Australian Government
Australian Institute of Health and Welfare

Cardiovascular disease, diabetes and chronic kidney disease

Australian facts

Morbidity—Hospital care

risk factors
chronic kidney disease
cardiovascular disease
diabetes
stroke

Cardiovascular disease, diabetes and chronic kidney disease

Australian facts

Morbidity—Hospital care

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Contents

Preface

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Abbreviations

ABS	Australian Bureau of Statistics
ACHI	Australian Classification of Health Interventions
ACS	Australian Coding Standards
AIHW	Australian Institute of Health and Welfare
ANZDATA	Australia and New Zealand Dialysis and Transplant Registry
CHD	coronary heart disease
CKD	chronic kidney disease
CVD	cardiovascular disease
ESKD	end-stage kidney disease
ICD	International Classification of Diseases
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
NHMD	National Hospital Morbidity Database
SES	socioeconomic status

Summary

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

How many hospitalisations occur for CVD, diabetes and CKD?

- In 2012–13, CVD, diabetes and CKD were associated with around 1.8 million hospitalisations, around 20% of all hospitalisations in Australia.
- Over 1.2 million hospitalisations were associated with CVD, and around half had CVD as the principal diagnosis—12.8% of all hospitalisations in 2012–13. Coronary heart disease (CHD) accounted for 148,950 hospitalisations (28% of all cardiovascular disease hospitalisations), heart failure 57,450 (11%) and stroke 36,390 (7%).
- Diabetes was recorded in around 840,000 hospitalisations—8.9% of all hospitalisations in 2012–13. Of these, 738,300 (88%) were associated with type 2 diabetes, 52,900 (6.3%) with type 1 diabetes and 31,900 (3.8%) hospitalisations with gestational diabetes.
- In 2012–13, there were 1.5 million hospitalisations associated with CKD. Regular dialysis (generally a day procedure where a person is discharged on the same or following day) accounted for the overwhelming majority—almost 1.3 million hospitalisations—and was the most common reason for hospitalisation in Australia.

What are the trends in hospital care?

- Over the last 2 decades, there was a slight decline in the rate of hospitalisations due to CVD, falling from 2,324 in 1993–94 to 2,067 per 100,000 population in 2012–13. CHD hospitalisations declined at a greater rate, declining by around one-third, while a similar decline was also observed for stroke, a 36% decline.
- Between 2002–03 and 2012–13, the rate of hospitalisations for dialysis in Australia increased by 46% and increased by 17% for CKD hospitalisations (excluding dialysis).

Who is affected most?

- CVD, CHD, stroke and diabetes hospitalisation rates as a principal diagnosis were higher among males than females (1.5, 2.3, 1.4 and 1.2 times as high, respectively). For CKD (excluding regular dialysis), male and female rates were similar.
- Aboriginal and Torres Strait Islander people, people in the lowest socioeconomic group and those living in *Remote and very remote* areas have the highest rates of CVD, diabetes and CKD hospitalisations. Indigenous diabetes hospitalisation rates, for example, were 4 times those of Other Australians.

How many hospitalisations were associated with more than one of these diseases?

- In 2012–13 in people aged 25 and over, there were 386,550 hospitalisations in which CVD, diabetes or CKD (excluding dialysis) was reported as a diagnosis in combination with at least 1 of the other diseases. Of these, 72% had 2 of the diseases and 28% had all 3.
- The most common combination of diseases was CVD and diabetes (170,440 hospitalisations) followed by CVD, diabetes and CKD (107,750 hospitalisations).

1 Introduction

This report on hospitalisations is part of the series *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts* authored by the National Centre for Monitoring Vascular Diseases at the Australian Institute of Health and Welfare (AIHW). It describes hospitalisations in the Australian population that were associated with 3 chronic diseases acting alone or together: cardiovascular disease (CVD), diabetes and chronic kidney disease (CKD).

These 3 chronic diseases contribute to considerable illness, disability and premature mortality, and result in a high use of health-care services. In 2012–13, CVD, diabetes and CKD were associated with around 1.8 million hospitalisations, around 20% of all hospitalisations in Australia.

Monitoring the direct or indirect contribution of these diseases to hospitalisations is important, so that their effect on the population health burden can be assessed. Substantial progress has been made in recent decades in improving cardiovascular health, with marked falls in CVD mortality and morbidity attributed to improved diagnosis and treatment, as well improvements in risk factors, such as lowering of smoking and high blood pressure rates (Briffa et al. 2009; Ford & Capewell 2011; Taylor et al. 2006). Nevertheless, CVD hospitalisations continue to reflect a heavy burden of the diseases on individuals and the health-care system.

While CVD hospitalisations have declined, hospitalisations for diabetes and CKD have increased in recent decades. The increase in diabetes hospitalisations, mainly associated with type 2 diabetes, is associated with unfavourable risk factor trends, such as increases in overweight and obesity, physical inactivity and unhealthy diet (Khalid et al. 2013). Complications from diabetes are contributing to kidney complications, but also circulatory and ophthalmic conditions, resulting in higher rates of hospitalisations for diabetes and CKD. People with multiple complications require increased and more complex medical care while in hospital compared with those without complications.

CVD, diabetes and CKD share many risk factors, and often coexist. The shared risk factors also promote co-occurrence of these diseases and strengthen the association between them. These risk factors do not just affect the onset of CVD, diabetes and CKD, but also affect their progression and increase the risk of complications. These diseases are also risk factors for each other. Diabetes is a well-established risk factor for CVD. Diabetes can also lead to kidney damage—a complication known as 'diabetic nephropathy'. CKD has been found to independently increase the risk of hypertension and other cardiovascular diseases including heart attack, angina, coronary artery disease, stroke and heart failure. CVD, especially hypertension, is one of the major causes of CKD.

Modifying and controlling risk factors for these diseases in people of all ages has the potential to lead to large health gains in the population through the reduction of illness and rates of hospitalisation (Drawz & Rosenberg 2013; Kataoka et al. 2013; Levey & Coresh 2012). Information on the interacting effects of CVD, CKD and diabetes, and their combined impact on hospital care are provided in this report.

The aim of this report is to provide a comprehensive summary of the latest available data on hospital care for these 3 key chronic diseases, using data from the National Hospital Morbidity Database (NHMD) at the AIHW. Describing the impact of CVD, diabetes and CKD requires both the principal and additional diagnoses to be examined, since CVD, diabetes and CKD can be recorded as the condition primarily responsible for the need for hospitalisation (the principal diagnosis), or they can be a comorbidity (a condition coexisting with another condition) and recorded as a condition that affected the management of the patient while in hospital (an additional diagnosis) (see Box 1.1).

The data presented in this report represent only part of the picture of the impact of these diseases on morbidity, as they only include the more severe impact of these diseases—people needing to access hospital care services to manage their condition. Other important components related to morbidity where these diseases have a major impact include primary care, outpatient care and pharmaceutical treatment; however, these components are beyond the scope of this report.

The report has 5 chapters aside from this introduction: 1 for each disease group—CVD, diabetes and CKD—1 for hospitalisations associated with the diseases together, and 1 describing selected procedures that are carried out during hospitalisation for these 3 diseases. Each chapter includes analysis of trends in hospitalisations (where possible), and how hospitalisations are distributed by sex and age. Some groups have a higher burden from these diseases than others; particularly Aboriginal and Torres Strait Islander people, those from the lowest socioeconomic status (SES) group and those living in remote areas of Australia, and so information on variations in hospitalisation are presented. A series of appendixes provides supporting data and information on methods and data sources.

Box 1.1: Defining hospitalisations in this report

The Australian Coding Standards (ACS) have been developed with the objective of satisfying sound coding conventions for use with the International Statistical Classification of Diseases and Health Related Problems, Tenth Revision, Australian Modification (ICD-10-AM) and Australian Classification of Health Interventions (ACHI). They apply to all public and private hospitals in Australia. The ongoing revision of the ACS ensures that they reflect changes in clinical practice, clinical classification amendments, Australian Refined Diagnosis Related Groups updates and various user requirements of inpatient data collections.

The hospitalisation data in this report are sourced from the AIHW National Hospital Morbidity Database (NHMD), which records information on admitted patient care (hospitalisations) in essentially all hospitals in Australia. Reporting to the NHMD occurs at the end of a person's admitted episode of care (separation or hospitalisation) and is based on the clinical documentation for that hospitalisation.

Hospitalisations (separations) are reported to the NHMD in accordance with the requirements of the Admitted Patient Care National Minimum Data Set (APC NMDS). The APC NMDS requires the principal diagnosis and additional diagnoses to be reported according to the most recent edition of the ICD-10-AM and associated ACS hospital separations were reported using the International Classification of Diseases and Related Health Conditions, Ninth Revision, Clinical Modification (ICD-9-CM) up to 1997–98 and using ICD-10-AM from 1998–99 onwards. The ICD-10-AM classification is reviewed and updated biennially.

The definitions used are available on the AIHW website at: <http://meteor.aihw.gov.au/content/index.phtml/itemId/568730>.

In this report, a 'hospitalisation' refers to an episode of admitted care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation).

There are 2 distinct types of diagnoses recorded in the database, principal and additional:

- *Principal diagnosis* is the diagnosis established after study to be chiefly responsible for occasioning the patient's hospitalisation.
- *Additional diagnosis* is a condition or complaint that either coexists with the principal diagnosis or arises during the hospitalisation. An additional diagnosis is reported if the condition affects patient management.

Characteristics of the person (such as age and sex), the length of stay in hospital and the outcome of the hospitalisation (discharge to home, transfer to another hospital, death) are also recorded.

The same person can have multiple hospitalisations and it is currently not possible to link records of multiple hospitalisations in the database to individuals and therefore to count the number of individuals being hospitalised, and their patterns of hospitalisation. For this reason, the data presented in this report do not represent the number or proportion of people admitted to hospital in Australia with CVD, diabetes or CKD.

In this report, hospitalisations for which CVD, diabetes and CKD are recorded as either the principal diagnosis or as an additional diagnosis are presented separately or combined depending on the diagnosis, disaggregation, and whether there are contrasting results for the principal and/or an additional diagnosis.

For more information, see Appendix B.

2 Cardiovascular disease

The term cardiovascular disease (CVD) is used to describe many different conditions affecting the heart and blood vessels. The main types of CVD in Australia are coronary heart disease (CHD), stroke and heart failure (Box 2.1). These conditions are presented separately in this chapter.

The main underlying cause of CVD is a process known as *atherosclerosis*. This is a condition where abnormal deposits of fat, cholesterol and other substances build up in the inner lining of the arteries to form *plaque*, which causes the artery walls to lose their elasticity. Atherosclerosis is most serious when it leads to reduced or blocked blood supply to the heart (causing angina or heart attack) or the brain (causing stroke). The process leading to atherosclerosis is slow and complex, often starting in childhood and progressing with age.

A number of factors are known to increase the risk of developing CVD. These include tobacco smoking, high blood pressure, high blood cholesterol, insufficient physical activity, overweight and obesity, poor nutrition and diabetes (see *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors* (AIHW, forthcoming 2015b) for further details).

Box 2.1: Coronary heart disease, stroke and heart failure

Coronary heart disease (CHD)

CHD, or ischaemic heart disease, as it is often referred to, is the most common form of CVD. There are 2 major clinical forms—heart attack (often known as acute myocardial infarction, or AMI) and angina. A heart attack is a life-threatening event that occurs when a blood vessel supplying the heart itself is suddenly blocked, threatening to damage the heart muscle and its functions. 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. Angina is generally not life-threatening on its own, although unstable angina is the most dangerous and less predictable form and is medically treated in a similar manner to heart attack. The major risk factors for CVD also increase the risk of developing CHD. CHD is very common, affecting over half a million Australians, and is the leading cause of death in Australia, accounting for over 20,000 deaths in 2011 (see *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: mortality* (AIHW 2014c) for further details).

Stroke

Stroke occurs when an artery supplying blood to the brain either suddenly becomes blocked (ischaemic stroke) or ruptures and begins to bleed (haemorrhagic stroke). Either may result in the death of part of the brain, leading to sudden impairment that can affect a range of functions. Stroke often causes paralysis of parts of the body normally controlled by the area of the brain affected by the stroke, or speech problems and other symptoms, such as difficulties with swallowing, vision and thinking. Stroke is often fatal, claiming around 9,000 lives in 2011 (see AIHW (2014c) for further details). In many, but not all, cases, stroke is preventable because many of its risk factors are modifiable, such as high blood pressure, physical inactivity, abdominal obesity and tobacco smoking.

Heart failure and cardiomyopathy

Heart failure occurs when the heart begins to function less effectively in its role of pumping blood around the body. Although it can occur suddenly, it usually develops slowly over many years, as the heart becomes gradually weaker and works less effectively. Heart failure can result from a variety of diseases and conditions that impair or overload the heart. These include heart attack, high blood pressure, damaged heart valve or primary heart muscle weakness (known as cardiomyopathy where the entire heart muscle, or a large part of it, is weakened by various causes, including viral infections and severe alcohol abuse).

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. Heart failure is life-threatening and usually associated with poor survival, claiming around 4,300 lives in 2011 (see AIHW (2014c) for further details) and often occurs as a comorbid condition of other chronic diseases, including CHD, diabetes and chronic kidney disease. While treatment may improve quality of life, reduce hospital admissions and extend a person's life, heart failure usually cannot be cured (National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2011; NHLBI 2014).

For more information on CVD, CHD, stroke and heart failure diagnosis codes, see Appendix C.

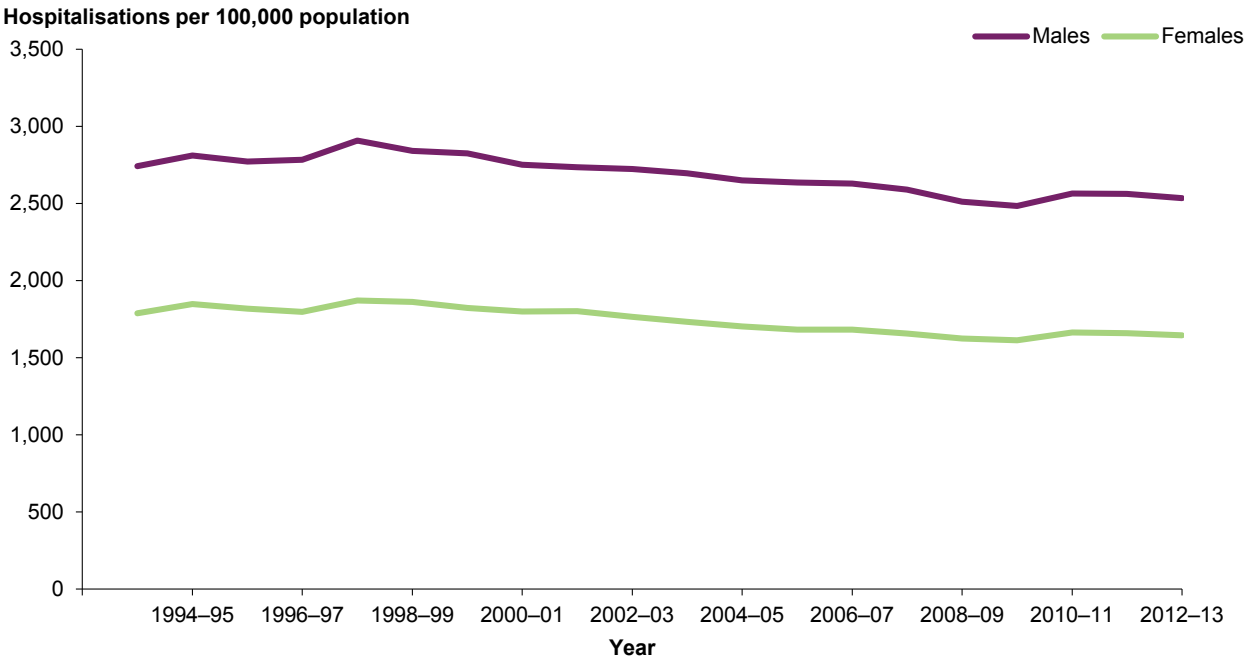
All cardiovascular diseases

In 2012–13, there were just over 1.2 million hospitalisations where CVD was recorded as the principal or an additional diagnosis. Of these, CVD was the principal diagnosis for around 524,900 hospitalisations and was an additional diagnosis for a further 683,500 hospitalisations. Together, these represent 12.8% of all hospitalisations in 2012–13. Note, in this report, congenital heart diseases are included in the count of CVD hospitalisations (see Appendix C, Table C1, for more information on CVD diagnosis codes).

Trends

Despite the increase in absolute numbers of hospitalisations, the age-standardised rates declined slightly, from 2,234 to 2,067 per 100,000 population between 1993–94 and 2012–13. The rate of CVD hospitalisations in males was consistently higher than that for females over the period, with both showing similar trends (Figure 2.1).

Over the same period, the number of hospitalisations where CVD was recorded as the principal diagnosis increased by 44% from 367,340 hospitalisations in 1993–94 to 524,900 hospitalisations in 2012–13. This is in part due to older Australians accounting for an increased share of the population, the occurrence of CVD becoming more common with age, and older people being higher users of health services, especially hospitals (AIHW 2014b).

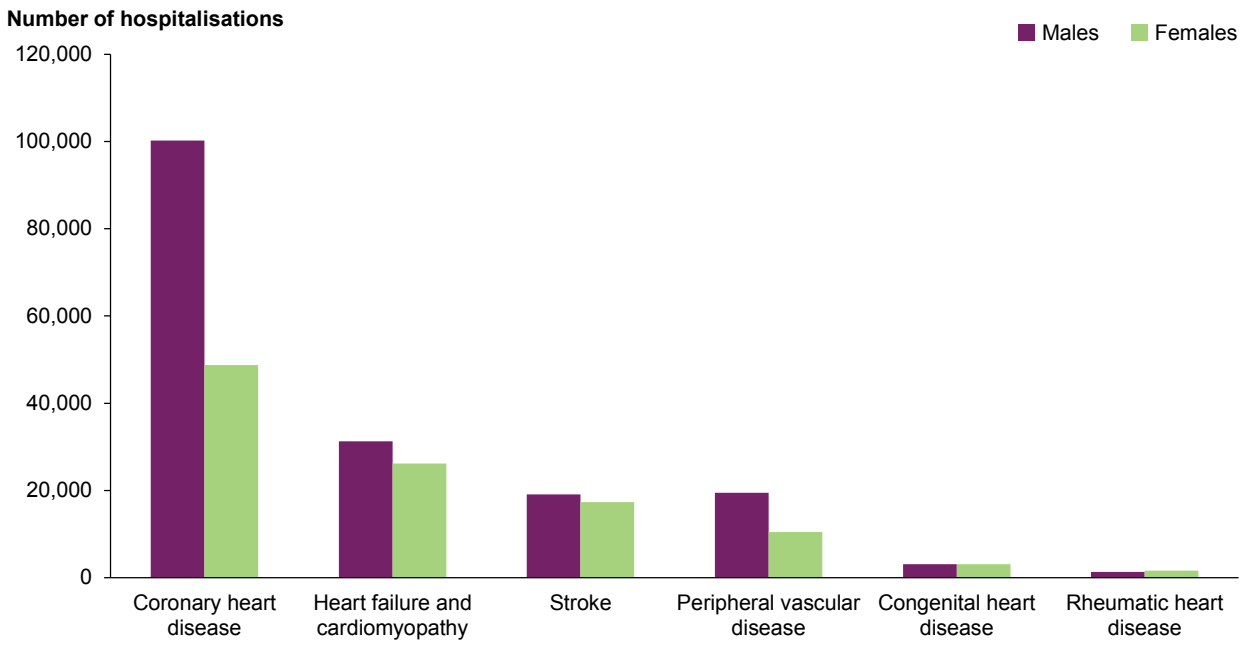


Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.1: Trends in hospitalisation rates for cardiovascular disease, as the principal diagnosis, by sex, 1993–94 to 2012–13

Major causes of CVD hospitalisations

In 2012–13, coronary heart disease (CHD) accounted for over 1 in 4 hospitalisations (148,950 hospitalisations) where CVD was recorded as the principal diagnosis. Other major causes of hospitalisation were heart failure and cardiomyopathy (57,450 or 10.9%) and stroke (36,390 or 6.9%), peripheral vascular disease (29,940 or 5.7%), congenital heart disease (6,200 or 1.2%) and rheumatic heart disease (2,950 or 0.6%) (Figure 2.2).



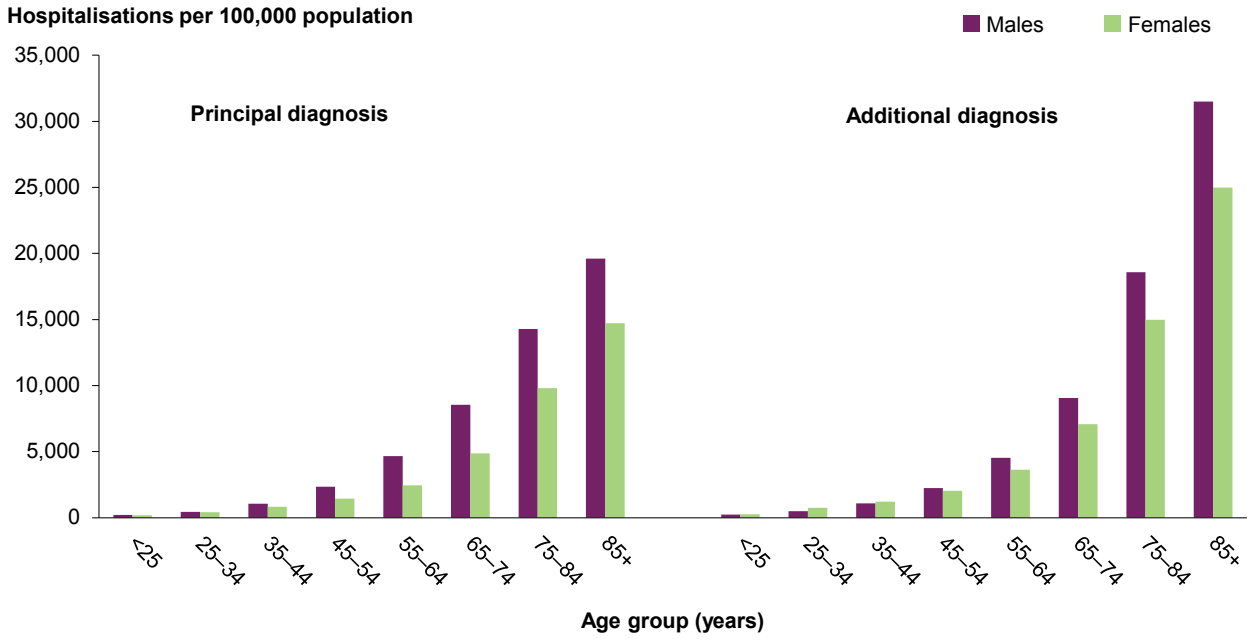
Source: AIHW National Hospital Morbidity Database.

Figure 2.2: Major causes of hospitalisation for cardiovascular disease, as the principal diagnosis, by sex, 2012–13

Sex and age

In 2012–13, CVD hospitalisations were most common in older Australians, with over three-quarters (78%) occurring in those aged 55 and over. Where CVD was recorded as the principal diagnosis, rates increased with age and were highest for those aged 85 and over, almost 5 times as high as for the 55–64 age group (16,466 compared with 3,546 per 100,000, respectively) (Table A1).

Rates of CVD hospitalisation as the principal diagnosis were higher among males than females across all age groups (Figure 2.3); overall, 1.5 times as high (2,536 and 1,643 per 100,000 population, respectively). The biggest difference between males and females was in the 55–64 age group, where rates among males were almost twice as high as for females.



Source: AIHW National Hospital Morbidity Database (Table A1).

Figure 2.3: Cardiovascular disease hospitalisation rates, as the principal and/or an additional diagnosis, by age and sex, 2012–13

Hospitalisation rates where CVD was recorded as an additional diagnosis increased with age as they did where CVD was the principal diagnosis, and were greatest among those aged 85 and over (almost 7 times the rate of those in the 55–64 year age group) (Table A1).

Males had slightly higher hospitalisation rates where CVD was an additional diagnosis compared with females (2,909 and 2,481 per 100,000, respectively). This is largely driven by the higher CVD hospitalisation rates among males from age 45 onwards, particularly in the 85-and-over age group, where the male rate was 1.3 times the female rate. Females had higher CVD hospitalisation rates in younger age groups; for example, in the 25–34 age group, females were hospitalised at 1.6 times the rate of males (Figure 2.3). This difference is somewhat driven by pregnancy-related CVD, as 30% of female hospitalisations in this age group had an obstetrics-related principal diagnosis.

Principal diagnoses for hospitalisations where CVD is an additional diagnosis

In situations where CVD coexisted with a different principal diagnosis and affected the care provided during hospitalisation, it was recorded as an additional diagnosis. Of the 683,500 hospitalisations where CVD was recorded as an additional diagnosis rather than as the principal diagnosis, diseases of the digestive system were recorded as the principal diagnosis in 15% of cases, and respiratory diseases in 9% of hospitalisations. Further, 'Factors influencing health status and contact with health services' was recorded as the principal diagnosis in almost 1 in 5 cases (19%), with the majority of these cases being 'Care involving use of rehabilitation services'. A further 12% of these hospitalisations had 'Signs, symptoms and abnormal clinical and laboratory findings' as their principal diagnosis, which includes signs and symptoms specific to the circulatory system, such as abnormal blood pressure, abnormal heart beats and cardiac murmurs (Table 2.1).

Table 2.1: Hospitalisations with an additional diagnosis of cardiovascular disease by their principal diagnosis, 2012–13

Principal diagnosis	Number of hospitalisations	Per cent
Diseases of the digestive system	101,365	14.8
Diseases of the respiratory system	64,066	9.4
Neoplasm	52,321	7.7
Diseases of the musculoskeletal system and connective tissue	34,509	5.0
Diseases of genitourinary system	35,559	5.2
Endocrine, nutritional an metabolic diseases	22,211	3.2
Infectious and parasitic diseases	22,232	3.3
Other diseases and conditions	351,211	51.4
Factors influencing health status and contact with health services	*129,107*	*18.9*
Symptoms, signs and abnormal clinical and laboratory findings	*84,082*	*12.3*
Other	*138,022*	*20.2*
Total	**683,474**	**100**

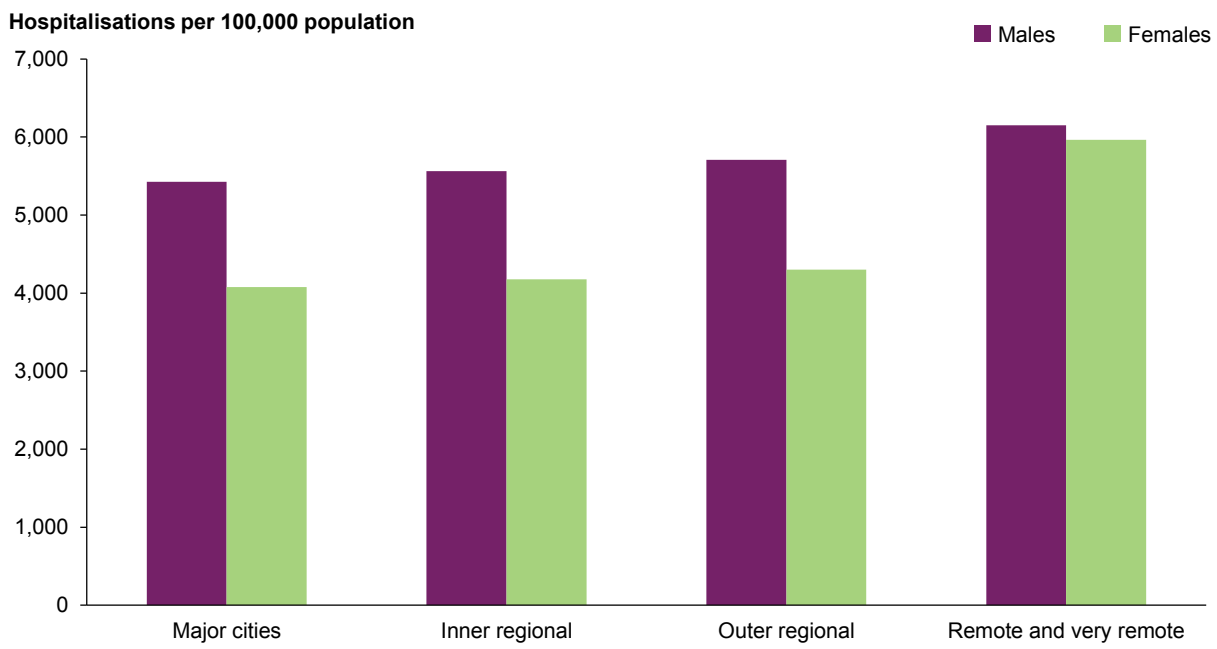
Source: AIHW National Hospital Morbidity Database.

Inequalities

Remoteness

In 2012–13, CVD hospitalisation rates increased with increasing levels of remoteness for both males and females, with the hospitalisation rate for CVD as the principal and/or an additional diagnosis 1.3 times as high in *Remote and very remote* areas compared with *Major cities*. This disparity was largely influenced by the rate for females, where females in *Remote and very remote* areas had a CVD hospitalisation rate 1.5 times that of females in *Major cities* (5,965 and 4,076 per 100,000, respectively). The corresponding rates for males were more similar, 6,152 and 5,427 hospitalisations per 100,000 population, respectively (Figure 2.4).

Higher hospitalisation rates in *Remote and very remote* areas are likely to reflect the high proportion of Aboriginal and Torres Strait Islander people living in these areas, who have higher rates of CVD than other Australians (AIHW 2011).



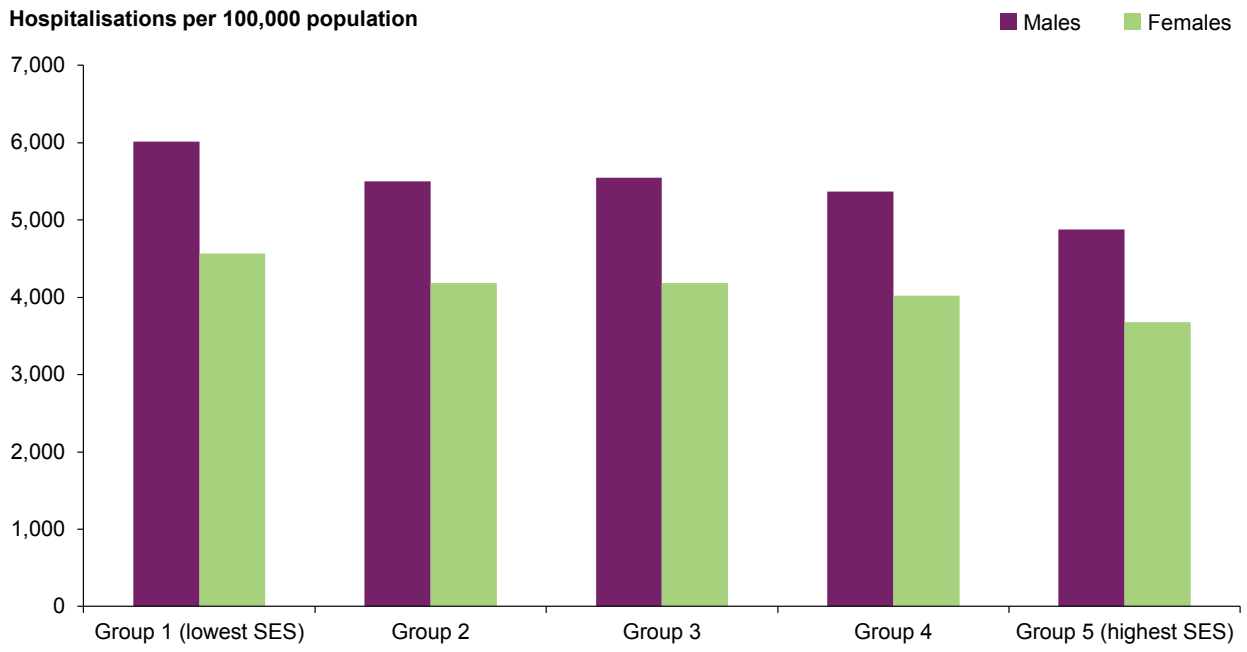
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.4: Cardiovascular disease hospitalisation rates, as the principal and/or an additional diagnosis, by remoteness and sex, 2012–13

CVD patients are often transferred from a local regional hospital to a larger urban hospital where more intense or critical care can be provided (Glazebrook & Harrison 2006; Hays et al. 2005). In 2012–13, 7.1% of CVD hospitalisations (principal and/or an additional diagnosis) in *Remote and very remote* areas were transferred to another hospital compared with 6.8% in *Outer regional* areas, 4.6% in *Inner regional* areas and 3.4% in *Major cities*. The higher rates of transfers may reflect that certain cardiac procedures, such as angiograms and cardiac revascularisation, are generally performed in large hospitals, which are predominantly located in urban areas.

Socioeconomic status

In 2012–13, age-standardised hospitalisation rates for CVD recorded as the principal and/or an additional diagnosis were 20% higher for those in the lowest socioeconomic group (based on area of usual residence) compared with the highest socioeconomic group—for males, the corresponding rates were 6,011 per 100,000 compared with 4,874, and for females, 4,564 per 100,000 compared with 3,677, respectively (Figure 2.5).



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

Figure 2.5: Cardiovascular disease hospitalisation rates, as the principal and/or an additional diagnosis, by socioeconomic status and sex, 2012–13

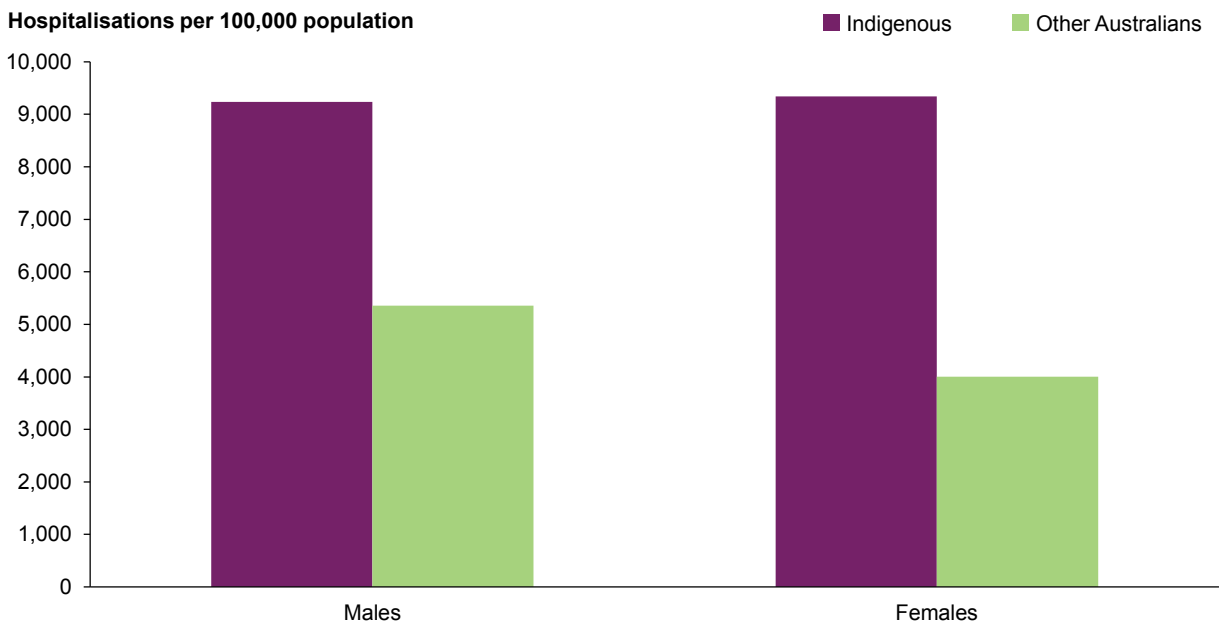
Aboriginal and Torres Strait Islander people

In 2012–13, hospitalisation rates for CVD were higher among Aboriginal and Torres Strait Islander people than for 'Other Australians' (non-Indigenous and Indigenous status not stated; see Appendix B). Age-standardised hospitalisation rates where CVD was recorded as the principal and/or an additional diagnosis were twice as high among Indigenous Australians than Other Australians (9,270 compared with 4,630 per 100,000 population).

Indigenous males and females were hospitalised for CVD at similar rates; however, there was a greater difference between Indigenous females and Other Australian females than there was for their male counterparts (Figure 2.6). Indigenous females were hospitalised at 2.3 times the rate of Other Australian females (9,340 and 4,002 per 100,000, respectively), and Indigenous males were hospitalised at 1.7 times the rate of Other Australian males (9,234 and 5,355 per 100,000, respectively).

CVD hospitalisation rate differences between Indigenous and Other Australians vary slightly for different major causes of CVD. For females, the greatest gap between Indigenous and Other Australians was for CHD, followed by heart failure and cardiomyopathy, and stroke (Indigenous females were 3.1, 2.9 and 2.1 times as likely to be hospitalised for these conditions, respectively). For males, heart failure and cardiomyopathy had the greatest difference, followed by CHD and stroke (Indigenous males were 2.2, 1.9 and 1.4 times as likely to be hospitalised, respectively).

It is well established that CVD is a large contributor to the health gap between Indigenous and Other Australians. CVD was found to be the greatest contributor to the mortality gap between Indigenous and Other Australians. Various studies have shown that Indigenous Australians with CHD experience lower intervention rates and poorer outcomes compared with non-Indigenous Australians (AHMAC 2012; AIHW: Mathur 2006; Ilton et al. 2014).



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

Figure 2.6: Cardiovascular disease hospitalisation rates, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

Length of stay in hospital

The average length of stay (the number of days a person spends in hospital) for people hospitalised with the principal diagnosis of CVD, has decreased over the last 2 decades—declining from 9.6 days in 1993–94 to 7.9 days in 2007–08 to 5.4 days in 2012–13 (people who are admitted and separated on the same date were excluded).

In 2012–13, the average length of stay for hospitalisations recorded with CVD as an additional diagnosis was 11.0 days.

