Australian Government
Australian Institute of Health and Welfare

Stroke and its management in Australia: an update

CARDIOVASCULAR DISEASE SERIES NO. 37

Australian Government
Australian Institute of Health and Welfare

Authoritative information and statistics to promote better health and wellbeing

CARDIOVASCULAR DISEASE SERIES
Number 37

Stroke and its management in Australia: an update

Australian Institute of Health and Welfare
Canberra

Cat. no. CVD 61

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

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

ISSN 1323-9236
ISBN 978-1-74249-441-8

Suggested citation
Australian Institute of Health and Welfare 2013. Stroke and its management in Australia: an update. Cardiovascular disease series no. 37. Cat. no. CVD 61. Canberra: AIHW.

Any enquiries about or comments on this publication should be directed to:
Communications, Media and Marketing Unit
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1032
Email: info@aihw.gov.au

Published by the Australian Institute of Health and Welfare

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

Contents

Acknowledgments

This report was prepared by Lany Trinh, Anne-Marie Waters, Lynelle Moon and Helena Hurst of the National Centre for Monitoring Cardiovascular Disease at the Australian Institute of Health and Welfare (AIHW).

The report was prepared under the guidance of the Cardiovascular Disease Monitoring Advisory Committee.

Valuable input was gratefully received from:

- **Cardiovascular Disease Monitoring Advisory Committee members:** Andrew Tonkin (Chair), Tom Briffa, Derek Chew, Annette Dobson, Jeff Flack, Louise Gates, Rob Grenfell, Noel Hayman, Ian Ring, John Lynch, Timothy Mathew, Lynelle Moon and Amanda Thrift.

- **Australian Institute of Health and Welfare:** Lisa McGlynn, Judith Abercromby, Evon Bowler, Peter Braun, Louise Catanzariti, Liz Gilbert, Wen Xingyan and Michael Bourchier.

The Department of Health and Ageing (DoHA) funded this report. The authors acknowledge the valuable comments from individual staff members of DoHA.

Abbreviations

ABS	Australian Bureau of Statistics
ACAP	Aged Care Assessment Program
ACAT	Aged Care Assessment Team
ACHI	Australian Classification of Health Interventions
ACFI	Aged Care Funding Instrument
AROC	Australasian Rehabilitation Outcomes Centre
AIHW	Australian Institute of Health and Welfare
ASR	Age-standardised rate
BEACH	Bettering the evaluation and care of health
CACP	Community Aged Care Packages
CHC	Complex Health Care
CT	Computerised tomography
CVD	Cardiovascular disease
DALY	Disability Adjusted Life Year
DDD	Defined Daily Dose
DoHA	Department of Health and Ageing
DTC	Day Therapy Centres
DUSC	Drug Utilisation Sub-Committee
EACH	Extended Aged Care at Home packages
EACHD	Extended Aged Care at Home Dementia packages
ERP	Estimated Resident Population
GP	General Practitioner
HACC	Home and Community Care
INR	International Normalised Ratio
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging
NATSIHS	National Aboriginal Torres Strait Islander Health Survey
NCCH	National Centre for Classification in Health

NEMESIS	North East Melbourne Stroke Incidence Study
NHMD	National Hospital Morbidity Database
NHS	National Health Survey
OECD	Organisation for Economic Co-operation and Development
PAR	Population attributable risk
PBS/RPBS	Pharmaceutical Benefits Scheme and Repatriation Pharmaceutical Scheme
PCCL	Patient Complication and Comorbidity Level
PCSS	The Perth Community Stroke Study
RCS	Resident Classification Scale
Rt-PA	Intravenous tissue plasminogen activator
SEIFA	Socio-Economic Index For Areas
SLA	Statistical Local Area
TIA	Transient ischaemic attack
WHO	World Health Organization

Symbols

–	nil or rounded to zero
. .	not applicable
n.a.	not available
n.p.	not publishable because of small numbers, confidentiality or other concerns about the quality of the data

Summary

Stroke poses a burden on patients, their families and services

- Although stroke event rates fell by 25% between 1997 and 2009, the estimated number of stroke events increased by almost 6% in the same period due to the ageing of the population.
- Stroke death rates declined in Australia by 70% between 1979 and 2010. In 2010, stroke caused 8,300 deaths in Australia, accounting for 6% of all deaths.
- More people are now surviving a stroke, with an estimated 375,800 people surviving in 2009.
- Between 1998 and 2009, disability caused by stroke declined from 45% to 35%.
- In 2009–10, there were more than 35,300 hospitalisations for stroke and 25,800 hospitalisations for rehabilitation care associated with stroke.
- Informal carers play an important role in the care of stroke survivors. In 2009, an estimated 75,000 primary carers provided assistance to people with stroke and disability. More than half of primary carers spend 40 hours or more each week in their caring role.
- In 2008–09, total health-care expenditure for stroke in Australia was $606 million, which accounts for 7.8% of the estimated health-care expenditure of all cardiovascular disease and is second only to coronary heart disease.
- Stroke prevalence rates were higher in Aboriginal and Torres Strait Islander people than in the non-Indigenous population, and higher in people from the lowest socioeconomic group than in those in the highest socioeconomic group.

Specialised care facilities for patients increase

- Stroke units significantly improve health outcomes of stroke patients. Between 2007 and 2011, the number of stroke units in public hospitals increased from 54 to 74 and the proportion of patients receiving stroke unit care increased from 50% to 60%.

But there is still room for improvement

- Thirty-nine per cent of hospitals required to admit and manage people with acute stroke reported having a stroke unit. Although this is an improvement compared with 2004 (19%), it is still low compared with some other countries with similar sized economies to Australia.
- From 2007 to 2010, the number of patients admitted for ischaemic stroke who received thrombolysis increased from 461 to 1,170. This could be related to an increase in the number of stroke units offering this service (from 24% in 2007 to 36% in 2011).
- Although discharge planning is recommended for all stroke survivors, and is a pivotal point in the journey to recovery, only 50% of stroke patients received such a plan in 2011.

Data gaps limit our knowledge in several areas

- There are limited national data on: the time elapsed between onset of stroke symptoms and the start of emergency care; uptake of best practice guidelines; or medications given in acute care or at discharge.

1 Introduction

Background

What is stroke?

Stroke occurs when an artery supplying blood to the brain either suddenly becomes blocked or begins to bleed (National Stroke Foundation 2012a). This may result in part of the brain dying, leading to a sudden impairment that can affect a range of activities such as speaking, thinking, movement and communication (National Stroke Foundation 2012b).

There are two main types of stroke: a blood clot or other particles blocking a blood vessel causes one type (ischaemic stroke, which is also known as cerebral infarction) and the rupturing and subsequent bleeding of a blood vessel causes the other (haemorrhagic stroke). Ischaemic stroke accounts for about 80% of stroke and haemorrhagic stroke accounts for about 20% (National Stroke Foundation 2012c).

Symptoms and signs of stroke include one or more of the following:

- motor impairments (weakness or paralysis of parts of the body, including the face, on one or both sides)
- sensory impairments (touch, pain, warm/cold), most often on one side
- speech difficulties or slurred speech
- vision difficulties (sudden loss of vision, blurred vision), most often on one side
- dizziness, loss of balance or unexplained fall
- sudden severe headache
- difficulty swallowing.

Stroke is sometimes referred to as cerebrovascular disease, but cerebrovascular disease is actually a broad category of diseases that include stroke and other disorders of the blood vessels supplying the brain or its covering membranes. In 2010, there were 8,304 deaths from stroke, accounting for 74% of cerebrovascular disease deaths (11,204 deaths) in that year. More detailed information about deaths from stroke is provided in Chapter 2. Where the terms stroke and cerebrovascular disease are used interchangeably in this report, this is noted.

What is transient ischaemic attack?

A condition related to stroke is transient ischaemic attack (TIA), which results from a temporary blockage of the blood supply to the brain, usually lasting only a few minutes, and producing stroke-like symptoms that disappear within 24 hours (National Stroke Foundation 2012a). It is a very important predictor of stroke.

What are the major risk factors?

The INTERSTROKE study found that 10 risk factors accounted for 90% of the population attributable risk (PAR) for stroke worldwide (O'Donnell et al. 2010). These risk factors included high blood pressure, physical inactivity, high waist-to-hip ratio and smoking.

People who have had a TIA are at high risk of stroke. Meta-analysis has shown that the risk of early stroke after TIA is 3.5% at 2 days, 8.0% at 30 days and 9.2% at 90 days (Wu et al. 2007). Thus, TIAs provide a warning and an opportunity for preventing stroke, and must be treated as an emergency.

As shown by the following estimates based on the Australian Bureau of Statistics (ABS) 2007–08 National Health Survey (NHS), some of the risk factors for stroke are very common (unpublished AIHW analysis of 2007–08 NHS; ABS 2009a; AIHW 2011a; AIHW 2011c; and AIHW 2008):

- In 2007–08, 25% of Australians aged 18 and over (about 2.8 million) were obese (ABS 2009a). In addition, 37% of Australians (about 4.1 million) were overweight but not obese.
- In 2007–08, 41% of Australians aged 18 and over (6.4 million) were abdominally obese (i.e. waist to hip ratio > 0.90 for men and > 0.85 for women).
- In 2007–08, 72% of Australians aged 15 and over (around 12.0 million) did not undertake sufficient physical activity, being either sedentary or having low levels of activity.
- 1999–00, 51% of Australians aged 25 and over (6.4 million) had high blood cholesterol levels.
- 1999–00, 30% of Australians aged 25 and over (about 3.7 million) had hypertension—that is, had high blood pressure or were on blood-pressure lowering medication according to the World Health Organization guidelines (Guidelines Subcommittee 1999).
- In 2010, 15% of Australians aged 14 and over (2.8 million) smoked daily.
- In 1999–00, 7.4% of Australians aged 25 and over (about 880,000) had diabetes.

A recent clinical audit of patient records from hospitals participating in the 2011 National Stroke Audit in Australia has also shown these risk factors are quite common in patients admitted to stroke units (National Stroke Foundation 2011a). The comorbidity and risk factor profile of these stroke patients at the time of admission was as follows:

- Almost 30% had diabetes, a third had recent ischaemic heart disease or acute myocardial infarction, 36% had atrial fibrillation, 40% had a previous stroke or a TIA, and 9% had rheumatic or other valvular heart disease.
- Seventy-three per cent had high blood pressure.
- Fifty per cent had high blood cholesterol.
- Thirty-one per cent were current or past smokers.
- Fourteen per cent had high alcohol consumption.

The 2011 National Stroke Audit also found that most stroke patients with high blood pressure or high blood cholesterol levels were receiving medication for these conditions (82% for high blood pressure and 71% for high blood cholesterol) before having their stroke (National Stroke Foundation 2011a). However, only 30% of stroke patients with atrial fibrillation were medicated for this condition before their stroke.

Stroke and the recurrence of stroke are preventable (Hankey 2011; Vecchione 2011; Silver 2012; National Stroke Foundation 2010). Reducing the high prevalence of the modifiable risk factors could prevent many strokes. In people who have had TIAs, rapid access to investigations and starting preventive measures immediately are essential.

Community awareness of risk factors for stroke appears to be somewhat limited. A study conducted in Adelaide before and after the National Stroke Foundation's 2009 National Stroke Week found that, of 251 respondents, 71% recognised high blood pressure as a risk factor for stroke and 53% recognised smoking (Spark et al. 2011). Fewer than 50% of respondents recognised other risk factors for stroke—obesity (44%), high cholesterol (40%), physical inactivity (23%), family history of stroke (18%) and diabetes (16%).

Community awareness of stroke signs and symptoms

Early recognition of stroke signs and symptoms is critical in ensuring that a person who is having a stroke presents at hospital in time to receive urgent treatment, such as access to a stroke unit and thrombolysis, that can improve their chance of survival and subsequent quality of life (Trobbiani et al. 2012). A systematic review of the barriers to rapid treatment for acute stroke found that two barriers were: lack of recognition of the symptoms of stroke by the patient and their family or failure to seek urgent help; and calling a general practitioner before calling an ambulance (Kwan et al. 2004).

Since 2006, the National Stroke Foundation has run annual stroke awareness campaigns during Stroke Week using FAST (face, arm, speech, time) (Bray et al. 2011). The FAST test asks three questions related to facial weakness, arm weakness and difficulty with speech (National Stroke Foundation 2012d).

