed world (Centers for Disease Control and Prevention 2004; Fenton et al. 2001). In 2008 in Australia, however, there was a decline in the rate of diagnoses in all states and territories except Western Australia. It is unclear whether this pattern will continue.

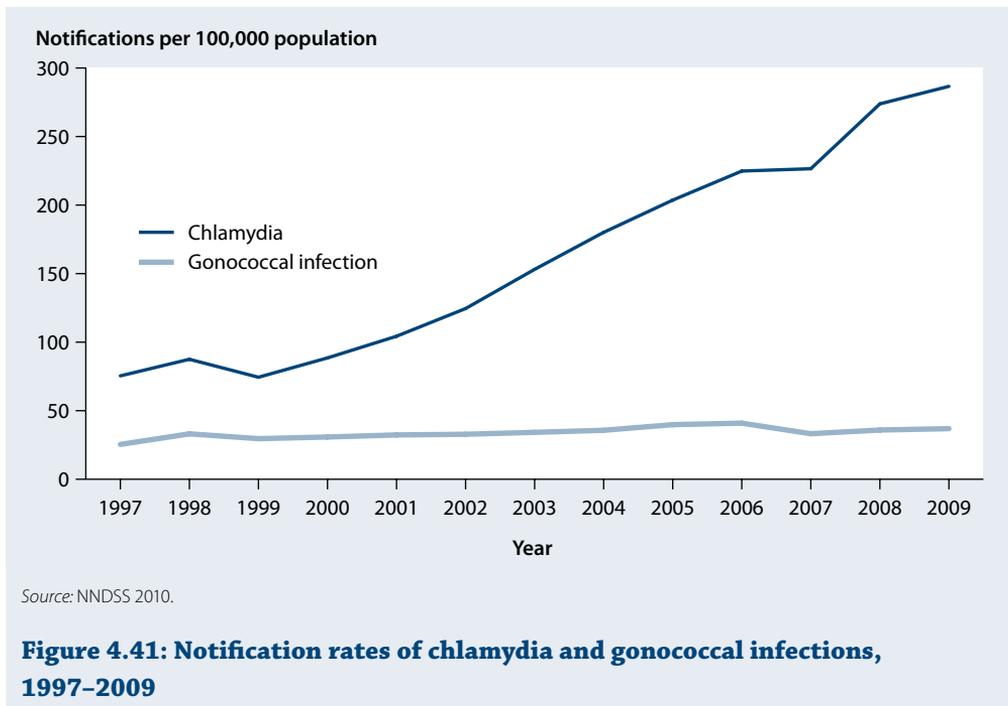
Notifications of congenital syphilis have remained low in Australia (7–14 cases per year or 0–0.1 per 100,000 population per year from 2006 to 2008) (NNDSS 2009). This reflects effective screening and treatment of pregnant women for syphilis.

Chlamydia and gonorrhoea

In 2008, chlamydia continued to be the most notified infection in Australia, with over 58,000 new diagnoses (NCHECR 2009). Chlamydia is a sexually transmissible infection due to the bacterium *Chlamydia trachomatis*. The most important feature of chlamydia is that it is often a silent infection in males and females. In males, it can infect the prostate, urethra and testes while females can develop infections of the cervix, uterus and pelvis. In females, complications may result in chronic pelvic pain, infertility and ectopic pregnancy (Bowden et al. 2002). Between 2003 and 2008, the rates of chlamydia diagnoses in both males and females almost doubled, although there are about 50% more cases in females than males. The age groups most affected are 15–19 and 20–29 year olds, which accounted for over 80% of infections in 2008 (NCHECR 2009).

Gonorrhoea is due to the bacterium *Neisseria gonorrhoeae* (also known as 'gonococcus'). It can cause a similar spectrum of disease to chlamydia but tends to be more symptomatic (Bowden et al. 2002). Unlike the rapid rise in chlamydia rates, gonorrhoea rates appear to have been stable (Figure 4.41). In New South Wales, Victoria and the Northern Territory, they declined substantially in 2008 compared with 2006 (NCHECR 2009).

There is a striking sex difference in the notification rates: gonococcal rates are far more common in males while chlamydia is more common in females (NNDSS 2009).