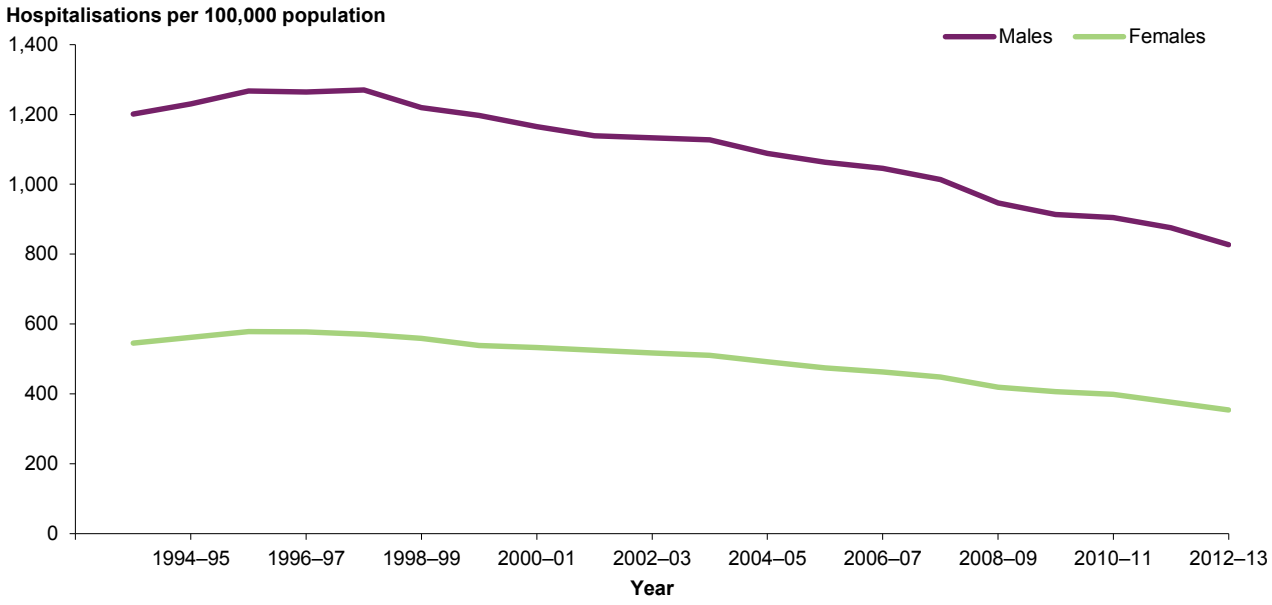
Average length of stay in hospital increases with age, with older people having longer lengths of stay in hospital. Those aged 85 and over stayed nearly twice as long in hospital as those aged 25–34; 7.0 days compared with 4.0 days, respectively, where CVD was recorded as the principal diagnosis. Where CVD was recorded as an additional diagnosis, the corresponding lengths of stay were 11.7 days and 8.8 days, respectively. The longer lengths of stay in older people most likely reflect the increasing complexity and multiplicity of their conditions.

Coronary heart disease

In 2012–13, there were 225,970 hospitalisations recorded with the principal or an additional diagnosis of CHD, of which two-thirds had the principal diagnosis of CHD (148,950 hospitalisations). Of these, angina accounted for 36% (54,160) and acute myocardial infarction (AMI) 36% (54,070). Together, CHD hospitalisations (principal and additional diagnoses) accounted for around 19% of all CVD hospitalisations.

Trends

Between 1993–94 and 2012–13, the number of hospitalisations for CHD in Australia increased by 7.4%, an average of 560 hospitalisations per year. Over the same period, there has been a steady reduction in age-standardised rates of hospitalisation recorded with the principal diagnosis of CHD, declining from 859 hospitalisations per 100,000 population in 1993–94 to 581 in 2012–13 (declining by around one-third over this period). This downward trend was slightly stronger for males than females (Figure 2.7).



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

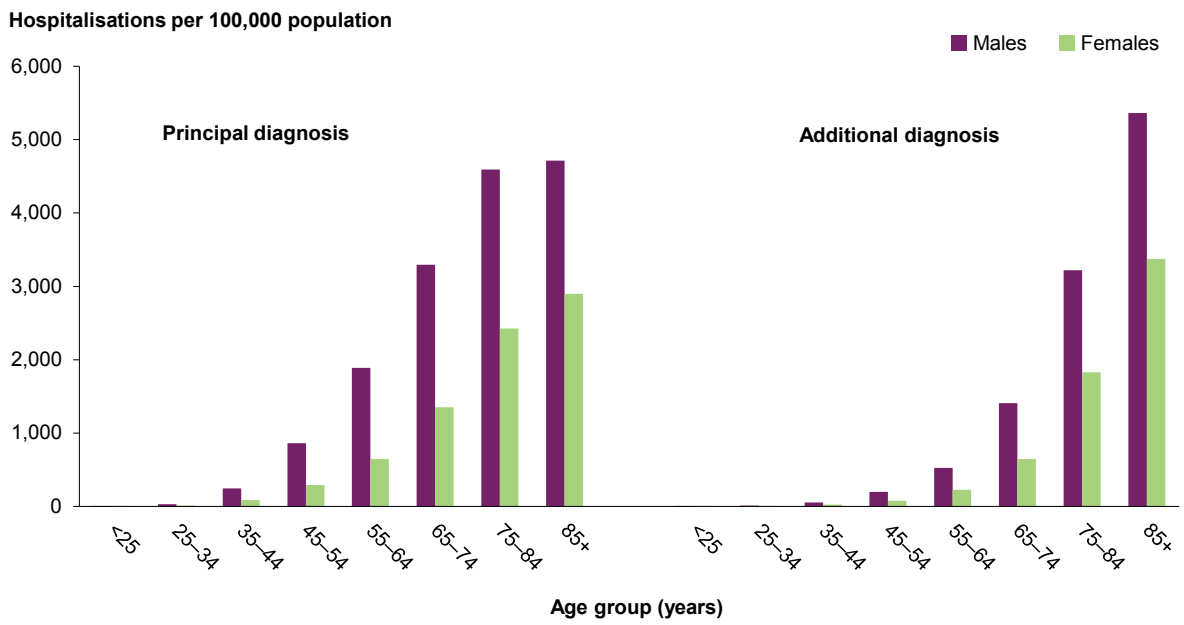
Figure 2.7: Trends in hospitalisation rates for coronary heart disease, as the principal diagnosis, by sex, 1993–94 to 2012–13

Sex and age

Hospitalisation rates for CHD increase rapidly with age. In 2012–13, age-specific rates for CHD as the principal diagnosis almost trebled for those aged 55–64 and those aged 85 and over (1,262 and 3,545 per 100,000, respectively) (Figure 2.8). Where CHD was recorded as an additional diagnosis, the age-specific rate for those aged 85 and over was almost 11 times that of those aged 55–64 (4,081 and 373 per 100,000, respectively).

Rates of CHD hospitalisation as the principal diagnosis were higher among males than females across all age groups (Figure 2.8); overall, 2.3 times as high (828 and 353 per 100,000, respectively). While the male rate was almost 3 times the female rate at age 45–54, it reduced to 1.6 times as high for those aged 85 and over.

Males had higher hospitalisation rates where CHD was an additional diagnosis compared with females (396 and 207 per 100,000, respectively). This is driven by the higher CHD hospitalisation rates among males from age 45 onwards (Figure 2.8).



Source: AIHW National Hospital Morbidity Database (Table A2).

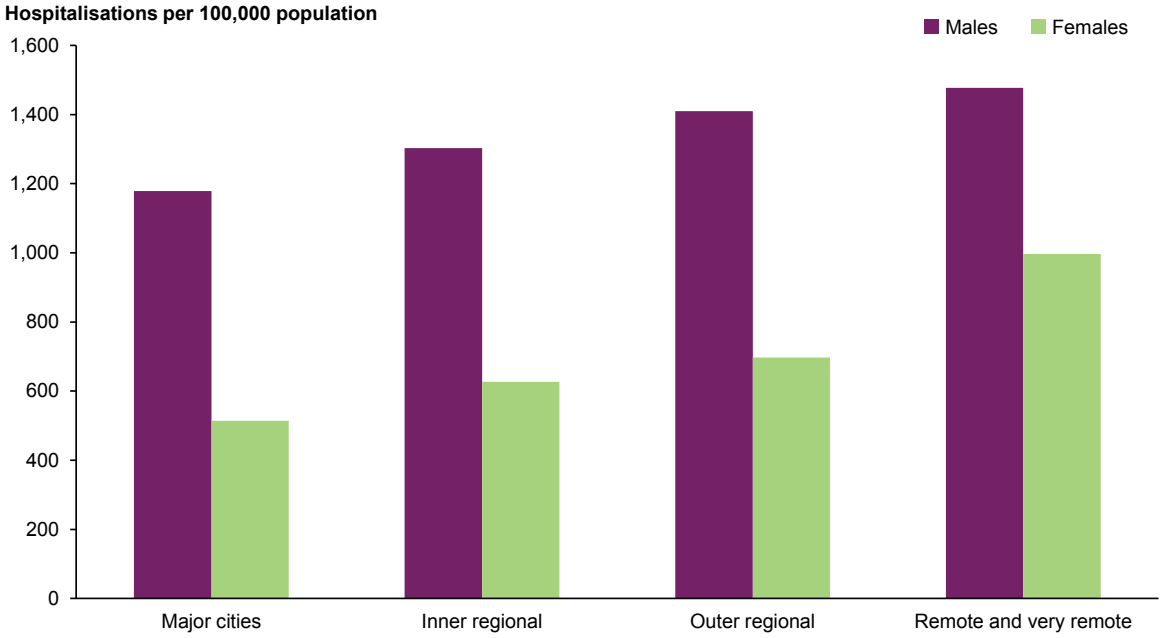
Figure 2.8: Hospitalisation rates for coronary heart disease, as the principal diagnosis and/or an additional diagnosis, by age and sex, 2012–13

Inequalities

Remoteness

In 2012–13, the rate of CHD hospitalisations recorded as the principal and/or an additional diagnosis increased with increasing remoteness for both males and females, with the overall CHD hospitalisation rate in *Remote and very remote* areas 1.5 times that of *Major cities* (1,256 and 824 per 100,000 population, respectively).

The difference between *Major cities* and *Remote and very remote* areas was greater for females than males. For females, the CHD hospitalisation rate was nearly twice as high in *Remote and very remote* areas than in *Major cities* (996 per 100,000 population compared with 514 per 100,000, respectively) (Figure 2.9). For males, the rate was 1.3 times as high for those living in *Remote and very remote* areas compared with *Major cities* (1,477 per 100,000 compared with 1,179, respectively). This disparity in CHD hospitalisation rates for both males and females was higher than the difference for all CVD.



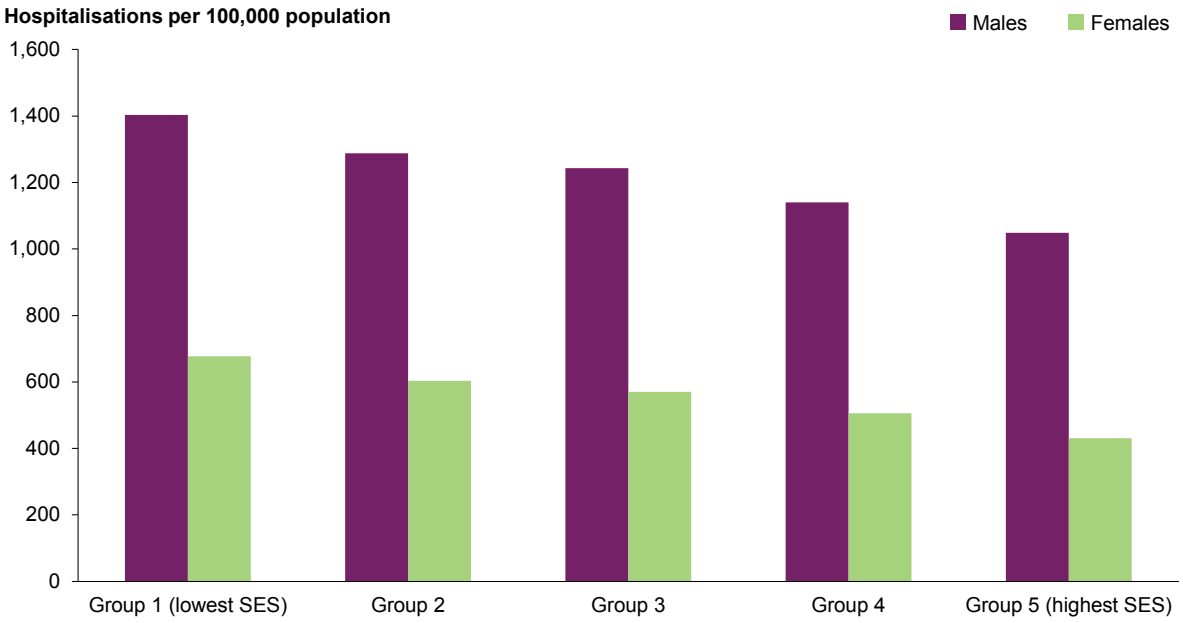
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.9: Coronary heart disease hospitalisation rates, as the principal and/or an additional diagnosis, by remoteness and sex, 2012–13

Socioeconomic status

In 2012–13, CHD hospitalisation rates recorded as the principal and/or an additional diagnosis were highest for those in the lowest socioeconomic group (based on area of usual residence; 1.4 times as high—719 and 1,024 per 100,000 population, respectively).

Males had higher rates of hospitalisation than females across all socioeconomic groups; however, the gap between the lowest and highest socioeconomic group was higher for females than males (Figure 2.10). For females, the CHD hospitalisation rate for the lowest socioeconomic group was 1.6 times as high as for the highest socioeconomic group (677 and 431 per 100,000, respectively). While among males, the gap was lower with rates 1.3 times as high among the lowest socioeconomic group compared with the highest socioeconomic group (1,403 and 1,049 per 100,000, respectively), this was still higher than the difference for all CVD (Figure 2.10).



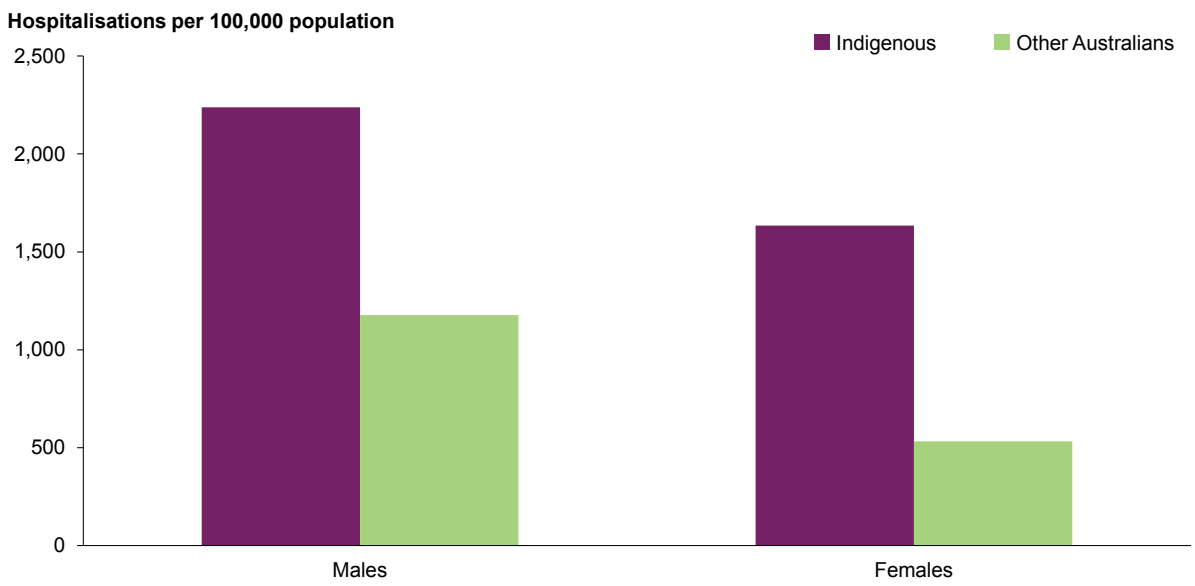
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.10: Coronary heart disease hospitalisation rates as the principal and/or an additional diagnosis, by socioeconomic status and sex, 2012–13

Aboriginal and Torres Strait Islander people

In 2012–13, hospitalisation rates for CHD were higher among Aboriginal and Torres Strait Islander people than for Other Australians—twice as high where CHD was recorded as the principal and/or an additional diagnosis compared with Other Australians (1,914 compared with 838 per 100,000 respectively).

While Indigenous males were hospitalised for CHD at higher rates than Indigenous females, the gap in CHD hospitalisation rates between Indigenous and Other Australians was greater for females than males (Figure 2.11). Indigenous females were hospitalised at 3.1 times the rate of Other Australian females (1,634 and 533 per 100,000, respectively) and Indigenous males were hospitalised at 1.9 times the rate of Other Australian males (2,237 and 1,177 per 100,000, respectively).



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

Figure 2.11: Coronary heart disease hospitalisation rates, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

Stroke

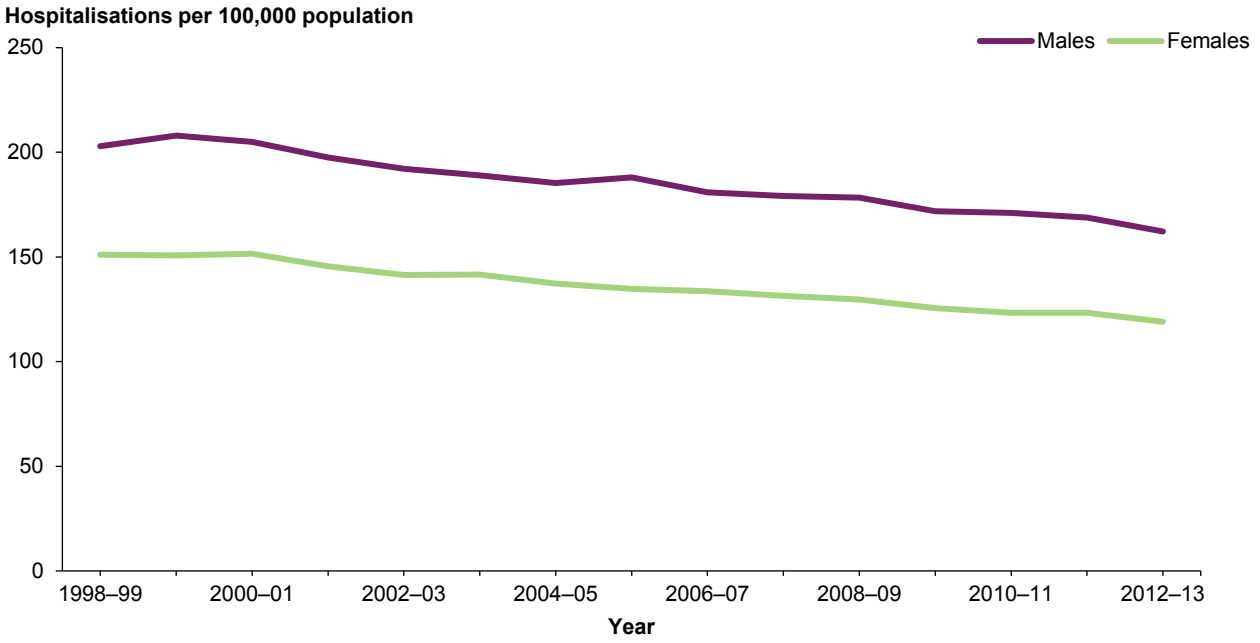
In 2012–13, there were about 67,900 hospitalisations in Australia with the principal and/or an additional diagnosis of stroke, accounting for 5.6% of all CVD hospitalisations. About half of these hospitalisations had the principal diagnosis of stroke (36,390 hospitalisations). Stroke hospitalisations as an additional diagnosis (around 31,500 hospitalisations) are mainly due to rehabilitation, as almost two-thirds of these hospitalisations had rehabilitation as the principal diagnosis.

Hospitals with stroke care units significantly improve the health outcomes and recovery of patients, as they have specialist staff and services specifically for stroke (Donnan et al. 2003; Stroke Unit Trialists' Collaboration 2007). Stroke care units have been shown to reduce death and disability by approximately 20% (National Stroke Foundation 2011). In 2011, 60% of people in Australia who had a stroke were treated in a specialised stroke unit (AIHW 2013c; National Stroke Foundation 2011).

Trends

Between 1998–99 and 2012–13, the age-standardised rate of hospitalisations for stroke fell by 20%, from 175 per 100,000 in 1998–99 to 140 in 2012–13. This decrease was similar for males and females, although the male rate remained consistently higher than the female rate over this period (Figure 2.12).

Over the same period, the number of hospitalisations where stroke was recorded as the principal diagnosis increased by 17%, an average increase of around 346 hospitalisations per year. This increase was greater for males than females over the 15 year period—22% compared with 12%.



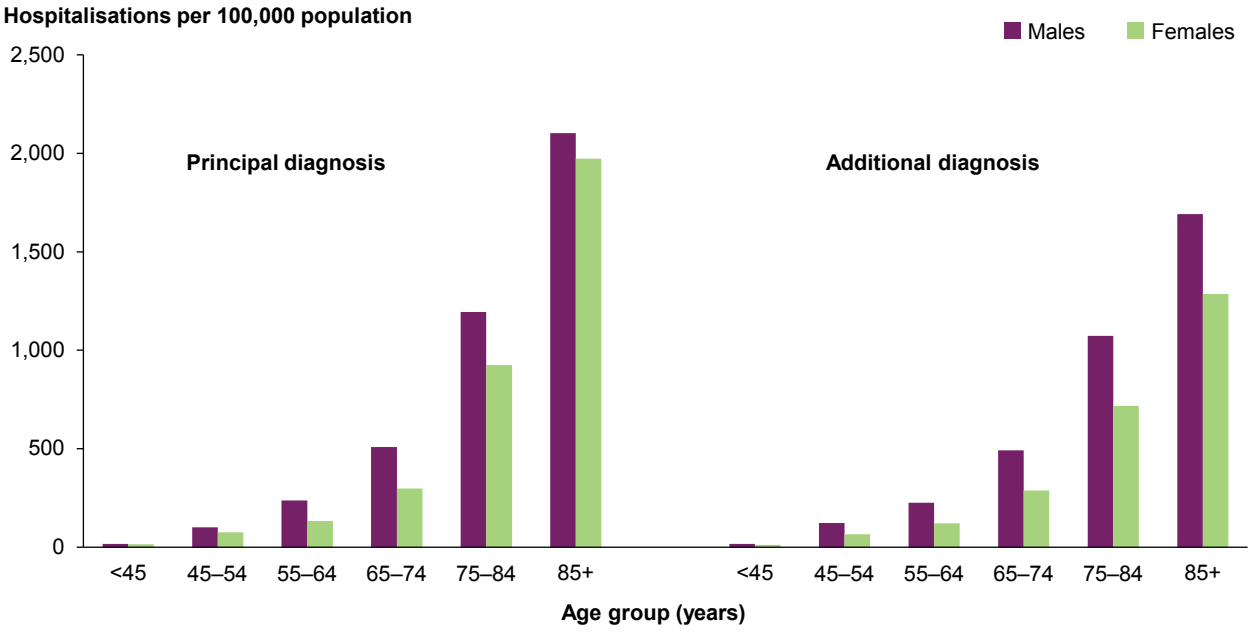
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.12: Trends in stroke hospitalisation rates, as the principal diagnosis, by sex, 1998–99 to 2012–13

Sex and age

Stroke hospitalisation rates increase rapidly among the elderly, with rates for those aged 85 and over 5 times as high as for those aged 65–74 where stroke is recorded as the principal diagnosis (2,020 per 100,000 compared with 402, respectively) and 3.7 times as high, respectively, where stroke is recorded as an additional diagnosis (1,430 per 100,000 compared with 388, respectively) (Table A3). More than half (54%) of stroke hospitalisations occurred among those aged 75 and over.

Males had higher hospitalisation rates for stroke than females (Figure 2.13). In 2012–13, the age-standardised hospitalisation rate for males with the principal diagnosis of stroke was 1.4 times as high as that for females (162 and 120 hospitalisations per 100,000 population, respectively). Where stroke was recorded as an additional diagnosis, the male rate was 1.6 times the female rate (152 per 100,000 compared with 96, respectively).



Source: AIHW National Hospital Morbidity Database (Table A3).

Figure 2.13: Stroke hospitalisation rates, as the principal and/or an additional diagnosis, by age and sex, 2012–13

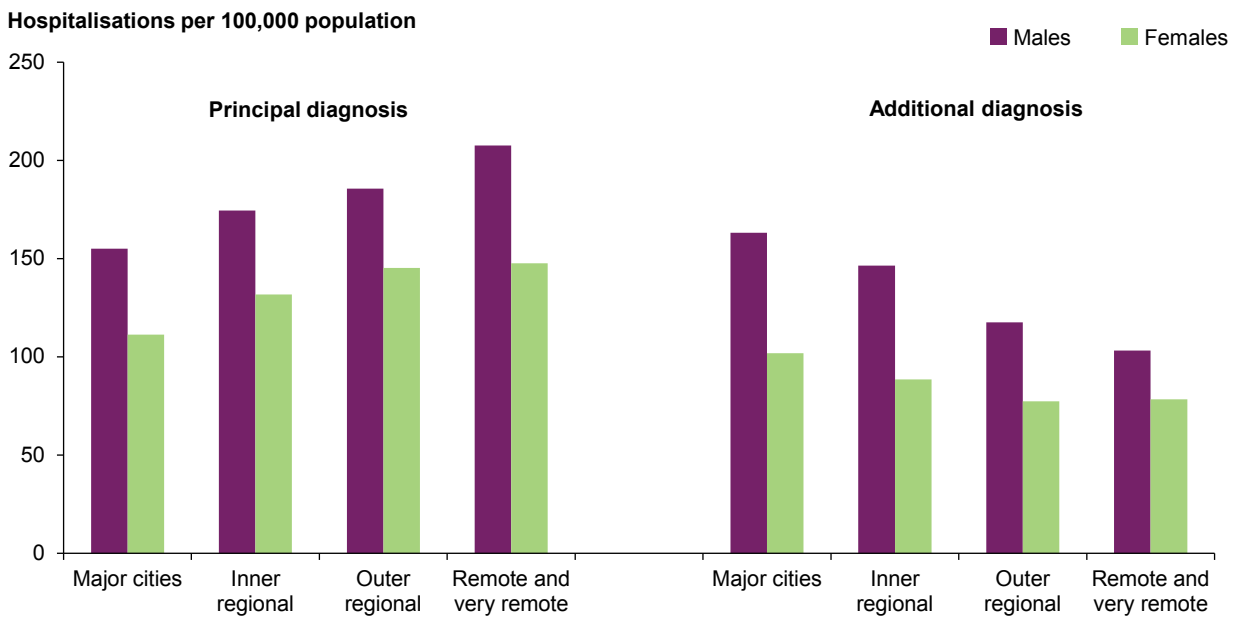
Inequalities

Remoteness

In 2012–13, hospitalisation rates for all stroke hospitalisations (principal and/or additional diagnoses) showed little difference across areas of remoteness. However, when stroke hospitalisations are analysed separately by principal or an additional diagnosis, rates vary by remoteness (Figure 2.14).

In 2012–13, hospitalisation rates where stroke was recorded as the principal diagnosis increased with increasing remoteness, with the rate in *Remote and very remote* areas 1.3 times the rate in *Major cities* for both males and females (for males 208 and 155 hospitalisations per 100,000 population, respectively, and for females 148 and 111 hospitalisations per 100,000 population, respectively).

In contrast, where stroke was recorded as an additional diagnosis, the opposite trend occurred—those in *Major cities* were more likely (1.4 times) to be hospitalised for an additional diagnosis of stroke than those in *Remote and very remote* areas (Figure 2.14). For males, those in *Major cities* were 1.6 times as likely to be hospitalised (163 and 103 hospitalisations per 100,000, respectively) and for females 1.3 times as likely to be hospitalised (102 and 78 per 100,000, respectively) as those in *Remote and very remote* areas. This opposite trend for stroke as an additional diagnosis is mainly due to rehabilitation, as almost two-thirds of hospitalisations with an additional diagnosis of stroke had rehabilitation as the principal diagnosis and three-quarters of these occurred in *Major cities*.



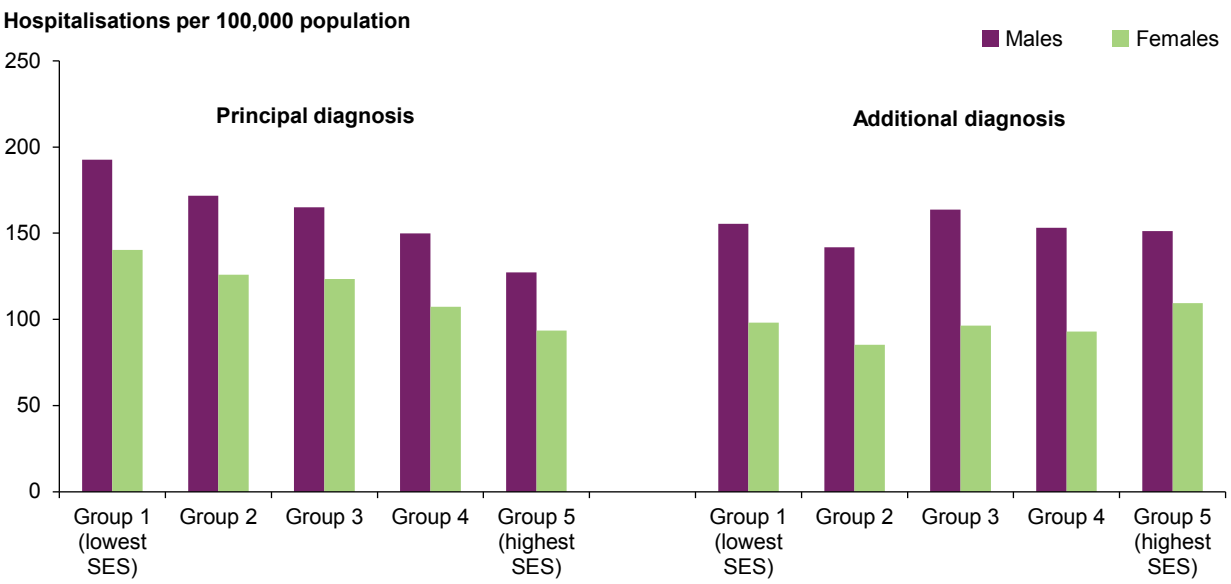
Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database (Table A3).

Figure 2.14: Stroke hospitalisation rates, as the principal and/or an additional diagnosis, by remoteness and sex, 2012–13

Socioeconomic status

In 2012–13, hospitalisation rates for all stroke hospitalisations (principal and/or additional diagnoses) showed little difference across socioeconomic groups (based on area of usual residence). While this held true where stroke was recorded as an additional diagnosis (for males, the rates in the lowest and highest socioeconomic groups were 156 and 151 per 100,000, and for females, 98 and 109 per 100,000, respectively), a different pattern emerged where stroke was recorded as the principal diagnosis. The hospitalisation rate for stroke as the principal diagnosis was 1.5 times as high for those in the lowest socioeconomic group compared with the highest socioeconomic group (193 and 127 per 100,000 for males and 140 and 94 per 100,000 for females, respectively) (Figure 2.15).



Note: Age-standardised to the 2001 Australian population.

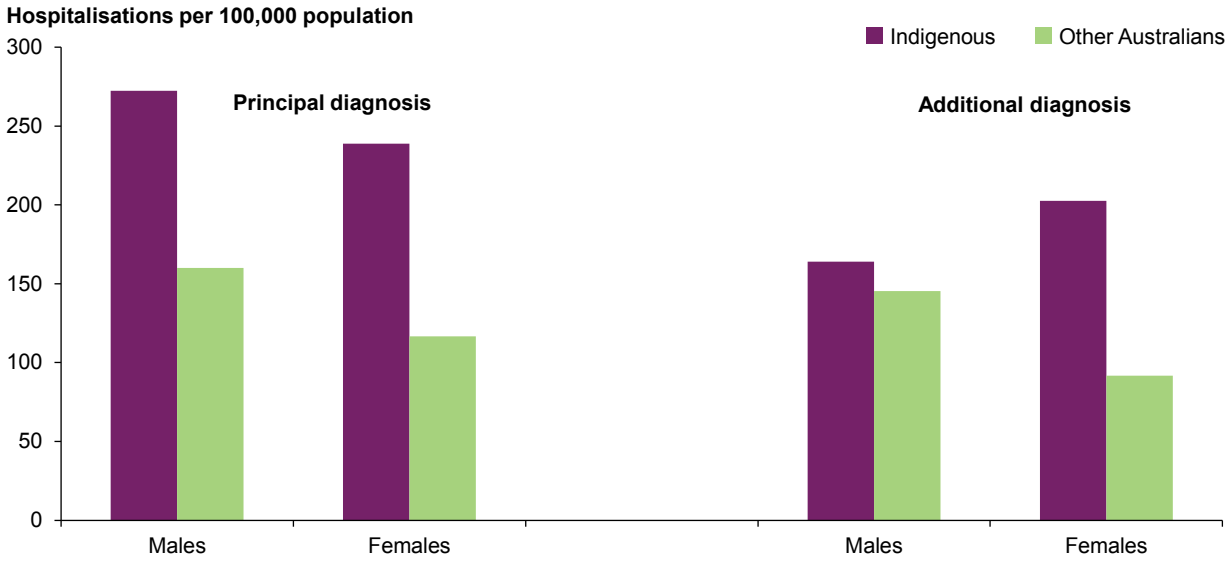
Source: AIHW National Hospital Morbidity Database (Table A3).

Figure 2.15: Stroke hospitalisation rates, as the principal and/or an additional diagnosis, by socioeconomic status and sex, 2012–13

Aboriginal and Torres Strait Islander people

In 2012–13, hospitalisation rates for stroke were higher among Aboriginal and Torres Strait Islander Australians than for Other Australians—rates were 1.7 times as high as for Other Australians (442 and 254 per 100,000 respectively) where stroke was recorded as the principal and/or an additional diagnosis.

While Indigenous males and females were hospitalised for stroke at relatively similar rates, the gap in stroke hospitalisation rates between Indigenous and Other Australians was greater for females than males. Where stroke was recorded as the principal diagnosis, Indigenous females were hospitalised at 2.0 times the rate of Other Australian females and Indigenous males at 1.7 times the rate of Other Australian males. Where stroke was recorded as an additional diagnosis, Indigenous females were hospitalised at 2.2 times the rate of Other Australian females and Indigenous males at 1.1 times the rate of Other Australian males (Figure 2.16).



Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database (Table A3).

Figure 2.16: Stroke hospitalisation rates, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

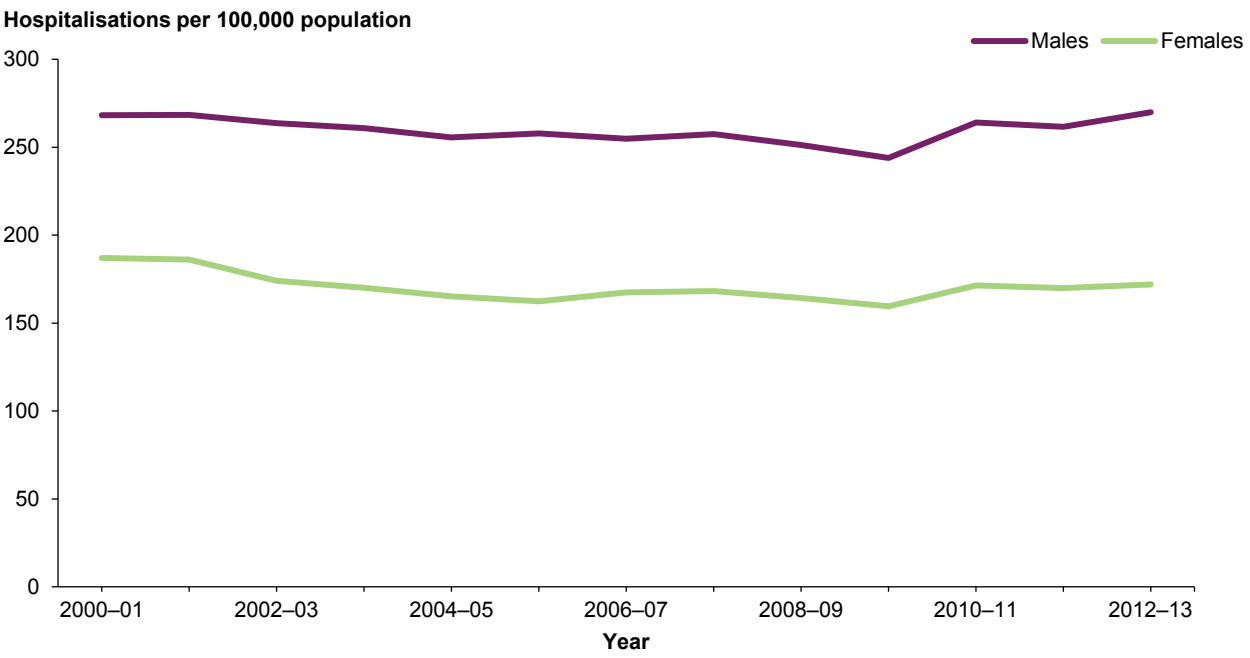
Heart failure and cardiomyopathy

In 2012–13, there were about 156,000 hospitalisations where heart failure or cardiomyopathy was recorded as either the principal and/or an additional diagnosis, of which 37% had the principal diagnosis of heart failure or cardiomyopathy. Together (principal and/or an additional diagnosis), heart failure or cardiomyopathy accounted for around 12.9% of all CVD hospitalisations and were the second most commonly occurring cause of CVD hospitalisations.

Trends

Overall, the number of hospitalisations has increased by 32% over the last decade, from around 43,650 in 2000–01 to 57,500 in 2012–13, although there were some notable fluctuations in hospitalisations between 2009–10 and 2011–12. Over the same period, however, the rate of hospitalisations where heart failure or cardiomyopathy was recorded as the principal diagnosis has remained relatively stable at around 216 hospitalisations per 100,000 population.

The rate of heart failure or cardiomyopathy hospitalisations in males was consistently higher than that for females over the period, with both showing relatively similar trends (Figure 2.17).