A recent study in Adelaide assessed public awareness of the symptoms, signs and risk factors for stroke and TIA before, immediately after and 3 months after the National Stroke Foundation's National Stroke Week in 2009 (Spark et al. 2011). The findings indicated that there was limited awareness of stroke symptoms among the general public, or what to do about them if they developed any symptoms. Overall, 61% of respondents identified slurred speech as a stroke warning sign, but less than half identified dizziness (42%), numbness (42%) and visual disturbances (41%) as warning signs. Among participants in the survey conducted before National Stroke Week, 62% reported that they would attend a hospital emergency department immediately if they experienced slurred speech and upper limb sensory loss. This was not significantly different from the corresponding proportion of respondents to the surveys conducted immediately after (66%), and 3 months after (60%), National Stroke Week, which suggests that public awareness of what to do if people experienced these symptoms did not improve after the national campaign. Overall, 35% of respondents had heard of FAST, and this proportion did improve significantly across the three surveys, from 22% before National Stroke Week to 40% immediately after, and 39% at 3 months.

An evaluation of stroke awareness campaigns in Australia, England and Canada found that such campaigns could improve knowledge of stroke warning signs in the population (Trobbiani et al. 2012). The Australian component of this study involved an evaluation of a campaign based on the FAST message that was conducted in Victoria in November 2009. Before the campaign, 59% of respondents could correctly identify at least two warning signs

of stroke compared with 68% after the campaign. Ninety per cent of participants reported that they would call emergency services in the event of a stroke.

Aims of this report

In February 2006, the Australian Institute of Health and Welfare (AIHW) published *How we manage stroke in Australia* (AIHW: Senes 2006). Since that time, there have been changes in the treatment of stroke such as the increased availability of more specialised stroke units in hospitals and increasing prescription of antithrombotic medicines. Thus it is timely to update the previous report.

The aims of this current report are to present a comprehensive picture about stroke and how it is managed in Australia using the latest available data. The report includes assessment of the impact of stroke on patients, their carers, the health system and aged–care services. In particular for stroke patients, the report includes information on incidence, prevalence, hospitalisation, disability, treatment and deaths. Where data are available, trends and inequalities in stroke and its management in Australia are also reported, along with international comparisons.

In addition to providing information about stroke, the report includes information about TIA, which is an important predictor of stroke.

Overview of this report

This chapter briefly describes stroke and TIA, and the major risk factors for stroke.

Chapter 2 examines the impact of stroke in Australia. It presents the latest available national estimates, as well as trends over time, of: the incidence and prevalence of stroke; the prevalence of stroke-related disability; deaths from stroke and TIA; the burden of stroke and health-care expenditure on stroke. This chapter also includes international comparisons of incidence, prevalence, burden of disease and mortality.

Chapter 3 presents information on stroke treatment in hospital, including treatment in specialised stroke units.

Chapter 4 describes the latest information, and changes over time, in general practice care of stroke and the supply of stroke medications in the community.

Chapter 5 examines the management of the consequences of stroke in terms of: the assistance needed and received by people with stroke and disability; rehabilitation of stroke or its sequelae; formal care services in the community; and the impact of stroke on primary carers of people with stroke.

Chapter 6 examines inequalities in the prevalence of stroke, hospitalisations for stroke, and death from stroke by Indigenous status, remoteness and socioeconomic status.

Data sources and methods

The report draws on a range of data sources and these are described in detail in Appendix C. Briefly, the main data sources used are the AIHW National Hospital Morbidity Database; the AIHW National Mortality Database and the AIHW General Record of Incidence of Mortality (GRIM) Books; the ABS 1998, 2003 and 2009 Surveys of Disability Ageing and Carers (SDAC); the Australian Government Pharmaceutical Benefits Database; Bettering the

evaluation and care of health (BEACH) Survey of General Practice; and the AIHW Disease Expenditure Database.

The statistical methods used in this report are described in Appendix A.

2 Impact of stroke

Key findings

- In 2009, around 375,800 Australians had had a stroke at some time in their lives. The majority (70%) were aged 65 and over.
- In 2009, it is estimated that just over a third (131,100) of Australians with stroke had a disability from their stroke. People with disability resulting from stroke were much more likely to be profoundly limited (always need help) in core activities (56%) than people with other disabilities.
- Between 1998 and 2009, the stroke prevalence rate fell for females but did not change for males.
- In 2010, stroke was the underlying cause of just over 8,300 deaths in Australia—on average, 23 people died from stroke every day. The good news is that the death rate has fallen by around 70% since 1979. However, although the average rate of decline in stroke death rates has accelerated for people aged 55 and over, it has slowed for those aged 35–54.
- In 2003, stroke accounted for 4.5% of the total burden of disease in Australia.
- In 2008–09, total health-care expenditure for stroke in Australia was $606 million, which is 8% of health-care expenditure for all cardiovascular disease and 0.5% of total health-care expenditure. Hospital-admitted patients accounted for the majority of the health expenditure for stroke.

Incidence

There are no national data on the incidence (number of new cases) of stroke in Australia. However, stroke incidence data are available from two population-based studies conducted in Perth and North East Melbourne. It is acknowledged that these studies are not very recent and therefore the estimates from them may not reflect the current incidence of stroke in Australia. The Perth Community Stroke Study (PCSS) was conducted in 1989–1990, 1995–1996 and 2000–2001 (Anderson et al. 1993; Jamrozik et al. 1999; Islam et al. 2008). The original North East Melbourne Stroke Incidence Study (NEMESIS) was conducted between 1 May 1996 and 30 April 1997, and a second study was conducted between 1 May 1997 and 30 April 1999 (Thrift et al. 2000; Thrift et al. 2006).

The majority of strokes (around 70%) are first-ever strokes (Jamrozik et al. 1999; Thrift et al. 2000). The incidence of stroke increases markedly from about 65 years of age. Results from the PCSS show that the median age of patients having a first-ever stroke during each 12-month study period was 76 in 1989–1990, 79 years in 1995–1996 and 77 in 2000–2001 (Islam et al. 2008). The mean age of patients having a first-ever stroke in the 1997–1999 NEMESIS study was 72 for males and 77 for females (Thrift et al. 2009).

Across the three PCSS studies, the age-adjusted stroke incidence rates were 57% higher in males than females (Islam et al. 2008). Investigators in both the Melbourne and Perth studies found that males tended to have strokes at younger ages than females, with just over 50% of first-ever strokes occurring in males aged under 75. In contrast, for females aged under 75, the corresponding proportion of first-ever strokes was 32% across the three Perth studies,

36% in the 1996–1997 NEMESIS study and 39% in the 1997–1999 NEMESIS study (Islam et al. 2008; Thrift et al. 2000; Thrift et al. 2009).

The 1997–1999 NEMESIS study found that the incidence of ischaemic stroke and intracerebral haemorrhage was significantly greater in males than females, while females had a greater incidence of subarachnoid haemorrhage than males (Thrift et al. 2009).

Changes in incidence over time

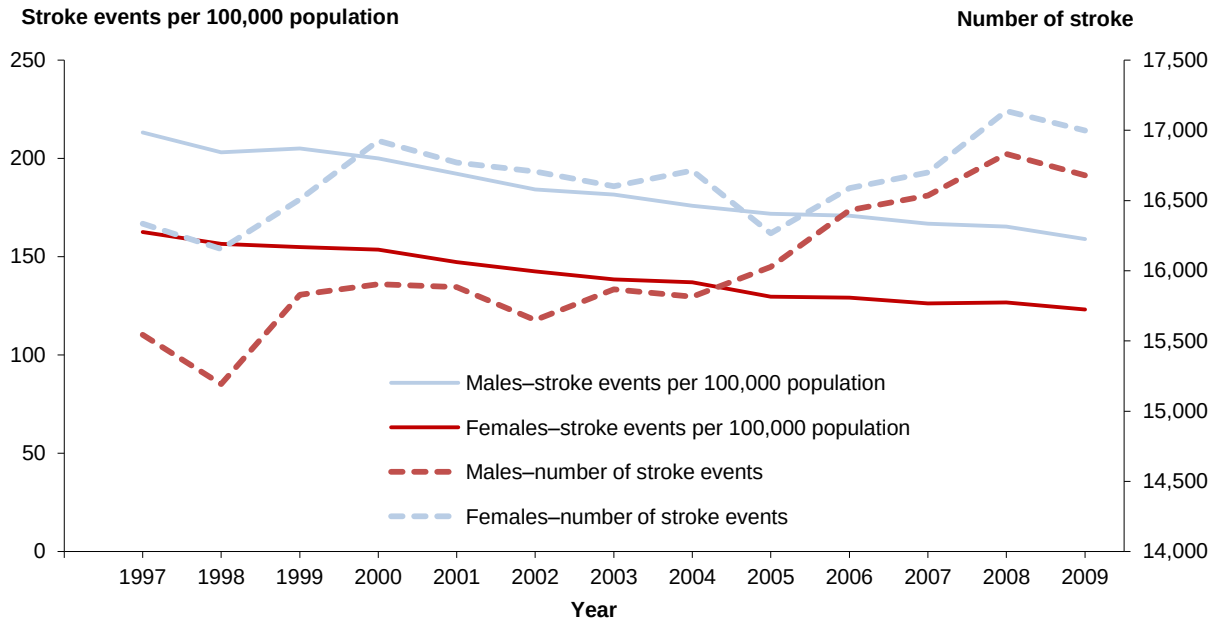
As discussed above, the PCSS study is the only Australian population-based study that enables trends in stroke incidence to be examined. Islam et al. (2008) studied trends in stroke incidence in Perth by comparing data collected over three 12-month study periods in 1989–1990, 1995–1996 and 2000–2001. It was found that age-adjusted stroke incidence rates fell significantly between the first and third study periods, by 49% for males and 37% for females. Overall, there were also significant declines in the age-adjusted incidence rates for ischaemic stroke, primary intracerebral haemorrhage and undetermined stroke type; however, the rate for subarachnoid haemorrhage was stable.

A more recent Western Australian study examined trends in the incidence of hospitalised cerebrovascular disease in 35–84 year olds between 2000 and 2007 (Nedkoff et al. 2012). For both men and women, there were significant falls in the age-adjusted rate over the 8-year period.

A hospital-based study in the Hunter region, conducted from 1 January 1996 to 31 December 2008, provides information about trends in stroke attack rates that could be used as a related measure of incidence (Marsden et al. 2010). Over the 13-year period, there were nearly 9,800 stroke events registered at 14 public acute hospitals among individuals aged 20 and over. The majority (91%) of patients had one stroke event registered, while the remainder had between two and six events registered. Between 1996 and 2008, the age-standardised stroke attack rates fell from 129 to 106 stroke attacks per 100,000 population, which equated to a statistically significant average rate of decline of 2.4% per annum.

Recently, Thrift et al. (2012) compared national estimates of hospitalisations for acute stroke and deaths from stroke in 1997 with estimates derived from NEMESIS. There was evidence that national hospital and mortality data provide a reasonable approximation of the actual number of strokes occurring in Australia each year. Based on this assumption, national trends in stroke event rates have been estimated.

Using the method in Thrift et al. (2012), incidence rates for stroke events declined by a quarter between 1997 and 2009. The age-standardised incidence rate for males fell from 213 per 100,000 population to 157 per 100,000 (Figure 2.1, Table D2.1). The comparable rates for females were 163 per 100,000 population, declining to 123 per 100,000. Over the 13-year period, stroke event rates were consistently 30% higher in males than females. Although stroke event rates fell, the estimated number of stroke events increased by almost 6% from 31,900 to 33,700 over the same period due to the ageing of the population. The increase in the number of stroke events between 1997 and 2009 was greater for males than females (Figure 2.1, Table D2.1).



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

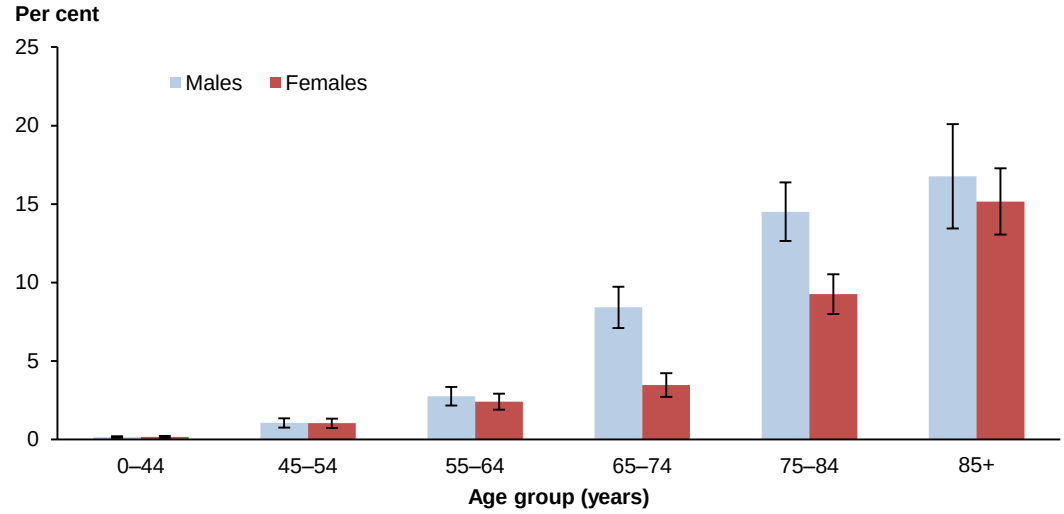
Source: AIHW analysis of the National Hospital Morbidity Database and the AIHW National Mortality Database.