Hepatitis B and C infections

Hepatitis B and C viruses can cause chronic liver damage and liver cancer. Notification rates of new cases of hepatitis B and C have remained fairly stable in recent years at just over 1 and just over 2 per 100,000 population respectively each year. In 2008, there were more than 200 new cases of hepatitis B infection and more than 400 cases of hepatitis C infection diagnosed (NCHECR 2009; NNDSS 2009). However, there have been movements in the number of newly diagnosed cases where the onset of the disease is unspecified (some will be new cases that have just developed and been diagnosed quickly, but some may be cases that developed some time in the past that have only recently been diagnosed). Over the 10 years from 2000 to 2009 there was a substantial decline in the total rate of newly diagnosed cases of hepatitis C, and a smaller decline for hepatitis B (NNDSS 2009).

A program to increase vaccination coverage in adolescents may explain a drop in the rate of new hepatitis B infections in recent years that occurred among those aged 15–29 years. Injecting drug use accounted for about 50% of new cases of hepatitis B infection with a small decline from 21% to 18% in the proportion of those attributable to heterosexual sex (NCHECR 2009). However, although there has been a decline in new hepatitis B infections, there are concerns that the long-term complications of chronic hepatitis B infection (that is, cirrhosis and liver cancer) may become an increasing problem in Australia as the currently infected individuals are ageing, with very few receiving antiviral therapy. One report predicts that, by 2017, the burden of chronic hepatitis B infection will lead to a three-fold increase in liver cancer rates compared with 2008, increased deaths attributable to the infection and an increasing demand on liver clinics (Butler et al. 2009).

From 2004 to 2008, there was a large decline in the rate of diagnosis of hepatitis C infection from 64.7 per 100,000 to 53.2 per 100,000. This was most marked in those aged 15–19 years, although those aged 20–39 years also had a large reduction in rates. This is thought to be due largely to less injecting drug use, which is considered one of the most important causes of hepatitis C transmission. However, other contributing factors, such as reductions in risk behaviour related to drug injecting and reduced testing, cannot be excluded (NCHECR 2009).

Gastrointestinal outbreaks

Gastrointestinal infections are common, with only limited data available to monitor them. Some data are available from OzFoodNet, a federal government agency that specialises in investigating outbreaks of gastrointestinal illness and clusters of disease due to contaminated food (OzFoodNet Working Group 2008a,b,c; 2009a,b). These reports under-represent the true number of outbreaks since many are not reported to health authorities (OzFoodNet Working Group 2009a).

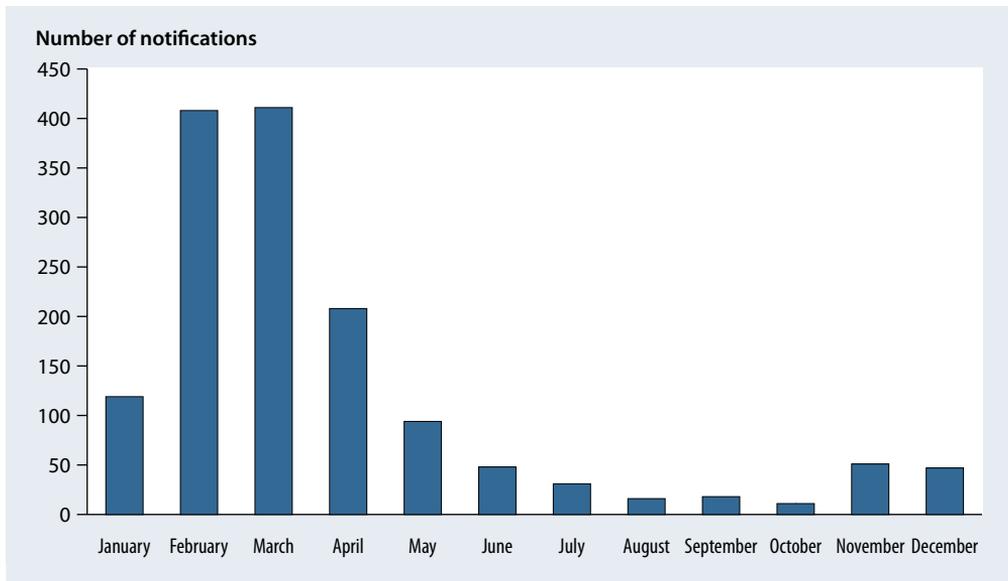
There were 1,742 outbreaks of gastrointestinal illness notified to OzFoodNet during the 15-month period from 1 January 2008 to March 2009, an average of 17 per week from around the country. Most of the outbreaks were attributed to person-to-person spread. The number of Australians affected in each quarter ranged from 3,518 to 7,446. The number hospitalised from these outbreaks ranged from 84 to 292 per quarter, with death rates ranging from 0.2% to 0.4%.