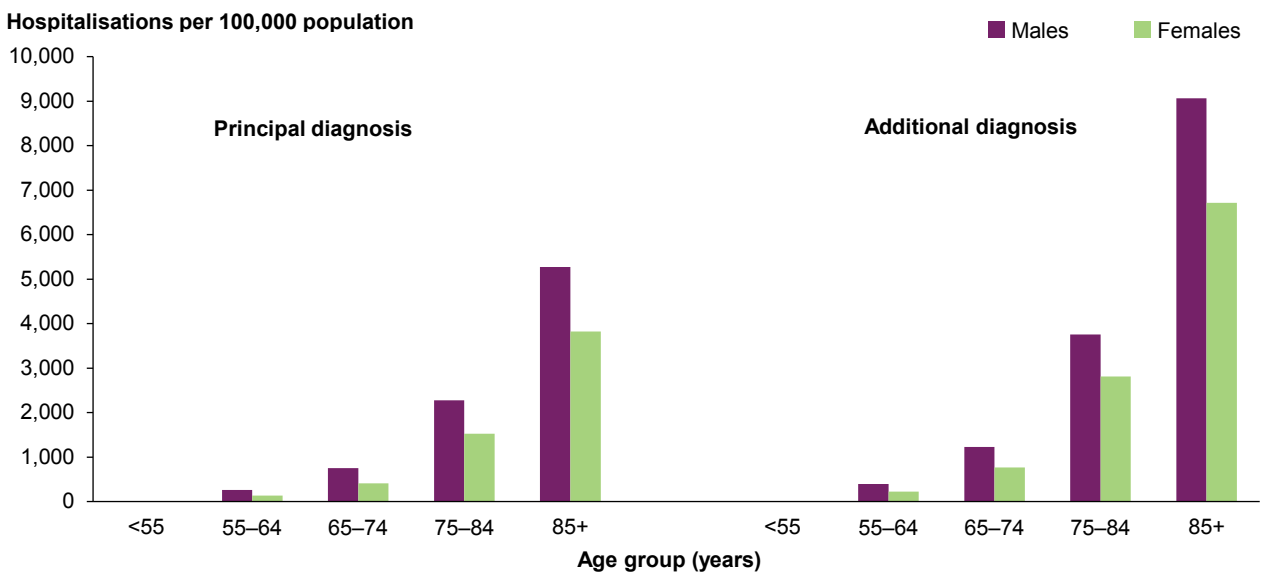
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.17: Trends in heart failure or cardiomyopathy hospitalisation rates, as the principal diagnosis, by sex, 2000–01 to 2012–13

Sex and age

Hospitalisation rates for heart failure or cardiomyopathy increase with age. Those aged 85 and over had hospitalisation rates 8 times as high as those aged 65–74 where heart failure or cardiomyopathy were recorded as either the principal and/or an additional diagnosis (principal diagnosis 4,337 per 100,000 compared with 577, respectively; additional diagnosis 7,551 per 100,000 compared with 995, respectively).

Males had higher rates of hospitalisation than females overall and across all age groups (Figure 2.18)—overall male rates were 1.4–1.6 times as high as female rates, where heart failure or cardiomyopathy was either the principal and/or an additional diagnosis (principal diagnosis 270 and 172 hospitalisations per 100,000 population, respectively; additional diagnosis 444 and 311 per 100,000, respectively).



Source: AIHW National Hospital Morbidity Database (Table A4).

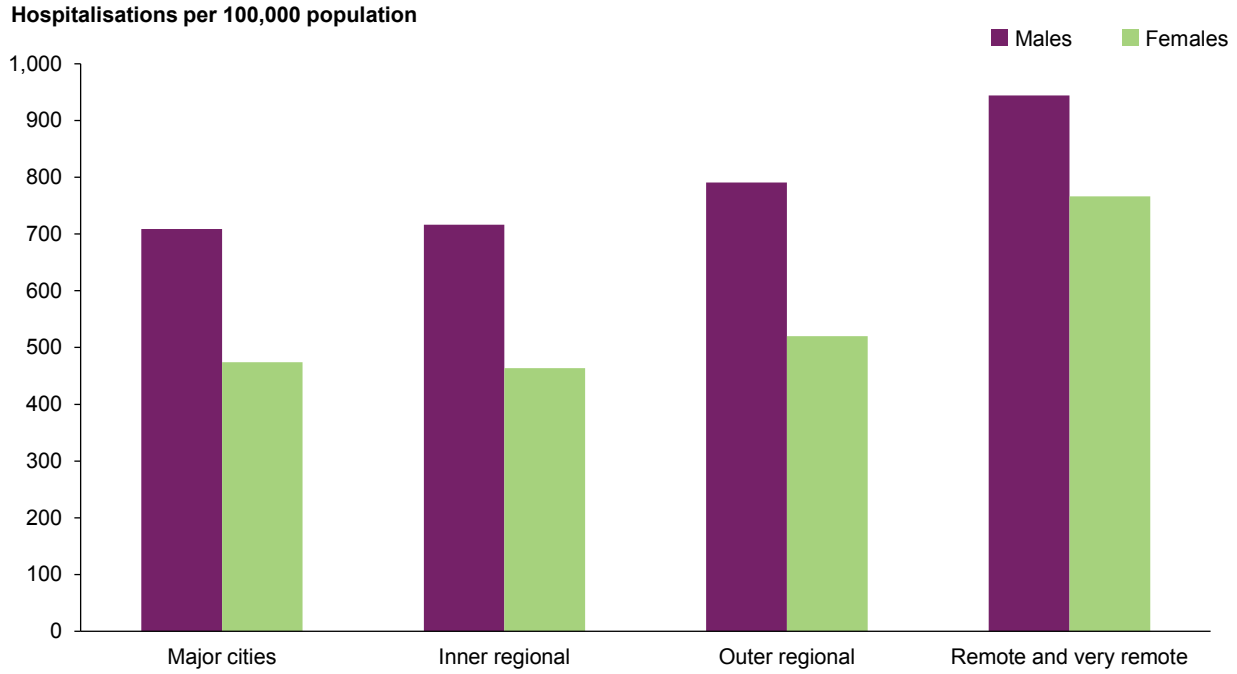
Figure 2.18: Heart failure or cardiomyopathy hospitalisation rates, as the principal and/or an additional diagnosis, by age and sex, 2012–13

Inequalities

Remoteness

In 2012–13, the rate of heart failure or cardiomyopathy hospitalisations recorded as the principal and/or an additional diagnosis increased with increasing remoteness for both males and females, with the heart failure or cardiomyopathy hospitalisation rate in *Remote and very remote* areas being 1.5 times that of *Major cities* (857 per 100,000 population compared with 577, respectively).

While males had higher hospitalisation rates across all remoteness areas, the difference between *Major cities* and *Remote and very remote* areas was greater for females than for males (Figure 2.19). For males living in *Remote and very remote* areas, the hospitalisation rate for heart failure or cardiomyopathy was 1.3 times as high as the rate in *Major cities* (944 per 100,000 compared with 709, respectively). For females, the gap was greater, with the rate 1.6 times as high in *Remote and very remote* areas than in *Major cities* (767 per 100,000 population compared with 474, respectively) (Figure 2.19).



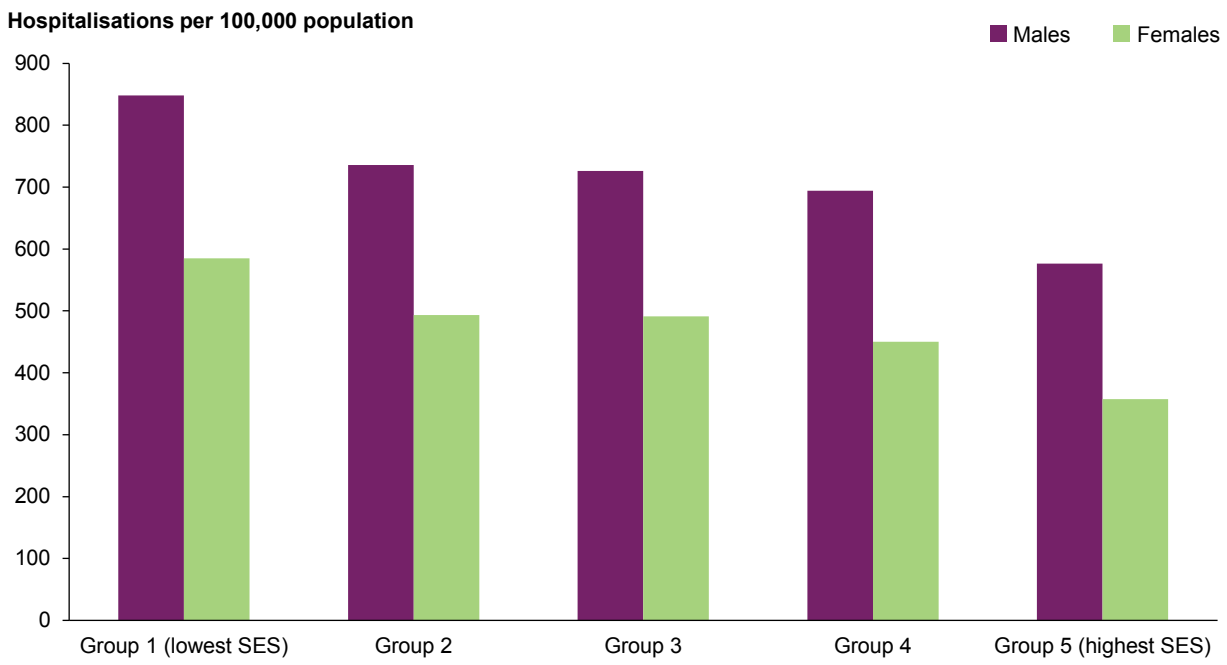
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.19: Heart failure or cardiomyopathy hospitalisation rates, as the principal and/or an additional diagnosis, by remoteness and sex, 2012–13

Socioeconomic status

In 2012–13, the hospitalisation rate for heart failure or cardiomyopathy recorded as the principal and/or an additional diagnosis was highest for those in the lowest socioeconomic group (based on area of usual residence; 1.6 times the rate in the highest socioeconomic group).

For both males and females, the gap between the lowest and highest socioeconomic group was similar—1.5 and 1.6 times as high, respectively (for males: 848 and 576 per 100,000 population and for females: 585 and 357 per 100,000 population, respectively) (Figure 2.20).



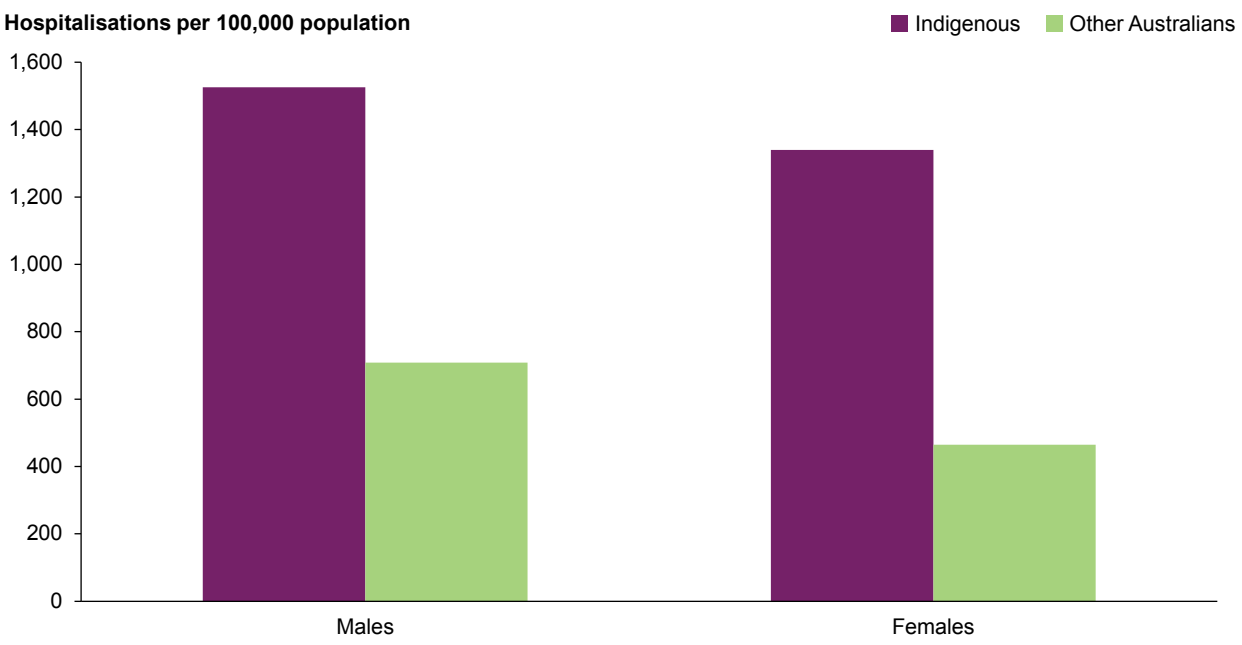
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 2.20: Heart failure or cardiomyopathy hospitalisation rates, as the principal and/or an additional diagnosis, by socioeconomic status and sex, 2012–13

Aboriginal and Torres Strait Islander people

In 2012–13, hospitalisation rates for heart failure or cardiomyopathy were higher among Indigenous Australians than for Other Australians—2.5 times as high as for Other Australians (1,423 compared with 574 per 100,000 respectively) where heart failure or cardiomyopathy was recorded as the principal and/or an additional diagnosis.

While Indigenous males were hospitalised for heart failure or cardiomyopathy at higher rates than Indigenous females, the gap in hospitalisation rates between Indigenous and Other Australians was greater for females than males. Indigenous females were hospitalised at 2.9 times the rate of Other Australian females (1,340 and 465 per 100,000, respectively) and Indigenous males at 2.2 times the rate of Other Australian males (1,526 and 709 per 100,000, respectively) (Figure 2.21).



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Figure 2.21: Heart failure or cardiomyopathy hospitalisation rates, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

3 Diabetes

Diabetes mellitus (in this report referred to as diabetes) is a disease characterised by high levels of glucose in the blood. It is caused either by the inability to produce insulin (a hormone produced by the pancreas to control blood glucose levels), or by the body not being able to use insulin effectively, or both (AIHW 2014b). Diabetes may progress to a range of complications, including heart disease, stroke, kidney disease, retinopathy (loss of vision) and lower limb amputation. For example, diabetes is the leading cause of treated end-stage kidney disease in Australia, accounting for 1 in 3 new cases in 2011 (McDonald et al. 2013). In Australia, an estimated 5% of the adult population have diabetes (see *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: prevalence and incidence* report AIHW (2014f) for further details).

Diabetes, both directly and indirectly, is recognised as having a substantial impact on the need for hospital care in Australia. Hospital services are often required to treat the advanced stages of diabetes complications or when blood glucose levels are unstable. While evidence is mixed, it is suggested that improved access to primary health care may prevent hospitalisations and improve health outcomes and lower health-care costs (Calderon-Larranaga et al. 2014; Gibson et al. 2013; Zhao et al. 2013).

As type 2 diabetes symptoms are often absent in the early stages of diabetes, and people can go undiagnosed for a long time, the true burden of diabetes in hospitalisations is often difficult to measure, and is likely to be underestimated in hospital and mortality records (Pettitt et al. 2014; Wild et al. 2004).

This chapter presents hospitalisation data for diabetes overall and the 3 main types of diabetes, where appropriate (see Box 3.1). This chapter does not present trend information for diabetes, as reliable and consistent trend information is not available for diabetes hospitalisations (see Box 3.2).

Box 3.1: Types of diabetes

Type 1 diabetes

Type 1 diabetes is caused by the destruction of the insulin-producing cells of the pancreas, and is usually due to an autoimmune process. The subsequent absence of insulin means glucose cannot be transported into the cells where it is used for energy, and blood glucose levels rise, which requires replacement insulin to be administered. Unless treated with insulin, people with type 1 diabetes accumulate dangerous chemicals in their blood, causing a condition known as ketoacidosis. This condition is life-threatening if not treated. The exact cause of type 1 diabetes is unknown, although it is believed to be an interaction of genetic predisposition and environmental factors. Although type 1 diabetes can occur at any age, it mainly develops during childhood and adolescence (Craig et al. 2011). Once a person is diagnosed with type 1 diabetes, they will require insulin treatment every day throughout their life.

Type 2 diabetes

Type 2 diabetes is the most common form of diabetes. It occurs when the body becomes resistant to the insulin being produced by the pancreas and the amount of insulin produced is inadequate to meet the body's needs. When first diagnosed with type 2 diabetes, blood glucose levels can often be maintained at normal levels through lifestyle modification and/or oral glucose-lowering medication, although insulin may eventually be required if the disease progresses. A number of risk factors are known to increase the risk of developing type 2 diabetes, including physical inactivity, unhealthy diet, obesity, tobacco smoking, high blood pressure and abnormal blood lipid levels (see *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors* (AIHW, forthcoming 2015b) for further details).

Gestational diabetes

Gestational diabetes is a form of diabetes that involves high blood sugar levels appearing for the first time during pregnancy, generally in the second or third trimester, among women who have not previously been diagnosed with other forms of diabetes. It can result in complications for mother and baby. While gestational diabetes usually disappears after the baby is born, it can recur in later pregnancies and increases the risk that both the mother and the baby may develop type 2 diabetes later in life. Some women can manage their gestational diabetes by changes to diet and exercise, while others require insulin treatment.

For more information of the hospital codes used in this report for diabetes, refer to Appendix C, Table C2.

Box 3.2: Australian Coding Standards for diabetes

The Australian Coding Standards (ACS) have been developed with the objective of satisfying sound coding conventions for use with ICD-10-AM and Australian Classification of Health Interventions (ACHI) (see Box 1.1 for further details). The ACS for diabetes have undergone considerable changes in the last few ICD-10-AM editions.

The coding practice for classifying diabetes under ICD-10-AM 6th edition (used 1 July 2008 to 30 June 2010) was largely consistent with previous editions of ICD-10-AM. However, clarification of how the coding standard for additional diagnoses should be applied meant that conditions would only be coded as an additional diagnosis if they were 'significant in terms of treatment required, investigations needed and resources used in each episode of care'. While this clarification resulted in a decrease in the number of conditions being coded as additional diagnoses for all hospitalisations, it had a particularly significant impact on the reporting of diabetes as an additional diagnosis for hospitalisations that involved a patient with diabetes.

The coding practice for classifying diabetes under ICD-10-AM 7th edition (implemented in Australian hospitals from 1 July 2010) changed as a result of changes made to the ACS specialty standard for diabetes. The changes resulted in a further decrease between 2009–10 and 2010–11 in the reporting of diabetes-related conditions, due to the condition not meeting the criteria for being assigned as either the principal or additional diagnosis.

During 2011, the National Casemix and Classification Centre's ICD Technical Group and the Diagnosis Related Group Technical Group investigated the effect of the changes to diabetes coding and recommended that 'when documented, diabetes mellitus should always be coded'. This recommendation was endorsed by the National Health Information Standards and Statistics Committee (NHISSC) in March 2012 meeting, for implementation from 1 July 2012.

Effect on reporting (see Appendix C, Table C2, for diabetes codes):

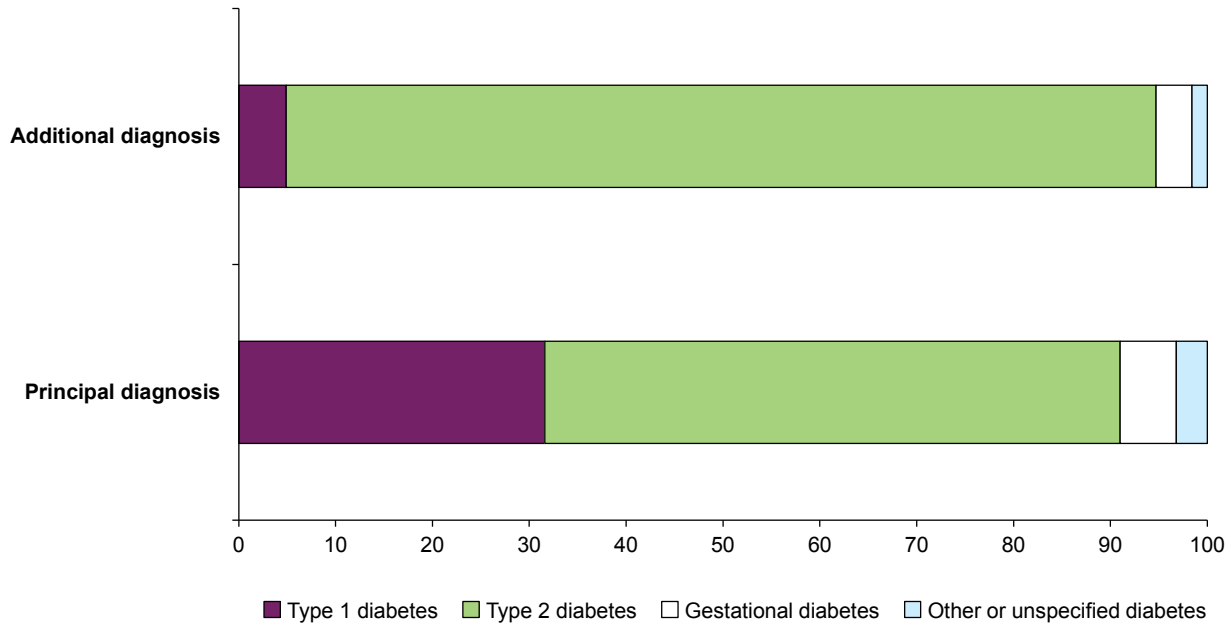
- Between 2009–10 and 2010–11, the numbers of hospitalisations reported for diabetes decreased by 41% from 442,340 in 2009–10 to 262,740 in 2010–11.
- Between 2010–11 and 2011–12, there were increases in the numbers of hospitalisations reported for diabetes that may be unrelated to coding changes.
- Between 2011–12 and 2012–13, the numbers of diabetes hospitalisations recorded as either the principal and/or additional diagnoses increased—8% increase where diabetes was recorded as the principal diagnosis, and 250% increase where it was recorded as an additional diagnosis.
- Examining the reporting of codes for E11—*Type 2 diabetes mellitus* in more detail, the greatest increases in reporting between 2011–12 and 2012–13 were for E11.3 (*Type 2 diabetes mellitus with ophthalmic complication*) and E11.9 (*Type 2 diabetes mellitus without complications*). There was also a very large increase in the reporting of E11.2 (*Type 2 diabetes mellitus with kidney complication*) (AIHW 2013a).

All diabetes

In 2012–13, there were around 837,230 hospitalisations where diabetes was recorded as the principal and/or an additional diagnosis, and together these represent 8.9% of all hospitalisations in Australia. In the vast majority of these hospitalisations (95%), diabetes was recorded as an additional diagnosis.

Of the 793,130 hospitalisations where diabetes was recorded as an additional diagnosis, 90% of these were for type 2 diabetes (around 712,150), 5% were for type 1 diabetes (38,950) and 4% (29,320) for gestational diabetes. Where diabetes was recorded as the principal diagnosis (44,100 hospitalisations), type 1 diabetes accounted for a much higher proportion—almost one-third of hospitalisations (13,950)—and type 2 diabetes accounted for around 59% or 26,200 hospitalisations (Figure 3.1).

The diabetes hospitalisation where diabetes was recorded as the principal and/or an additional diagnosis rate was 23% higher for males than females (age-standardised rate of 3,703 hospitalisations compared with 3,003 per 100,000, respectively), with the majority (89%) of hospitalisations occurring in those aged 45 and over.



Source: AIHW National Hospital Morbidity Database (Tables A6–A8).

Figure 3.1: Proportion of diabetes hospitalisations, by type of diabetes, 2012–13

Principal diagnoses for hospitalisations where diabetes is an additional diagnosis

In situations where diabetes coexisted with a different principal diagnosis and affected patient care during hospitalisation, it was recorded as an additional diagnosis. Of the 793,130 hospitalisations where diabetes was recorded as an additional diagnosis, diseases of the cardiovascular system were recorded as the principal diagnosis in 13% of cases, and diseases of the digestive system and neoplasms accounted for 9% and 8% of hospitalisations, respectively (Table 3.1). In addition, of the hospitalisations where diabetes was recorded as an additional diagnosis, 15% had 'Factors influencing health status and contact with health services' recorded as their principal diagnosis, with regular dialysis accounting for the vast majority of these hospitalisations.

Table 3.1: Hospitalisations with an additional diagnosis of diabetes by their principal diagnosis, 2012–13

Principal diagnosis	Number of hospitalisations	Per cent
Diseases of the cardiovascular system	102,625	12.9
Diseases of the digestive system	68,373	8.6
Neoplasm	60,179	7.6
Diseases of the musculoskeletal system and connective tissue	48,150	6.1
Diseases of the eye	46,661	5.9
Diseases of genitourinary system	45,776	5.8
Diseases of the respiratory system	44,505	5.6
Pregnancy, childbirth and the puerperium	32,297	4.1
Other diseases and conditions	344,568	43.4
Factors influencing health status and contact with health services	*114,875*	*14.5*
Symptoms, signs and abnormal clinical and laboratory findings	*70,878*	*8.9*
Other	*158,809*	*20.0*
Total	**793,128**	**100**

Source: AIHW National Hospital Morbidity Database.

Inequalities

Remoteness

In 2012–13, hospitalisation rates where diabetes was recorded as the principal and/or an additional diagnosis were 1.8 times as high in *Remote and very remote areas* than in *Major cities* (5,933 compared with 3,246 per 100,000 population, respectively). This difference is largely driven by the hospitalisation rates for females, where the rate in *Remote and very remote areas* was 2.5 times the rate in *Major cities* (7,135 compared with 2,888 per 100,000 population, respectively).

The disparity in hospitalisation rates by region may reflect the high proportion of Aboriginal and Torres Strait Islander people living in remote Australia, who have higher rates of diabetes. The higher diabetes hospitalisation rate in remote areas is also influenced by other geographical, environmental and social factors that contribute to the poorer health of people living in these areas (AIHW 2014b).

People who are hospitalised in remote areas are more likely to be transferred to another hospital (AIHW 2014a). In 2012–13, 6.5% of diabetes hospitalisations in *Remote and very remote* areas were transferred to another hospital compared with 4.9% in *Outer regional* areas, 2.9% in *Inner regional* areas and 2.6% in *Major cities*.

Socioeconomic status

In 2012–13, the lower socioeconomic groups (based on area of usual residence) were associated with higher rates of hospitalisation where diabetes was recorded as the principal and/or an additional diagnosis. The hospitalisation rate for diabetes was 1.8 times as high in the lowest socioeconomic group compared with the highest socioeconomic group (4,239 compared with 2,304 per 100,000 population, respectively).

Aboriginal and Torres Strait Islander people

In 2012–13, hospitalisation rates where diabetes was recorded as the principal and/or an additional diagnosis were 4 times as high among Indigenous Australians as for Other Australians.

In 2012–13, Indigenous males were 3 times as likely as Other Australian males to be hospitalised for diabetes as the principal and/or an additional diagnosis (10,779 compared with 3,578 per 100,000 population, respectively). The disparity was even greater for Indigenous females, who were 5 times as likely to be hospitalised for diabetes as Other Australian females (14,010 compared with 2,774 per 100,000 population, respectively).

Type 1 diabetes

In 2012–13, there were around 52,900 hospitalisations for type 1 diabetes recorded as the principal and/or an additional diagnosis. Of these, type 1 diabetes was the principal diagnosis for around 13,950 hospitalisations (26%) and was as an additional diagnosis for a further 38,950 hospitalisations. Together these represent 6.3% of all diabetes hospitalisations.

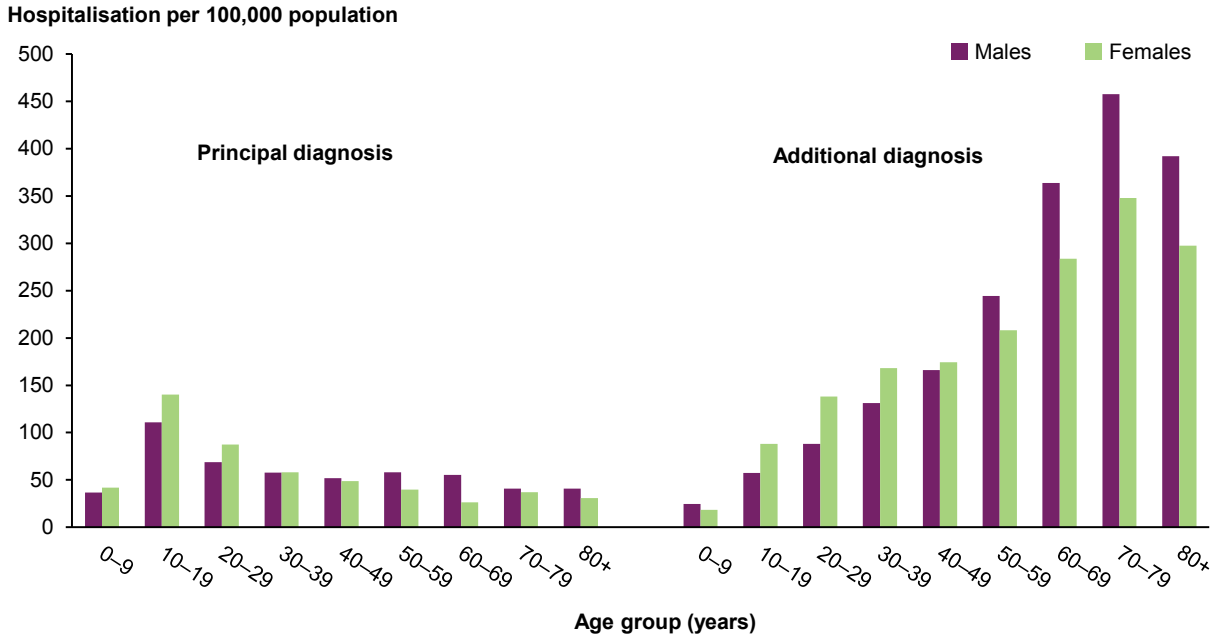
Sex and age

Males and females were fairly equally represented in the data in 2012–13, with males accounting for half of hospitalisations where type 1 diabetes was recorded as the principal diagnosis. The age-standardised hospitalisation rate for males and females were similar (61 and 63 per 100,000 population, respectively) (Table A6). Hospitalisation rates were also similar for males and females where type 1 diabetes was recorded as an additional diagnosis (164 and 162 per 100,000 respectively).

While overall type 1 diabetes hospitalisation rates were similar for males and females, this varied by age. Males had substantially higher rates of hospitalisations for type 1 diabetes among the older age groups. However, females had higher rates among those aged under 30 (Figure 3.2). This, in part, may be due to females being more likely to be diagnosed with type 1 diabetes at a younger age than males (AIHW 2014d).

Where type 1 diabetes was recorded as the principal diagnosis, rates peaked in those aged 10–29 and then declined and remained fairly stable across the remaining age groups. This may represent hospital admissions to start insulin therapy at diagnosis (hence reflecting the peak ages of incidence), higher rates of diabetic ketoacidosis (a potentially life-threatening complication in people with diabetes) or severe hypoglycaemic episodes (low blood glucose) in teenagers and young adults who may not be managing their diabetes sufficiently (Helgeson et al. 2013; Silverstein & Rosenbloom 2003).

Hospitalisation rates for type 1 diabetes showed a different age pattern when recorded as an additional diagnosis rather than the principal diagnosis. Where type 1 diabetes was recorded as an additional diagnosis, hospitalisation rates increased steadily up to the age of 79 and then declined (Figure 3.2). This is, in part, due to diabetes complications increasing with age as people are living with the disease for a longer period and type 1 diabetes tends to have an early onset of the disease. It may also be due to increasing numbers of adults with insulin-treated type 2 diabetes who are misclassified as having type 1 diabetes (AIHW 2014e).



Source: AIHW National Hospital Morbidity Database (Table A6).

Figure 3.2: Type 1 diabetes hospitalisation rates, as the principal diagnosis and/or an additional diagnosis, by sex, 2012–13

Length of stay in hospital

The average length of stay (number of days a person spends in hospital) for hospitalisations where type 1 diabetes was recorded as the principal diagnosis was 4.3 days (people who are admitted and separated on the same date were excluded). It was 6.4 days where type 1 diabetes was recorded as an additional diagnosis.

Average length of stay in hospital increases with increasing age, with older people having longer lengths of stay in hospital with the principal or an additional diagnosis of diabetes. For example, those aged 45 and over stayed on average longer than those aged under 45—7.0 days compared with 3.3 days, respectively, where type 1 diabetes was the principal diagnosis and 7.0 days compared with 3.2 days, respectively, where type 1 diabetes was an additional diagnosis. The longer length of stay in older people most likely reflects the increasing complexity and multiplicity of their conditions (Bach et al. 2014).

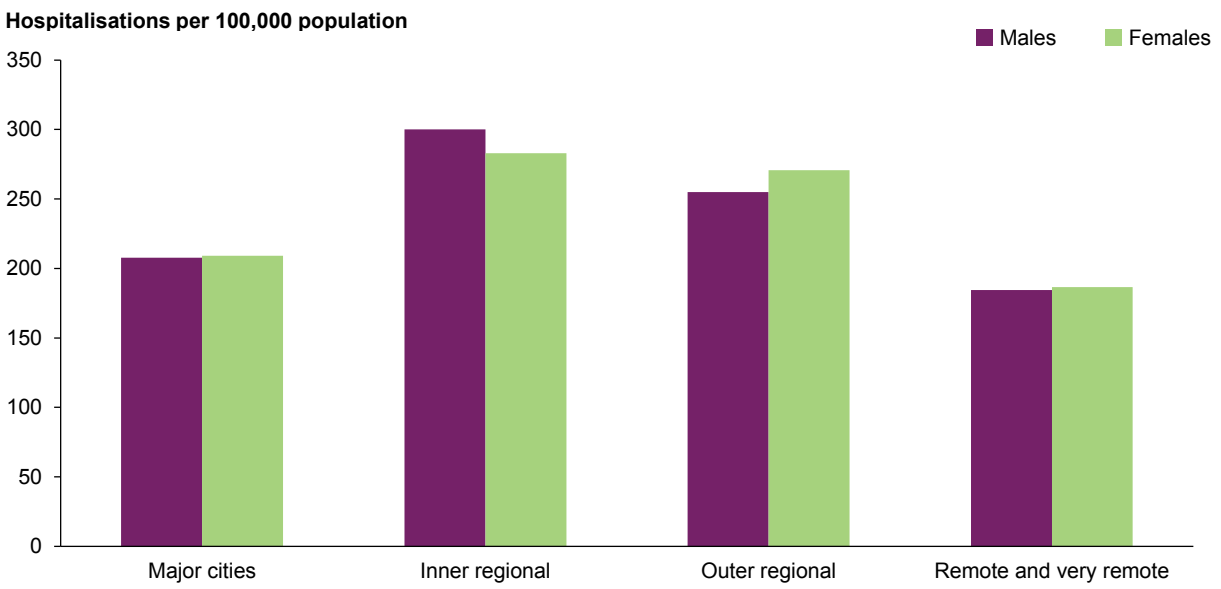
Inequalities

Remoteness

In 2012–13, type 1 diabetes hospitalisation rates were highest for people living in *Inner regional* and *Outer regional* areas compared with those living in *Major cities* and *Remote and very remote* areas (Figure 3.3).

Where type 1 diabetes was recorded as the principal and/or an additional diagnosis, the age-standardised hospitalisation rates increased from 208 per 100,000 in *Major cities* to 291 per 100,000 and 262 per 100,000 population in *Inner regional* and *Outer regional* areas, respectively. *Remote and very remote* areas had the lowest rate of hospitalisations for type 1 diabetes (186 per 100,000 population). These patterns were similar for males and females.

The lower rates in *Remote and very remote* areas is likely to reflect the lower incidence rates for type 1 diabetes generally seen among Aboriginal and Torres Strait Islander people who make up a high proportion of the population in these areas (Minges et al. 2011).



Note: Age-standardised to the 2001 Australian population.

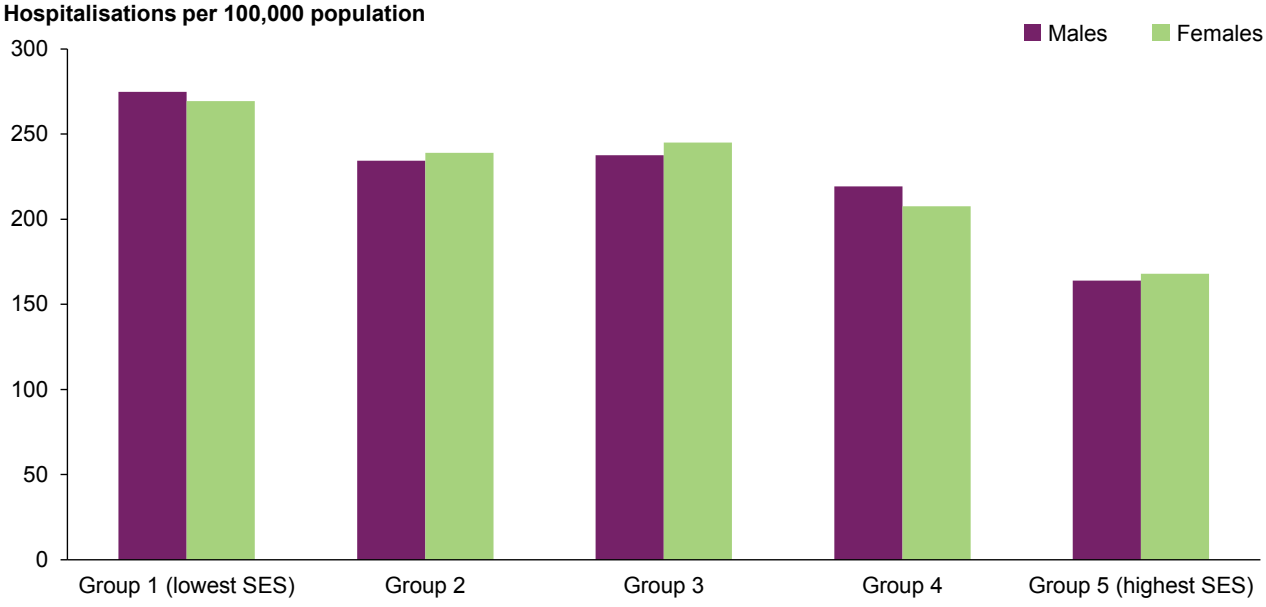
Source: AIHW National Hospital Morbidity Database.

Figure 3.3: Type 1 diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by remoteness and sex, 2012–13

Socioeconomic status

In 2012–13, the hospitalisation rates for type 1 diabetes were highest for those in the lowest socioeconomic group (based on area of usual residence), where type 1 diabetes was recorded as the principal or an additional diagnosis—rates were 1.6 times as high as for those in the highest socioeconomic group (Figure 3.4).