Figure 2.1: Estimated number and rate of stroke events, by sex, 1997–2009

Prevalence

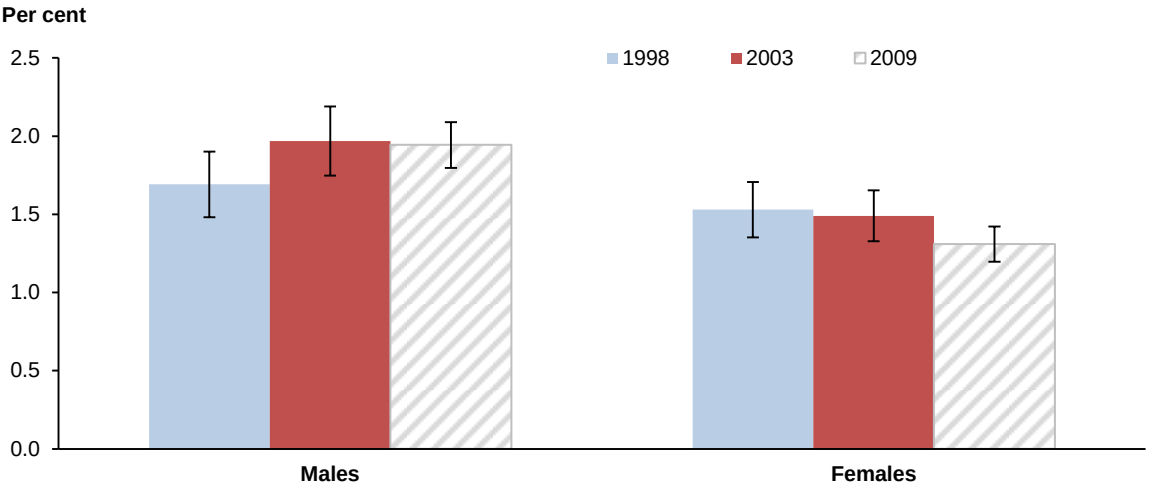
The estimates of stroke prevalence reported here are based on self-reported data from the 1998, 2003 and 2009 Surveys of Disability, Ageing and Carers (SDACs) conducted by the ABS. Information about these surveys and their sample sizes is provided in Appendix C.

In 2009, an estimated 375,759 Australians had had a stroke at some time in their lives, and the prevalence rate increased with age (Figure 2.2). Overall, after adjusting to account for age differences, the prevalence of stroke was significantly greater in males (1.9%) than females (1.3%) (Table D2.2). The largest, and statistically significant, differences in the prevalence of stroke between males and females occurred between the ages of 65 and 84 (Figure 2.2). Overall, 70% of people who had had a stroke were aged 65 and over, although the proportion of males aged 65 and over who had had a stroke (72%) was slightly higher than that for females of the same age (68%) (Table D2.2).



Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Figure 2.2: Stroke prevalence, by age and sex, 2009



(a) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of ABS 1998, 2003 and 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record Files on CD-ROM.

Figure 2.3: Stroke prevalence[a], by sex, 1998, 2003 and 2009

Changes in prevalence over time

National trend data on the prevalence of stroke are available from the ABS 1998, 2003 and 2009 SDACs, which all used a comparable measure of stroke. Between 1998 and 2009, the prevalence of stroke fell from 1.5% to 1.3% in females but increased from 1.7% to 1.9% in males; however, neither change was statistically significant (Figure 2.3). Although the prevalence rate of stroke did not change significantly over the 12-year period, the estimated number of males who had survived a stroke increased by more than 50% from 131,535 in 1998 to 205,798 in 2009, while, for females, the number of stroke survivors increased from 150,532 in 1998 to 168,377 in 2003 and then increased slightly to 169,961 in 2009 (Table D2.3).

Although not a national study, nor specifically measuring stroke alone, the prevalence of hospitalised atherothrombotic cerebrovascular disease in Western Australia fell significantly between 2000 and 2007 in both men and women aged 35–84 (Briffa et al. in press).

Disability resulting from stroke

In 2009, it is estimated that just over a third (131,130) of people with stroke had a disability that resulted from their stroke. That is, they had suffered a stroke that interfered with everyday activities (Table 2.1). This represents 3% of all people with disability and 46% of all people with stroke and disability that was not necessarily caused by stroke. Of people with stroke-related disability, 28% were aged under 65 and 72% were aged 65 and over. In contrast, 39% of all people with disability were aged 65 and over (Table 2.1).

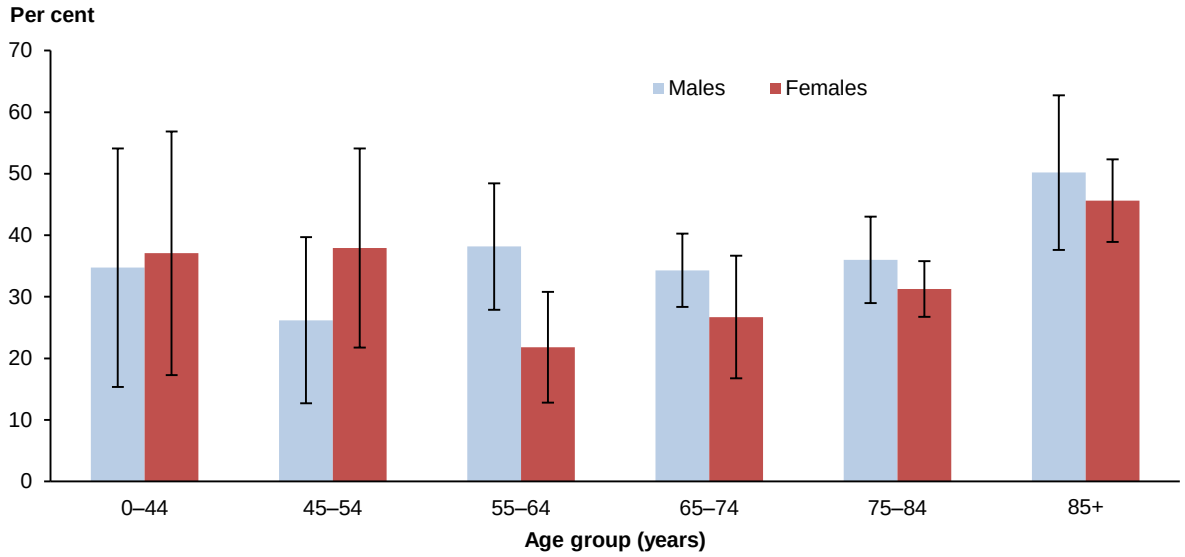
Table 2.1: Estimated prevalence of stroke and disability, 2009

Age group (years)	Persons with stroke and disability resulting from stroke	Persons with stroke and disability	Persons with stroke	All persons with disability	Persons with disability resulting from stroke		
	Number	Number	Number	Number	Percentage of all people with stroke and disability	Percentage of all people with stroke	Percentage of all people with disability
0–44	7,154	11,611	19,896	1,099,166	61.6	36.0	0.7
45–54	9,824	19,208	30,637	529,498	51.1	32.1	1.9
55–64	19,107	43,515	62,709	766,143	43.9	30.5	2.5
65–74	28,895	64,918	90,240	668,127	44.5	32.0	4.3
75–84	38,822	91,071	114,410	577,468	42.6	33.9	6.7
85+	27,327	54,990	57,867	297,352	49.7	47.2	9.2
All ages	**131,130**	**285,312**	**375,759**	**3,937,754**	**46.0**	**34.9**	**3.3**

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Overall, there was no difference in the proportion of males and females with disability resulting from stroke even after adjusting for age. However, females aged 85 or over had a significantly higher prevalence of disability due to stroke than those aged 55–84 but no significant differences by age group were found for males (Figure 2.4,Table D2.4). The most common types of disability resulting from stroke were: restriction in physical activities or work; incomplete use of limbs; difficulty gripping or holding things; slow at learning or understanding; and speech difficulties (Table 2.2).

People with disability resulting from stroke were much more likely to be profoundly limited in core activities (56%) than all people with stroke who had a disability that was not necessarily caused by stroke (38%) and all people with disability (16%) (Table 2.3). Persons with profound limitations of activity are unable to do, or always needs help with, a core activity task.



Note: Estimates for males aged 0–54 and females aged 0–44 have an associated relative standard error (RSE) of greater than 25% and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Figure 2.4: Estimated prevalence of disability resulting from stroke, by age and sex, 2009

Table 2.2: Estimated disability types resulting from stroke, 2009

Disability type[(a)]	People with disability resulting from stroke	
	Number	Per cent
Restriction in physical activities or work	70,876	54.1
Incomplete use of feet or legs	52,914	40.4
Incomplete use of arms or fingers	46,325	35.3
Difficulty gripping or holding things	41,790	31.9
Slow at learning or understanding	34,263	26.1
Speech difficulties	33,192	25.3
Chronic or recurring pain or discomfort	25,044	19.1
Nervous or emotional condition	20,963	16.0
Other disability type(s)	19,889	15.2
Loss of sight	16,110	12.3
Loss of hearing	10,324	7.9
Breathing difficulties	9,991	7.6
Blackouts, fits or loss of consciousness	7,523	5.7
Mental illness	7,476	5.7
Disfigurement or deformity	7,172	5.5
Total persons with a disability caused by stroke	**131,130**	**100.0**

(a) More than one type of disability may be present concurrently therefore the sum of each type of disability does not add to the total number of persons with a disability caused by stroke.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Table 2.3: Estimated disability status of people with disability resulting from stroke

Disability status[a]	People with disability resulting from stroke		People with stroke and disability		All people with disability	
	Number[b]	Per cent	Number[b]	Per cent	Number[b]	Per cent
Profoundly limited in core activities[c]	72,873	55.6	108,006	37.9	615,817	15.6
Severely limited in core activities[c]	22,386	17.1	52,025	18.2	615,956	15.6
Moderately limited in core activities[c]	16,885	12.9	41,828	14.7	647,819	16.5
Mildly limited in core activities	13,244	10.1	66,289	23.2	1,199,806	30.5
Not limited in core activities[c] but restricted in schooling or employment	*2,245	1.7	*4,891	1.7	332,929	8.5
Not limited in core activities[c] or restricted in schooling or employment	*3,496	2.7	12,272	4.3	525,427	13.3
Total	**131,130**	**100.0**	**285,312**	**100.0**	**3,937,754**	**100.0**

(a) For an explanation of levels of activity limitation, refer to Box 1 in Appendix C.

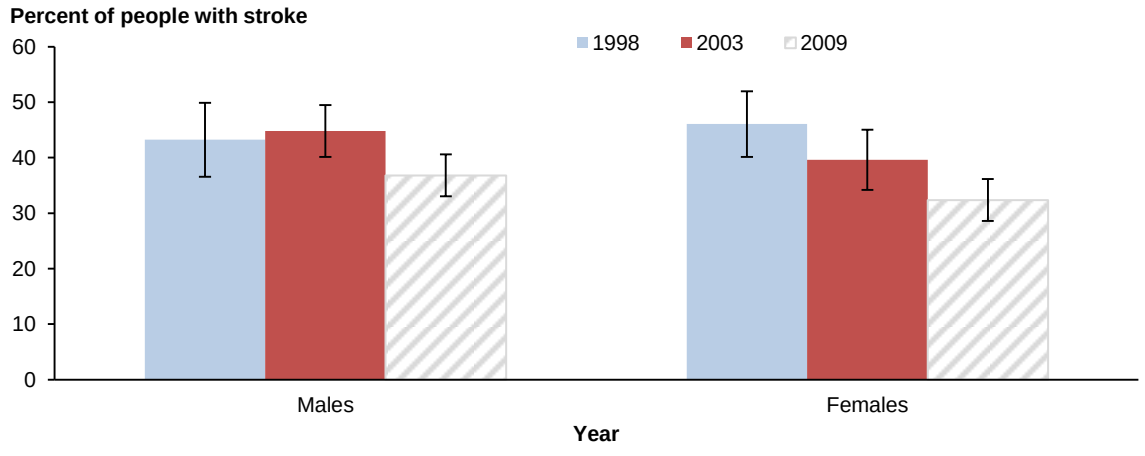
(b) Estimates marked with an asterisk have an associated relative standard error (RSE) of between 25% (with one asterisk) and 50% (with two asterisks) and should be interpreted with caution.