Of the outbreaks transmitted by food, the cause was often not identified. But when it was, *Salmonella* was the most common agent, in particular *Salmonella* Typhimurium. *Salmonella* is a bacterium found in a variety of animals as well as humans and it can contaminate virtually any food.

Cryptosporidiosis

Cryptosporidium is a parasite that can infect humans. Illnesses due to it are known as cryptosporidiosis, the most common of which is a self-limiting watery diarrhoea. However, in certain groups with reduced immunity, such as those with AIDS, it can lead to life-threatening disease. Humans can be infected through a number of ways: ingesting contaminated water (for example in public swimming pools), eating contaminated food, contact with infected animals and even from infected people (Senanayake 2007).

While cases of cryptosporidiosis occur every year, in early 2009 there was a large outbreak that mainly affected New South Wales, the Australian Capital Territory, Victoria and Queensland (NNDSS 2009). Data from New South Wales clearly demonstrate the higher than anticipated number of cases in 2009, of which 78% were identified in the first 4 months of the year (Figure 4.42). Almost 60% of cryptosporidiosis notifications in New South Wales (835 out of the 1,430 cases) between 1 October 2008 to 30 September 2009 were in children under 10 years of age (NSW Health Department 2010).



Source: NSW Health Department 2010.

Figure 4.42: Cryptosporidiosis notifications in New South Wales in 2009

Tuberculosis

Tuberculosis (TB) is a potentially serious infection caused by a group of bacteria known as the TB complex, with most cases caused by *Mycobacterium tuberculosis*. It especially affects the lungs, with fever-like symptoms and destruction of tissue. New TB cases still occur in Australia, with about 1,000 new cases identified annually, representing a rate of just over 5 per 100,000 population (NNDSS 2009). This is low compared with other developed and developing nations, although some groups in Australia have higher rates of infection: 18.3 per 100,000 and 6.6 per 100,000 in people born overseas and Indigenous Australians respectively. TB treatment programs remain effective in Australia, with 95% cure rates (Roche 2008b).

People with HIV are prone to TB and this has become a problem overseas. The death rate for TB in HIV-positive individuals is much higher than in non-HIV individuals (Corbett et al. 2003). A United States study found that 26% of their TB cases in 2007 were associated with HIV. In Australia, out of 486 individuals with TB who were tested for HIV in 2007, only 13 (3%) were positive (Barry & Konstantinos 2009).

Although TB can affect virtually any part of the body, TB of the lungs (usually without TB infection in another part of the body) is still the most common form in Australia, occurring in about 60% of cases (Roche et al. 2008b). TB of the lungs is especially important because, unlike other forms of TB, it can be spread to other individuals and therefore poses a public health risk.

Emerging infections

Highly virulent strain of *Clostridium difficile*

Clostridium difficile is a bacterium that can cause an infection typically marked by diarrhoea following the use of antibiotics. Although the infection has been recognised for about 30 years, a highly virulent strain, known as NAP1 or PCR ribotype 027, recently emerged in North America and Europe. This was associated with severe infection, leading to higher rates of death and surgical removal of infected bowel than had been seen with this infection previously (Riley 2009). Despite the emergence of this strain in other parts of the world, Australia had not seen any cases; however, in 2009, the first case of this aggressive strain of *C. difficile* appeared here, having probably been brought from the United States (Riley et al. 2009).

Multiresistant bacteria in returning travellers

An increasing problem worldwide is the ability of various bacteria to become resistant to a range of antibiotics. The difficulties in treating infections with these bacteria arise because there are so few effective antibiotics against them, and the antibiotics are often very expensive or have serious side effects. One of these bacteria is a highly resistant form of *Escherichia coli*, a bacterium which normally colonises the healthy bowel. While Australia is thought to have low levels of such highly resistant *E. coli*, it is a bigger problem in other countries. An Australian study showed that international travel is a risk factor for being colonised with highly resistant *E. coli*. The researchers found that only 8% of travellers were colonised with the resistant bacterium before travel but this increased to 47% on return to Australia. Being colonised with these bacteria does not necessarily mean that infection will occur, but if it does it can be troublesome. Interestingly, within 1 month of the travellers' return to Australia, the highly resistant *E. coli* had disappeared from their bowels in most cases, being replaced by the 'local' less resistant 'Australian' *E. coli* (Kennedy & Collignon, 2009).

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