Similar differences were seen between the lowest and highest socioeconomic groups for males and females—1.7 and 1.6 times as high (275 compared with 164, and 269 compared with 168 per 100,000 population, respectively) (Figure 3.4).

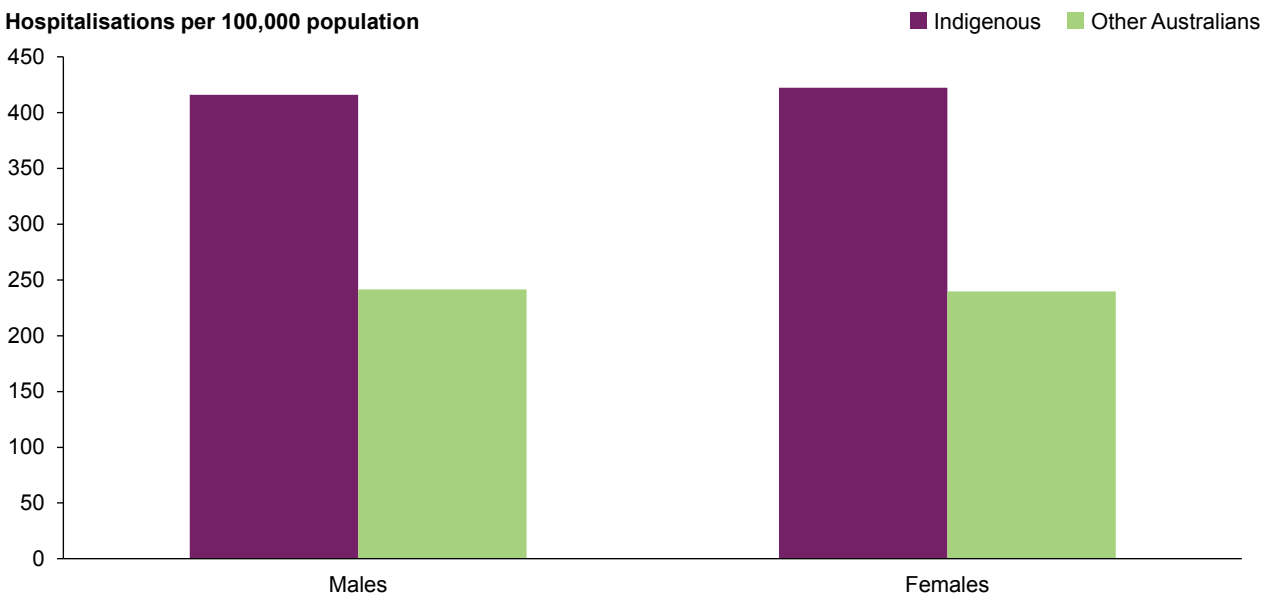


Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 3.4: Type 1 diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by socioeconomic group and sex, 2012–13

Aboriginal and Torres Strait Islander people

In 2012–13, Indigenous males and females were 1.7 times as likely as Other Australian males and females to be hospitalised for type 1 diabetes as the principal and/or an additional diagnosis (416 compared with 241 per 100,000 for males, and 422 compared with 240 per 100,000 population for females, respectively) (Figure 3.5).



Note: Age–standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Figure 3.5: Type 1 diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

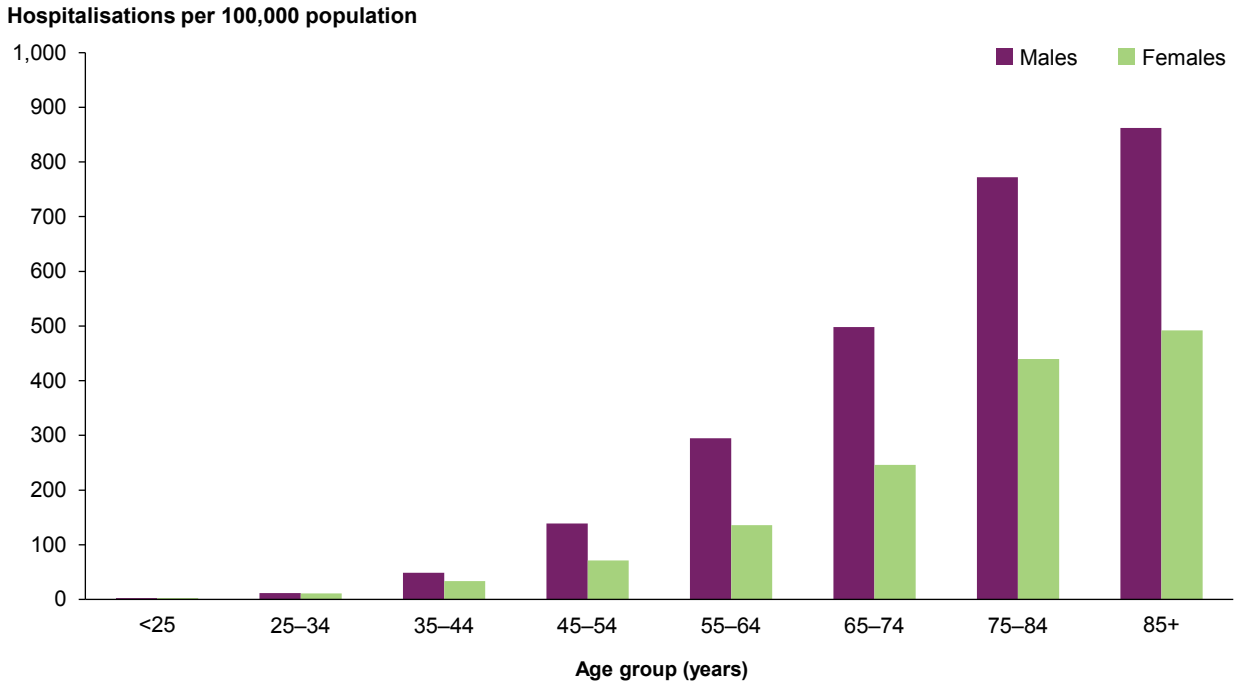
Type 2 diabetes

In 2012–13, there were around 738,350 hospitalisations for type 2 diabetes recorded as the principal and/or an additional diagnosis. Of these, type 2 diabetes was the principal diagnosis for around 26,200 (3.5%) and was as an additional diagnosis for a further 712,150 (96.5%) hospitalisations (Table A7). Together, these represent 88% of all diabetes hospitalisations.

Sex and age

In 2012–13, males accounted for just over half of all diabetes hospitalisations for type 2 diabetes recorded as the principal diagnosis (63% compared to 37% for females). Type 2 diabetes hospitalisation rates for males were 1.9 times that for females (as the principal diagnosis, 136 and 73 per 100,000 population, respectively and as an additional diagnosis, 3,288 compared with 2,346 per 100,000 population, respectively).

Hospitalisation rates for type 2 diabetes as the principal diagnosis increase rapidly with age, with those aged 85 and over being hospitalised at 6 times the rate of those aged 45–54 (624 per 100,000 compared with 105, respectively). Males had higher rates of hospitalisations for type 2 diabetes than females across all age groups (Figure 3.6).

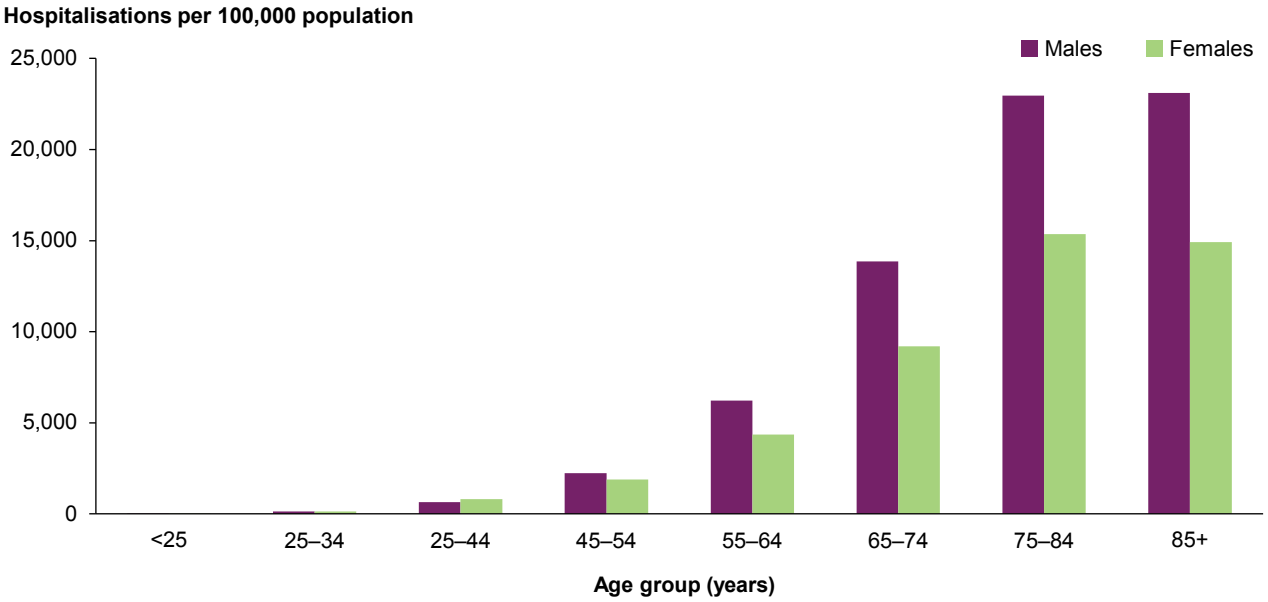


Source: AIHW National Hospital Morbidity Database (Table A7).

Figure 3.6: Type 2 diabetes hospitalisation rates, as the principal diagnosis, by sex, 2012–13

Hospitalisation rates where type 2 diabetes was recorded as an additional diagnosis also increased with increasing age, with rates 9 times as high among those aged 85 and over than those aged 45–54 (17,831 compared with 2,055 per 100,000 population, respectively) (Figure 3.7). This gap was much larger where type 2 diabetes was recorded as the principal diagnosis than additional diagnosis.

The gap between males and females increased with age where type 2 diabetes was recorded as an additional diagnosis. The hospitalisation rate was 1.4 times as high for males as for females (Figure 3.7).



Source: AIHW National Hospital Morbidity Database (Table A7).

Figure 3.7: Type 2 diabetes hospitalisation rates, as an additional diagnosis, by sex, 2012–13

Length of stay in hospital

The average length of stay (number of days a person spends in hospital) for hospitalisations where type 2 diabetes was recorded as the principal diagnosis was 8.6 days (people who are admitted and separated on the same date were excluded). It was 7.4 days where type 2 diabetes was recorded as an additional diagnosis.

Average length of stay in hospital increased with increasing age, with older people having longer lengths of stay in hospital where diabetes was recorded as the principal diagnosis. For example, those aged 45 and over stayed on average 1.6 times as long as those aged under 45—5.6 days compared with 8.8 days, respectively.

Where type 2 diabetes was recorded as an additional diagnosis, the average length of stay was relatively similar in those aged under 45 and those 45 and over (7.8 days compared with 7.4 days, respectively). This is due to a peak in the average length of stay for males aged 15–34, whose average length of stay was 14.8 days, and a peak for females of 8.6 days in those aged 25–29.

In part, this peak in the average length of stay in younger age groups may be a result of teenagers and young people not managing their diabetes sufficiently (Blackburn et al. 2013) or ineffective transition of young people with diabetes to an adult-oriented system of care resulting in young people not receiving the care they require, which may increase diabetes-related complications in adolescents (Bowen et al. 2010).

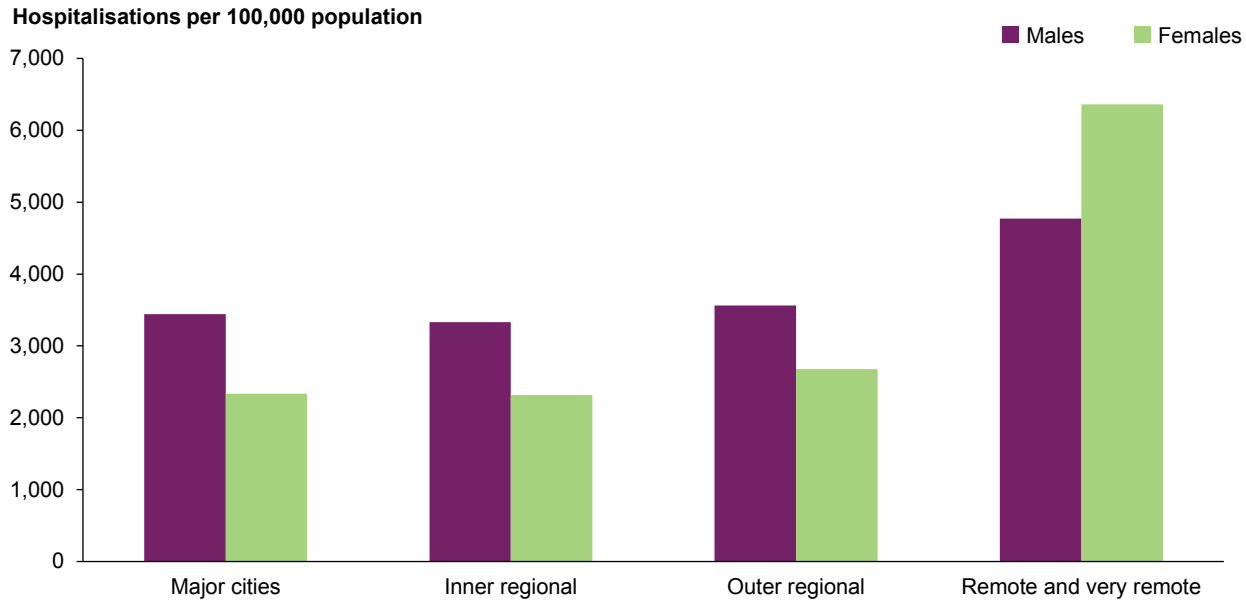
Inequalities

Remoteness

In 2012–13, type 2 diabetes hospitalisation rates (principal and/or an additional diagnosis) increased with remoteness, with rates nearly twice as high in *Remote and very remote* areas than in *Major cities*.

The gap in hospitalisation rates between *Remote and very remote* areas and *Major cities* was much higher for females than males—for females rates were 2.7 times as high in *Remote and very remote areas* (6,360 and 2,334 per 100,000, respectively), while for males, rates were 1.4 times as high (4,771 and 3,441 hospitalisations per 100,000 population, respectively) (Figure 3.8).

The higher rates in *Remote and very remote* areas is likely to reflect the higher incidence of type 2 diabetes generally seen among Aboriginal and Torres Strait Islander people who make up a higher proportion of the population in these areas (Azzopardi et al. 2012).



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

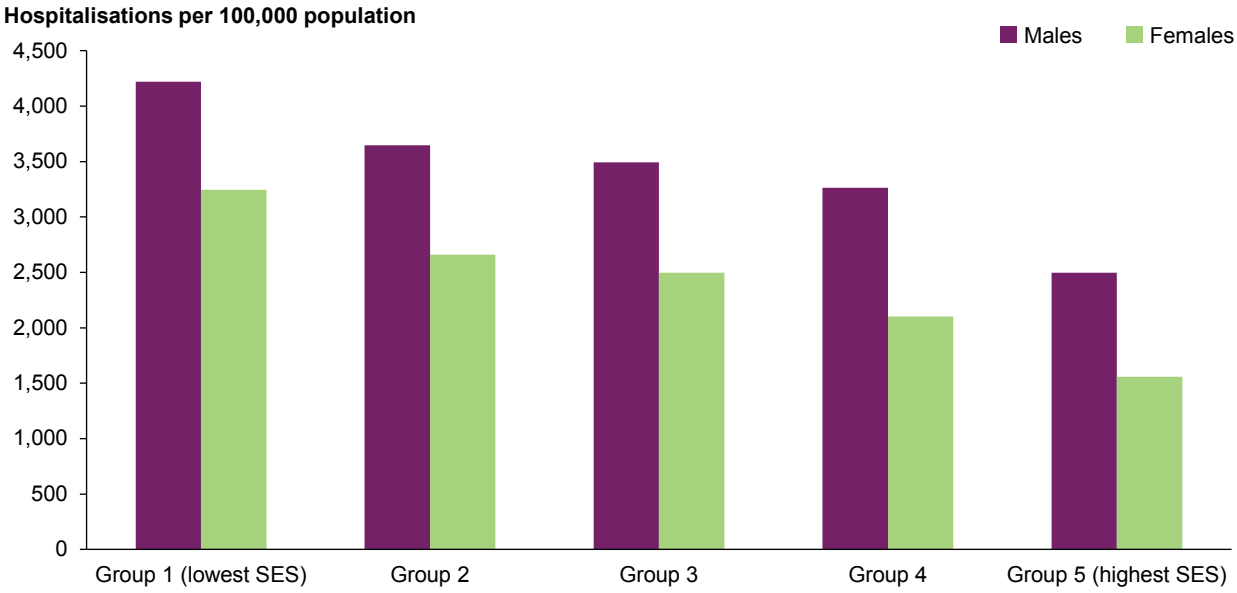
Figure 3.8: Type 2 diabetes hospitalisation rates, as the principal and/or additional diagnosis, by remoteness and sex, 2012–13

Socioeconomic status

In 2012–13, hospitalisation rates for type 2 diabetes recorded with the principal and/or an additional diagnosis increased with decreasing socioeconomic group (based on area of usual residence)—rates were almost twice as high for people in the lowest socioeconomic group compared with those in the highest socioeconomic group.

The gap between the lowest and highest socioeconomic group in hospitalisation rates for type 2 diabetes was greater for females than males. For females, rates in the lowest socioeconomic group were 2.1 times as high while for males rates were 1.7 times as high compared with the highest socioeconomic group (3,246 compared with 1,557 per 100,000 population for females, respectively, and 4,219 compared with 2,496 per 100,000 population for males, respectively) (Figure 3.9).

The higher hospitalisation rates for type 2 diabetes among the lower socioeconomic groups reflect the higher incidence of type 2 diabetes among this population, which in turn may be influenced by socioeconomic disadvantage limiting opportunities for lifestyle modifications—which are one of the main determinants of risk for type 2 diabetes (Azzopardi et al. 2012)—and the availablity of local health-care resources (Williams et al. 2012).



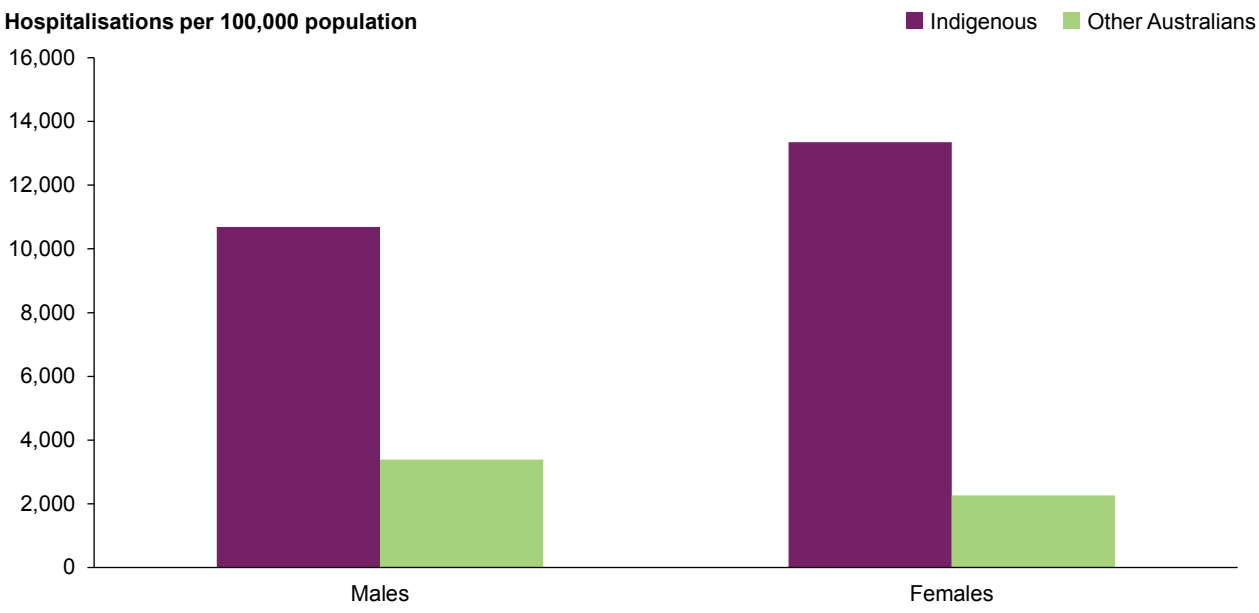
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 3.9: Type 2 diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by socioeconomic group and sex, 2012–13

Aboriginal and Torres Strait Islander people

In 2012–13, hospitalisation rates were 4 times as high among Indigenous Australians compared with Other Australians, where type 2 diabetes was recorded as the principal and/or an additional diagnosis. The disparity was greater for females than males, with Indigenous females almost 6 times as likely to be hospitalised for type 2 diabetes than Other Australian females, while Indigenous males were 3 times as likely to be hospitalised as Other Australian males (13,350 compared with 2,265 per 100,000 for females, respectively, and 10,689 compared with 3,387 per 100,000 population for males, respectively) (Figure 3.10).

The higher hospitalisation rates for type 2 diabetes in Indigenous Australians reflect the higher incidence of type 2 diabetes and the increased risk of complications among this population, which in turn is influenced by genetic factors, higher levels of overweight and obesity and other diabetes risk factors, and limited access to health resources which pose significant challenges to managing type 2 diabetes in rural and remote settings (Azzopardi et al. 2012; Thomas et al. 2014).



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

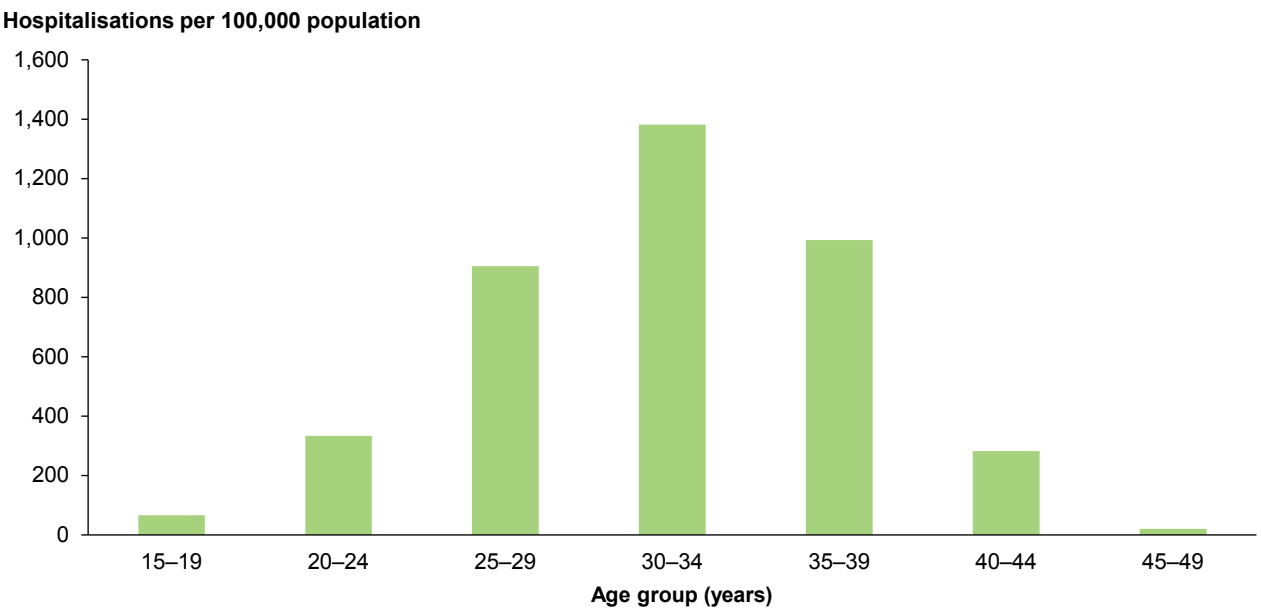
Figure 3.10: Type 2 diabetes, hospitalisation rates, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

Gestational diabetes

In the most recent year of hospital data, 2012–13, hospitalisations for gestational diabetes were most commonly reported as an additional diagnosis, the principal diagnosis being largely for birth or delivery of 1 or more infants.

In 2012–13, there were around 31,880 hospitalisations for gestational diabetes recorded as either diagnosis (principal and/or additional diagnosis). Of these, 8% were recorded as the principal diagnosis and 92% as an additional diagnosis (Table A8). The peak age group for hospitalisations for gestational diabetes was those aged 30–34 (rate of 1,382 per 100,000 population), with the majority (82%) of gestational diabetes hospitalisations occurring among those aged between 25 and 39 (Figure 3.11).

Studies have shown that women who have had gestational diabetes have a lifetime risk of over 70% of developing type 2 diabetes (Shih et al. 2013). The children of pregnancies affected by gestational diabetes may also have a greater risk of obesity and type 2 diabetes (Herring & Oken 2011).



Source: AIHW National Hospital Morbidity Database.

Figure 3.11: Gestational diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by age, 2012–13

Length of stay in hospital

The average length of stay (the number of days a person spends in hospital) for people hospitalised with gestational diabetes was 3.8 days where it was recorded as the principal diagnosis and 4.0 days where it was an additional diagnosis (people who are admitted and separated on the same date were excluded).

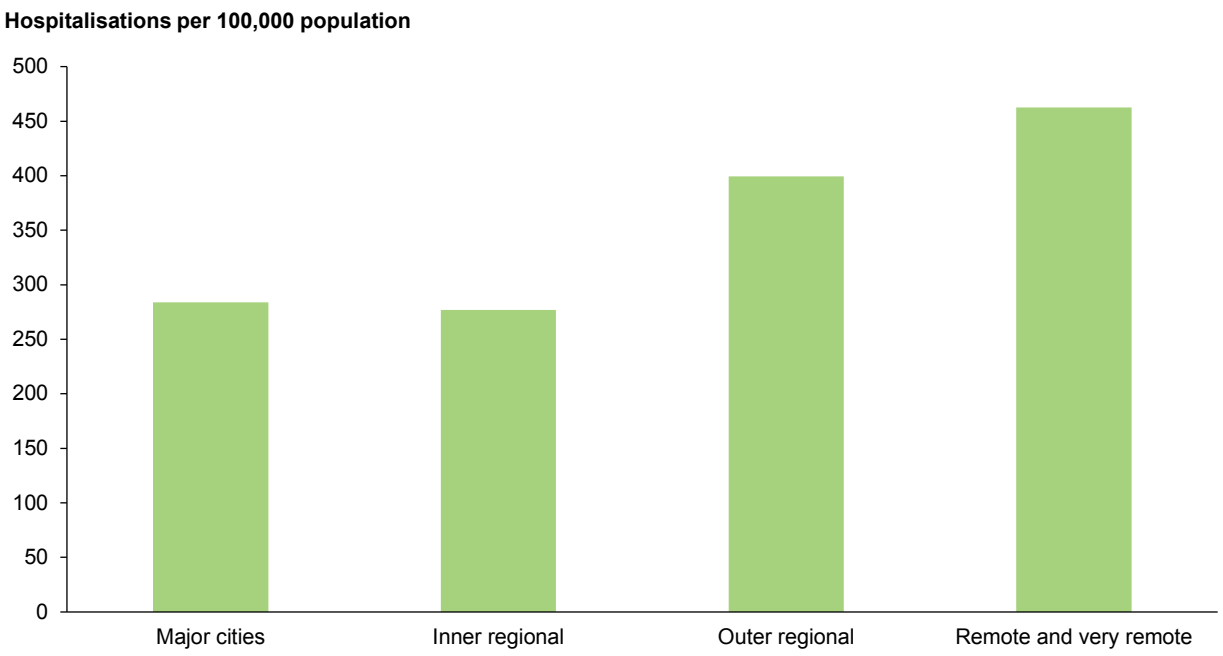
Average length of stay in hospital increases with age, with females over 45 having longer lengths of stay in hospital for any (principal and/or additional) diagnosis.

Inequalities

Remoteness

In 2012–13, females living in *Remote and very remote* areas had higher rates of hospitalisation for gestational diabetes (as the principal and/or an additional diagnosis) than those living in *Major cities*—hospitalisation rates were 1.6 times as high in *Remote or very remote* areas (463 per 100,000 compared with 284 per 100,000 in *Major cities*, respectively) (Figure 3.12).

The higher gestational diabetes hospitalisation rates in remote areas of Australia partly reflects the higher proportion of Indigenous Australians living in these areas, and their higher rates of gestational diabetes. Other contributing factors to the high hospitalisation rates in remote areas include inaccessibility to health-care and social services and socioeconomic disadvantage experienced by people living in these areas (AIHW: Templeton & Pieris-Caldwell 2008; Ishak & Petocz 2003).

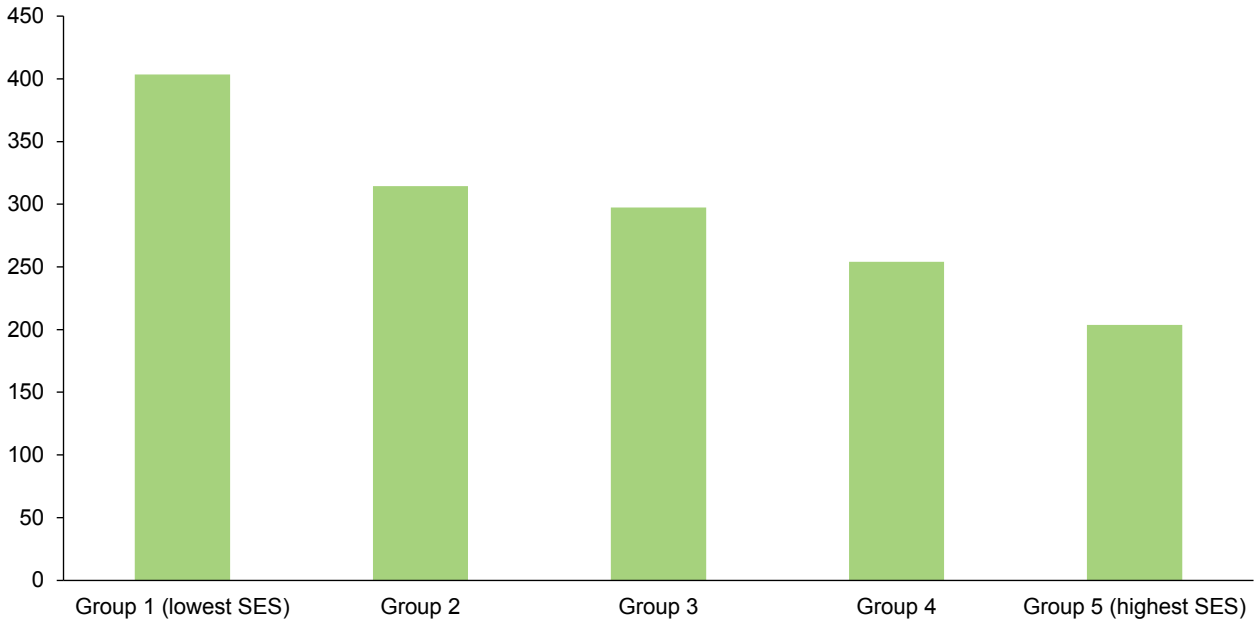


Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 3.12: Gestational diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by remoteness, 2012–13

Socioeconomic status

In 2012–13, hospitalisation rates where gestational diabetes was recorded as the principal and/or an additional diagnosis increased with decreasing socioeconomic group (based on area of usual residence). The hospitalisation rates for gestational diabetes were twice as high in the lowest socioeconomic group compared with the highest socioeconomic group (403 per 100,000 compared with 204, respectively) (Figure 3.13).

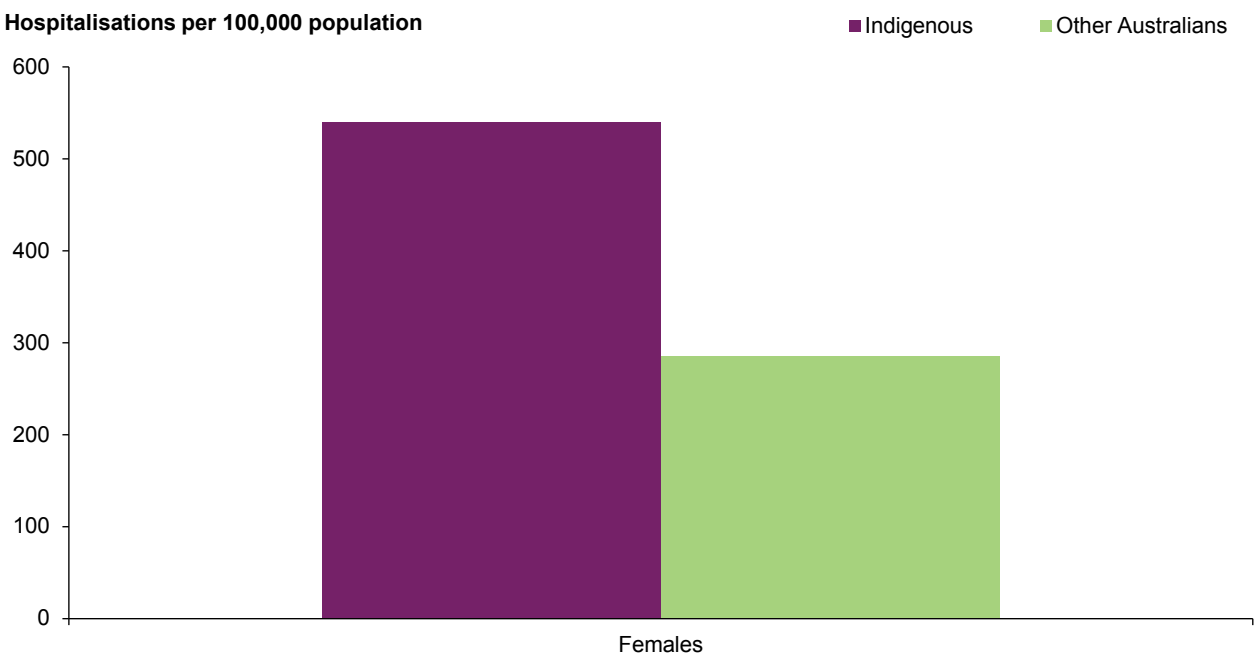


Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 3.13: Gestational diabetes hospitalisation rates, as the principal and/or an additional diagnosis, by socioeconomic group, 2012–13

Aboriginal and Torres Strait Islander people

In 2012–13, Indigenous females were 1.9 times as likely as other Australian females to be hospitalised for gestational diabetes as the principal and/or an additional diagnosis (540 compared with 285 per 100,000 population, respectively) (Figure 3.14).



Note: Age–standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 3.14: Hospitalisation rates with gestational diabetes as the principal and/or an additional diagnosis by Indigenous status, 2012–13

4 Chronic kidney disease

Chronic kidney disease (CKD) refers to all kidney conditions where a person has evidence of kidney damage or reduced kidney function, lasting at least 3 months. CKD is often preventable and many people do not know they have kidney disease because up to 90% of kidney function can be lost before symptoms are evident. 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 of the disease.

CKD is usually categorised into 5 stages (1 to 5) according to the level of kidney function, or evidence of kidney damage indicated by biological markers such as blood or protein in the urine (see Appendix C, Box C1). Those with the more severe forms of CKD are more likely to be hospitalised. End-stage kidney disease (ESKD), the most severe form of CKD, usually requires kidney replacement therapy (KRT) to survive. KRT has 2 forms—kidney transplantation or dialysis. Dialysis is an artificial way of removing waste substances from the blood and is mostly provided in hospitals or satellite clinics, but can also be provided in a home setting (Kidney Health Australia 2007).

CKD is a common and a largely preventable disease because many of its risk factors are modifiable, such as high blood pressure, tobacco smoking and obesity (see *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors* (AIHW, forthcoming 2015b) for further details). Many of the risk factors for CKD also apply to other chronic diseases such as CVD and diabetes, which in turn are risk factors for CKD.

Box 4.1: Australian Coding Standards for chronic kidney disease (CKD)

The Australian Coding Standards (ACS) have been developed with the objective of satisfying sound coding conventions for use with ICD-10-AM and Australian Classification of Health Interventions (ACHI) (see Box 1.1 for further details). The National Hospital Morbidity Database uses the ICD-10-AM ACS for coding of diagnoses and procedures in hospitalisation records. As no single ICD-10-AM code identifies CKD, codes from several chapters of the ICD-10-AM that indicate kidney disease of varying aetiologies need to be collated to obtain the best understanding of CKD occurrence. These other diseases and/or conditions include, for example, diabetes, hypertension and congenital causes. Therefore, there is likely to be an overlap in the CKD hospitalisations presented in this chapter with the CVD and diabetes hospitalisations presented in chapters 2 and 3, respectively. The complete list of codes used to define CKD in this report is included in Appendix C.

While there have been some changes to CKD coding over recent years, this has had a lesser impact than that seen for diabetes. For CKD, a particular change that has occurred was the introduction of staging of CKD, which came into effect in 2008–09 with the 6th edition of the ICD-10-AM (see Appendix C, Box C1). The most recent change to the ACS related to the coding standard for diabetes (see Box 3.2), implemented from 1 July 2012, has seen an increase in the additional diagnoses for diabetes-related CKD. This change has increased the number of hospitalisations where CKD is an additional diagnosis from 153,000 per 100,000 in 2011–12 to 236,000 per 100,000 in 2012–13. Diabetes coding changes have also affected trends in CKD hospitalisations where it is recorded as a principal diagnosis, with a drop in CKD rates to coincide with the coding change to diabetes in 2010 (see Figure 4.4 and Figure A1 in Appendix A).

All chronic kidney disease

In 2012–13, there were 1.5 million hospitalisations where CKD was recorded as the principal and/or an additional diagnosis. Dialysis accounted for the overwhelming majority—almost 1.3 million hospitalisations—and was the most common reason for hospitalisation in Australia. Around 274,090 other hospitalisations for CKD (as the principal and/or an additional diagnosis, excluding dialysis) were also recorded. Of these hospitalisations, 14% had the principal diagnosis of CKD. See Box 4.1 for details on CKD coding in the hospital database.