(c) Core activities include communication, mobility and self-care.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Changes in disability resulting from stroke over time

Between 1998 and 2009, there was a significant change in the proportion of females with disability resulting from stroke, with the prevalence falling from 46.1% in 1998 to 32.4% in 2009 (Figure 2.5, Table D2.5). Although the prevalence of disability resulting from stoke in males fell from 44.8% in 2003 to 36.8% in 2009, the difference was not statistically significant.



Note: Age-standardised to the total estimated number of people with stroke in 2003.

Source: AIHW analysis of ABS 1998, 2003 and 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record Files on CD-ROM.

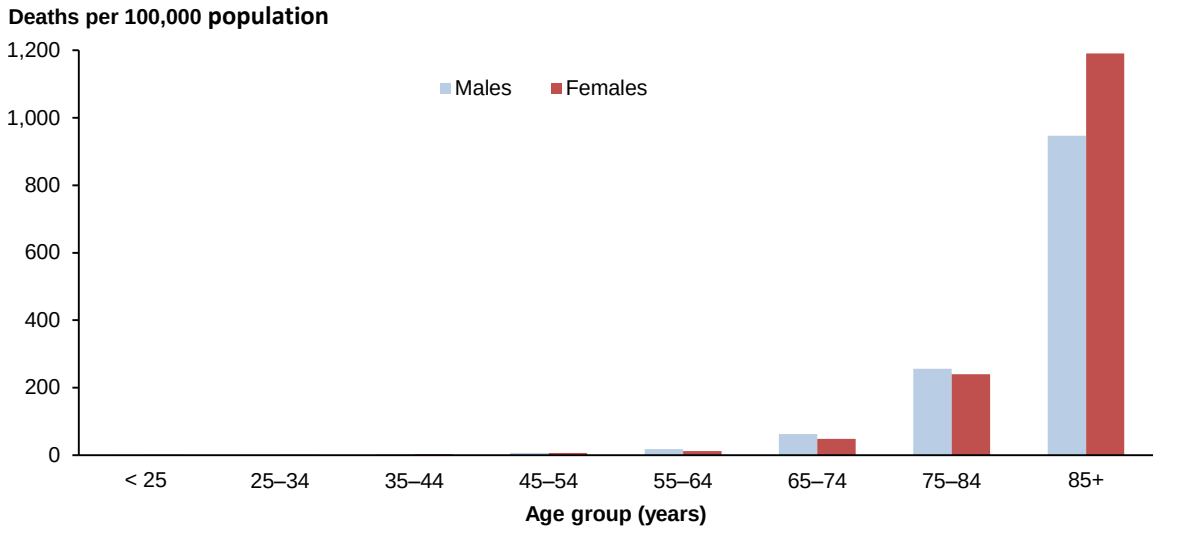
Figure 2.5: Prevalence of disability resulting from stroke, by sex, 1998, 2003 and 2009

Deaths from stroke and transient ischaemic attack

All stroke

In 2010, there were 8,304 deaths with an underlying cause of stroke registered in Australia. This means that, on average, 23 people died from stroke every day in that year. Stroke deaths represented 6% of all deaths in 2010 (143,473 deaths) and 18% of all cardiovascular disease deaths (45,499 deaths), making stroke the second most common cause of cardiovascular death after coronary heart disease (21,708 deaths).

Stroke death rates increased greatly with age, with 81% of stroke deaths occurring among those aged 75 or over. More females (5,055) died from stroke than males (3,249) but age-specific rates were higher in males than females between the ages of 55 and 84 (Figure 2.6). However, after adjusting for age, there no little difference in the stroke death rate between males and females (31 per 100,000 population for both) (Table D2.6).



Note: Data for 2010 are preliminary and are subject to further revision.

Source: AIHW analysis of the AIHW National Mortality Database.

Figure 2.6: Stroke death rates, by age and sex, 2010

Type of stroke

Of all deaths from stroke registered in 2010, 29% were recorded as haemorrhagic stroke and 11% as ischaemic stroke (i.e. cerebral infarction) (Table 2.4). The majority (60%) of deaths from stroke were not specified as either haemorrhagic or ischaemic, which makes it difficult to make any meaningful interpretation of stroke deaths by type of stroke.

Table 2.4: Stroke deaths, by type of stroke, 2010

	Number of deaths			Percentage of all stroke deaths		
Type of stroke	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Subarachnoid haemorrhage	225	325	550	6.9	6.4	6.6
Intracerebral haemorrhage	582	704	1,286	17.9	13.9	15.5
Other non-traumatic intracranial haemorrhage	307	285	592	9.4	5.6	7.1
All haemorrhagic stroke	*1,114*	*1,314*	*2,428*	*34.3*	*26.0*	*29.2*
Ischaemic stroke (i.e. cerebral infarction)	393	537	930	12.1	10.6	11.2
Stroke, not specified as haemorrhage or infarction	1,742	3,204	4,946	53.6	63.4	59.6
All stroke	**3,249**	**5,055**	**8,304**	**100.0**	**100.0**	**100.0**

Note: Data for 2010 are preliminary and are subject to further revision.

Source: Analysis of the AIHW National Mortality Database.

Transient ischaemic attack

Between 2006 and 2010, there were 261 deaths registered in Australia with an underlying cause of TIA (Table 2.5). Although it is rare for TIA to cause death, it may have been recorded as the underlying cause for some of these deaths if it started the train of events that lead to the death.

Almost three quarters of TIA deaths occurred in people aged 85 and over. Although two-thirds of TIA deaths over the 5-year period occurred in females, there was no difference in the age-adjusted death rate by sex.

Table 2.5: TIA deaths, by age and sex, 2006–2010

	Number of deaths			Deaths per 100,000 population		
Age group (years)	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
< 80	15	11	26	< 0.1	< 0.1	< 0.1
80–84	16	26	42	1.8	2.1	2.0
85+	55	138	193	9.3	11.7	10.9
All ages	**86**	**175**	**261**			
All ages (crude rate)				**0.2**	**0.3**	**0.2**
All ages (age-standardised rate)[(a)]				**0.2**	**0.2**	**0.2**

(a) Age-standardised to the Australian population as at 30 June 2001.

Note: Data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

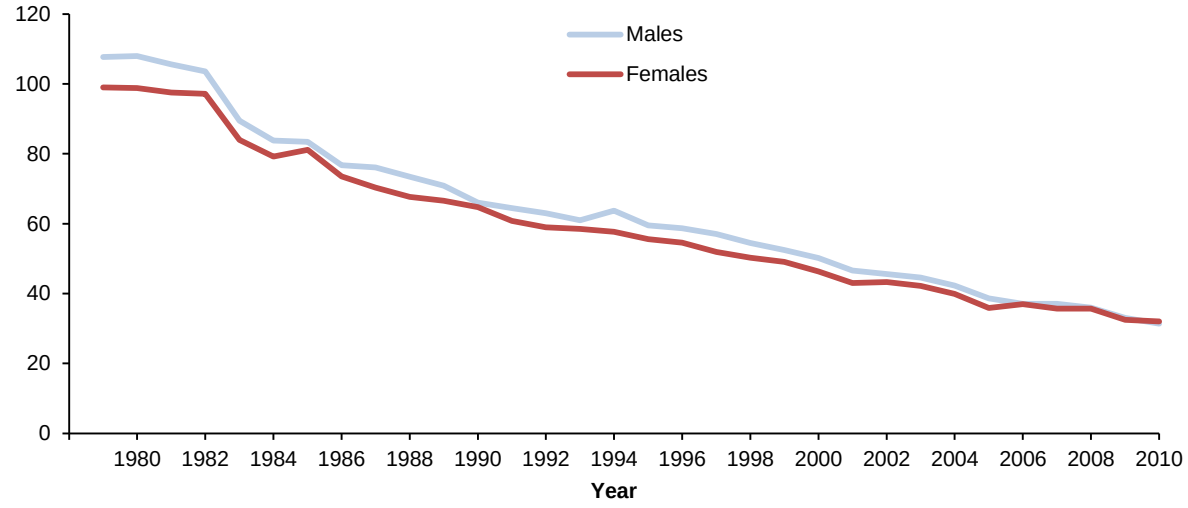
Source: Analysis of the AIHW National Mortality Database.

Changes in deaths over time

Stroke mortality rates have been declining for several decades. The age-standardised death rate for stroke in males fell from 108 deaths per 100,000 population in 1979 to 31 deaths per 100,000 in 2010: a fall of 71% over the 32-year period (Figure 2.7). A similar decline was seen among females over this period, with the age-adjusted stroke death rate falling from 99 to 32 deaths per 100,000 population (Table D2.7). The decline in stroke mortality can be attributed, at least partly, to a reduction in risk factors such as tobacco smoking and hypertension

(Gillum 1997; OECD 2011). Improvements in medical treatment for stroke have also increased survival (National Stroke Foundation 2010; OECD 2011).

However, although stroke death rates are declining overall, the rates of decline are not consistent across age groups. For example, the rate of decline among 35–54-year-old females has slowed over time from an average of 8.9% per annum in 1979–1988 to 4.2% per annum in 1989–1998 to 2.1% per annum in 1999–2010 (Figure 2.8). Similarly, stroke death rates among males aged 35–54 fell significantly between 1979 and 1998 by an average of 8.5% per annum, but then the rate of decline slowed to 2.2% per annum between 1989 and 1998 and to 1.6% per annum between 1999 and 2010. In contrast, since 1989, the average rate of decline has accelerated over time for both males and females aged 55–74 and 75 and over.

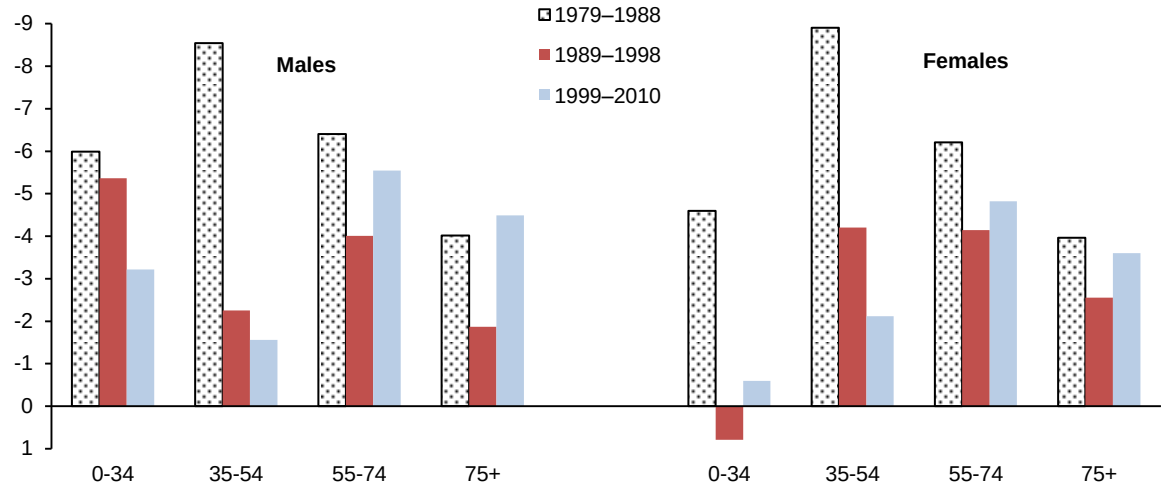


Notes:

1. Age-standardised to the Australian population as at 30 June 2001.
2. Death rates for 1979–1996 have been adjusted to ICD-10 standards using a comparability factor of 0.83.
3. Data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

Sources: Analysis of the AIHW National Mortality Database; AIHW 2010b.

Figure 2.7: Stroke death rates, by sex, 1979–2010



Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Death rates for 1979–1996 have been adjusted to ICD-10 standards using a comparability factor of 0.83.
3. Data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

Sources: Analysis of the AIHW National Mortality Database; AIHW 2010b.