Chronic kidney disease as the principal diagnosis

In 2012–13, there were 1.3 million hospitalisations where CKD was recorded as the principal diagnosis. Of these hospitalisations, 1.27 million (97%) were for regular dialysis treatment, and 37,960 (3%) for other CKD diagnoses. Altogether, CKD as the principal diagnosis accounted for 14% of all hospitalisations in Australian hospitals in 2012–13.

Major causes of hospitalisation

As discussed in Box 4.1, CKD hospitalisations are not defined from a single ICD-10-AM code but are defined using a range of codes. In 2012–13, after regular dialysis, 'Chronic kidney disease' was the most commonly recorded principal diagnosis for CKD, followed by 'Kidney tubulo-interstitial disease' (Table 4.1).

Table 4.1: Major causes of hospitalisation for chronic kidney disease (as the principal diagnosis), 2012–13

ICD-10-AM chapter level	Number
Chronic kidney disease	12,645
Kidney tubulo-interstitial disease	9,448
Glomerular diseases	3,754
Complications related to dialysis and kidney transplant	2,799
Other disorders of kidney and ureter	2,249
Congenital malformations	1,131
Diabetic nephropathy	1,016
Hypertensive kidney disease	887
Unspecified kidney failure	443
Regular dialysis (excluding preparatory care)	1,268,538
Preparatory care for dialysis	3,586
Total	**1,306,496**

Source: AIHW National Hospital Morbidity Database.

Regular dialysis as the principal diagnosis

In the coding of hospitalisations, dialysis is recorded in 2 ways, either as the principal diagnosis or as a procedure. Data in this section refer to regular dialysis hospitalisations (haemodialysis and peritoneal dialysis) where dialysis was recorded as the principal diagnosis—that is, where the intention of the admission to hospital was for carrying out a same-day procedure and the patient was discharged on the same day or on the next day after admission.

In 2012–13, there were 1.27 million hospitalisations for CKD where the principal diagnosis was regular dialysis, accounting for 13.5% of all hospitalisations (Table 4.2).

Table 4.2: Hospitalisations with the principal diagnosis of regular dialysis, 2012–13

	Males	Females	Persons
Number	750,268	518,270	1,268,538
Hospitalisations per 100,000	6,321	4,024	5,085

Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database (Table A9).

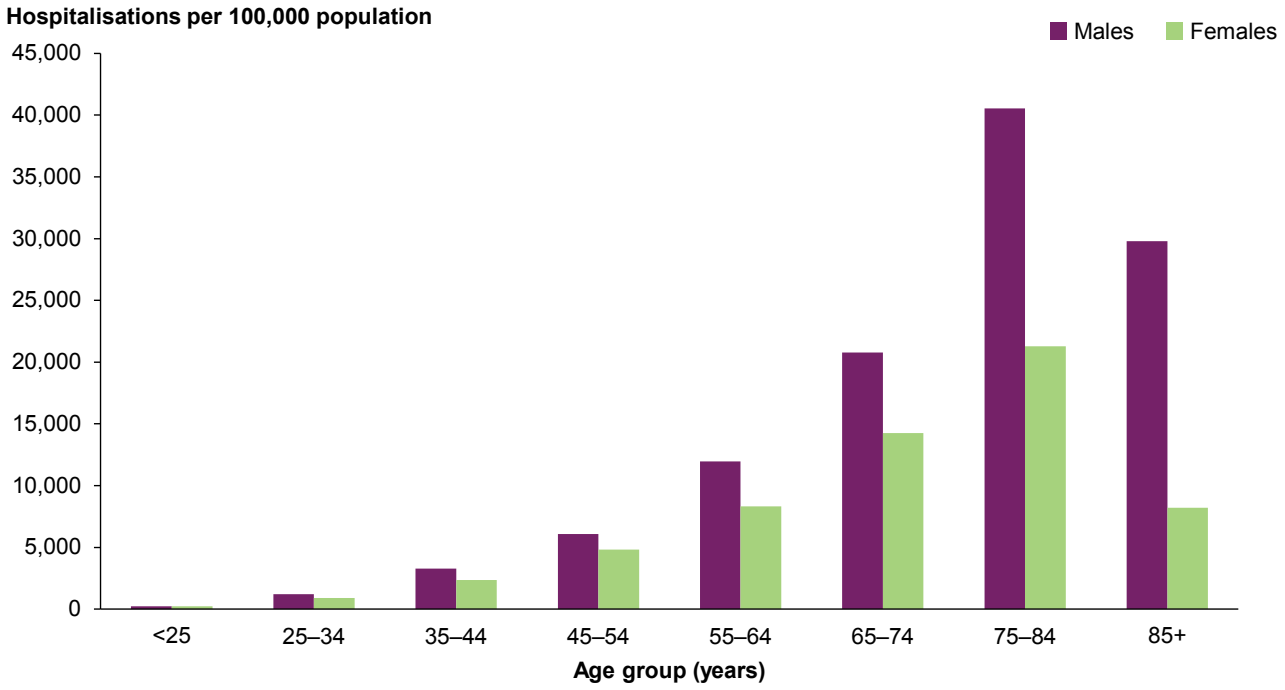
Hospitalisation data count the number of dialysis episodes rather than the number of people who receive dialysis. On average, dialysis patients attend 3 sessions per week. The Australian and New Zealand Dialysis and Transplant registry (ANZDATA; see Appendix D for further details) records the prevalence (number) of dialysis patients in Australia. As at 31 December 2012, there were around 11,450 patients receiving regular dialysis in Australia, of which 9,220 were haemodialysis patients—the main form of regular dialysis performed in hospital. The ANZDATA registry also collects patients' primary renal disease. In 2012, the most common disease for new patients who received haemodialysis was diabetic nephropathy (39%), followed by glomerulonephritis (18%) and hypertension (13%) (AIHW analysis of the ANZDATA Registry).

Sex and age

In 2012–13, hospitalisation rates for regular dialysis increased with age up to 75–84 (Figure 4.1). Those aged 75–84 were hospitalised for regular dialysis at 5.5 times the rate of those aged 45–54 (30,015 and 5,458 per 100,000 population, respectively). The lower hospitalisation rates in those 85 and over may reflect the greater use of conservative care in this age group for a variety of reasons, including comorbidities, late referral, little survival benefit if treated with dialysis, and personal choice (Chandna et al. 1999, 2011; Kurella Tamura et al. 2009; Murtagh et al. 2007). Older Australians are more likely to die of ESKD without having received dialysis or transplant than younger Australians (Sparke et al. 2013).

Across all age groups, males had higher rates of hospitalisation for regular dialysis than females. When overall hospitalisation rates were adjusted for age, the hospitalisation rate for males was 1.6 times as high as the rate for females (6,321 and 4,024 per 100,000 population, respectively) (Table A9). This is consistent with the results from ANZDATA (McDonald et al. 2013) which showed that in 2012, males were 1.6 times as likely as females to be registered with ANZDATA as receiving any sort of kidney replacement therapy, dialysis or transplant (see *Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: Prevalence and incidence* (AIHW 2014f) for further details).

As age increases, the gap in hospitalisation rates between males and females widens—the male rate was 1.5 times as high as the female rate for 65–74 year olds, increasing to 1.9 times the rate for 75–84 year olds and 3.6 times the rate for those aged 85 and older. This widening of the gap may reflect that Australian women aged 75 and over were less likely to be treated with dialysis or transplant for ESKD than men (Sparke et al. 2013).

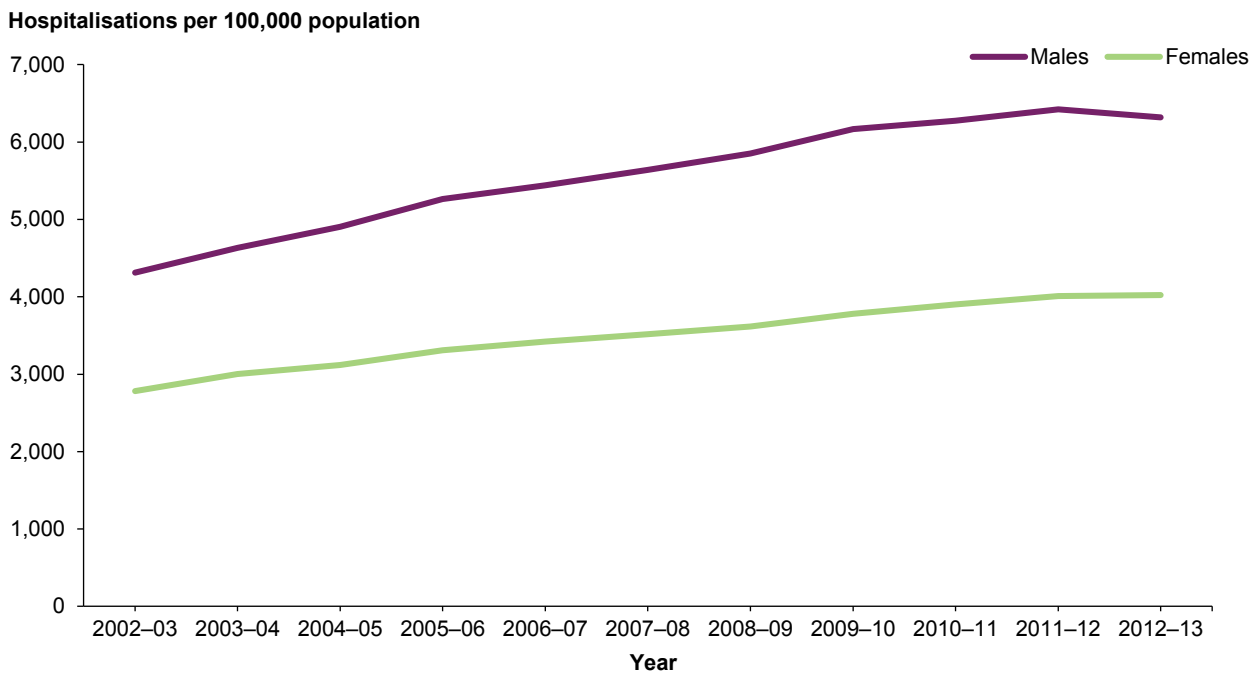


Source: AIHW National Hospital Morbidity Database (Table A9).

Figure 4.1: Hospitalisations with the principal diagnosis of regular dialysis, by age and sex, 2012–13

Trends

Between 2002–03 and 2012–13, the number of hospitalisations for regular dialysis in Australia increased by 83%, an average increase of around 52,000 hospitalisations per year. This increase was similar for males and females over the 11-year period—84% and 82%, respectively. In addition, the age-standardised rate of hospitalisations for dialysis increased by nearly 46%, and the increase was also similar for males and females (47% compared with 45%, respectively) (Figure 4.2).



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

Figure 4.2: Trends in hospitalisation rates for dialysis, as the principal diagnosis, by sex, 2002–03 to 2012–13

CKD as the principal diagnosis, excluding regular dialysis

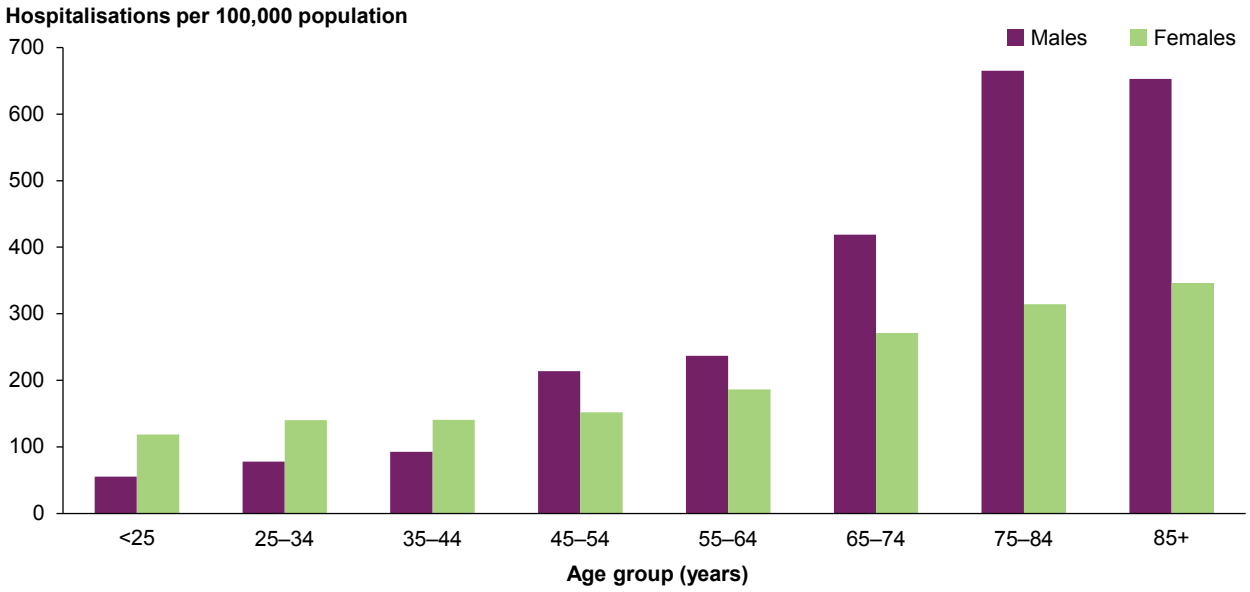
In addition to the 1.27 million hospitalisations for regular dialysis described in the previous section, there were around 37,960 hospitalisations where CKD was recorded as the principal diagnosis in 2012–13. These accounted for 0.4% of all hospitalisations in Australia.

Sex and age

Males and females were equally represented in CKD hospitalisations in 2012–13, with 50% of hospitalisations where CKD was the principal diagnosis being for males (Table A10). There was also little difference in the age-standardised male and female hospitalisation rates (163 and 158 per 100,000 population, respectively).

The age-specific hospitalisation rate for CKD increased with age for both males and females and was highest among those aged 75–84 for males (665 per 100,000 population) and those aged 85 and over for females (346 per 100,000) (Figure 4.3). The male rate increased more rapidly than the female rate.

Males had substantially higher rates of hospitalisations for CKD than females among the older age groups, with males aged 75–84 having a rate 2.8 times as high as males aged 55–64 (665 and 237 per 100,000, respectively), whereas the gap among females in the same age groups was less (314 and 187 per 100,000, respectively). However, females had higher rates than males among those aged less than 45, due in part to the much higher number of hospitalisations for tubulo-interstitial nephritis among females. Included in this is pyelonephritis, the most common cause being urinary tract infections for which adult women are at 50 times higher risk than men (Masson et al. 2009).



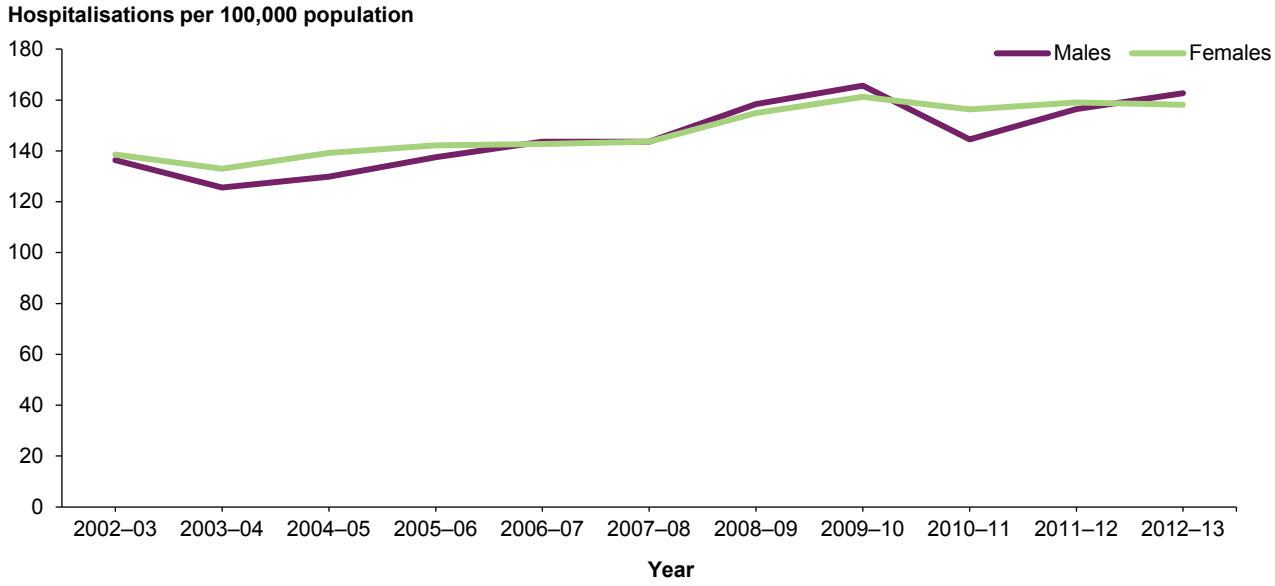
Source: AIHW National Hospital Morbidity Database (Table A10).

Figure 4.3: Hospitalisation with the principal diagnosis of chronic kidney disease (excluding regular dialysis), by age and sex, 2012–13

Trends

Between 2002–03 and 2012–13, the number and rate of hospitalisations where CKD was recorded as the principal diagnosis generally increased. In 2002–03, there were about 26,800 hospitalisations where CKD was the principal diagnosis, increasing by 42% in 2012–13 to around 37,960 hospitalisations. Over the same period, the age-standardised rates increased by 17% (136 and 159 per 100,000 population, respectively) (Figure 4.4).

The drop in the male rate in 2010–11 is due to a change in the coding of diabetes in hospital (see 'Chapter 3 Diabetes' and Box 4.1). When diabetic nephropathy is excluded from the trend analysis, there is a linear increase in hospitalisation rates across the years (see Appendix A, Figure A1).



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Figure 4.4: Trends in hospitalisation rates for CKD, as the principal diagnosis, by sex, 2002–03 to 2012–13

Chronic kidney disease as an additional diagnosis

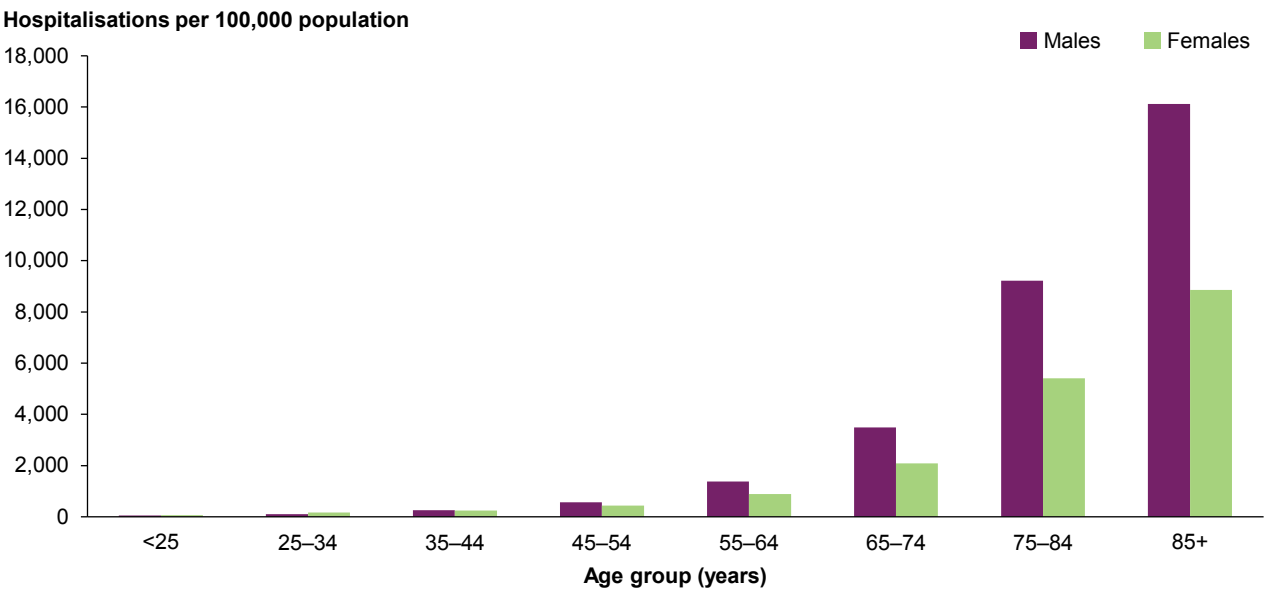
In situations where CKD coexisted with a different principal diagnosis and affected patient care during hospitalisation, it was recorded as an additional diagnosis. When dialysis is excluded, CKD is more often coded as an additional diagnosis rather than as the principal diagnosis. Due to the multiple coding list used to classify CKD (Box 4.1 and Appendix C), there may be more than 1 diagnosis of CKD on a hospital record; however, CKD is only counted once in the following analysis. This section looks at CKD as an additional diagnosis, where CKD was not also recorded as the principal diagnosis.

In 2012–13, there were around 236,130 hospitalisations where CKD was recorded as an additional diagnosis. This was just over 2.5% of all hospitalisations for that year.

Sex and age

In 2012–13, males had more hospitalisations than females where CKD was recorded as an additional diagnosis, with 57% of the hospitalisations being for males. Males also had higher hospitalisation rates than females, with the age-standardised hospitalisation rate for males being 1.6 times that of females (1,144 and 733 per 100,000 population, respectively) (Table A9).

The majority of hospitalisations (73%) occurred in those aged over 65 (Figure 4.5), which is reflected in the age-specific rates. Males and females aged 85 and over were at least 10 times as likely to be hospitalised for CKD as those aged 55–64 (for males, rates were 16,120 and 1,381 per 100,000, respectively; and for females 8,861 and 894 per 100,000, respectively).



Source: AIHW National Hospital Morbidity Database (Table A10).

Figure 4.5: Hospitalisation with an additional diagnosis of CKD, by age and sex, 2012–13

Principal diagnosis for hospitalisations where CKD is an additional diagnosis

Where CKD was recorded as an additional diagnosis, CVD was recorded as the principal diagnosis in 19.5% of cases, and with other genitourinary (no CKD) and respiratory diseases accounting for 9.2% and 8.7% of hospitalisations, respectively (Table 4.3).

Table 4.3: Hospitalisations with an additional diagnosis of CKD by their principal diagnosis, 2012–13

Principal diagnosis	Number of hospitalisations	Per cent
Diseases of the circulatory system	45,940	19.5
Other diseases of the genitourinary system (not classified as CKD)	21,638	9.2
Diseases of the respiratory system	20,468	8.7
Endocrine, nutritional and metabolic diseases	15,519	6.6
Diseases of the digestive system	14,526	6.2
Other diseases and conditions	118,043	50.0
Total	**236,134**	**100**

Source: AIHW National Hospital Morbidity Database.

Inequalities

Remoteness

All CKD, excluding regular dialysis

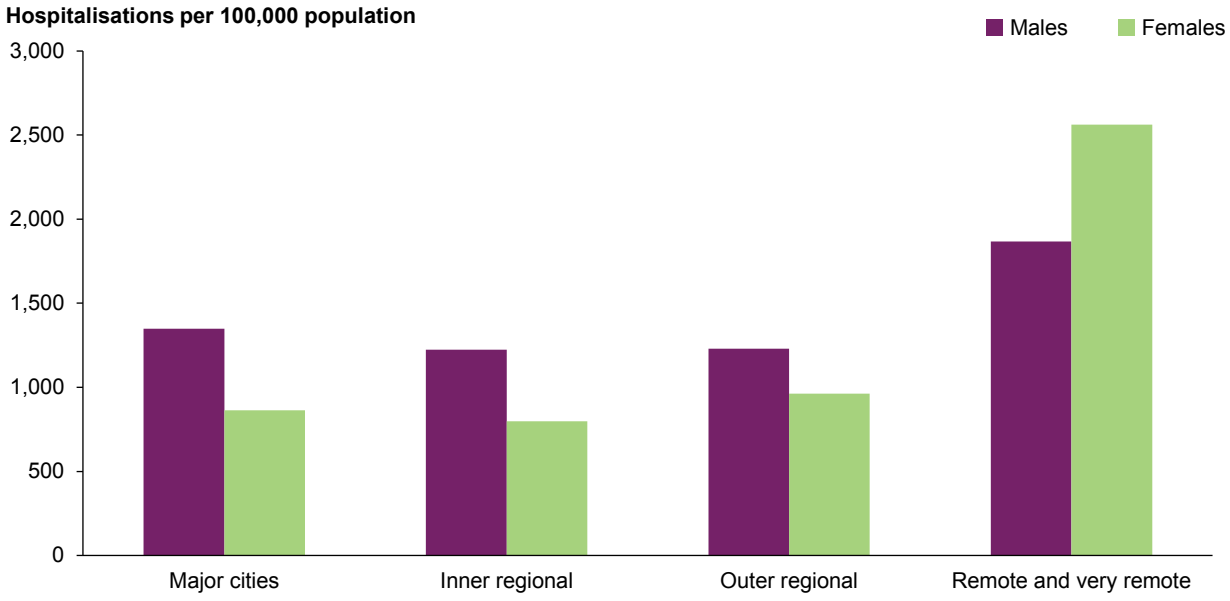
In 2012–13, the hospitalisation rate where CKD was recorded as the principal and/or an additional diagnosis was twice as high in *Remote and very remote* areas compared with *Major cities* (Table A10).

The disparity in hospitalisation rates by region reflects the high proportion of Aboriginal and Torres Strait Islander people living in remote areas of Australia and their higher rates of CKD (AIHW 2013a). In a previous AIHW report, it was found that Indigenous Australians accounted for 54% of CKD hospitalisations as the principal diagnosis in *Remote* areas despite only making up 15% of the population (AIHW 2011).

In 2012–13, despite males having higher rates of CKD, females in *Remote and very remote* areas had higher hospitalisations rates for CKD than males. The CKD hospitalisation rate in *Remote and very remote* areas was 3.0 times the rate in *Major cities* for females (2,561 and 862 per 100,000 population, respectively) and 1.4 times for males (1,866 and 1,349 per 100,000 population, respectively) (Figure 4.6).

This pattern of greater differences among females across geographical areas may in part be due to higher levels of albuminuria (the early marker of CKD), higher rates of CKD and/or higher treated ESKD found among Indigenous females compared with their male counterparts (AIHW 2011; Hoy et al. 2012). The reasons for this are complex and likely to be influenced by several factors, including higher rates of diabetes and obesity in Indigenous females—both key risk factors for CKD (Hoy et al. 2010, 2012).

It is important to note that patients may be transferred from a local hospital to a larger hospital where more intense or critical care can be provided based on need (Glazebrook & Harrison 2006; Hays et al. 2005). In 2012–13, 4.2% of CKD hospitalisations as the principal and/or an additional diagnosis in *Remote or very remote* areas were transferred to another hospital compared with 4.4% in *Outer regional* areas, 2.7% in *Inner regional* areas and 1.8% in *Major cities*.



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

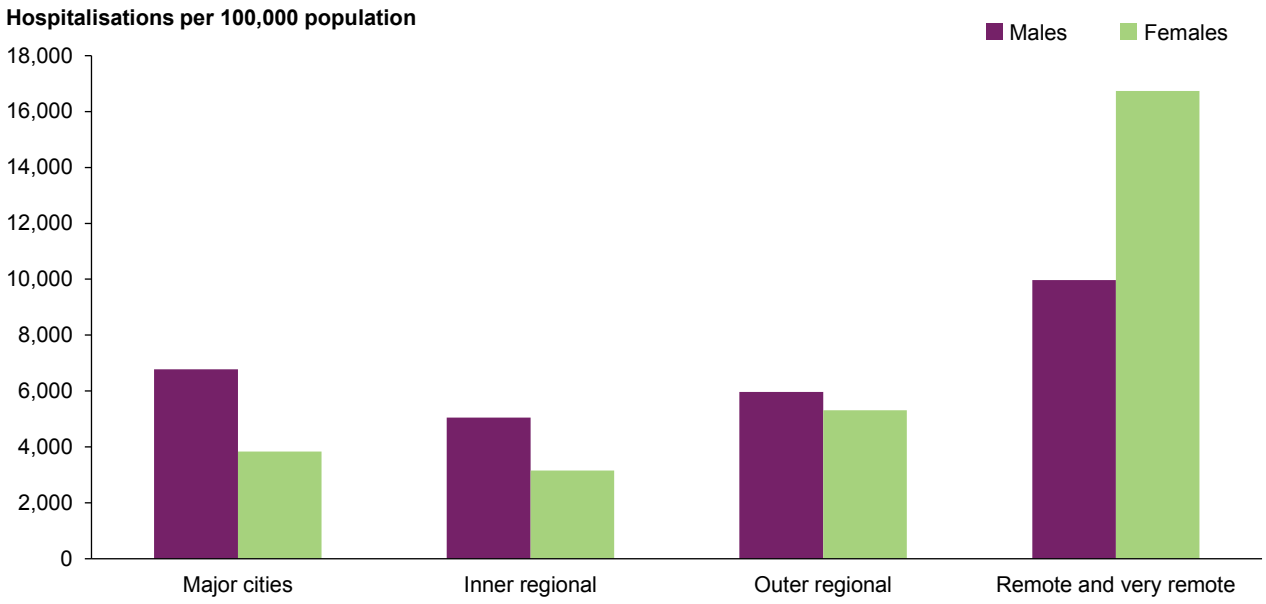
Figure 4.6: Hospitalisation rates with CKD, as the principal and/or an additional diagnosis, by remoteness and sex, 2012–13

Regular dialysis as the principal diagnosis

In 2012–13, people living in *Remote and very remote* areas were hospitalised at 2.5 times the rate for regular dialysis (as the principal diagnosis) than those living in *Major cities* (Table A9).

The gap in dialysis hospitalisation rates between *Remote and very remote* areas and *Major cities* was much higher for females than males—males in *Remote and very remote* areas were 1.5 times as likely to be hospitalised than males in *Major cities* (9,969 and 6,784 per 100,000 population, respectively) while females were 4.4 times as likely to be hospitalised than females in *Major cities* (16,739 and 3,844 per 100,000 population, respectively) (Figure 4.7).

The higher hospitalisation rates in *Remote and very remote* areas are largely driven by the high proportion of Indigenous Australians on dialysis in *Very remote* areas—previous analysis has found that Indigenous Australians make up 97% of hospitalisations for dialysis in *Very remote* areas compared with 3% in *Major cities* (AIHW 2011). As discussed previously, there are a number of reasons why female rates are higher. Those in *Inner regional* and *Outer regional* areas were less likely to be hospitalised for regular dialysis than those in *Major cities*.



Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database (Table A9).

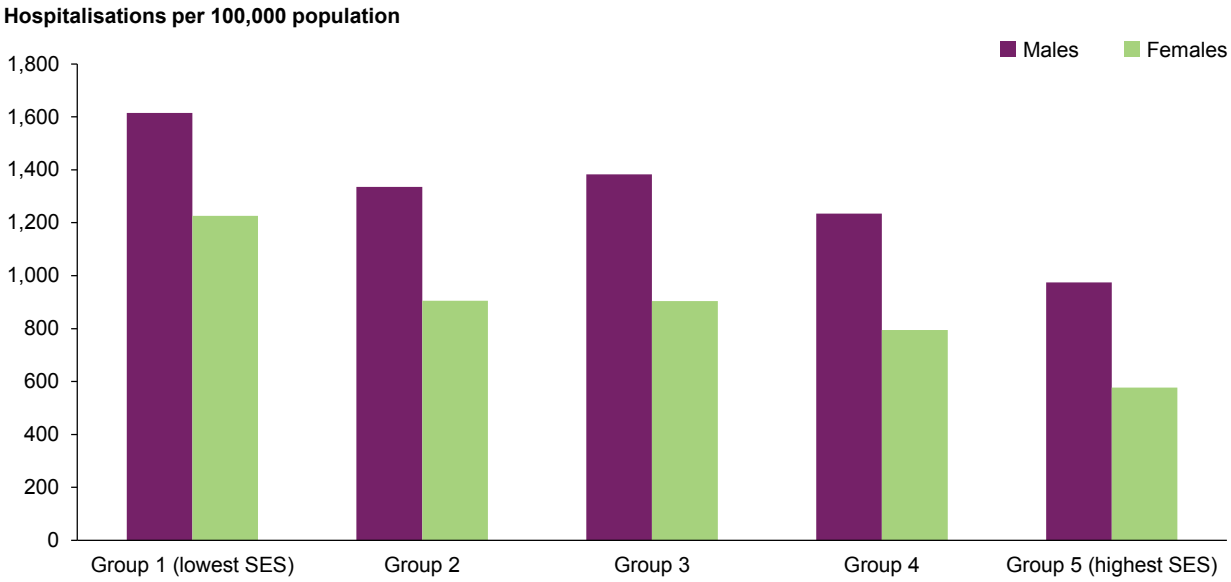
Figure 4.7: Dialysis hospitalisation rates, as the principal diagnosis, by remoteness and sex, 2012–13

Socioeconomic status

All CKD, excluding regular dialysis

In 2012–13, lower socioeconomic status (based on area of usual residence) was associated with higher hospitalisation rates where CKD was recorded as principal and/or additional diagnosis for both males and females (Figure 4.8). Rates in the lowest socioeconomic group were almost twice as high as rates in the highest group. CKD hospitalisations in the lowest socioeconomic group were almost 1.7 times as high as those in the highest socioeconomic group for males (1,616 compared with 976 per 100,000, respectively), and 2.1 times as high for females (1,227 and 578 per 100,000, respectively).

Males had higher hospitalisation rates for CKD across all socioeconomic groups with the gap narrowing with increasing socioeconomic disadvantage—males in the highest socioeconomic group were 1.7 times as likely as females to be hospitalised for CKD (976 and 578 per 100,000 population, respectively), whereas males in the lowest socioeconomic group were 1.3 times as likely to be hospitalised as females (1,616 and 1,227 per 100,000 population respectively).



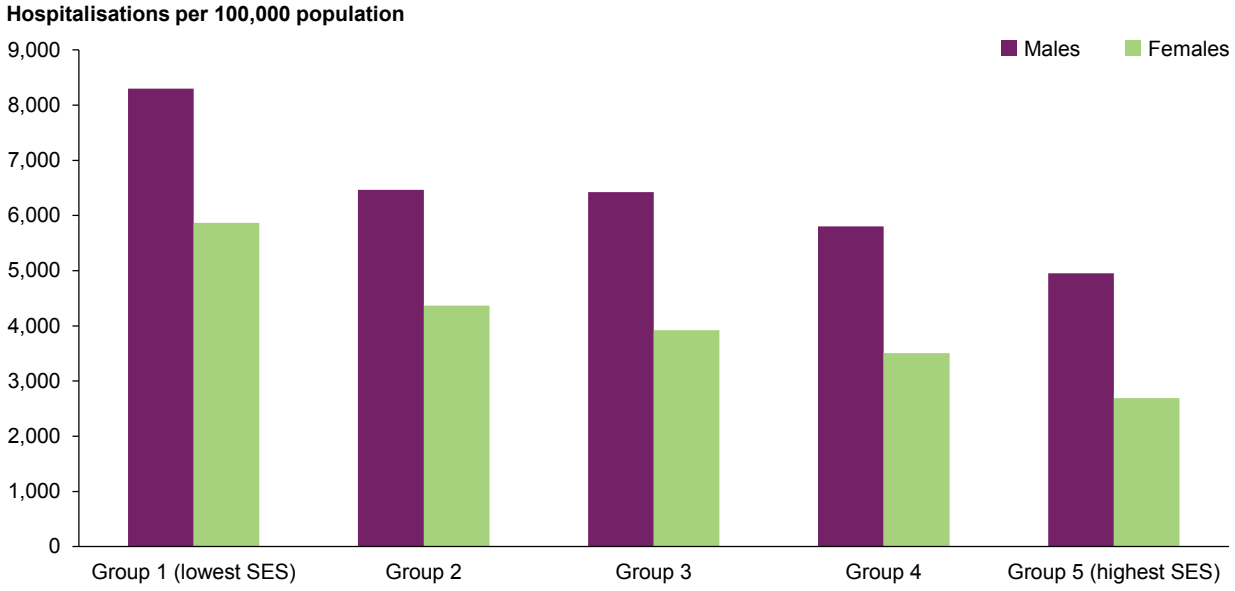
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 4.8: Hospitalisation rates with CKD, as the principal and/or an additional diagnosis, by socioeconomic status and sex, 2012–13

Regular dialysis as the principal diagnosis

In 2012–13, hospitalisation rates for regular dialysis (as the principal diagnosis) generally increased with socioeconomic disadvantage (Figure 4.9). The rate of dialysis hospitalisations among people in the lowest socioeconomic group compared with the highest socioeconomic group was 1.7 times as high for males (8,300 and 4,955 per 100,000 population, respectively) and 2.2 times as high for females (5,866 and 2,690 per 100,000, respectively).

Males had higher rates of hospitalisation for regular dialysis than females in all socioeconomic groups, with the relative difference between males and females increasing with higher socioeconomic groups. Males in the highest socioeconomic group were 1.8 times as likely to be hospitalised for regular dialysis as females in the same socioeconomic group (4,955 and 2,690 per 100,000 population, respectively), compared with 1.4 times for males and females in the lowest socioeconomic group (8,300 and 5,866 per 100,000 population, respectively).



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database (Table A9).

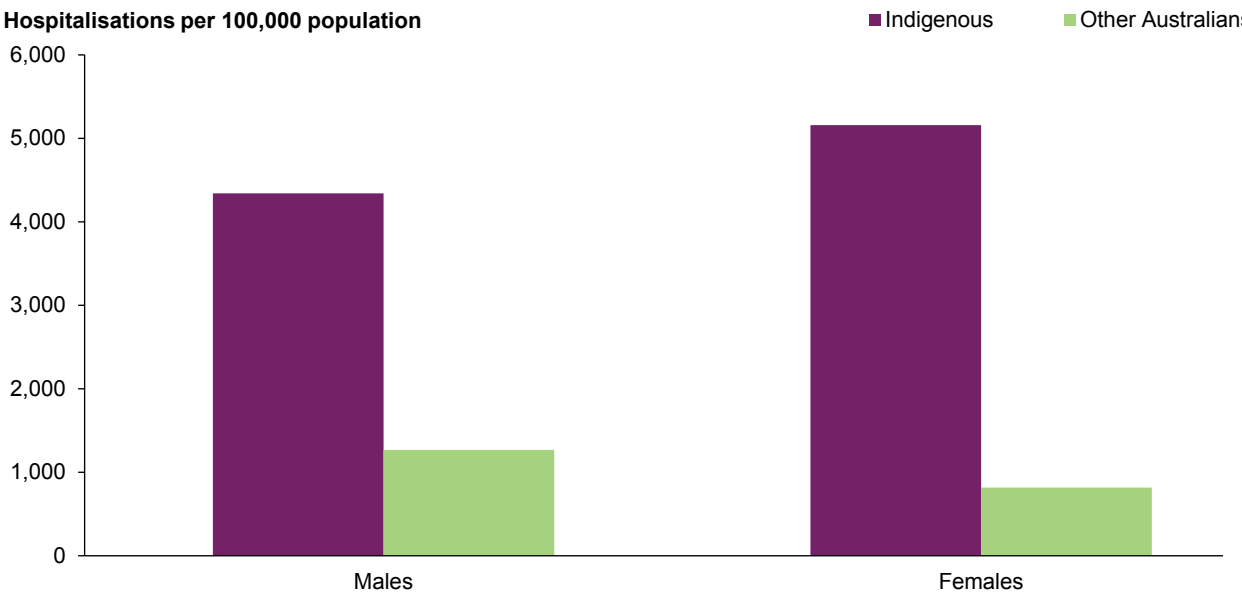
Figure 4.9: Dialysis hospitalisation rates, as the principal diagnosis, by socioeconomic group and sex, 2012–13

Aboriginal and Torres Strait Islander people

All CKD, excluding regular dialysis

CKD is a significant contributor to morbidity and mortality among Indigenous Australians. In 2012–13, hospitalisation rates for CKD were higher among Aboriginal and Torres Strait Islander people than for Other Australians—nearly 5 times as high where CKD was recorded as the principal and/or an additional diagnosis compared with Other Australians.

Indigenous males were 3.4 times as likely as Other Australian males to be hospitalised for CKD as the principal and/or an additional diagnosis (4,340 and 1,269 per 100,000 population, respectively) (Figure 4.10). The disparity was even greater for females, with Indigenous females 6.3 times as likely to be hospitalised for CKD as Other Australian females (5,157 and 817 per 100,000 population, respectively).



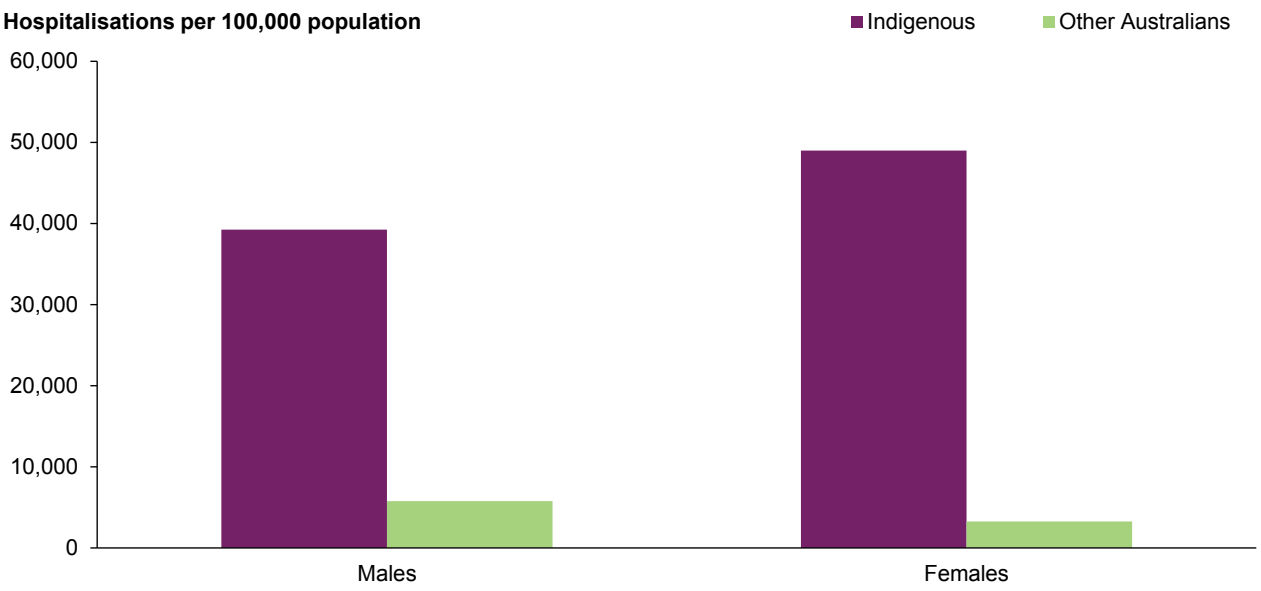
Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database.

Figure 4.10: Hospitalisation rates with CKD, as the principal and/or an additional diagnosis, by Indigenous status and sex, 2012–13

Regular dialysis as the principal diagnosis

In 2012–13, hospitalisation rates for regular dialysis (as the principal diagnosis) were much higher for Indigenous Australians than for Other Australians (10 times as high), particularly for females. Indigenous males were 6.8 times as likely as Other Australian males to have a hospitalisation for regular dialysis (39,268 and 5,805 per 100,000 population, respectively) and Indigenous females were 14.9 times as likely to have a hospitalisation for regular dialysis as Other Australian females (49,011 and 3,281 per 100,000 population, respectively) (Figure 4.11). As discussed in the remoteness section above, there are several reasons for the greater disparity among Indigenous females.

Indigenous Australians are also over-represented on the ANZDATA registry. In 2012, 12% of hospital and satellite haemodialysis patients recorded on the ANZDATA registry were Indigenous (AIHW analysis of the ANZDATA Registry), despite Indigenous Australians making up only 3% of the total population.



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database (Table A9).

Figure 4.11: Dialysis hospitalisation rates, as the principal diagnosis, by Indigenous status and sex, 2012–13

Length of stay in hospital

The average length of stay (the number of days a person spends in hospital) for hospitalisations where CKD was recorded as the principal diagnosis was 4.9 days (people who are admitted and separated on the same date were excluded). It was 9.6 days where CKD was recorded as an additional diagnosis.

Average length of stay in hospital increases with age, with older people having longer lengths of stay in hospital for the principal and/or an additional diagnosis. For example, those aged 85 and over stayed on average 7.9 days compared with 4.8 days for those aged 45–54 where CKD was the principal diagnosis. Where CKD was recorded as an additional diagnosis, the corresponding lengths of stay were 10.5 days and 9.1 days, respectively. The longer length of stay in older people most likely reflects the increasing complexity and multiplicity of their conditions (Campbell et al. 2004; Westert et al. 2001).

5 Cardiovascular disease, diabetes and chronic kidney disease comorbidity

As noted in Chapter 1 ('Introduction'), CVD, diabetes and CKD are serious, chronic and long-lasting diseases. They share a number of risk factors, and have complex causalities where each of them may be associated with or exacerbate the presence of the others. The presence of more than 1 of these diseases in an individual is referred to as *comorbidity*.

It is recognised that the effects of comorbid disease may be greater than the sum of the individual effects of each disease (Couser et al. 2011; De Cosmo et al. 2014; Fox et al. 2012). The presence of comorbidity in people with CVD, diabetes and CKD often indicates more severe disease and a poorer prognosis (less of an ability to recover). The presence of comorbidities also requires more complex health care, and so the burden on health-care services is further increased. This has been observed in greater levels of health-care utilisation, including more hospital admissions and longer stays in hospital (Kuwabara et al. 2008). Increases in contact with primary health-care professionals have also been observed (Struijs et al. 2006).

This chapter looks at the overall pattern of hospitalisations for these diseases, both in the total volume of their occurrence and in the extent to which they overlap. The main focus here is on the absolute and relative number of hospitalisations for these diseases in combination. In this report, where a patient has 2 or more of the conditions recorded in the record of their episode of hospitalisation, this is referred to as comorbidity.

The purpose of the National Hospital Morbidity Database (NHMD) is to record information about a patient's conditions (that is, disease) that require treatment during the episode of care (this is described in more detail in Appendix D). It is possible that diabetes and CKD could be present but not reported because they were judged to not have affected the care and treatment provided during the hospitalisation. Hence, it is likely that the overall comorbidity of the diseases will be under-reported.

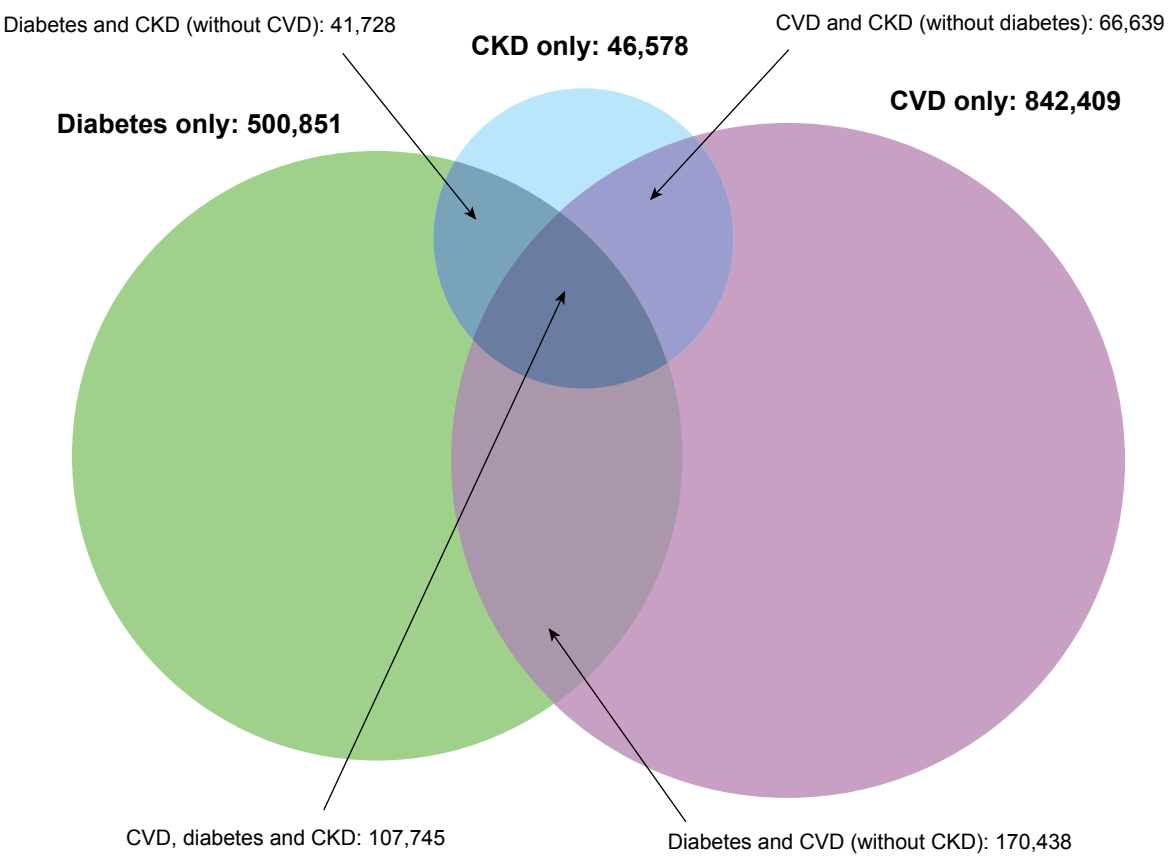
Dialysis hospitalisations have been excluded from this chapter that looks at comorbidity in hospital due to the different characteristics they have from other hospitalisations; however, it can be extrapolated from ANZDATA that at least half of patients who receive regular dialysis for their ESKD had a comorbidity of diabetes or CVD (McDonald et al. 2013). In addition, the analysis in this chapter was limited to people aged 25 and over because of the rarity of these diseases in young people (less than 1% of all cases with comorbidity were in people under 25).

Contribution of CVD, diabetes and CKD to hospitalisations

In 2012–13, there were around 1.8 million hospitalisations in which CVD, diabetes or CKD was present as the principal and/or an additional diagnosis, in people aged 25 or over (Figure 5.1). This equates to 22% of all non-dialysis hospitalisations for people 25 and older.

The majority (67%) of hospitalisations, around 1.2 million, included CVD, either alone or in combination with diabetes and/or CKD. Most of these (71%) were for CVD by itself, and 29% occurred in combination with diabetes or CKD.

There were 278,805 hospitalisations where 2 of the diseases were present, and a further 107,745 where all 3 were present. Thus, 386,550, or 22% of all hospitalisations recording CVD, diabetes or CKD, had 2 or more of these diseases recorded (comorbidity), accounting for 5% of all non-dialysis hospitalisations. The most common combination of diseases was CVD and diabetes (170,438 hospitalisations), followed by CVD, diabetes and CKD (107,745 hospitalisations). It is worth noting here the special coding rules for diabetes where it is universally coded whereas CKD and CVD are not (see 'Chapter 3 Diabetes' and Appendix C for more information).



Note: The relative proportions displayed in the Venn diagram are specific to the chapter (persons over 25) and are not intended for comparison with other chapters which contain all persons.

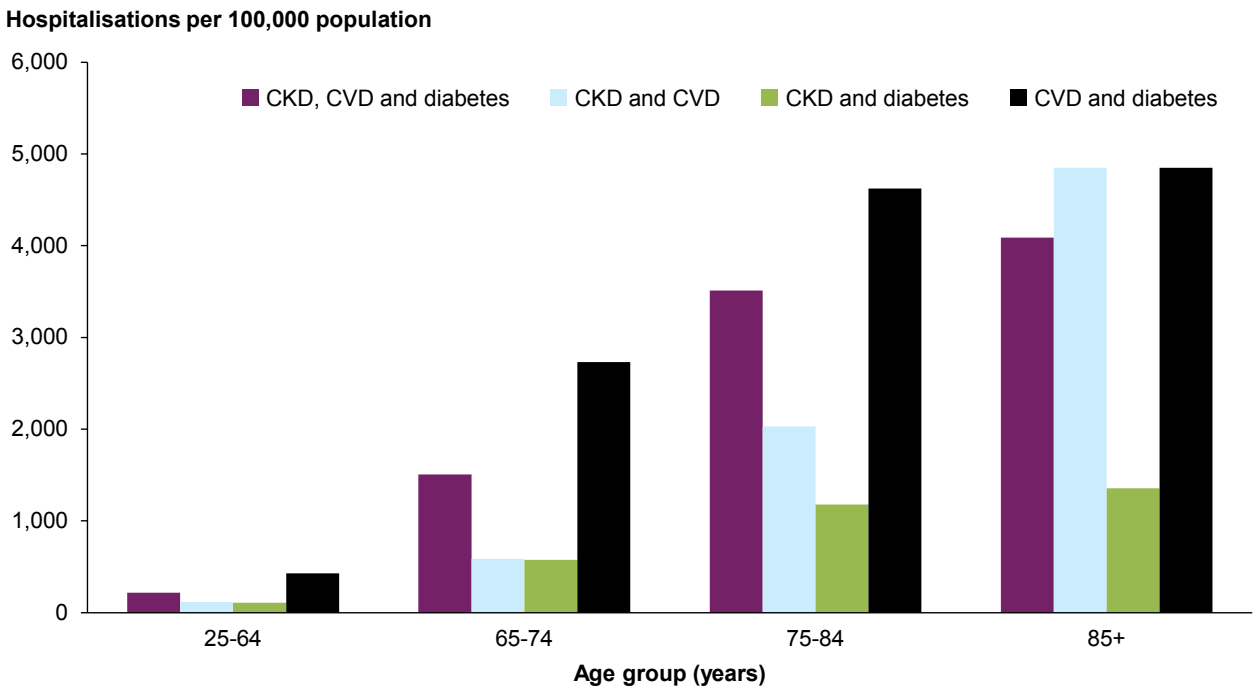
Source: AIHW National Hospital Morbidity Database (Table A12).

Figure 5.1: Hospitalisations (excluding dialysis) for persons aged 25 and over with CVD, diabetes or CKD, 2012–13

Age and sex

The rate of hospitalisations with a comorbidity increases with age. This is true for both males and females (Figure 5.2 and Table A11).

In 2012–13, people aged 65–74 were 5–7 times as likely to have one combination of comorbidity recorded as people aged 25–64. For those aged over 75, this difference increased to between 11 and 18 times the rate of those aged 25–64 with the exception of those aged 85 and over with a comorbidity of CKD and CVD who were 42 times as likely to be hospitalised with this comorbidity than people in the 25–64 age group. Those with a comorbidity of CKD and CVD were the only comorbidity group where there was a large increase between the age groups of 75–84 and 85 and over.

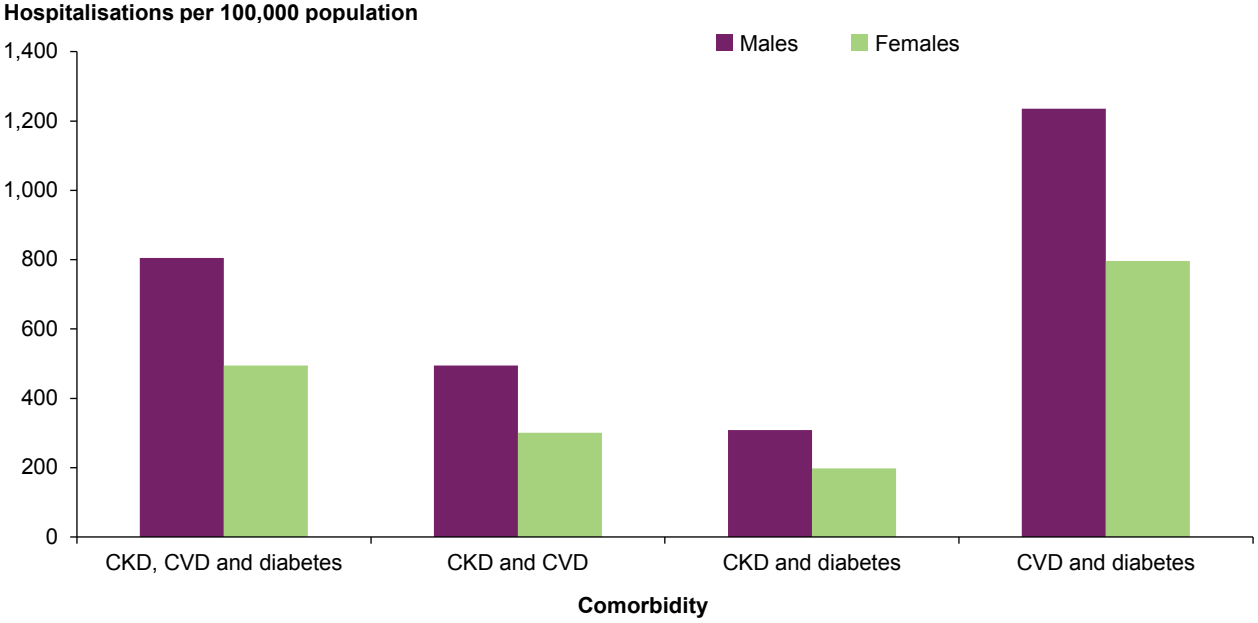


Note: Hospitalisations were for adults aged 25 and over only.

Source: AIHW National Hospital Morbidity Database.

Figure 5.2: Age-specific hospitalisation rates for persons with 2 or more diagnoses of CVD, diabetes and CKD, 2012–13

After adjusting for age, males were hospitalised at a rate around 1.6 times that for females where a comorbidity was present in any combination (Figure 5.3). This is greater than the difference for CVD only or CKD only (males 1.2 times as likely as females to be hospitalised), or diabetes only (males 1.1 times as likely to be hospitalised).



Notes

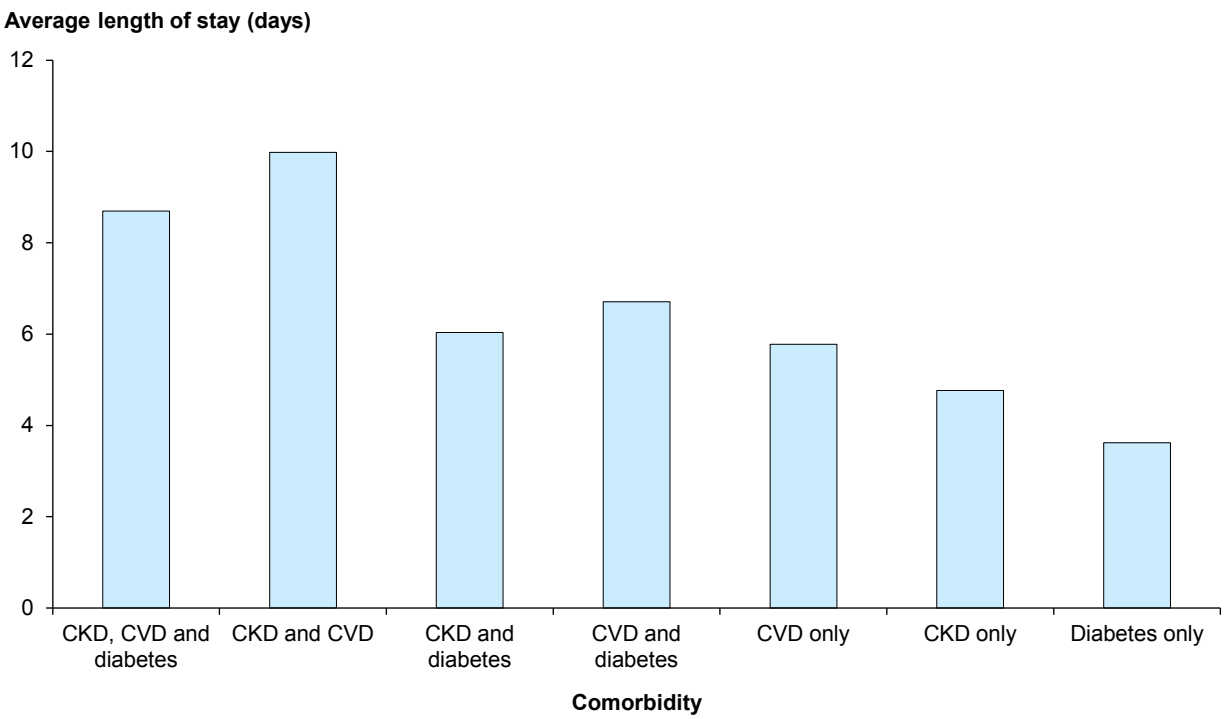
1. Rates have been age-standardised to the 2001 Australian population.
2. Hospitalisations were for adults aged 25 and over only.

Source: AIHW National Hospital Morbidity Database.

Figure 5.3: Hospitalisation rates for persons with 2 or more diagnoses of CVD, diabetes and CKD, by sex, 2012–13

Length of stay

Hospitalisations with comorbidity had on average a longer length of stay in hospital (people who are admitted and separated on the same date were excluded) than hospitalisations with CVD only, diabetes only or CKD only. Hospitalisations which recorded CKD and CVD together had the longest length of stay, an average length of stay of 10.8 days, while diabetes-only hospitalisations had the shortest average length of stay at 5.8 days (Figure 5.4).



Note: Hospitalisations were for adults aged 25 and over only. Excludes same-day patients.

Source: AIHW National Hospital Morbidity Database.

Figure 5.4: Average length of stay for hospitalisations with 1 or more diagnoses of CVD, diabetes and CKD, 2012–13

Principal diagnosis

Due to the fact that CVD and particularly diabetes and CKD are often coded as an additional diagnosis, the principal diagnosis for these hospitalisations will not always be CVD, diabetes or CKD. One-third (33%) of hospitalisations with comorbidity of CVD, diabetes or CKD had 1 of these diseases as the principal diagnosis, and this increased to 39% where 2 or more of these diseases are recorded. The fact that two-thirds of these hospitalisations do not have 1 of these diseases as the principal diagnosis highlights the fact that there are often other comorbidities associated with these diseases. For example, in 7% of hospitalisations with comorbidity of CVD, diabetes or CKD, respiratory conditions were listed as the principal diagnosis and in 6% of hospitalisations with comorbidity of CVD, diabetes or CKD, digestive disorders were listed as the principal diagnosis.

Table 5.1 summarises the principal diagnosis for records with 2 or more comorbidities of CVD, diabetes and CKD.

Table 5.1: Hospitalisations for persons with comorbidity of CVD, diabetes and CKD, principal diagnosis, 2012–13

Principal diagnosis	Number	Per cent
CVD	123,853	32.0
Respiratory conditions	27,308	7.1
Injury, poisoning and other external causes	24,437	6.3
Digestive disorders	22,113	5.7
Genitourinary conditions (not CKD)	18,954	4.9
Cancer	13,599	3.5
CKD	13,336	3.5
Musculoskeletal conditions	12,883	3.3
Diabetes	12,463	3.2
Infections and parasitic conditions	11,366	2.9
Diseases of the blood	10,635	2.8
Diseases of the skin and subcutaneous tissue	7,945	2.1
Endocrine (not diabetes)	6,919	1.8
Factors influencing health status and service use *(these include regular dialysis including preparatory care rehabilitation and transplantation)*	42,718	11.1
Other	38,021	9.8
Total	**386,550**	**100.0**

Note: Hospitalisations were for adults aged 25 and over only.
Source: AIHW National Hospital Morbidity Database.

Health inequalities

Remoteness

In 2012–13, people living in *Remote and very remote* areas were more likely to be hospitalised for any of the diseases (CVD, diabetes or CKD) than people in *Major cities*. As the number of comorbidities increases, so does the relative difference in hospitalisation rates between *Remote and very remote* areas and *Major cities*.

People with 1-disease only (CVD only, diabetes only or CKD only) living in *Remote and very remote* areas were 1.2 times as likely as people in *Major cities* to be hospitalised (6,764 per 100,000 compared with 5,433, respectively). People with all 3 diseases were 2.7 times as likely to be hospitalised if they lived in a *Remote or very remote* area compared with those in *Major cities* (1,134 and 419 per 100,000 population, respectively).

When the disparities are analysed by sex, females appear to be driving the majority of the gap between *Remote and very remote* areas and *Major cities*, particularly as the number of comorbidities increases. Females with all 3 diseases were 4.4 times as likely to be hospitalised if they lived in a *Remote or very remote* area compared with those in *Major cities* (1,360 and 311 per 100,000 population, respectively) whereas males with all 3 conditions were 1.7 times as likely to hospitalised if they lived in a *Remote or very remote* area (957 and 552 per 100,000 population, respectively) (Table 5.2).

Table 5.2: Hospitalisations with CVD, diabetes and CKD, by remoteness and sex, 2012–13 (rate per 100,000 population)

Number of diseases	Major cities	Inner regional	Outer regional	Remote and very remote	Rate ratio (Remote and very remote/ Major cities)
			Males		
1 disease only[(a)]	5,963	6,214	6,242	6,452	1.1
2 diseases	1,339	1,346	1,431	1,696	1.3
3 diseases	552	460	497	957	1.7
			Females		
1 disease only[(a)]	5,007	5,140	5,360	7,245	1.4
2 diseases	825	853	922	1,804	2.2
3 diseases	311	264	380	1,360	4.4

(a) Includes CVD only, or diabetes only or CKD only.

Notes

1. Hospitalisations were for adults aged 25 and over only.
2. Rates have been age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Socioeconomic status

People in the lowest socioeconomic group (based on area of usual residence) were more likely to be hospitalised for CVD, diabetes or CKD than those in the highest socioeconomic group regardless of their level of comorbidity status; however, the disparity increased as comorbidities increased.

Among those who had all 3 diseases, people from the lowest socioeconomic group were 2.4 times as likely to be hospitalised as those in the highest socioeconomic group (597 and 255 per 100,000 population, respectively). In contrast, the difference was less for those who had 1 disease only, with those in the lowest socioeconomic group 1.3 times as likely to be hospitalised as those in the highest socioeconomic group (6,056 and 4,779 per 100,000 population, respectively).

Males and females had similar disparities between the lowest and highest socioeconomic group for 1 disease only or 2 diseases; however, females had a greater disparity than males when all 3 diseases were present (females were hospitalised at almost 3 times the rate whereas males were hospitalised at twice the rate) (Table 5.3).

Table 5.3: Hospitalisations with CVD, diabetes and CKD, by socioeconomic status and sex, 2012–13 (rate per 100,000 population)

Number of diseases	Group 1 (lowest SES)	Group 2	Group 3	Group 4	Group 5 (highest SES)	Rate ratio (lowest/highest)
			Males			
1 disease only[(a)]	6,526	6,163	6,139	5,947	5,301	1.2
2 diseases	1,679	1,396	1,385	1,245	1,005	1.7
3 diseases	700	549	540	499	357	2.0
			Females			
1 disease only[(a)]	5,668	5,229	5,263	4,889	4,346	1.3
2 diseases	1,127	933	850	753	583	1.9
3 diseases	511	336	321	272	173	2.9

(a) Includes CVD only, or diabetes only or CKD only.

Notes

1. Hospitalisations were for adults aged 25 and over only.
2. Rates have been age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Aboriginal and Torres Strait Islander people

Indigenous Australians have higher hospitalisation rates than Other Australians regardless of their comorbidity status and the disparity increases with greater comorbidity—from 1.5 times that of Other Australians when 1 disease only is present to 7.3 times the rate of Other Australians when all 3 diseases are present.

Indigenous females had the highest disparities across all comorbidity groups—2.2 times as likely as Other Australian females to have 1 disease only (17,021 and 7,601 per 100,000, respectively) and 11 times as likely as Other Australian females to have all 3 diseases (4,684 and 437 per 100,000, respectively). Indigenous males were 1.6 times as likely as Other Australian males to have 1 disease only and 5 times as likely as Other Australian males to have all 3 diseases (Table 5.4).

Table 5.4: Hospitalisations with CVD, diabetes and CKD, by Indigenous status and sex, 2012–13 (rate per 100,000 population)

	Males			Females		
Number of diseases	Indigenous	Other Australians	Rate ratio[(a)]	Indigenous	Other Australians	Rate ratio[(a)]
1 disease only[(b)]	14,725	9,141	1.6	17,021	7,601	2.2
2 diseases	5,072	2,028	2.5	5,799	1,232	4.7
3 diseases	3,904	777	5.0	4,684	437	10.7

(a) Indigenous/Other Australians.

(b) Includes CVD only, or diabetes only or CKD only.

Notes

1. Hospitalisations were for adults aged 25 and over only.
2. Rates have been age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Hospitalisation with comorbidity in the context of each disease

In 2012–13, the proportion of hospitalisations with 2 or more diseases was different for each disease. CKD had the largest number of hospitalisations with CVD and/or diabetes at 82%, followed by diabetes (with CVD and/or CKD) at 39% and CVD (with diabetes and/or CKD) at 29% (Table 5.5). Around 6% of hospitalisations had all 3 diseases.

Table 5.5: Hospitalisations with CVD, diabetes and CKD, 2012–13

Diseases	Number of hospitalisations	CVD (%)[(a)]	Diabetes (%)[(a)]	CKD (%)[(a)]
2 diseases				
CKD and CVD	66,639	5.6	. .	25.4
CKD and diabetes	41,728	. .	5.1	15.9
CVD and diabetes	170,438	14.4	20.8	. .
3 diseases				
CKD, CVD and diabetes	107,745	9.1	13.1	41.0
Hospitalisations with at least 2 diseases	**386,550**	**29.0**	**39.0**	**82.3**

. . Not applicable.

(a) Percentage refers to the proportion of hospitalisations with a disease (CVD, diabetes or CKD) that has a record of another disease (CVD, diabetes or CKD). For example, for CVD, the 2 diseases CKD and CVD are any hospitalisation with a diagnosis of CVD and CKD divided by the total CVD hospitalisations (principal and additional). This gives the percentage of CVD hospitalisation that has a diagnosis of the 2 diseases CKD and CVD.

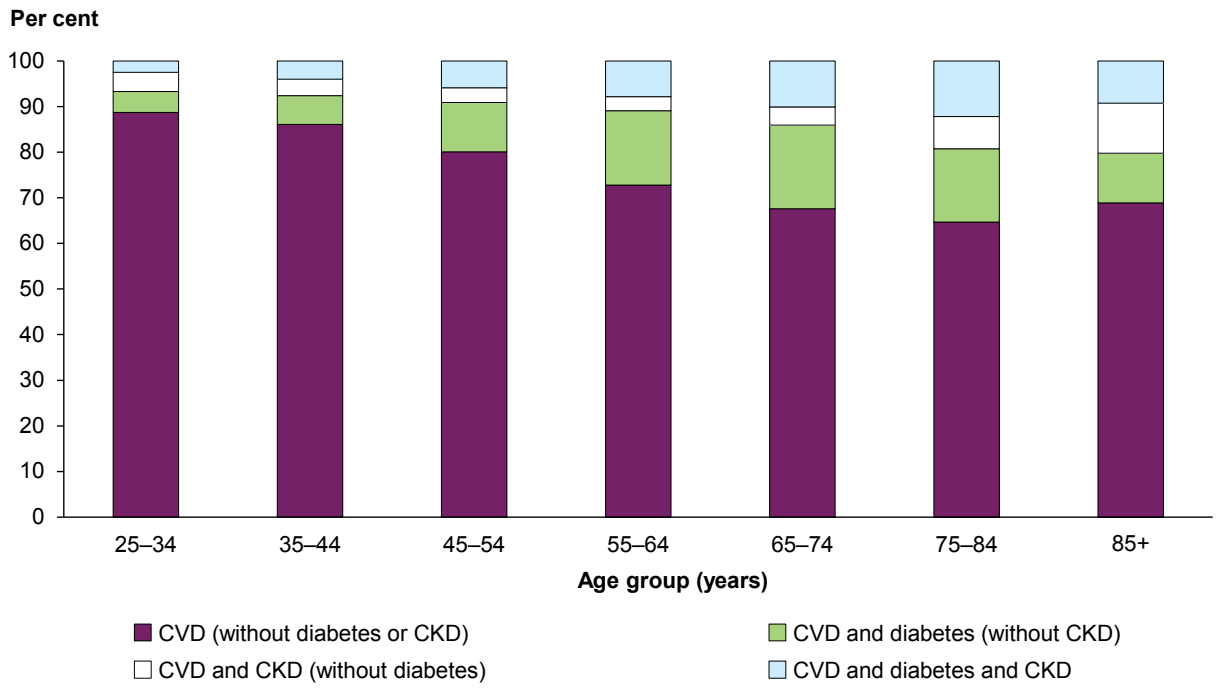
Note: Hospitalisations were for adults aged 25 and over only.

Source: AIHW National Hospital Morbidity Database.

Hospitalisations with a diagnosis of CVD

There were around 1.2 million hospitalisations with CVD. Of these hospitalisations, around 278,180 (23%) also had a diagnosis of diabetes, and around 174,380 (15%) had a diagnosis of CKD. Almost 1 in 10 hospitalisations for CVD also had diabetes and CKD present.

The proportion of CVD hospitalisations with comorbidity increased with age, from 11% in those aged 25–34 to 35% in those over 75–84 (Figure 5.5). This has largely been driven by the increase in comorbidity of CVD and diabetes followed by all 3 diseases together.



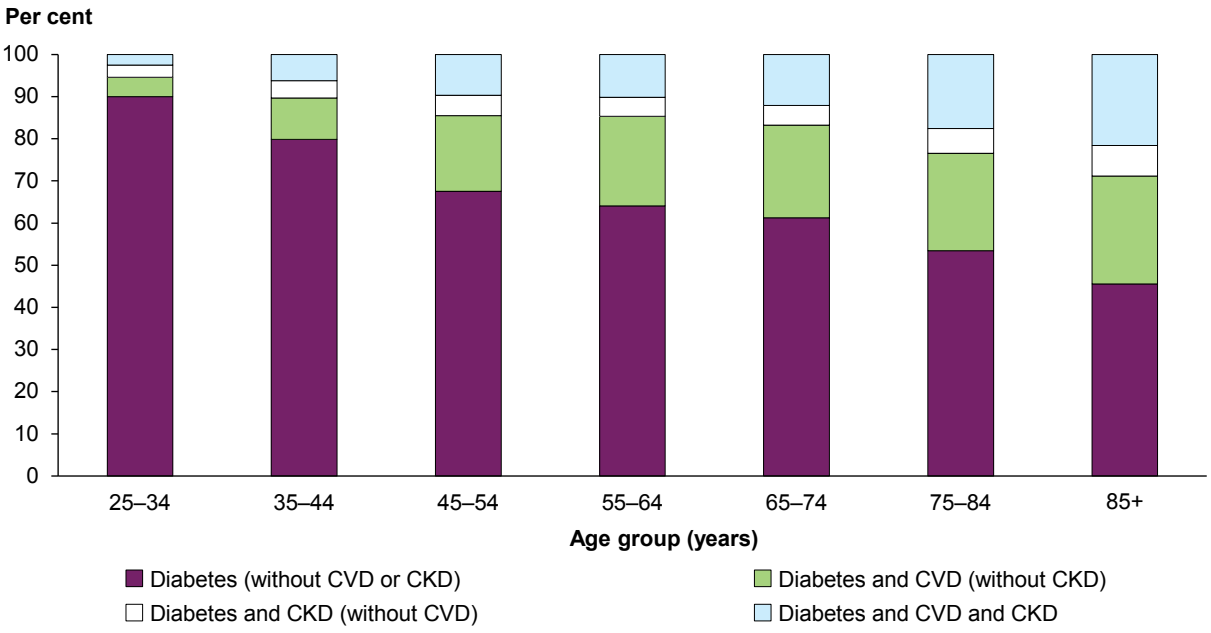
Note: Hospitalisations were for adults aged 25 and over only.
Source: AIHW National Hospital Morbidity Database.

Figure 5.5: CVD hospitalisation with 1 or more diagnoses of CVD, diabetes and CKD, by age, 2012–13

Hospitalisations with a diagnosis of diabetes

There were around 820,760 hospitalisations with diabetes. Of the hospitalisations with diabetes, around 278,180 (34%) also had a diagnosis of CVD and around 149,470 (18%) had a diagnosis of CKD. Further, 13% of diabetes hospitalisations also had CVD and CKD present.

The proportion of diabetes hospitalisations with comorbidity also increased with age from 10% in those aged 25–34 to 54% in those over 85 (Figure 5.6). The largest relative increase by age in hospitalisation rates occurred in the group with all 3 diseases recorded, increasing by over 8 times. Diabetes with CVD also increased by more than 5 times from the 25–34 year age group to the 85 and over group.