Figure 2.8: Average annual percentage changes in age-standardised death rates for stroke, by age and period of registration, 1979 to 2010

The burden of stroke

Burden of disease provides an estimate of healthy life lost due to premature death and prolonged illness or disability (AIHW 2012a). The latest available national burden of disease estimates are based on 2003 data from a study conducted by the AIHW and the University of Queensland (Begg et al. 2007).

In 2003, stroke accounted for 4.5% of the total burden of disease in Australia. It accounted for 5.1% of the overall disease burden for females, making it the third major contributor behind anxiety and depression and CHD. Among males, stroke was the fifth leading contributor, accounting for 3.9% of the overall disease burden (Begg et al. 2007).

In 2003, 75% of the stroke burden for females, and 68% for males, resulted from years of life lost to premature death. The balance, 25% for females and 32% for males, was the result of years of healthy life lost because of poor health or disability.

Health-care expenditure on stroke

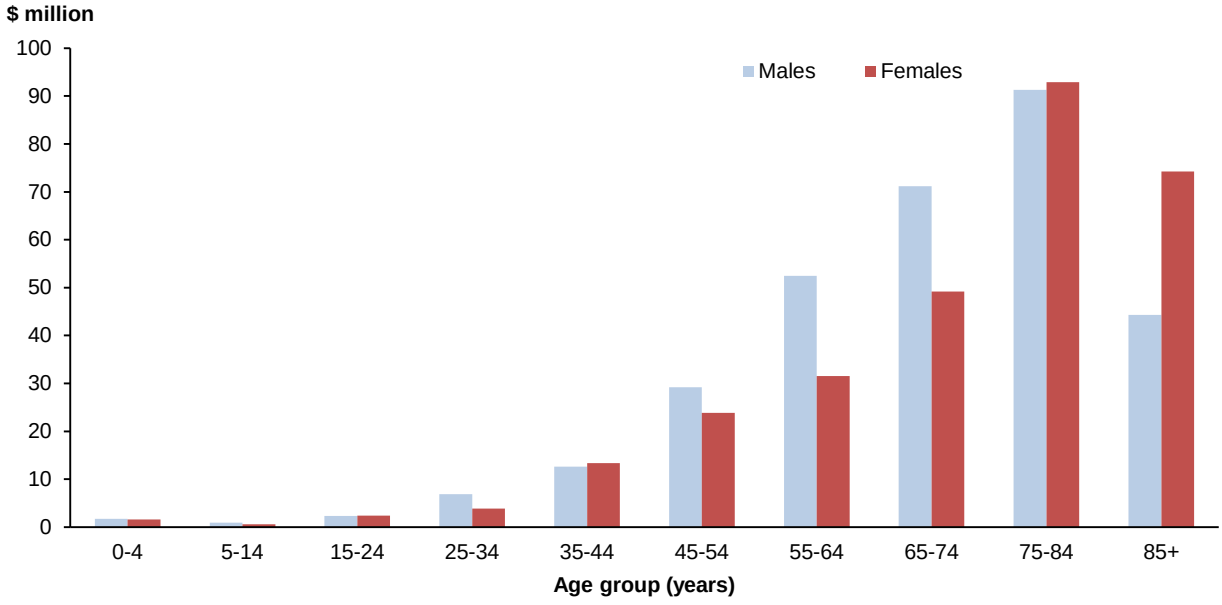
In 2008–09, total estimated health-care expenditure for stroke (ICD-10 codes I60–I64) in Australia was $606 million, which accounted for 7.8% of total estimated health-care expenditure for all cardiovascular disease ($7,731 million) and 0.5% of total health-care expenditure ($113.6 billion) (AIHW 2012c). It should be noted that health-care expenditure data do not include expenditure from residential aged–care facilities. The categories of expenditure that are covered in this report are expenditure for hospital-admitted patients, out-of-hospital medical services and prescription pharmaceuticals. More information about the disease expenditure data included in this report is provided in Appendix C.

Most (92.4%) of the estimated total health-care expenditure for stroke in 2008–09 was spent on hospital-admitted patients ($560.1 million), 4.2% ($25.7 million) on prescription pharmaceuticals and 3.4% ($20.6 million) on out-of-hospital medical services.

In 2008–09, prescriptions for blood-pressure lowering drugs for cardiovascular disease (CVD) cost $685 million. Of this, only $1 million was estimated to be for stroke. Many drugs prescribed to treat or reduce the risk of stroke are also widely used for people with other CVD.

In 2008–09, total estimated expenditure on stroke was slightly higher for males ($312.9 million) than females ($293.5 million). The health expenditure on stroke per person in 2008–09 was higher for males ($29) than females ($27).

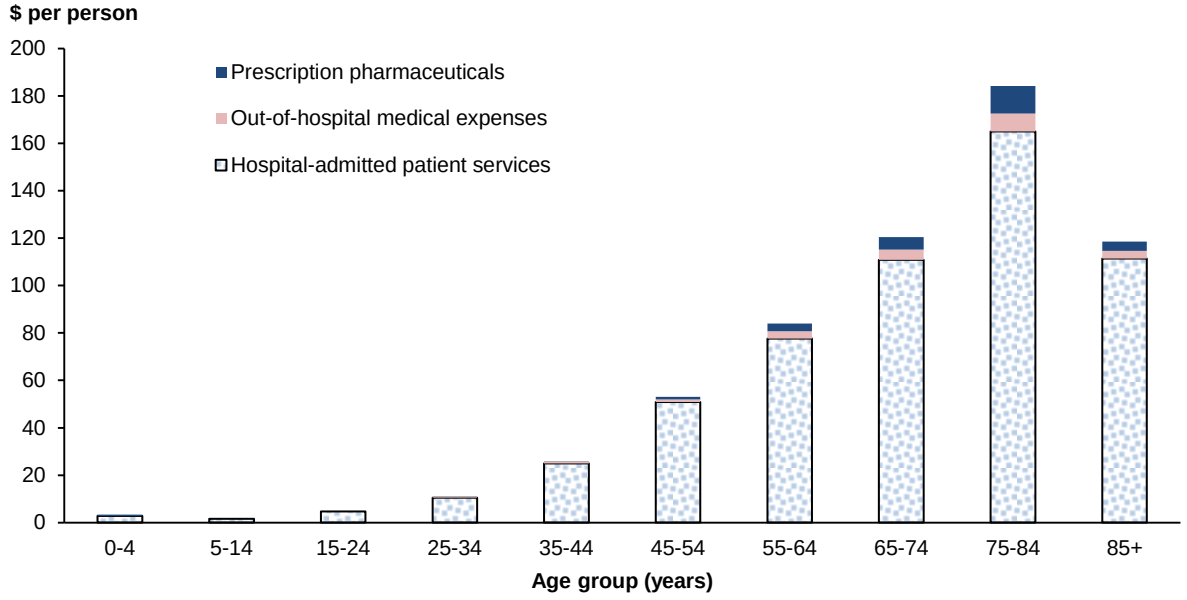
Expenditure on stroke for both sexes increased sharply from about age 35 (Figure 2.9). Expenditure for males aged 45–74 was higher than that for females of the same age, but, from the age of 75, expenditure for females was higher than that for males. The higher expenditure for women among those aged 75 and over relates to the greater life expectancy of women—because stroke mainly affects the elderly, and there are more elderly women than men, it also follows that overall expenditure for stroke was higher for women.



Note: Does not include expenditure on research.

Source: AIHW Disease Expenditure Database.

Figure 2.9: Estimated health-care expenditure for stroke, by age and sex, 2008–09



Notes

1. Does not include expenditure on research.
2. Per person expenditure was calculated using the estimated resident population for Australian at 31 December 2008.

Source: AIHW Disease Expenditure Database.

Figure 2.10: Estimated health-care expenditure for stroke per person, by age and area of expenditure, 2008–09

In 2008-09, total estimated expenditure for hospital-admitted patients for stroke was $290 million for males and $270 million for females (Table D2.9). Expenditure for out-of-hospital medical services for stroke was estimated to be $9.6 million for males and $11 million for females, while expenditure for prescription pharmaceuticals was $13.4 million for males and $12.3 million for females.

Estimated expenditure per person for hospital-admitted patients for stroke increased sharply with age, as did expenditure per person for prescription pharmaceuticals (Figure 2.10; Table D2.10). Expenditure per person for out-of-hospital medical services for stroke increased with age until the age of 84, but then fell considerably for those aged 85 and over (Table D2.10). The decline could indicate that stroke care is increasingly being delivered to this elderly group in hospital or in a residential aged-care facility rather than in the community.

International comparisons

The international comparisons of the impact of stroke presented in this section are sourced from World Health Organization (WHO) data. The WHO classifies countries into 14 subregions of the world on the basis of regional boundaries and on their levels of child and adult mortality (WHO 2004). The latter usually reflect the development level of a region. Under the WHO classification, Australia is part of the subregion of developed countries in Western Pacific region (i.e. Western Pacific Region A) together with Brunei Darussalam, Japan, New Zealand and Singapore. This region has a very low level of child and adult mortality (WHO 2004). It should be noted that the WHO international incidence and prevalence data are only available by region and therefore there are no Australia-only data.

Incidence

Between 2000 and 2004, the estimated number of first-ever strokes in the world increased from 3.8 million to 9 million; however, it should be noted that improvements in WHO data and methods between the two years might explain some of this increase (WHO 2012).

Of the estimated number of first-ever strokes worldwide in 2004, 3% (274,000) occurred in Western Pacific Region A: the Western Pacific subregion of developed countries that includes Australia (WHO 2012). The estimated number of first ever-strokes in Western Pacific Region A increased almost 3-fold between 2000 (97,000) and 2004. Compared with the 13 other WHO subregions of the world, Western Pacific Region A ranked 3rd lowest for stroke incidence (i.e. first-ever strokes) in 2004 and 4th lowest in 2000. The Americas subregion that includes Bolivia, Ecuador, Guatemala, Haiti, Nicaragua and Peru (Americas Region D) ranked lowest for stroke incidence in 2000 (19,000 first-ever strokes) and 2004 (50,000), while Western Pacific Region B, the WHO subregion of developing countries in the Western Pacific, ranked highest for incidence in both years (1.3 million first-ever strokes in 2000 and 3 million in 2004) (WHO 2012).

Prevalence

In contrast to incidence, the estimated number of stroke survivors worldwide fell by 21% between 2000 and 2004, from 38.6 million to 30.5 million (WHO 2012). However, as noted above, differences between the two years are partly due to improvements in data and methods, and so comparisons may not provide accurate estimates of trends over time.

Despite the decrease in global stroke prevalence between 2000 and 2004, there was little change in Western Pacific Region A over the same period, with an estimated 2.0 million stroke survivors in 2000 and 1.9 million in 2004 (WHO 2012). Of the 14 WHO subregions of the world, Western Pacific Region A ranked 7th lowest for stroke prevalence in 2000 and 8th lowest in 2004. The Americas Region D ranked lowest for stroke prevalence in 2000 (174,999 stroke survivors) and in 2004 (139,000 stroke survivors), while Western Pacific Region B ranked highest in both years (11.3 million stroke survivors in 2000 and 7 million in 2004) (WHO 2012).

Burden of disease

In 2004, cerebrovascular disease was the 6th leading cause of burden of disease worldwide with an estimated 46.6 million disability adjusted life years (DALYs) lost, representing 3% of total DALYs in that year (1,523 million) (WHO 2008).

Among the 34 Organisation for Economic Co-operation and Development (OECD) countries, Australia's age-adjusted cerebrovascular disease rate of 228 DALYs per 100,000 population ranked 4th lowest in 2004—Switzerland had the lowest rate (184 DALYs per 100,000 population) and Turkey the highest (1,232 DALYs per 100,000) (WHO 2008). Australian males ranked 3rd lowest (237 DALYs per 100,000 population), while Australian females ranked 6th lowest (219 per 100,000) compared with their OECD counterparts.

Between 2002 and 2004, Australia's ranking with respect to its burden of cerebrovascular disease death remained the same compared with other OECD countries. In 2002, Australia's age-standardised cerebrovascular disease rate of 246 DALYs per 100,000 population ranked 4th lowest of the OECD countries, while Switzerland had the lowest rate (200 DALYs per 100,000 population) and Turkey the highest (1,132 DALYs per 100,000) (WHO 2008).