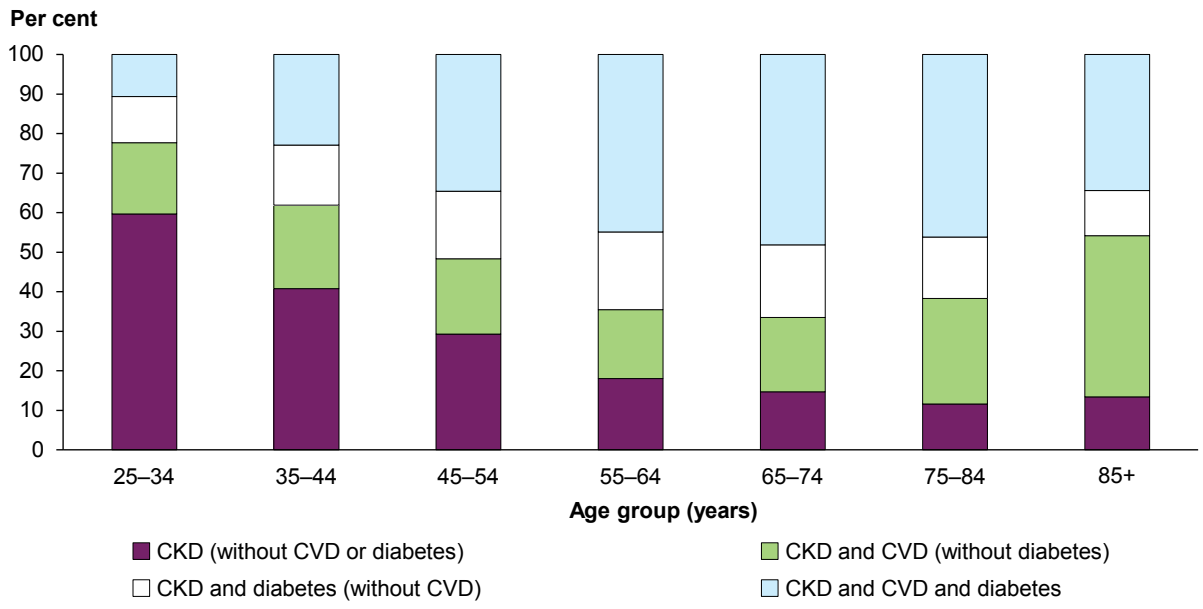
Note: Hospitalisations were for adults aged 25 and over only.
Source: AIHW National Hospital Morbidity Database.

Figure 5.6: Diabetes hospitalisations with 1 or more diagnoses of CVD, diabetes and CKD, by age, 2012–13

Hospitalisations with a diagnosis of CKD

There were around 262,690 hospitalisations for CKD. Of the hospitalisations with CKD, 174,380 (66%) also had a diagnosis of CVD and 149,470 (57%) had a diagnosis of diabetes. Further, 41% of CKD hospitalisations also had CVD and diabetes present.

The proportion of CKD hospitalisations with comorbidity increased with age, from 40% in those aged 25–34 to 88% in those aged 75–84 (Figure 5.7). As with diabetes, the largest relative increase by age occurred in the group with all 3 diseases recorded, increasing by 4.5 times between the 25–34 and 65–74 age groups. In those aged 85 and over, CKD and CVD was the largest group, accounting for 41% of CKD cases.



Note: Hospitalisations were for adults aged 25 and over only.
Source: AIHW National Hospital Morbidity Database.

Figure 5.7: CKD hospitalisations with 1 or more diagnoses of CVD, diabetes and CKD, by age, 2012–13

6 Hospital procedures

Hospital procedures in this report are those procedures provided in hospital to admitted patients to diagnose or treat CVD, CKD or diabetes complications.

Data in this chapter are sourced from the AIHW National Hospital Morbidity Database and refer only to procedures provided for admitted patients in hospitals, although it is possible for procedures to be performed elsewhere, including in outpatient settings within hospitals. In most cases, the data reported in this chapter are rates of all procedures among the Australian population and the procedures were counted only once if the same procedure was conducted more than once in a hospitalisation.

Note that in contrast with previous AIHW reports, this chapter does not include computerised tomography (CT) brain scans and magnetic resonance imaging (MRI) brain scans. Since 2010–11, only imaging procedures that have been coded as the principal diagnosis (that is, the patient was admitted to hospital on the basis that the procedure was to be carried out), or were provided in a same-day admission, have been recorded.

This chapter includes the most common procedures provided in hospital to diagnose and treat CVD, diabetes or CKD. This section reports on both diagnostic procedures—which aim to identify the type, severity and location of problems—and the therapeutic procedures—which aim to treat any problems once they have been identified.

Hospital procedures for cardiovascular disease

The diagnostic procedures reported in this section are coronary angiography and echocardiography. The therapeutic procedures reported in this section are percutaneous coronary interventions, coronary artery bypass grafting, heart valve repair or replacement, pacemaker insertion, cardiac defibrillator implant, carotid endarterectomy and heart transplants.

Diagnostic procedures

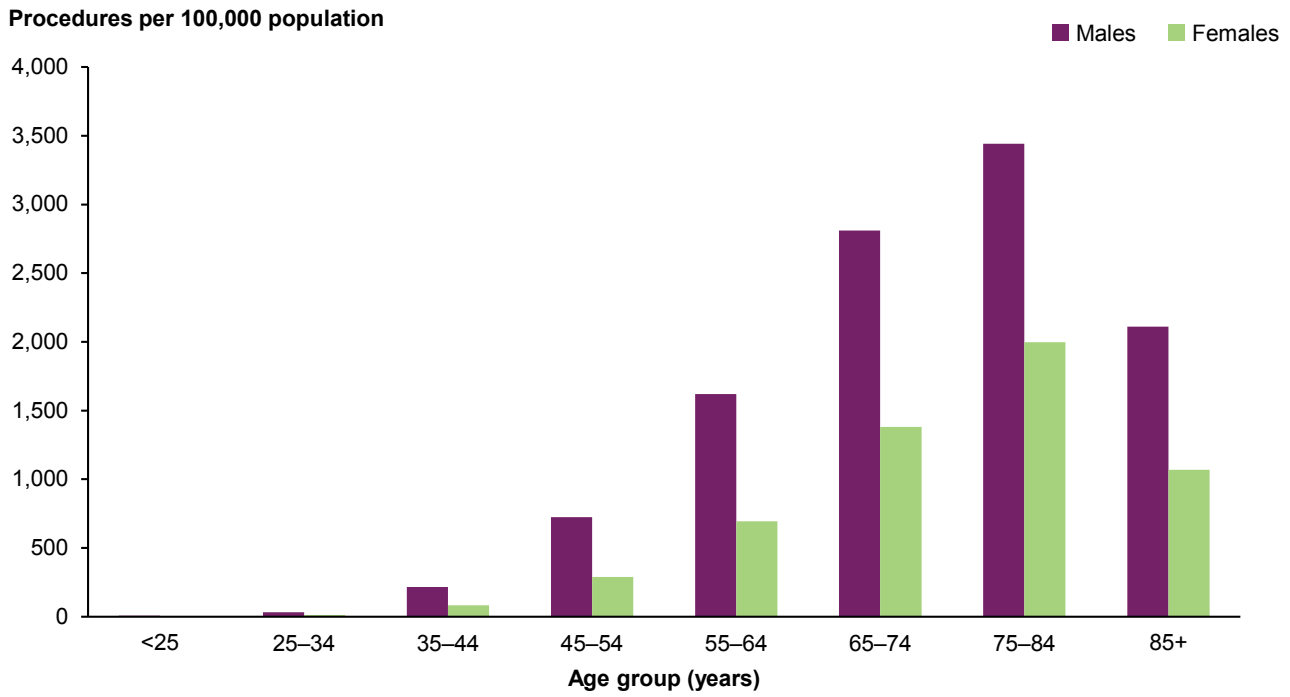
Coronary angiography

Coronary angiography gives a picture of the coronary arteries (those that supply the heart itself) to determine where, and the extent to which, they may be narrowed or blocked. A catheter is guided to the heart, where a special dye is released into the coronary arteries when an X-ray is taken. The images obtained then provide detailed information about the health of the heart and arteries. This is an important diagnostic test for coronary heart disease, providing medical professionals with the information they need to decide upon treatment options, such as the need for percutaneous coronary interventions (see 'Therapeutic procedures' below).

In 2012–13, 122,950 coronary angiography procedures were reported for patients admitted to hospital.

Coronary angiography procedures were more commonly reported for males than females, with 80,750 procedures (66%) for males and 42,200 (34%) for females. The age-adjusted rate of these procedures was also higher among males, with rates twice as high in males than in females (663 and 318 per 100,000, respectively).

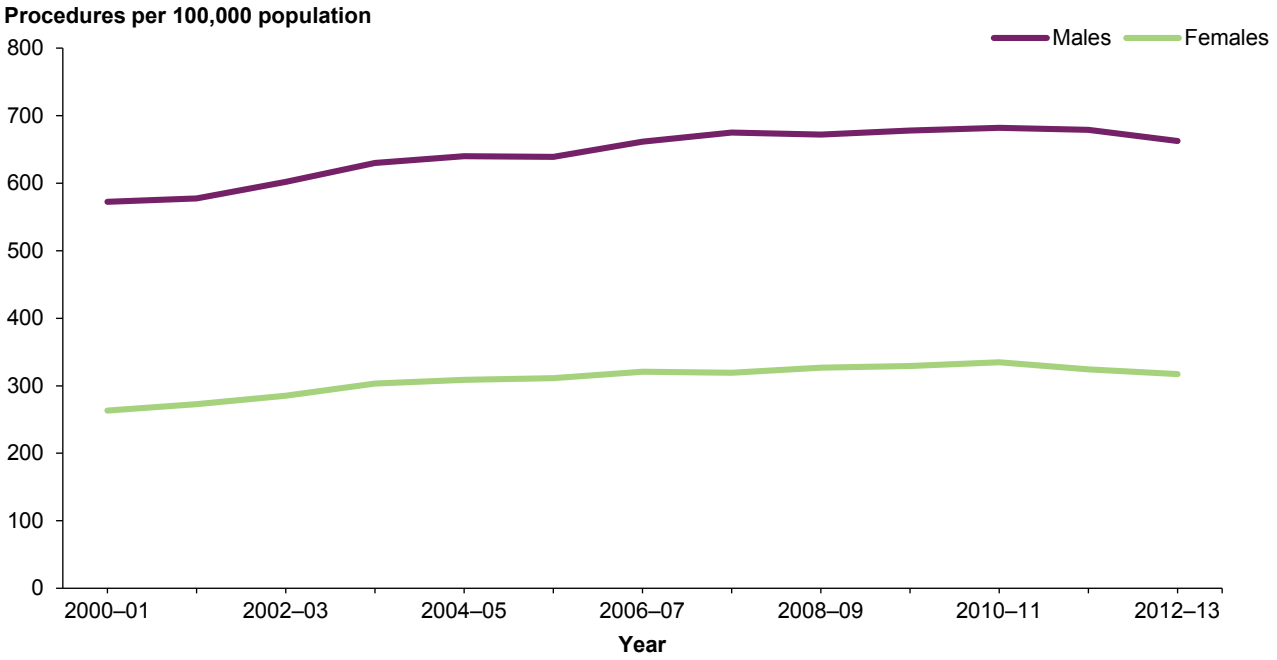
The rate of these procedures increased with age until the peak age group 75–84—where rates were 5.3 times as high as for 45–54 age group—after which the rate decreases (Figure 6.1).



Source: AIHW National Hospital Morbidity Database (Table A13).

Figure 6.1: Coronary angiography rates, by age and sex, 2012–13

Over the last decade, there has been an increase in coronary angiography procedures in hospital. Between 2000–01 and 2012–13, the number of coronary angiography procedures increased by 57% from 78,390 to 122,950 in 2012–13, and the age-adjusted rate increased by 17% from 412 to 484 procedures per 100,000 population. The procedure rate for males has remained consistently twice that for females over this period, with the rate of increase greater for males than for females (21% compared with 16%, respectively) (Figure 6.2).



Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database (Table A13).

Figure 6.2: Trends in coronary angiography rates, by sex, 2000–01 to 2012–13

Echocardiography

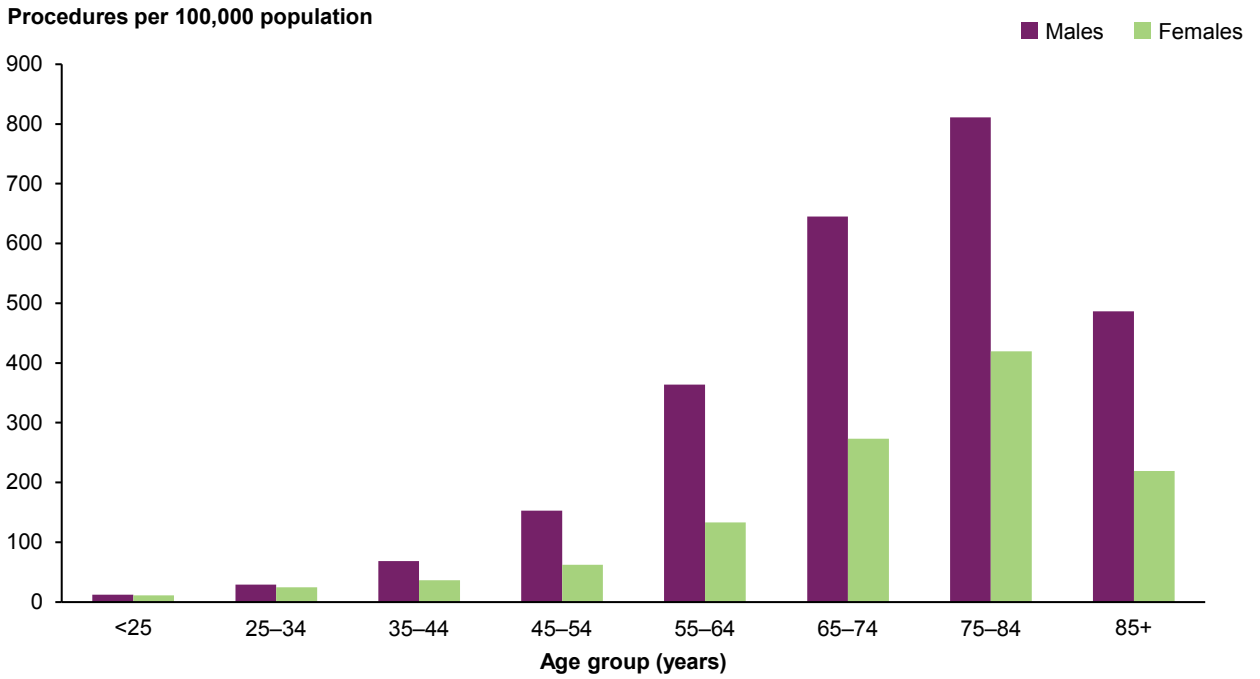
Echocardiography is a procedure that takes moving pictures of the heart using high frequency sound waves (ultrasound). With this technology, it is possible to assess the size of the various heart chambers, the appearance and motions of the heart valves, and the volume of blood flow through the heart.

In 2012–13, 28,960 echocardiography procedures were reported for patients admitted to hospital.

Two-thirds of echocardiography procedures were carried out in males (19,390 or 67%). This difference is also reflected in the age-standardised rate of echocardiography procedures, which was twice as high for males than for females (160 compared with 74 procedures per 100,000 people, respectively).

Rates of echocardiography procedures increased rapidly with age, with rates peaking in the 75–84 age group, and then declining thereafter (Figure 6.3).

The rate of echocardiography procedures has been relatively steady between 2000–01 and 2012–13 (109 compared with 116 procedures per 100,000 people, respectively). However, the absolute number of procedures has increased from 20,830 in 2000–01 to 28,960 in 2012–13.



Source: AIHW National Hospital Morbidity Database (Table A14).

Figure 6.3: Echocardiography rates, by age group and sex, 2012–13

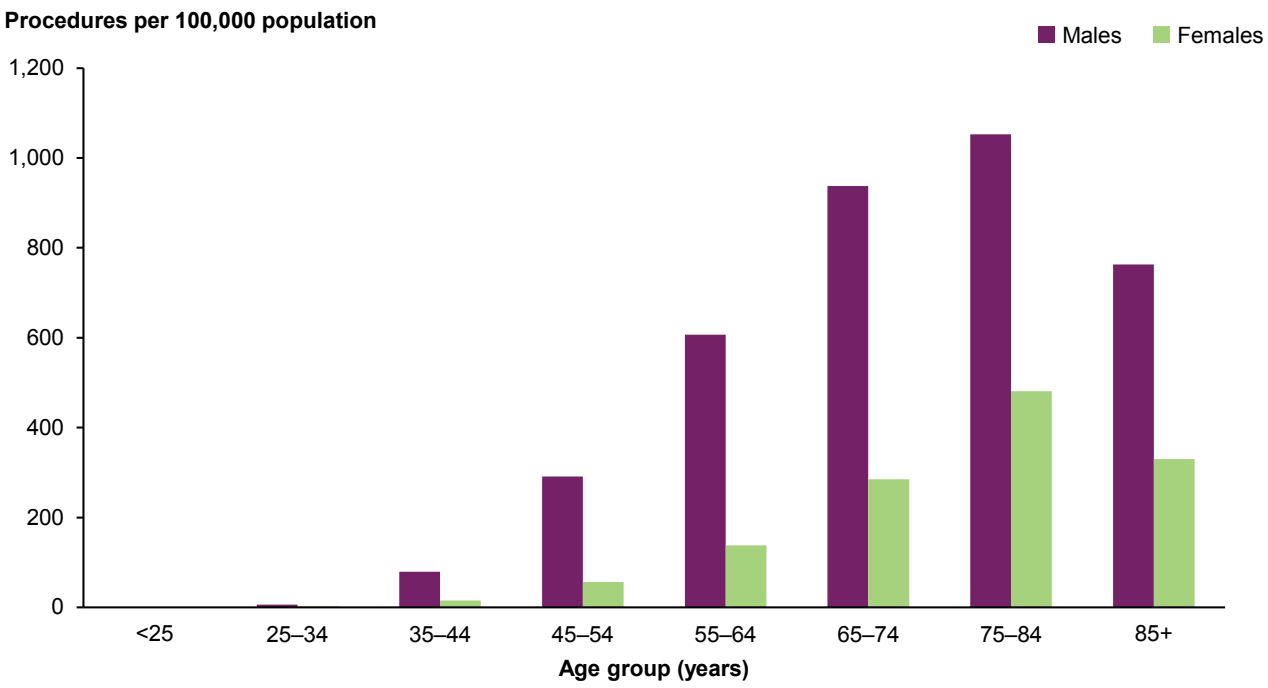
Therapeutic procedures

Percutaneous coronary interventions

Percutaneous (through-the-skin) coronary interventions (PCIs) are used to restore blood flow to blocked coronary arteries. Two types of procedures are used: coronary angioplasty without stent, and coronary stenting. Coronary angioplasty involves inserting a catheter with a small balloon into a coronary artery which is inflated to clear the blockage. Coronary stenting is similar, but involves the insertion of a stent (an expandable mesh tube) into affected coronary arteries. Of all PCIs reported for patients admitted to hospital, in 2012–13, 93% involved stenting.

In 2012–13, there were 37,400 hospitalisations with at least one PCI procedure reported in hospital, three-quarters of which (75% or 28,180) were for males. The age-standardised rate for PCIs for males (230 per 100,000 population) was over 3 times the rate for females (69 per 100,000 population).

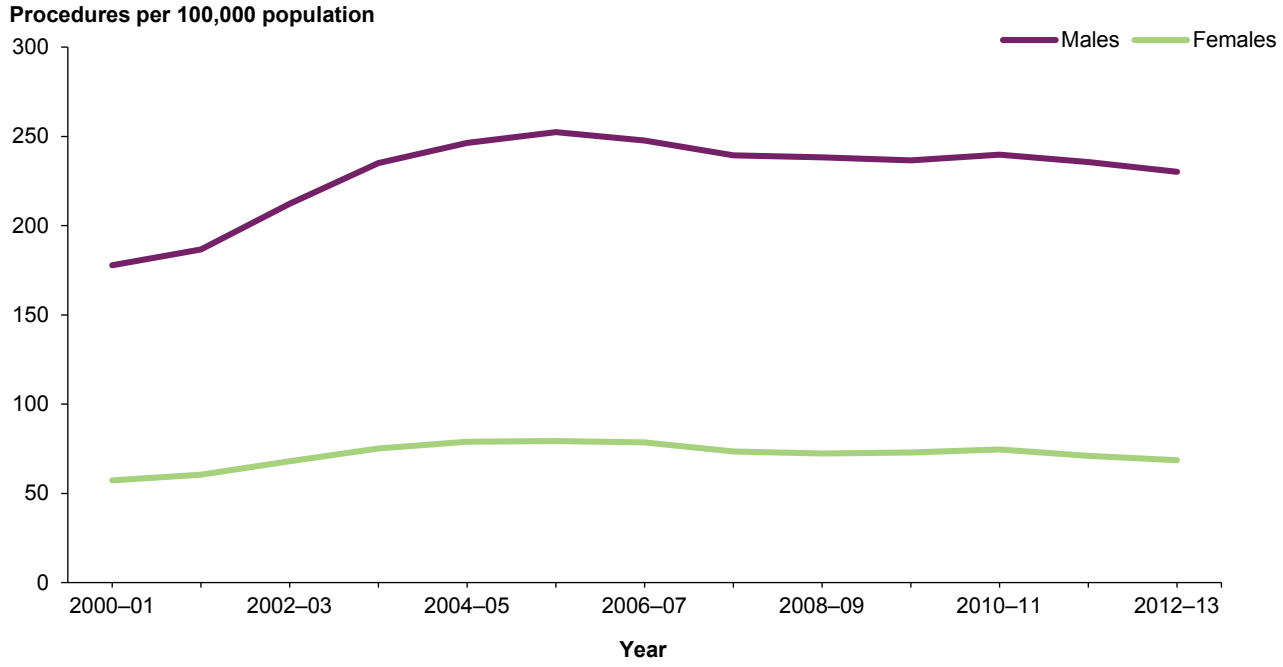
For males and females, the rate of PCIs increased steadily with age until age 75–84 and then declined for those aged 85 and over (Figure 6.4).



Source: AIHW National Hospital Morbidity Database (Table A15).

Figure 6.4: Percutaneous coronary intervention rates, by age and sex, 2012–13

Between 2000–01 and 2012–13, the age-standardised rate of PCIs increased by 27%, from 116 to 147 procedures per 100,000 population. This increase was higher for males than for females (29% compared with 20%, respectively). Since 2007–08, the rates of PCIs have remained relatively stable for both males and females (Figure 6.5).



Note: Age-standardised to the 2001 Australian population.
Source: AIHW National Hospital Morbidity Database (Table A15).

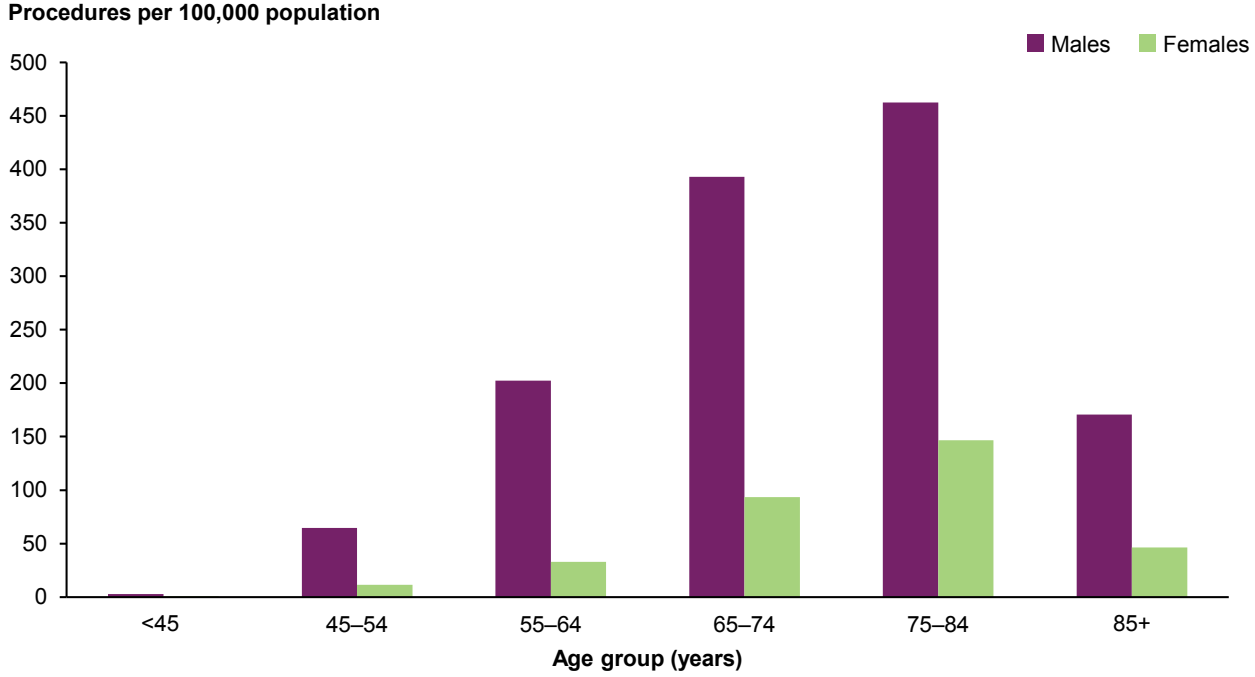
Figure 6.5: Trends in percutaneous coronary intervention rates, by sex, 2000–01 to 2012–13

Coronary artery bypass grafting

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 a patient's inner chest, arm or leg and attaching it to vessels on the outside of the heart to bypass a blocked artery.

In 2012–13, 12,230 CABG procedures were performed. The procedures were reported much more often in males (9,760 procedures, or 80%) than females. This difference was also reflected in the age-standardised procedure rate, with the rate for males 4 times the rate for females (79 compared with 19 procedures per 100,000, respectively).

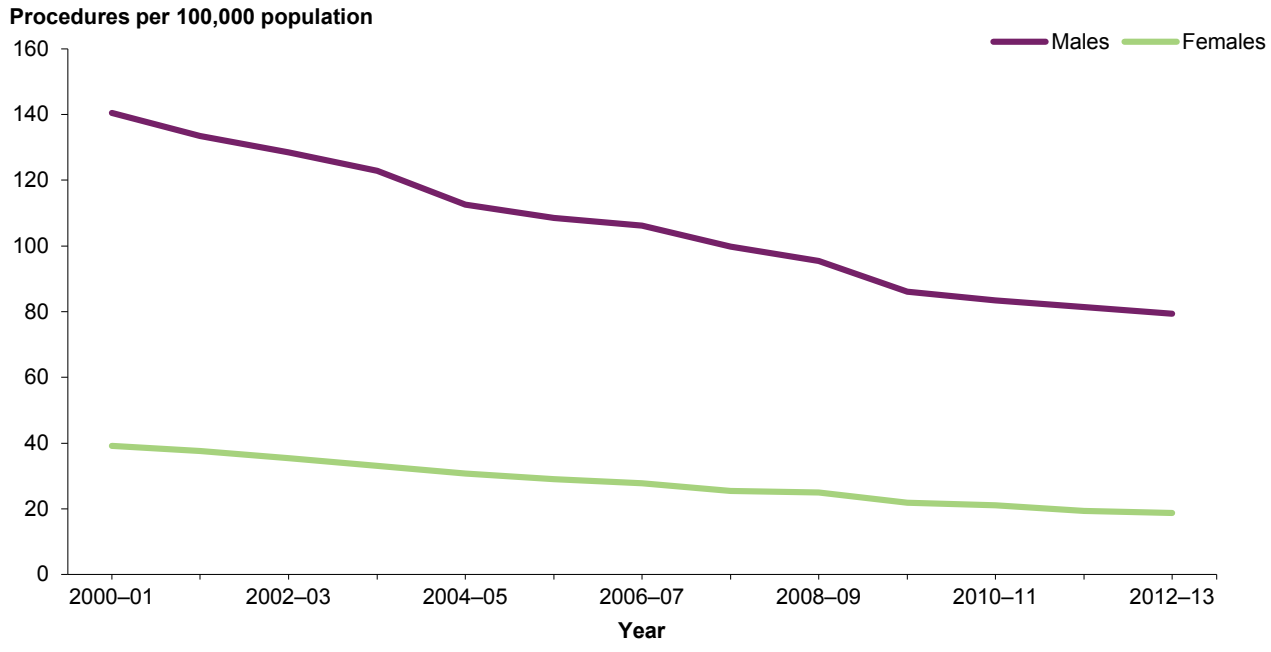
The rate of CABG procedures increased with age up to age group 75–84 and then fell rapidly for both males and females (Figure 6.6).



Source: AIHW National Hospital Morbidity Database (Table A16).

Figure 6.6: Coronary artery bypass graft rates, by age and sex, 2012–13

Between 2000–01 and 2012–13, the age-standardised rate of CABG procedures decreased steadily, a decline of 50% between 2000–01 and 2012–13 (from 88 to 48 procedures per 100,000 population, respectively). The overall rate of decline between 2000–01 and 2012–13 was greater in females (52%) than in males (43%) (Figure 6.7). The absolute number of these procedures also declined over this period by 37%, from 16,700 in 2000–01 to 12,230 in 2012–13.



Source: AIHW National Hospital Morbidity Database (Table A16).

Figure 6.7: Trends in coronary artery bypass graft rates, by sex, 2000–01 to 2012–13

Heart valve repair or replacement

Heart valve repair or replacement procedures are performed when the normal flow of blood through the heart is disrupted by damaged valves, making it harder for the heart to pump blood around the body effectively. This can lead to heart failure. The damage to heart valves may be caused by acute rheumatic fever or rheumatic heart disease, coronary heart disease, or forms of congenital heart disease.

In 2012–13, 9,040 heart valve repair or replacement procedures were reported. Almost two-thirds (62%) of the procedures were provided to males (5,620). The age-standardised rate for heart valve repair and/or replacement procedures was almost twice as high for males as for females (48 per 100,000 compared with 26, respectively) (Table A17).

Pacemaker insertion

A pacemaker is a small device that is placed in the chest or abdomen to help control abnormal heart rhythms. Once the electrical leads are correctly positioned, as confirmed by X–ray, the pacemaker device is placed under the skin and the leads are connected to the pacemaker box. This device uses electrical pulses to prompt the heart to beat at a normal rate. Pacemakers are used to treat arrhythmias. Arrhythmias are problems with the rate or rhythm of the heartbeat.

In 2012–13, 14,540 pacemaker insertion procedures were reported in hospital. This procedure was more common in males (8,432 or 58%) than females. The age-standardised procedure rate for males (73 procedures per 100,000 people) was nearly twice that for females (42 per 100,000) (Table A18).

Cardiac defibrillator implant

A cardiac defibrillator implant is a device implanted into a patient's chest that monitors the heart rhythm and delivers electric shocks to the heart when required to eliminate abnormal rhythms. They are effective in preventing sudden cardiac death in people at high risk of the life-threatening cardiac arrhythmia known as ventricular fibrillation.

In 2012–13, 3,510 cardiac defibrillator implantation procedures were provided in hospital to admitted patients. Most procedures (2,709 or 77%) were provided for males. This difference is also reflected in the age-standardised procedure rates, which were 4 times as high in males (23 procedures per 100,000 people) as in females (6 per 100,000) (Table A19).

Carotid endarterectomy

Carotid endarterectomy is a procedure where atherosclerotic plaques are surgically removed from the carotid arteries in the neck, which supply blood to the brain. This procedure is used to reduce the risk of stroke caused by blockage.

In 2012–13, 2,400 carotid endarterectomy procedures were provided in hospital to admitted patients. Most patients were males (1,698 or 71%). Similarly, the age-standardised rate of procedures was almost 3 times as high for males (14 procedures per 100,000 of the population) as for females (5 per 100,000 population) (Table A20).

Heart transplant

A heart transplant involves implanting a working heart from a recently deceased organ donor into a patient. This procedure is usually used for the treatment of the most severe forms of heart failure or coronary heart disease.

Heart transplants are uncommon, with just 81 procedures provided in hospital to admitted patients in 2012–13. Most of these procedures were provided for males (66 procedures). Under half of the procedures (32, or 40%) were provided for patients aged less than 45.

Hospital procedures for diabetes complications

There are no specific procedure codes for diabetes in the hospital data; however, it is possible to link diabetes diagnosis to procedures. Lower limb amputation is one of the procedures often linked to diabetes.

Lower-limb amputation

If people do not manage their diabetes well, they are at risk from conditions such as neuropathy (nerve damage) and microvascular disease (such as peripheral vascular disease). These conditions can cause foot ulcers. In the most severe cases, these ulcers may lead to the amputation of the affected toes, foot and lower leg.

Many diabetic patients who undergo amputation will have a subsequent amputation on the other side within a few years (Schaper et al. 2012). The remaining limb becomes more vulnerable to ulceration and infection because it has to bear extra pressure. Nearly half of lower-limb amputations involve above- or below-knee amputations, the remainder are minor, involving toes or feet (ADS 2008).

In 2012–13, there were 4,190 lower-limb amputations provided in hospital to admitted patients with a diagnosis of either diabetes or peripheral vascular disease. The vast majority of these (3,570, or 85%) were provided for patients with a diagnosis of diabetes, and of these 12% also had a diagnosis of peripheral vascular disease recorded. These procedures were more common in males (72%) and for those aged 65 and over (61%).

Hospital procedures for chronic kidney disease

Patients with CKD may undergo many procedures in hospital; however, the 2 specific procedures for CKD that are presented in this report are kidney transplants and dialysis. Kidney replacement therapy, either in the form of transplantation or dialysis, is required for a patient to survive in cases where kidney function has deteriorated to such an extent that it is no longer sufficient to sustain life.

Kidney transplant

Kidney transplantation is where a kidney from either a living or recently deceased donor is implanted in a patient. While transplantation is considered the preferred option for kidney replacement therapy by patients and health-care professionals because it improves quality of life, has better survival outcomes and results in a lower cost, there is still the risk of rejection and related complications, including the loss of kidney function during their lifetime for patients living with a transplanted kidney (CARI 2007; Mathew et al. 2005).

In 2012–13, 911 kidney transplants were performed in hospital in Australia. Most of these procedures were provided for male patients (588, or 65% of procedures) and almost two-thirds (61%) of patients were aged less than 55.

According to Australian and New Zealand Organ Registry (ANZOD), between 2000 and 2012, the number of kidney transplants increased by 55%, with about 1 in 3 transplants coming from a living donor (ANZOD 2013). Over the last 2 decades, there has been a 45% increase in transplants from deceased donors, increasing from 392 to 570 between 1991 and 2011, respectively. There has also been a rapid rise in transplants from living donors—a fourfold increase from 78 to 354 between 1991 and 2008, respectively. However, in recent years the number of transplants from living donors has fallen (354 to 255 between 2008 and 2011, respectively).

Dialysis

Where kidney transplants are unavailable, or a candidate is not suitable for a transplant, dialysis therapy is another option to treat ESKD. There were 1.3 million hospitalisations for CKD where the principal diagnosis was regular dialysis in 2012–13. In hospital, dialysis for CKD is recorded as a diagnosis code and information on this can be found in Chapter 4 ('Chronic kidney disease'). It is also recorded as a procedure, and 97% of dialysis procedures have regular dialysis as a principal diagnosis. Therefore, counting dialysis episodes by the diagnosis codes is the most accurate way of assessing dialysis for CKD (see 'Regular dialysis as the principal diagnosis' in Chapter 4).

Appendix A: Detailed statistical tables

Table A1: Cardiovascular disease hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<25	208	193	200	227	266	246
25–34	445	415	430	483	757	619
35–44	1,072	841	956	1,077	1,211	1,145
45–54	2,343	1,435	1,885	2,250	2,042	2,145
55–64	4,656	2,457	3,546	4,529	3,640	4,080
65–74	8,550	4,869	6,689	9,065	7,089	8,066
75–84	14,296	9,809	11,843	18,578	14,977	16,609
85+	19,613	14,732	16,466	31,488	24,979	27,291
All ages	2,648	1,939	2,293	3,010	2,958	2,984
All ages (age-standardised rate)[(a)]	2,536	1,643	2,067	2,909	2,481	2,673
Hospitalisations (number)	*301,873*	*223,031*	*524,904*	*343,135*	*340,338*	*683,474*
Remoteness[(a)]						
Major cities	2,457	1,571	1,985	2,970	2,506	2,709
Inner regional	2,698	1,780	2,218	2,864	2,399	2,611
Outer regional	2,854	1,886	2,367	2,853	2,417	2,623
Remote and very remote	2,911	2,188	2,578	3,241	3,776	3,464
Rate ratio (Remote and very remote/ Major cities)	*1.2*	*1.4*	*1.3*	*1.1*	*1.5*	*1.3*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	2,767	1,839	2,282	3,244	2,726	2,962
Group 2	2,631	1,715	2,152	2,868	2,468	2,645
Group 3	2,586	1,673	2,106	2,959	2,509	2,710
Group 4	2,476	1,583	2,004	2,896	2,440	2,643
Group 5 (highest SES)	2,230	1,387	1,782	2,644	2,290	2,441
Rate ratio (lowest/highest)	*1.2*	*1.3*	*1.3*	*1.2*	*1.2*	*1.2*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	3,634	2,931	3,253	5,600	6,408	6,017
Other Australians	2,510	1,611	2,037	2,846	2,391	2,594
Rate ratio (Indigenous/Other Australians)	*1.4*	*1.8*	*1.6*	*2.0*	*2.7*	*2.3*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A2: Coronary heart disease hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<25	2	1	1	1	1	1
25–34	28	9	19	10	6	8
35–44	242	86	164	53	27	39
45–54	859	291	572	196	78	136
55–64	1,890	645	1,262	524	224	373
65–74	3,296	1,353	2,313	1,406	648	1,022
75–84	4,593	2,428	3,409	3,218	1,828	2,458
85+	4,717	2,899	3,545	5,364	3,374	4,081
All ages	894	431	662	613	385	336
All ages (age-standardised rate)[(a)]	828	353	581	396	207	294
Hospitalisations (number)	*100,190*	*48,761*	*148,951*	*46,654*	*30,360*	*77,014*
Remoteness[(a)]						
Major cities	784	316	537	395	198	287
Inner regional	908	414	652	395	213	297
Outer regional	972	461	717	438	236	334
Remote and very remote	1,002	653	844	477	344	413
Rate ratio (Remote and very remote/ Major cities)	*1.3*	*2.1*	*1.6*	*1.2*	*1.7*	*1.4*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	949	434	683	454	243	341
Group 2	881	396	630	407	208	300
Group 3	853	362	597	390	209	292
Group 4	763	310	526	377	196	279
Group 5 (highest SES)	685	258	460	364	173	260
Rate ratio (lowest/highest)	*1.4*	*1.7*	*1.5*	*1.2*	*1.4*	*1.3*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	1,486	1,046	1,251	751	588	664
Other Australians	804	338	561	372	195	277
Rate ratio (Indigenous/Other Australians)	*1.8*	*3.1*	*2.2*	*2.0*	*3.0*	*2.4*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A3: Stroke hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<25	5	4	4	8	4	6
25–34	14	15	14	13	11	12
35–44	42	36	39	36	26	31
45–54	101	76	89	123	66	94
55–64	237	132	184	226	121	173
65–74	508	298	402	492	288	388
75–84	1,195	925	1,048	1,073	718	879
85+	2,104	1,973	2,020	1,692	1,286	1,430
All ages	167	151	159	157	118	138
All ages (age-standardised rate)[(a)]	162	120	140	152	96	122
Hospitalisations (number)	*19,068*	*17,324*	*36,392*	*17,899*	*13,615*	*31,514*
Remoteness[(a)]						
Major cities	155	111	132	163	102	130
Inner regional	174	132	152	146	88	116
Outer regional	186	145	165	118	77	97
Remote and very remote	208	148	177	103	78	92
Rate ratio (Remote and very remote/ Major cities)	*1.3*	*1.3*	*1.3*	*0.6*	*0.8*	*0.7*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	193	140	165	156	98	126
Group 2	172	126	148	142	85	112
Group 3	165	124	143	164	96	129
Group 4	150	107	128	153	93	120
Group 5 (highest SES)	127	94	110	151	109	128
Rate ratio (lowest/highest)	*1.5*	*1.5*	*1.5*	*1.0*	*0.9*	*1.0*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	272	239	256	164	203	186
Other Australians	160	117	137	145	92	117
Rate ratio (Indigenous/Other Australians)	*1.7*	*2.0*	*1.9*	*1.1*	*2.2*	*1.6*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A4: Heart failure and cardiomyopathy hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<55	29	17	23	46	30	38
55–64	259	131	194	397	220	307
65–74	748	411	577	1,227	769	995
75–84	2,277	1,521	1,863	3,753	2,809	3,237
85+	5,275	3,820	4,337	9,064	6,717	7,551
All ages	275	227	251	452	409	430
All ages (age-standardised rate)[(a)]	270	172	216	444	311	371
Hospitalisations (number)	*31,297*	*26,152*	*57,449*	*51,493*	*47,055*	*98,548*
Remoteness[(a)]						
Major cities	263	166	209	446	308	369
Inner regional	277	168	217	439	296	360
Outer regional	311	198	252	480	323	397
Remote and very remote	406	301	357	539	466	500
Rate ratio (Remote and very remote/ Major cities)	*1.5*	*1.8*	*1.7*	*1.2*	*1.5*	*1.4*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	324	213	263	524	372	442
Group 2	282	180	227	453	314	376
Group 3	274	175	220	452	316	377
Group 4	264	155	204	431	295	355
Group 5 (highest SES)	208	122	160	368	235	293
Rate ratio (lowest/highest)	*1.6*	*1.7*	*1.6*	*1.4*	*1.6*	*1.5*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	652	492	563	874	848	860
Other Australians	267	165	211	442	299	363
Rate ratio (Indigenous/Other Australians)	*2.4*	*3.0*	*2.7*	*2.0*	*2.8*	*2.4*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A5: All diabetes hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<25	77	112	94	68	191	128
25–34	77	190	133	275	1,532	898
35–44	106	147	127	812	1,639	1,228
45–54	203	116	159	2,474	2,114	2,292
55–64	352	168	259	6,643	4,683	5,654
65–74	558	282	418	14,452	9,612	12,004
75–84	822	482	636	23,609	15,865	19,375
85+	907	521	658	23,635	15,275	18,245
All ages	209	177	193	3,683	3,244	3,463
All ages (age-standardised rate)[(a)]	201	168	183	3,502	2,834	3,132
Hospitalisations (number)	*23,776*	*20,322*	*44,098*	*419,885*	*373,243*	*793,128*
Remoteness[(a)]						
Major cities	193	142	165	3,512	2,745	3,081
Inner regional	205	171	186	3,471	2,774	3,094
Outer regional	251	306	277	3,615	3,124	3,357
Remote and very remote	344	569	443	4,680	6,570	5,494
Rate ratio (Remote and very remote/ Major cities)	*1.8*	*4.0*	*2.7*	*1.3*	*2.4*	*1.8*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	261	253	255	4,290	3,748	3,984
Group 2	223	196	208	3,711	3,085	3,362
Group 3	198	163	178	3,586	2,944	3,226
Group 4	188	132	158	3,346	2,494	2,875
Group 5 (highest SES)	137	101	117	2,577	1,874	2,187
Rate ratio (lowest/highest)	*1.9*	*2.5*	*2.2*	*1.7*	*2.0*	*1.8*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	672	764	717	10,107	13,245	11,698
Other Australians	193	149	168	3,385	2,625	2,967
Rate ratio (Indigenous/Other Australians)	*3.5*	*5.1*	*4.3*	*3.0*	*5.0*	*3.9*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A6: Type 1 diabetes hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
0–9	37	42	39	25	18	22
10–19	111	140	125	58	88	72
20–29	69	87	78	88	138	113
30–39	58	58	58	131	168	150
40–49	52	49	50	166	174	170
50–59	58	40	49	244	208	226
60–69	55	26	41	364	284	323
70–79	41	37	39	458	348	401
85+	41	31	35	392	297	335
All ages	61	61	61	170	170	170
All ages (age-standardised rate)[(a)]	61	63	62	164	162	162
Hospitalisations (number)	*6,948*	*6,999*	*13,947*	*19,387*	*19,562*	*38,949*
Remoteness[(a)]						
Major cities	56	57	56	152	152	152
Inner regional	80	79	79	221	204	212
Outer regional	79	89	84	176	182	179
Remote and very remote	64	81	67	130	125	128
Rate ratio (Remote and very remote/ Major cities)	*1.1*	*1.4*	*1.2*	*0.9*	*0.8*	*0.8*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	77	79	78	198	190	194
Group 2	67	71	69	167	168	167
Group 3	63	65	64	175	180	177
Group 4	61	57	59	158	151	154
Group 5 (highest SES)	39	46	43	124	122	123
Rate ratio (lowest/highest)	*2.0*	*1.7*	*1.8*	*1.6*	*1.6*	*1.6*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	88	78	83	328	344	337
Other Australians	61	63	62	181	177	178
Rate ratio (Indigenous/Other Australians)	*1.4*	*1.2*	*1.3*	*1.8*	*1.9*	*1.9*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A7: Type 2 diabetes hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<25	3	2	2	10	25	18
25–34	12	11	11	141	266	203
35–44	49	34	41	645	811	728
45–54	139	71	105	2,231	1,882	2,055
55–64	295	136	215	6,219	4,364	5,283
65–74	498	246	371	13,869	9,193	11,504
75–84	772	439	590	22,963	15,366	18,809
85+	863	492	624	23,117	14,919	17,831
All ages	144	85	114	3,460	2,761	3,109
All ages (age-standardised rate)[(a)]	136	73	103	3,288	2,346	2,783
Hospitalisations (number)	*16,396*	*9,801*	*26,197*	*394,545*	*317,607*	*712,152*
Remoteness[(a)]						
Major cities	134	66	98	3,307	2,268	2,741
Inner regional	122	64	92	3,209	2,251	2,702
Outer regional	167	105	135	3,395	2,574	2,973
Remote and very remote	277	298	283	4,494	6,062	5,162
Rate ratio (Remote and very remote/ Major cities)	*2.1*	*4.5*	*2.9*	*1.4*	*2.7*	*1.9*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	180	111	144	4,040	3,135	3,555
Group 2	152	84	116	3,496	2,576	3,003
Group 3	132	72	100	3,360	2,424	2,855
Group 4	122	53	86	3,142	2,050	2,552
Group 5 (highest SES)	95	43	68	2,401	1,514	1,919
Rate ratio (lowest/highest)	*1.9*	*2.6*	*2.1*	*1.7*	*2.1*	*1.9*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	563	529	545	10,126	12,821	11,491
Other Australians	129	65	95	3,258	2,200	2,691
Rate ratio (Indigenous/Other Australians)	*4.4*	*8.1*	*5.7*	*3.1*	*5.8*	*4.3*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A8: Gestational diabetes hospitalisation rates by population groups, principal and additional diagnosis, 2012–13

Population subgroup	Hospitalisations per 100,000 population	
	Principal diagnosis	Additional diagnosis
Age group (years)		
15–19	12	54
20–24	38	295
25–29	82	823
30–34	99	1282
35–39	66	926
40–44	19	263
45–49	2	18
All ages	22	257
All ages (age-standardised rate)[(a)]	24	273
Hospitalisations (number)	*2,557*	*29,321*
Remoteness[(a)]		
Major cities	14	270
Inner regional	19	258
Outer regional	94	305
Remote and very remote	133	331
Rate ratio (Remote and very remote/Major cities)	*9.5*	*1.2*
Socioeconomic status (SES) group[(a)]		
Group 1 (lowest SES)	45	358
Group 2	32	283
Group 3	19	279
Group 4	16	238
Group 5 (highest SES)	8	196
Rate ratio (lowest/highest)	*5.6*	*1.8*
Aboriginal and Torres Straits Islander status[(a)]		
Indigenous	150	390
Other Australians	19	266
Rate ratio (Indigenous/Other Australians)	*7.9*	*1.5*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A9: Regular dialysis hospitalisation rates by population groups, principal diagnosis, 2012–13

	Hospitalisations per 100,000 population		
Population subgroup	**Males**	**Females**	**Persons**
Age group (years)			
<25	232	217	225
25–34	1,215	888	1,052
35–44	3,294	2,347	2,818
45–54	6,093	4,834	5,458
55–64	11,956	8,313	10,117
65–74	20,787	14,252	17,482
75–84	40,545	21,286	30,015
85+	29,781	8,214	15,875
All ages	6,580	4,505	5,538
All ages (age-standardised rate)[(a)]	6,321	4,024	5,085
Hospitalisations (number)	*750,268*	*518,270*	*1,268,538*
Remoteness[(a)]			
Major cities	6,784	3,844	5,186
Inner regional	5,049	3,159	4,040
Outer regional	5,972	5,316	5,608
Remote and very remote	9,969	16,739	12,864
Rate ratio (Remote and very remote/Major cities)	*1.5*	*4.4*	*2.5*
Socioeconomic status (SES) group[(a)]			
Group 1 (lowest SES)	8,300	5,866	7,012
Group 2	6,463	4,365	5,342
Group 3	6,426	3,921	5,081
Group 4	5,805	3,509	4,549
Group 5 (highest SES)	4,955	2,690	3,693
Rate ratio (lowest/highest)	*1.7*	*2.2*	*1.9*
Aboriginal and Torres Straits Islander status[(a)]			
Indigenous	39,268	49,011	44,253
Other Australians	5,805	3,281	4,449
Rate ratio (Indigenous/Other Australians)	*6.8*	*14.9*	*9.9*

(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A10: Chronic kidney disease hospitalisation rates (excluding dialysis) by population groups, principal and additional diagnosis, 2012–13

	Hospitalisations per 100,000 population					
	Principal diagnosis			Additional diagnosis		
Population subgroup	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Age group (years)						
<25	55	119	86	59	71	65
25–34	78	140	109	106	174	140
35–44	93	141	117	254	245	250
45–54	214	152	183	568	444	506
55–64	237	186	211	1,381	894	1,135
65–74	419	271	344	3,496	2,093	2,787
75–84	665	314	473	9,219	5,407	7,135
85+	653	346	455	16,120	8,861	11,439
All ages	167	164	166	1,173	890	1,031
All ages (age-standardised rate)[(a)]	163	158	159	1,144	733	915
Hospitalisations (number)	*19,054*	*18,903*	*37,958*	*133,709*	*102,425*	*236,134*
Remoteness[(a)]						
Major cities	166	149	155	1,183	714	918
Inner regional	162	147	154	1,062	652	836
Outer regional	137	180	158	1,092	783	924
Remote and very remote	219	415	306	1,647	2,146	1,854
Rate ratio (Remote and very remote/Major cities)	*1.3*	*2.8*	*2.0*	*1.4*	*3.0*	*2.0*
Socioeconomic status (SES) group[(a)]						
Group 1 (lowest SES)	190	195	191	1,426	1,032	1,206
Group 2	178	161	168	1,159	745	929
Group 3	199	174	184	1,185	731	933
Group 4	131	141	135	1,104	654	852
Group 5 (highest SES)	110	107	107	867	471	641
Rate ratio (lowest/highest)	*1.7*	*1.8*	*1.8*	*1.6*	*2.2*	*1.9*
Aboriginal and Torres Straits Islander status[(a)]						
Indigenous	424	623	526	3,916	4,533	4,237
Other Australians	158	146	150	1,111	671	866
Rate ratio (Indigenous/Other Australians)	*2.7*	*4.3*	*3.5*	*3.5*	*6.8*	*4.9*

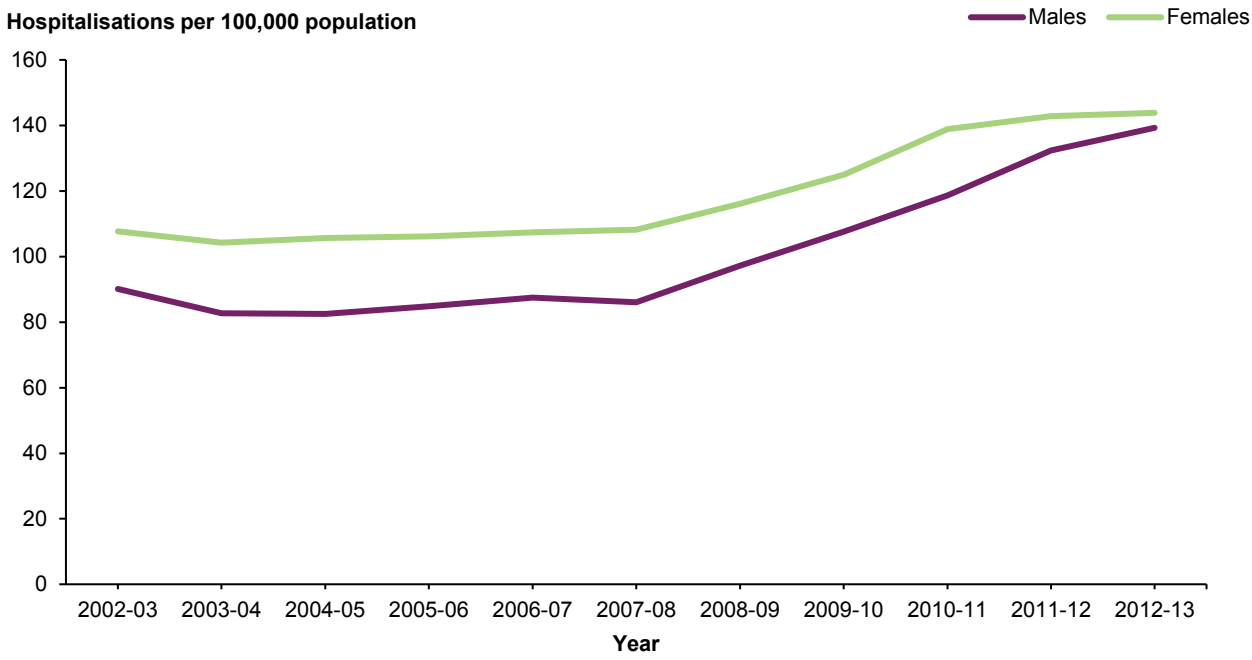
(a) Age-standardised to the 2001 Australian Standard Population.

Source: AIHW National Hospital Morbidity Database.

Table A11: Age–specific hospitalisation rates per 100,000 with any combination of CVD, diabetes or CKD diagnosis, by sex, 2012–13

	Age group (years)						
Sex	**25–34**	**35–44**	**45–54**	**55–64**	**65–74**	**75–84**	**85+**
				CVD, diabetes and CKD			
Males	25	83	268	742	1,902	4,537	5,764
Females	28	85	208	467	1,118	2,658	3,167
Persons	26	84	238	603	1,506	3,510	4,090
				CKD and CVD			
Males	43	88	154	293	737	2,629	6,729
Females	47	67	108	177	441	1,534	3,814
Persons	45	77	131	234	587	2,031	4,850
				CKD and diabetes			
Males	21	50	133	320	729	1,535	1,977
Females	37	61	103	211	427	883	1,014
Persons	29	56	118	265	576	1,178	1,356
				CVD and diabetes			
Males	42	136	531	1,636	3,492	5,543	5,738
Females	53	131	351	888	1,987	3,865	4,362
Persons	48	133	440	1,258	2,731	4,625	4,851
				CVD only			
Males	823	1,857	3,678	6,600	11,648	20,502	33,459
Females	1,050	1,785	2,846	4,631	8,547	17,010	28,894
Persons	935	1,820	3,258	5,606	10,080	18,593	30,516
				CKD only			
Males	95	125	226	262	543	1,174	2,298
Females	202	173	177	225	377	641	1,210
Persons	148	149	201	243	459	883	1,596
				Diabetes only			
Males	263	649	1,744	4,298	8,887	12,816	11,062
Females	1,603	1,509	1,568	3,285	6,363	8,942	7,252
Persons	928	1,081	1,655	3,787	7,611	10,698	8,606

Source: AIHW National Hospital Morbidity Database.



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

Figure A1: Trends in hospitalisation rates for CKD (as the principal diagnosis), excluding diabetic nephropathy, by sex, 2002–03 to 2012–13

Table A12: Hospitalisations (excluding regular dialysis) for people aged 25 years and over with a diagnosis of CVD, diabetes and CKD, by sex, 2012–13

Hospitalisation type	Number			Rate per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
1 disease						
CVD only	436,326	406,082	842,409	5,720	4,612	5,139
Diabetes only	253,466	247,385	500,851	3,290	2,967	3,104
CKD only	24,289	22,289	46,578	320	263	287
2 diseases						
CVD and CKD (without diabetes)	37,454	29,185	66,639	500	304	390
CVD and diabetes (without CKD)	98,144	72,294	170,438	1,276	819	1,037
Diabetes and CKD (without CVD)	24,057	17,671	41,728	316	203	254
3 diseases						
CVD, diabetes and CKD	62,500	45,245	107,745	823	506	650
All cause hospitalisations (non-dialysis)	**3,659,756**	**4,351,587**	**8,011,343**	. .	. .	. .

.. Not applicable.
Source: AIHW National Hospital Morbidity Database.

Table A13: Coronary angiography by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<25	280	170	452	7.4	4.7	6.1
25–34	532	196	728	31.7	11.9	21.9
35–44	3,429	1,328	4,757	215.4	82.5	148.6
45–54	10,993	4,446	15,439	723.7	287.3	503.5
55–64	20,955	9,135	30,090	1,619.8	692.7	1,151.8
65–74	25,328	12,743	38,071	2,810.6	1,382.1	2,088.1
75–84	15,980	11,185	27,165	3,443.3	1,997.7	2,652.8
85+	3,256	2,994	6,250	2,111.4	1,069.6	1,439.7
All ages	80,753	42,197	122,952	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	662.8	317.5	484.0

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Table A14: Echocardiography by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<25	451	396	847	11.9	11.0	11.4
25–34	486	401	887	29.0	24.3	26.7
35–44	1,089	583	1,672	68.4	36.2	52.2
45–54	2,323	961	3,284	152.9	62.1	107.1
55–64	4,709	1,755	6,464	364.0	133.1	247.4
65–74	5,815	2,519	8,334	645.3	273.2	457.1
75–84	3,763	2,347	6,110	810.8	419.2	596.7
85+	750	613	1,363	486.4	219.0	314.0
All ages	19,386	9,575	28,961	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	160.1	74.2	115.5

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Table A15: Percutaneous coronary interventions by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<25	24	14	38	0.6	0.4	0.5
25–34	104	33	137	6.2	2.0	4.1
35–44	1,264	246	1,510	79.4	15.3	47.2
45–54	4,425	868	5,293	291.3	56.1	172.6
55–64	7,847	1,820	9,667	606.6	138.0	370.0
65–74	8,451	2,625	11,076	937.8	284.7	607.5
75–84	4,884	2,694	7,578	1,052.4	481.2	740.0
85+	1,176	924	2,100	762.6	330.1	483.7
All ages	28,175	9,224	37,399	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	230.2	68.7	146.8

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Table A16: Coronary artery bypass grafts by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<45	202	55	257	2.9	0.8	1.8
45–54	983	175	1,158	64.7	11.3	37.8
55–64	2,619	434	3,053	202.4	32.9	116.9
65–74	3,542	863	4,405	393.0	93.6	241.6
75–84	2,146	821	2,967	462.4	146.6	289.7
85+	263	130	393	170.5	46.4	90.5
All ages	9,755	2,478	12,233	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	79.4	18.7	47.9

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Table A17: Heart valve replacements by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<25	287	244	531	7.6	6.7	7.2
25–34	102	91	193	6.1	5.5	5.8
35–44	156	114	270	9.8	7.1	8.4
45–54	383	202	585	25.2	13.1	19.1
55–64	879	447	1,326	67.9	33.9	50.8
65–74	1,673	813	2,486	185.6	88.2	136.4
75–84	1,675	1,074	2,749	360.9	191.8	268.5
85+	465	434	899	301.5	155.0	207.1
All ages	5,620	3,419	9,039	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	47.6	25.7	36.0

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Table A18: Pacemaker insertions by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<25	31	27	58	0.8	0.7	0.8
25–34	27	39	66	1.6	2.4	2.0
35–44	78	66	144	4.9	4.1	4.5
45–54	199	122	321	13.1	7.9	10.5
55–64	702	418	1,120	54.3	31.7	42.9
65–74	2,081	1,212	3,293	230.9	131.4	180.6
75–84	3,405	2,489	5,894	733.7	444.5	575.6
85+	1,909	1,737	3,646	1,237.9	620.5	839.8
All ages	8,432	6,110	14,542	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	73.0	42.0	55.6

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Table A19: Cardiac defibrillator implantations by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<25	36	14	50	0.9	0.4	0.7
25–34	45	33	78	2.7	2.0	2.3
35–44	128	44	172	8.0	2.7	5.4
45–54	285	102	387	18.8	6.6	12.6
55–64	592	194	786	45.8	14.7	30.1
65–74	945	232	1,177	104.9	25.2	64.6
75–84	607	160	767	130.8	28.6	74.9
85+	71	21	92	46.0	7.5	21.2
All ages	2,709	800	3,509	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	22.5	6.2	14.0

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity database.

Table A20: Carotid endarterectomies by age and sex, 2012–13

Age group (years)	Number of procedures			Procedures per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
<55	58	35	93	0.7	0.4	0.5
55–64	306	112	418	23.7	8.5	16.0
65–74	693	247	940	76.9	26.8	51.6
75–84	537	232	769	115.7	41.4	75.1
85+	104	74	178	67.4	26.4	41.0
All ages	1,698	700	2,398	. .	. .	. .
All ages (age-standardised rate)	. .	. .	. .	14.1	5.2	9.4

. . Not applicable.

Note: Age-standardised to the 2001 Australian population.

Source: AIHW National Hospital Morbidity Database.

Appendix B: Methods and definitions

Age-specific rates

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

Age-standardised rates

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

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

Rate ratio

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

Reporting hospitalisations

The National Hospital Morbidity Database (NHMD) compiles episode-level records from admitted patient morbidity data collection systems in Australian hospitals. The database contains data relating to admitted patients in almost all hospitals in Australia.

The counting unit in the NHMD is the separation, described as hospitalisations in this report. Separation is the term used to refer to the episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation).

Although hospital separations data are a valuable source of information about admitted patient care, they have limitations as indicators of ill health. Sick people who are not admitted to hospital are not counted and those who have more than 1 separation in a reference year are counted on each occasion.

The hospital separations data do not include episodes of non-admitted patient care provided in outpatient clinics or emergency departments. Patients in these settings may be admitted subsequently, with the care provided to them as admitted patients being included in the NHMD. The following care types were excluded when undertaking the analysis: 7.3 (newborn – unqualified days only), 9 (organ procurement – posthumous) and 10 (hospital boarder). Data on diagnoses are recorded uniformly using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM 7th edition) (NCCH 2010). Information on procedures was recorded using the Australian Classification of Health Interventions (ACHI). The relevant diagnosis and procedure codes used in this report are described in Appendix C. A data quality statement for the AIHW NHMD can be found at: <http://meteor.aihw.gov.au/content/index.phtml/itemId/568730>. Additional detailed information can also be found in Appendix A of *Australian hospital statistics 2012–13* (AIHW 2014a).

Reporting data by remoteness

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

The category *Major cities* include Australia's capital cities, with the exceptions of Hobart and Darwin, which are classified as *Inner regional*. In this report, populations from *Remote* and *Very remote* areas were grouped under 1 category of remoteness. The sixth category, *Migratory*, is not used in this publication. In this report, remoteness is based on area of usual residence of the patient.

Further information is available on the ABS website at:
<http://www.abs.gov.au/websitedbs/d3310114.nsf/home/australian+statistical+geography+standard+(asgs)>.

Reporting data by socioeconomic group

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

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

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

In this report, socioeconomic disadvantage is based on area of usual residence of the patient.

The IRSD values used in this report are based on the 2011 Census. Further information is available on the ABS website at:
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012011?OpenDocument>.

Reporting Aboriginal and Torres Strait Islander status

In this report, comparisons are made between Aboriginal and Torres Strait Islander persons, and Other Australians. Aboriginal or Torres Strait Islander persons are persons of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander (see 'Glossary'). The category 'Other Australians' combines people who do not identify as Indigenous and people with not-stated Indigenous status.

The Indigenous status data in the NHMD for all states and territories are considered of sufficient quality for statistical reporting for 2010–11, 2011–12 and 2012–13. In 2011–12, an estimated 88% of Indigenous patients were correctly identified in public hospitals. The overall quality of the data provided for Indigenous status is considered to be in need of some improvement (AIHW 2013a).

Populations used in this report

National populations

The ABS estimated (mid-year) resident population data were used to calculate rates throughout this report. These data were sourced from ABS Australian demographic statistics (ABS cat. no. 3101.0) as at December 2012. Relevant years and states were selected based on numerator data availability, and are available on the ABS website at:
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Sep%202011?OpenDocument>.

Regional populations

Remoteness areas

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

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

Link to correspondence files between the (now superseded) Australian Standard Geographical Classification (ASGC) and ASGS:
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1216.0.15.002July%202011?OpenDocument>.

Socioeconomic status

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

Link to IRSD data by geographical units:
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012011?OpenDocument>.

Link to population data by geographical unit:
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3235.02012?OpenDocument>.

Aboriginal and Torres Strait Islander populations

For Indigenous comparisons, the ABS Indigenous estimated populations were used, based on the 2011 Census of Population and Housing (ABS 2014a). Estimates of Other Australians have been calculated from non-recast estimated resident populations (ERPs) based on the 2011 Census (ABS 2014b). Rates for 2012–13 have been calculated from ERPs at June 2013 (ABS 2014b).

Link to Aboriginal and Torres Strait Islander populations:
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3238.02001%20to%202026?OpenDocument>.

Appendix C: Classifications

International Statistical Classification of Diseases and Related Health Conditions

Australia uses the International Statistical Classification of Diseases and Related Health Conditions. For hospital diagnoses and procedures, a slightly different classification, modified for morbidity coding in Australia, is used. In this report, hospital data up to 1997–98 uses the International Classification of Diseases and Related Health Conditions, 9th Revision, Clinical Modification (ICD-9-CM), and thereafter, the International Statistical Classification of Diseases and Related Health Conditions, 10th Revision, Australian Modification (ICD-10-AM). Details of the codes used for diagnosis in this report are given below (tables C1 to C3).

ICD-10-AM was developed by the National Centre for Classification in Health (NCCH) and has been in use since 1998. It was developed with assistance from clinicians and clinical coders to ensure that the classification is current and appropriate for Australian clinical practice. ICD-10-AM is a derived version of the World Health Organization (WHO) ICD-10. It uses an alphanumeric coding scheme for diseases and external causes of injury. It is structured by body system and aetiology, and comprises 3, 4 and 5 character categories. ICD-10-AM is updated on a regular basis, with the regular updates of ICD-10 being included as part of the updating process. See *Australian hospital statistics 2012–13* (AIHW 2014a) for more information.

Table C1: Codes used to define diagnosis groups for cardiovascular disease

Cardiovascular disease type	ICD-9-CM codes	ICD-10-AM codes
Cardiovascular disease	390–459	I00–I99
Coronary heart disease	410–414	I20–I25
Acute myocardial infarction	410	I21
Angina	413	I20
Cerebrovascular disease	430–438	I60–I69
Stroke	430–434, 436	I60–I64
Transient ischaemic attack (TIA)	435	G45
Heart failure and cardiomyopathy	414.8, 428.0, 428.1, 428.9, 425.2, 425.4, 425.5, 425.7, 425.8, 425.9	I50, I25.5, I42.0, I42.5–I42.9, I43
Heart failure	428	I50
Peripheral vascular disease	440–444	I70–I74
Congenital heart disease	745–747	Q20–Q28

Table C2: ICD-10-AM codes used to define diagnosis groups for diabetes

Type of diabetes	ICD-10-AM codes
Diabetes	E10–E14
Type 1 diabetes	E10
Type 2 diabetes	E11
Other and Unspecified diabetes	E13–E14
Gestational diabetes	O24.4

Table C3: ICD-10-AM codes used to define diagnosis groups for CKD

Group of chronic kidney disease	ICD-10-AM codes
Regular dialysis	
Haemodialysis	Z49.1
Peritoneal dialysis	Z49.2
Other	
Diabetic nephropathy	E10.2, E11.2, E13.2, E14.2
Hypertensive kidney disease	I12, I13, I15.0, I15.1
Glomerular diseases	N00–N07, N08
Kidney tubulo-interstitial diseases	N11, N12, N14, N15, N16
Chronic kidney failure	N18
Unspecified kidney failure	N19
Other disorders of kidney and ureter	N25–N28, N391, N392, E85.1, D59.3, B52.0
Congenital malformations	Q60–Q63
Complications related to dialysis and kidney transplant	T82.4, T86.1
Preparatory care for dialysis	Z49.0
Kidney transplant and dialysis status	Z94.0, Z99.2

Australian Classification of Health Interventions

The Australian Classification of Health Interventions (ACHI) is Australia's intervention classification and is used in conjunction with ICD-10-AM to code interventions. Procedure codes used in this report are from the ACHI. The National Centre for Classification in Health (NCCH) issues new editions of ICD and ACHI codes every 2 years.

The data in this report were extracted from the procedures recorded using the 7th edition of ACHI (NCCH 2010). The ACHI classification is divided into 20 chapters by anatomical site. These subchapters are further divided into more specific procedure blocks, ordered from the least invasive to the most invasive. The blocks, which are numbered sequentially, group the very specific procedure information. In this report, procedures are mostly presented based on the ACHI procedures and the ACHI procedure blocks (Table C4). See *Australian hospital statistics 2012–13* (AHS 2014a) for more information.

Table C4: Australian Classification of Health Interventions (ACHI) codes for procedures used in this report

Procedure codes	ACHI code
Cardiovascular disease	
Coronary angiography	Block: 668
Percutaneous coronary interventions	Blocks: 670,671
Coronary artery bypass grafting	Blocks: 672–679
Heart transplant	Bock: 660
Cardiac defibrillator implants	Block :653
Valve replacement, repair or reconstruction	Blocks: 621–638
Pacemaker insertion	Block: 650
Defibrillator implant	Block: 653
Echocardiography	Block: 1942
Carotid endarterectomy	33500–00 (Block: 700)
Diabetes	
Lower limb amputation	Block: 1533
Kidney disease	
Kidney transplants	36503–00 (Block: 1058)
Dialysis	Block: 1060,1061

Stages of chronic kidney disease

Box C1: Stages of chronic kidney disease

Stage 1: Kidney damage with normal kidney function (eGFR ≥ 90 mL/min/1.73 m^2)

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

Stage 2: Kidney damage with mild loss in kidney function (eGFR 60–89 mL/min/1.73 m^2)

Most patients have no symptoms but high blood pressure is frequent. Patients also had albuminuria.

Stage 3a and b: Mild–moderate loss of kidney function (eGFR 45–59 mL/min/1.73 m^2) (3a), or moderate–severe loss of kidney function (eGFR 30–44 mL/min/1.73 m^2) (3b)

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 mL/min/1.73 m^2)

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 mL/min/1.73 m2 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, and disturbances or structural or functional changes in the peripheral nervous system.

Source: Adapted from Kidney Health Australia (2007, 2012).

Appendix D: Data sources

National Hospital Morbidity Database

The hospitalisation data in this report are sourced from the AIHW National Hospital Morbidity Database (NHMD), which is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. The NHMD is based on the Admitted Patient Care National Minimum Data Set (APC NMDS). It records information on admitted patient care (hospitalisations) in essentially all hospitals in Australia, and includes demographic, administrative and length-of-stay data, as well as data on the diagnoses of the patients, the procedures they underwent in hospital and external causes of injury and poisoning.

The purpose of the APC NMDS is to collect information about care provided to admitted patients in Australian hospitals. The scope of the APC NMDS is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, freestanding day hospital facilities and alcohol and drug treatment centres in Australia. Hospitals operated by the Australian Defence Force, corrections authorities and in Australia's offshore territories are not in scope but some are included.

Reporting to the NHMD occurs at the end of a person's admitted episode of care (separation or hospitalisation) and is based on the clinical documentation for that hospitalisation. Hospitalisations (separations) are reported to the NHMD in accordance with the requirements of the APC NMDS. The APC NMDS requires the principal diagnosis and any additional diagnoses to be reported according to the most recent edition of the International Statistical Classification of Diseases and Health Related Problems, 10th Revision, Australian Modification (ICD-10-AM) and associated Australian Coding Standards.

Most of the data used in this report were for the financial year 2012–13. Some trend information was also included from 1993–94 to 2012–13.

The data in this report were extracted from the AIHW NHMD in June 2014 and small changes may have occurred since this time.

Link to National Hospital Morbidity Database Data Quality Statement: <http://meteor.aihw.gov.au/content/index.phtml/itemId/568730>.

Australia and New Zealand Dialysis and Transplant Registry (ANZDATA)

ANZDATA collects information to monitor dialysis and transplant treatments from all renal units in Australia and New Zealand on all patients receiving kidney replacement therapy where the intention to treat is long term. Cases of acute kidney failure are excluded. The Registry is coordinated within the Queen Elizabeth Hospital in Adelaide, and compiles data on incidence and prevalence of treated end-stage kidney disease (ESKD), complications, comorbidities and patient deaths. All relevant hospitals and related dialysis units participate. While patients have the option of opting out of having part or all of their data recorded, this rarely happens.

The interpretation and reporting of these data are the responsibility of the AIHW and in no way should be seen as an official policy or interpretation of the ANZDATA Registry.

Information about the data quality of ANZDATA can be found in the *ANZDATA Registry 2012 Report* (McDonald et al. 2013), available at: <http://www.anzdata.org.au/v1/report_2012.html>.

Glossary

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

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

additional diagnosis: Conditions or complaints, either coexisting with the principal diagnosis or arising during the episode of admitted patient care (hospitalisation), episode of residential care or attendance at a health-care establishment that require the provision of care. Multiple diagnoses may be recorded.

admitted patient: A patient who undergoes a hospital's admission process.

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

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

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

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

body mass index (BMI): The most commonly used method of assessing whether a person is of normal weight, underweight, overweight or obese. It is calculated by dividing the person's weight (in kilograms) by their height (in metres) squared; that is, kg ÷ m2. For both men and women, underweight is a BMI below 18.5, acceptable weight is from 18.5 to less than 25, overweight is 25 and above (includes obese), and obese is 30 and over. Sometimes overweight and obese are combined, and defined as a BMI of 25 and over.

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

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

care type: The care type defines the overall nature of a clinical service provided to an admitted patient during an episode of care (admitted care), or the type of service provided by the hospital for boarders or posthumous organ procurement (other care). Admitted patient care consists of the following categories: acute care, rehabilitation care, palliative care, geriatric evaluation and management, psychogeriatric care, maintenance care, newborn care and other admitted care (that is, where the principal clinical intent does not meet the criteria for any of the above). Other services include: posthumous organ procurement and hospital boarder.

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

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

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

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

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

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

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

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

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

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

haemodialysis: A form of dialysis where a machine is connected to a person's bloodstream to filter the blood externally.

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

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

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

hospitalisation: An episode of care for an *admitted patient*, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation). Separation also means the process by which an admitted patient completes an episode of care either by being discharged, dying, transferring to another hospital or changing type of care. (See also *separation*.)

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

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

length of stay: Duration of hospital stay, calculated by subtracting the date the patient is admitted from the date of separation and deducting days the patient was on leave. A same-day patient is allocated a length of stay of 1 day.

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

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

Other Australians: People who have declared they are not Aboriginal or Torres Strait Islander descent, and those whose Indigenous status is unknown.

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

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

principal diagnosis: The diagnosis listed in hospital records to describe the problem that was chiefly responsible for hospitalisation.

procedure: A clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training and/or requires special facilities or equipment available only in an acute-care setting.

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

same-day separation: An admitted patient who is admitted and separated on the same date.

separation: The formal process where a hospital records the completion of an episode of treatment and/or care for an admitted patient. In this report, described by the term *hospitalisation*.

stroke: When an artery supplying blood to the brain suddenly becomes blocked or bleeds. Often causes paralysis of parts of the body normally controlled by that area of the brain, or speech problems and other symptoms.

transient ischaemic attack (TIA): A 'mini' stroke, with temporary problems in speech or paralysis that last for 24 hours or less, often only minutes. It is a strong warning sign of a more severe stroke.

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

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

unstable angina: A form of angina that is more dangerous than normal angina but less so than a heart attack. It can feature chest pain that occurs at rest; and in someone who already has angina, it can be marked by new patterns of onset with exertion or by pain that comes on more easily, more often or for longer than previously.

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List of tables

List of figures

List of boxes

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

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

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