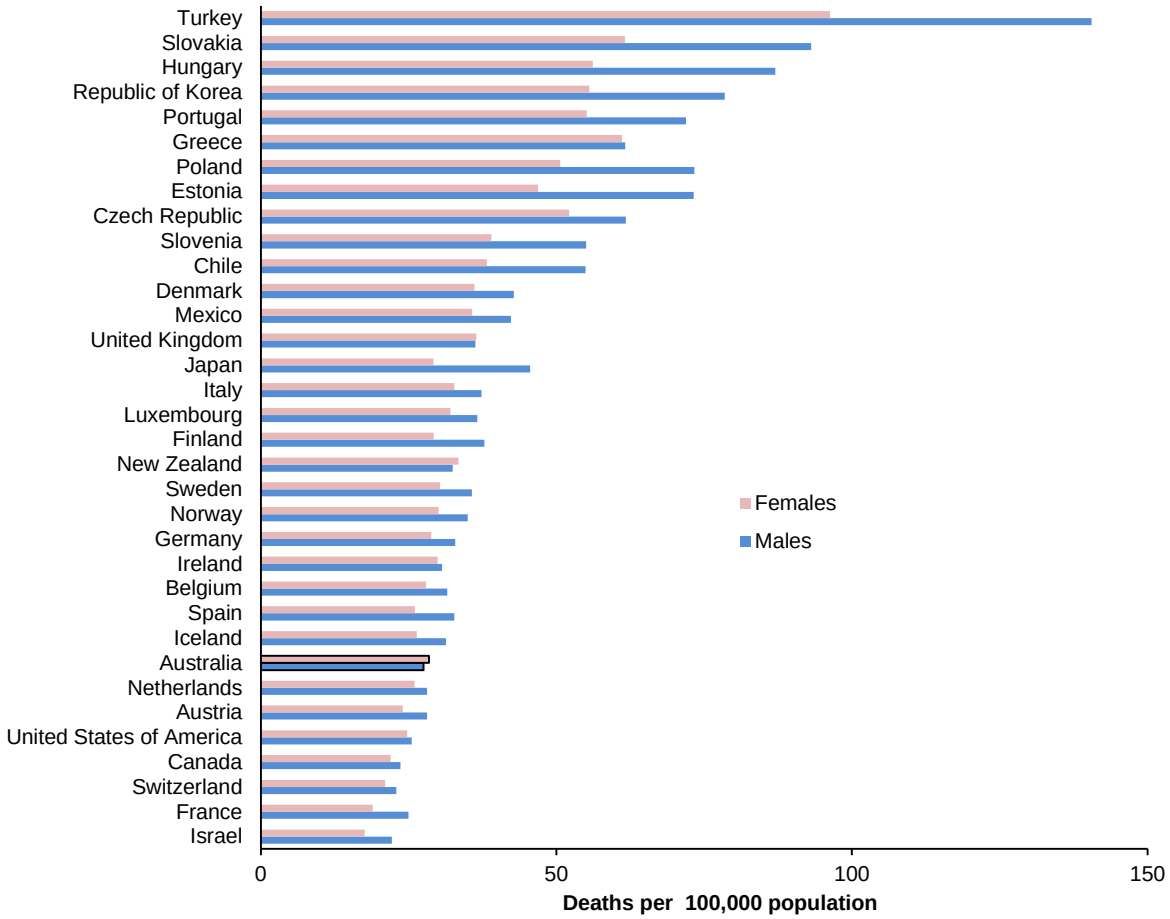
Deaths

International data are available from the WHO for deaths from cerebrovascular disease but not specifically from stroke. However, most deaths from cerebrovascular disease are due to stroke, with stroke accounting for 74% of all cerebrovascular disease deaths (11,204 deaths) in Australia in 2010.

In 2008, there were an estimated 6.2 million deaths from cerebrovascular disease worldwide, representing 11% of all deaths in that year (an estimated 56.9 million deaths) (WHO 2012).

Compared with other OECD countries, Australia's age-standardised cerebrovascular death rate ranked 8th lowest in 2008. Israel had the lowest age-standardised cerebrovascular disease death rate (19.7 per 100,000 population) of all OECD countries and Turkey had the highest rate (116.5 per 100,000) (Figure 2.11). Among males in OECD countries, Australia ranked 6th lowest (27.5 deaths per 100,000 population), with the lowest rate occurring in Israel (22.2 per 100,000) and the highest in Turkey (140.5 per 100,000). Among females in OECD countries, Australia ranked 11th lowest (28.4 deaths per 100,000 population), with the lowest rate occurring in Israel (17.5 per 100,000) and the highest in Turkey (96.3 per 100,000).

Between 2002 and 2008, Australia's ranking with respect to its cerebrovascular disease death rate slipped from 6th lowest to 8th lowest compared with other OECD countries. In 2002, Australia had an age-standardised cerebrovascular disease death rate of 33.4 per 100,000 population, while Switzerland had the lowest rate (26.2 per 100,000 population) and Turkey the highest (139.7 per 100,000) (WHO 2008).



Notes

1. Cerebrovascular deaths occurring in 2008.
2. Rates have been age-standardised to the WHO global standard population.
3. Where 2008 data unavailable, data prior to 2008 were projected for some countries. See (WHO 2011).

Source: (WHO 2012)

Figure 2.11: Cerebrovascular death rates in OECD countries by sex, 2008

3 Stroke treatment in hospital

Key findings

- In 2009–10, there were 35,300 hospitalisations with a principal diagnosis of stroke and 15,700 hospitalisations with a principal diagnosis of TIA. Males had higher stroke hospitalisation rates than females in all age groups.
- Between 1998–99 and 2009–10, hospitalisation rates for stroke declined by 15% for males and 17% for females.
- In 2009–10, just over three-quarters (77%) of stroke hospitalisations had at least one allied health intervention and 71% had at least one imaging procedure.
- Between 2000–01 and 2009–10, the proportion of stroke hospitalisations with at least a magnetic resonance imaging (MRI) brain scan more than doubled, increasing from 8% to 20%.
- Between 2007 and 2011, the number of stroke units in Australia increased from 54 to 74, and the proportion of patients receiving care in a stroke unit during their admission increased from 50% to 60%.
- Despite these improvements, there are a number of apparent gaps in treatment.

This chapter examines data on the management of stroke in hospitals including specialised stroke units in 2009–10. The management and treatment of stroke is complex because a wide range of interventions and health-care specialities are required. The interventions that are for the immediate care needs of patients at the onset of a stroke mostly take place in hospitals.

The care required for stroke differs somewhat with the type of stroke. Where possible, this chapter compares management for different types of stroke.

The *Clinical guidelines for stroke management 2010* provide a series of evidence-based recommendations relating to the management of stroke and TIA in Australia (National Stroke Foundation 2010).These guidelines cover stroke in adults aged 18 and over and all types of stroke except subarachnoid haemorrhagic stroke. The continuum of care covered by the guidelines includes pre-hospital, acute, post-acute and community care, secondary prevention of stroke and management of TIA. The key guidelines assessed as part of the National Stroke Foundation's 2011 National Stroke Audit are shown in Box 3.1.

Box 3.1: Key guidelines for stroke management assessed as part of the National Stroke Foundation's 2011 National Stroke Audit

The *Clinical guidelines for stroke management 2010* (National Stroke Foundation 2010) recommend:

Admission

- All people with stroke should be admitted to hospital and be treated in a stroke unit with a multidisciplinary team.
- All people with stroke should be admitted directly to a stroke unit, preferably within 3 hours of stroke onset.
- If people with suspected stroke present to non-stroke unit hospitals, transfer protocols should be developed and used to guide urgent transfers to the nearest stroke unit hospital.
- Emergency department staff should use a validated stroke-screening tool to assist in rapid, accurate assessment for all people with stroke.

Early assessment and diagnosis

- All patients with suspected stroke should have a brain CT or MRI immediately where facilities are available or within 24 hours. Patients eligible for thrombolysis should undergo brain imaging immediately.
- All patients with carotid territory symptoms who would potentially be candidates for carotid re-vascularisation should have urgent carotid imaging.

Acute treatment

- Thrombolysis (i.e. intravenous tissue plasminogen activator or rt-PA) in acute ischaemic stroke should only be undertaken in patients satisfying specific inclusion and exclusion criteria (see Appendix E).
- Aspirin should be given as soon as possible after the onset of stroke symptoms (i.e. within 48h) if CT/MRI excludes haemorrhage.

Assessment and management of the consequences of stroke

- Multidisciplinary assessments should take place as soon as possible after admission and ideally with 2 days.
- For dysphagia, all patients should be screened for swallowing deficits before being given any food, drinks or oral medication within 24 hours after the admission.
- Coordination of care in the multidisciplinary team and communication with patient by undertaking regular meeting between the team, patient and the family.

Secondary prevention and management of complications

- Every stroke patient should be assessed and informed of their risk factors for a further stroke and possible strategies to modify identified risk factors. The risk factors and interventions include: stopping smoking; improving diet; increasing regular exercise; and avoiding excessive alcohol.
- All stroke and TIA patients, whether normotensive or hypertensive, should receive blood-pressure lowering therapy, unless contraindicated by symptomatic hypotension.
- Long-term antiplatelet therapy should be prescribed to all people with ischaemic stroke or TIA who are not prescribed anticoagulation therapy.
- Therapy with a statin should be used for all patients with ischaemic stroke or TIA.

(Continued)

Box 3.1 (continued): Key guidelines for stroke management assessed as part of the National Stroke Foundation's 2011 National Stroke Audit

Discharge plan

Hospital services should ensure that a documented post-discharge care plan is developed in collaboration with the patient and family and a copy provided to them. This may include relevant community services, self-management strategies (e.g. information on medications, and compliance advice, goals and therapy to continue at home), stroke support services, any further rehabilitation or outpatient appointments, and an appropriate contact number for any queries.

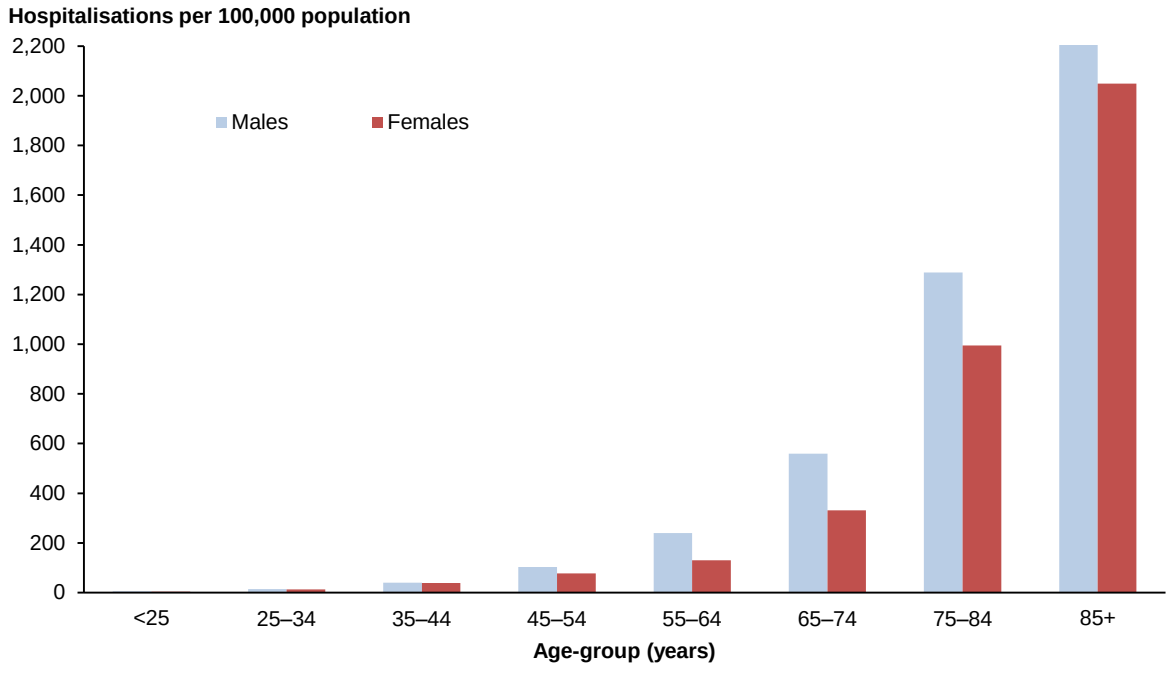
Source: National Stroke Foundation 2010.

Hospitalisations in 2009–10

Stroke

In 2009–10, there were 35, 345 hospitalisations with a principal diagnosis of stroke. Of these, 52% were for males and 48% for females (Table D3.1). Of all hospitalisations where stroke was the principal diagnosis, 48% were for ischaemic stroke, 29% for haemorrhagic stroke and 23% for unspecified stroke (Table D3.4).

The stroke hospitalisation rate in 2009–10 increased substantially with age, and rates were higher for males than females at all ages (Figure 3.1).



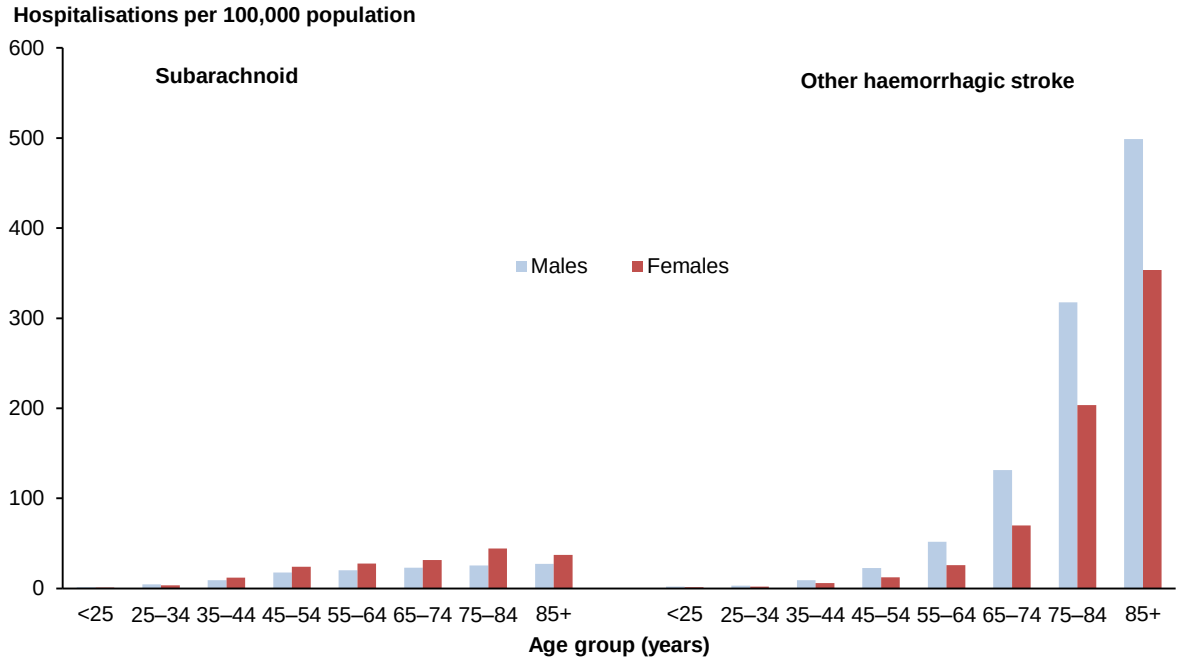
Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.1: Stroke hospitalisation rates, by age and sex, 2009–10

Similar age and sex patterns occurred for ischaemic stroke although the hospitalisation rate for females aged 85 and over was higher than that for males of the same age (Table D3.2).

Hospitalisation rates for both intracerebral haemorrhage and subarachnoid haemorrhage also increased with age (Figure 3.2).

However, although age-specific intracerebral haemorrhage hospitalisation rates were higher in males than females at all ages, the opposite was true for subarachnoid haemorrhage from the age of 35 (Figure 3.2; Table D3.3).

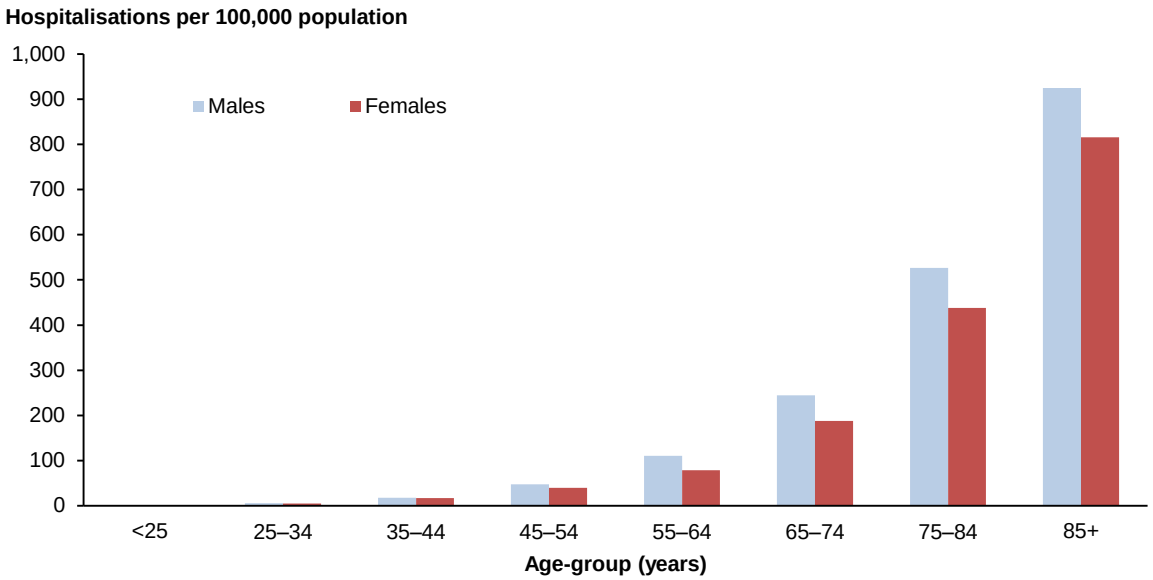


Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.2: Haemorrhagic stroke hospitalisation rates, by type, age and sex, 2009–10

Transient ischaemic attack

In 2009–10, TIA was the principal diagnosis for 15,734 hospitalisations. As for stroke hospitalisation rates, TIA hospitalisation rates increased with age (Figure 3.3). TIA hospitalisation rates were higher in males than females from the age of 25 and, overall, the age-adjusted TIA hospitalisation rate was higher in males (72.9 per 100,000 population) than in females (59.2 per 100,000) (Table D3.5).



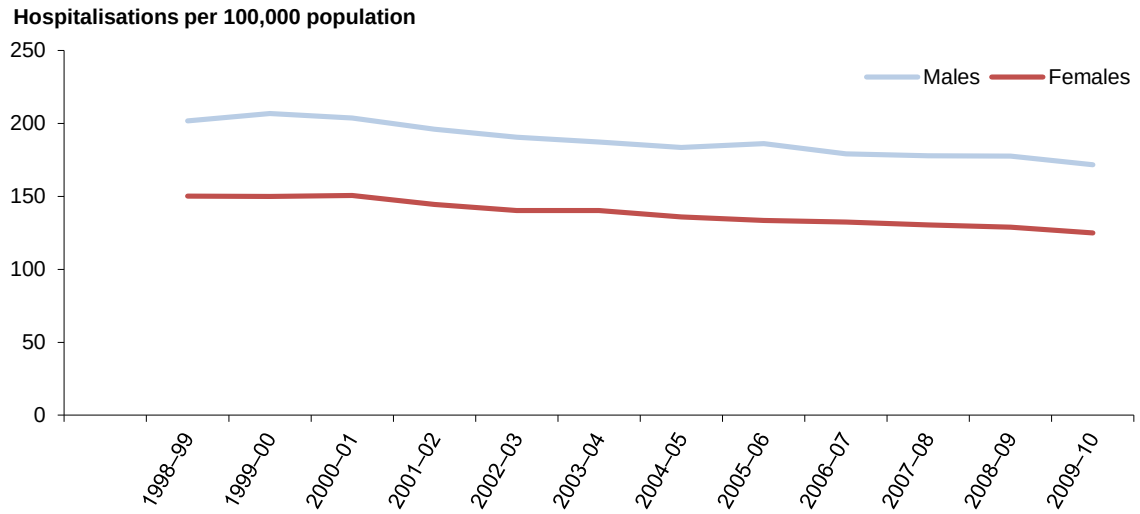
Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.3: Hospitalisation rates for transient ischaemic attack, by age and sex, 2009–10

Changes in hospitalisations over time

This section examines changes in stroke hospitalisations between 1998–99 and 2009–10. The reason that 1998–99 has been chosen as the starting point is that the ICD-10-AM classification (International Statistical Classification of Diseases and Related Health Conditions, Tenth Revision, Australian Modification) has been used to code hospital diagnoses and procedures since 1998–99. However, it is possible that the trends reported here could be affected by the change from ICD-9-CM (International Statistical Classification of Disease and related Health Conditions, Ninth revision, Clinical Modification) to ICD-10-AM. Despite this change in classification, the trends remained consistent during the whole period as shown in Figure 3.4.

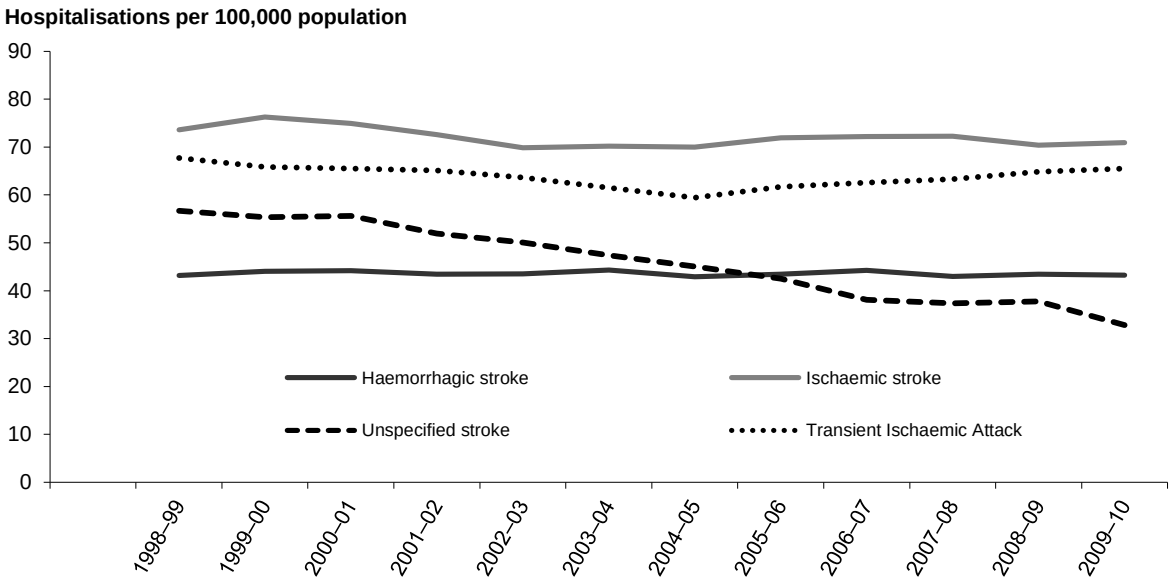
Between 1998–99 and 2009–10, overall hospitalisation rates for stroke have consistently declined for both males and females. Over the 12-year period, the age-standardised hospitalisation rate for males fell by 15% (from 202 per 100,000 in 1998–99 to 172 per 100,000 in 2009–10) and the rate for females fell by 17% (from 150 per 100,000 in 1998–99 to 125 per 100,000 in 2009–10) (Figure 3.4). Hospitalisation rates for stroke were consistently higher in males than females over the 12-year period, with male rates between 1.3 and 1.4 times as high those of females (Table D3.6).



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

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.4: Trends in stroke hospitalisation rates, by sex, 1998–99 to 2009–10



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

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.5: Trends in hospitalisation rates for main types of stroke, 1998–99 to 2009–10

Age-adjusted stroke hospitalisation rates declined by an average of 1.6% annually between 1998–99 and 2009–10. The decline was faster for females (1.7%) than for males (1.6%). Most of the decline was driven by a significant decrease in the hospitalisation rates for unspecified stroke (4.9%), although smaller declines were also observed in hospitalisation rates for haemorrhagic and ischaemic stroke (Figure 3.5; Tables D3.7, D3.8 and D3.9).

Alongside these declines, there has been an increase in TIA hospitalisation rates.

Both the decrease in hospitalisation rates for unspecified stroke over time, and the increase in TIA hospitalisation rates since 2004–05, could be related to improved diagnosis of these conditions. Improved diagnosis may have led to some unspecified stroke being recorded as non-stroke conditions, thereby contributing to the decline in the hospitalisation rate for unspecified stroke (Figure 3.5; Table D3.8).

Over the 12-year period, age-adjusted hospitalisation rates for ischaemic stroke fell by an average of 0.5% per year, although the average annual rate of decline was faster between 1998–99 and 2004–05 (1.4% per year) than between 2004–05 and 2009–10 (0.01% per year) (Figure 3.5; Table D3.7). Between 1998–99 and 2009–10, the trends in the age-adjusted hospitalisation rates for haemorrhagic stroke differed by sex—male rates have been increasing by 0.3% per year and female rates have been declining by 0.5% per year (Table D3.7).

Age-adjusted hospitalisation rates for TIA declined between 1998–99 and 2004–05 by an average of 2.0% per year, but started to increase between 2004–05 and 2009–10 at an average annual rate of 1.9%. The rate of increase in TIA hospitalisation rates since 2004–05 was greater in females than males (2.3% compared with 1.5%) (Table D3.9). Similar to the decrease in hospitalisation rates for unspecified stroke over time, the increase in TIA hospitalisation rates since 2004–05 might be related to improvements in diagnosis. Such improvements may in part be a result of the national stroke guideline recommendation that all patients presenting with suspected TIA should undergo a complete assessment at the initial point of healthcare contact (National Stroke Foundation 2010).

Main characteristics of stroke and TIA hospitalisations

Urgency of admission

Admission can be categorised as 'Emergency' (required within 24 hours) or 'Elective' (required at some stage beyond 24 hours). Emergency/elective status is not assigned for some admissions (e.g. obstetric care and planned care such as dialysis) (AIHW 2012b).

Stroke is a condition that requires urgent care because the timeliness of care can have a large impact on the severity of its sequelae. In 2009–10, most stroke hospitalisations were emergency admissions (84%), while close to one in 10 stroke hospitalisations (9%) were elective (Table 3.1). Similarly, the majority (90%) of TIA hospitalisations were emergency admissions.

Table 3.1: Urgency of admission[(a)] of stroke and TIA hospitalisations, 2009–10

	Percentage of hospitalisations				
	Haemorrhagic stroke	Ischaemic stroke	Unspecified stroke	All stroke	TIA
Elective	9.1	7.7	10.5	**8.8**	7.2
Emergency	82.6	84.9	83.0	**83.8**	90.4
Other[(b)]	8.3	7.4	6.5	**7.5**	2.4
Total	100.0	100.0	100.0	**100.0**	100.0

(a) Note that this variable was incomplete for public hospitals in Tasmania and private hospitals in Northern Territory.

(b) 'Other' includes hospitalisation where the urgency of admission was not assigned such as for obstetric care or planned care, such as dialysis, as well those with missing information on the status of urgency of their admission.

Source: AIHW analysis of the National Hospital Morbidity Database.

Patient days and length of stay

In 2009–10, total patient days for all stroke hospitalisations amounted to 331,363 days and the average length of stay for these hospitalisations was 9 days. There was some variation by type of stroke, with haemorrhagic and ischaemic stroke having an average length of stay of around 10 days, while unspecified stroke had an average (mean) length of stay of almost 8 days. Overall, 11% of stroke hospitalisations were same-day admissions, but this varied by type of stroke, with around 17% of hospitalisations for haemorrhagic and unspecified stroke being same-day compared with only 4% of ischaemic stroke hospitalisations. Over 17% of TIA hospitalisations were same-day hospitalisations (Table 3.2).

Small differences in the average duration of hospitalisations by type of stroke hide variations in the distribution of the length of stay by stroke type. In 2009–10, the median length of stay for unspecified stroke was 4 days compared with 5 days for haemorrhagic stroke and around 7 days for ischaemic stroke (Table 3.2). The higher mean than median length of stay indicates that some hospitalisations have a very long length of stay.

Table 3.2: Length of stay and bed days for stroke and TIA hospitalisations, 2009–10

	All stroke	Haemorrhagic stroke	Ischaemic stroke	Unspecified stroke	TIA
			Length of stay (days)		
10th percentile	1	1	1	1	1
25th percentile	2	1	3	1	1
Median	6	5	7	4	2
75th percentile	11	12	12	8	4
90th percentile	21	23	22	17	7
Mean	9.4	9.6	9.9	7.8	3.4
			Percentage of hospitalisations		
Same-day patients	10.9	17.3	4.2	16.7	17.2
			Patient days		
Total days	331,363	10,245	17,079	8,021	15,734

Source: AIHW analysis of the National Hospital Morbidity Database.

Care type and sector

Care type describes the overall nature of a clinical service provided to an admitted patient during an episode of care. Care type can be classified as acute, rehabilitation, geriatric evaluation and management, psychogeriatric, maintenance, newborn and other admitted patient care (AIHW 2012b).

In 2009–10, the vast majority of stroke hospitalisations (95%) were acute episodes of care (Table 3.3). Most (89%) of the stroke hospitalisations were managed in public hospitals and 11% in private hospitals (Table 3.3). Fourteen per cent of patients with unspecified stroke were treated in private hospitals. The comparable rates for ischaemic and haemorrhagic stroke were 10% and 9% respectively, although the greatest number of private hospitalisations (1766) was for ischaemic stroke followed by unspecified stroke (1143) and haemorrhagic stroke (904).

Almost all TIA hospitalisations (99.5%) were acute episodes of care (Table 3.3). The proportion of TIA hospitalisations in private hospital was slightly higher than for all stroke hospitalisations (14% compared with 11%).

Separation mode

The mode of separation records the status of the patient at the time of separation and, for some categories, the place to which the person was discharged or transferred (AIHW 2012b).

The most common separation mode for stroke hospitalisations was 'other', where a patient was discharged to their usual residence, their own accommodation or a welfare institution that could include prison, a hostel or a group home providing primarily welfare services (38%). About one in four hospitalisations were transferred to another acute hospital (Table 3.3). A third of hospitalisations for haemorrhagic stroke were transferred to another acute hospital, compared with around a quarter of hospitalisations for ischaemic and unspecified stroke.

In 2009–10, 14% of all stroke hospitalisations and 21% haemorrhagic stroke hospitalisations ended with death in hospital.

Not surprisingly, the great majority of TIA hospitalisations (85%) were discharged to home and only 9% were transferred to another acute hospital (Table 3.3).

Patient complication and comorbidity level

The patient complication and comorbidity level (PCCL) is a measure of the cumulative effect of a patient's complications and comorbidities, and is calculated for each episode as part of the Australian Refined Diagnosis Related Groups classification. PCCLs can be used to gauge the 'severity' of a patient's condition (AIHW 2012b).

The majority of stroke hospitalisations had a severe or catastrophic comorbidity or complication level (59%), particularly hospitalisations for ischaemic stroke (67%). In contrast, 58% of TIA hospitalisations had no complication or comorbidity and 20% had a severe or catastrophic level of complication and comorbidity (Table 3.3).

Table 3.3: Characteristics of stroke and TIA hospitalisations, 2009–10

Characteristic	Percentage of hospitalisations				
	All stroke	Haemorrhagic stroke	Ischaemic stroke	Unspecified stroke	TIA
Care type					
Acute	95.2	95.3	95.2	95.0	99.5
Palliative	2.4	2.9	1.9	2.6	0.0
Geriatric evaluation and management	2.1	1.5	2.5	1.8	0.4
Maintenance	0.2	0.2	0.2	0.3	0.1
Other care[(a)]	0.2	0.0	0.3	0.3	0.0
Not reported	0.0	0.0	0.0	0.0	0.0
Sector					
Public	89.2	91.2	89.7	85.7	86.4
Private	10.8	8.8	10.3	14.3	13.6
Separation mode					
Transfer to other acute hospital	26.4	32.5	23.0	26.0	8.9
Transfer to a residential aged–care service, unless this is the usual place of residence	3.8	2.7	4.1	4.8	2.1
Transfer to other health-care accommodation (includes mother craft hospitals)	1.0	0.9	1.2	0.8	0.3
Statistical discharge/type change	16.3	12.7	20.3	12.5	2.4
Died	14.3	21.4	10.3	13.8	0.2
Other[(b)]	37.6	29.4	40.7	41.5	85.1
Includes: discharge/transfer to an (other) psychiatric hospital; left against medical advice/ discharge at own risk; and statistical discharge from leave.	0.5	0.4	0.5	0.6	1.0
Patient complication and comorbidity Level (PCCL)					
No complication or comorbidity	20.7	31.5	13.9	21.5	58.2
Minor complication or comorbidity	0.4	0.9	0.3	0.2	0.1
Moderate complication or comorbidity	19.5	16.0	19.2	24.5	21.3
Severe complication or comorbidity	30.0	22.7	33.2	32.7	15.8
Catastrophic complication or comorbidity	29.3	28.9	33.4	21.1	4.6

(a) Includes rehabilitation, psychogeriatric and newborn care; and other admitted patient care where the principal clinical intent does not meet the criteria for any of the above.

(b) Discharge to usual residence/own accommodation/welfare institution (includes prisons, hostels and group homes providing primarily welfare services).

Source: AIHW analysis of the National Hospital Morbidity Database.

Hospital procedures

A procedure is 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 (NCCH 2008). Procedures include: surgical procedures; non-surgical investigative and therapeutic procedures such as X-rays and

chemotherapy; allied health interventions; and client support interventions that are neither investigative nor therapeutic (such as anaesthesia). It should be noted that the reporting of these procedures are guided according to the Australian Coding Standards (NCCH 2008). Many procedures that are routinely performed when patients are admitted at the hospital are not coded. They can occur multiple times during an episode and usually the resources used to perform these procedures are reflected in the diagnosis or in an associated procedure. These procedures are normally not coded because they are routine in nature, performed for most patients and/or can occur multiple times during an episode. Most importantly, the resources used to perform these procedures are often reflected in the diagnosis or in an associated procedure. That is, for a particular diagnosis or procedure, there is a standard treatment that is unnecessary to code. For example:

- X-ray and application of plaster is expected with a diagnosis of Colles' fracture
- intravenous antibiotics are expected with a diagnosis of septicaemia
- cardioplegia in cardiac surgery is performed routinely.

Procedures for stroke patients that may be considered standard treatment, and therefore unnecessary to code, include the following:

- drug treatment, which should not be coded except if:
  - the substance is given as the principal treatment in same-day episodes of care (e.g. chemotherapy for neoplasm or HIV, see ACS 0044 Chemotherapy)
  - drug treatment is specifically covered in a coding standard (see ACS 1316 Cement spacer/beads and ACS 1615 Specific interventions for the sick neonate)
- echocardiogram except transoesophageal echocardiogram
- electrocardiography (ECG) except patient-activated implantable cardiac event monitoring (loop recorder)
- monitoring: cardiac, electroencephalography (EEG), vascular pressure except radiographic/video EEG monitoring >=24 hours
- ultrasound
- plain X-rays without contrast

It should be noted that some codes on the above list extract may be required in certain standards elsewhere in the Australian Coding Standards. In such cases, the standard overrides this list and the stated code should therefore be assigned as described in the relevant standard. The listed procedures should be coded if anaesthesia (except local) is required for the procedure (see ACS 0031 Anaesthesia). These procedures should be coded if they are the principal reason for admission in same-day episodes of care.

The analysis in this section examines procedures and interventions undertaken during hospitalisation for stroke, but excludes related accompanying procedures such as anaesthesia. It should be noted that not all procedures are required to be coded, particularly those routine in nature that form part of the standard treatment of care. In addition, coding changes have had a significant effect on the recording of some procedures over time. For example, the number of imaging services procedures reported decreased by over 88% overall between 2009–10 and 2010–11 after its addition to the list of procedures for which coding was no longer necessary (AIHW 2012b). Stroke-related procedures were selected based on their frequency in all stroke hospitalisations, guidance from an expert and recommendations of the latest *National Stroke Clinical Guidelines*.

Procedures among all stroke hospitalisations

Most (91%) hospitalisations in 2009–10 with a principal diagnosis of stroke had at least one procedure undertaken during the hospitalisation (Table 3.4). However, this proportion varied by type of stroke, being highest for ischaemic stroke (96%) and lowest for unspecified stroke (79%).

Table 3.4: Proportion of stroke hospitalisations with at least one procedure performed, by main types of stroke, 2009–10

	Proportion of hospitalisations with at least one procedure (per cent)			
	All stroke (35,345 hospitalisations)	Haemorrhagic stroke (10,245 hospitalisations)	Ischaemic stroke (17,079 hospitalisations)	Unspecified stroke (8,021 hospitalisations)
Had at least one procedure	91.3	92.5	96.2	79.5
Did not have any procedure	8.7	7.5	3.8	20.5

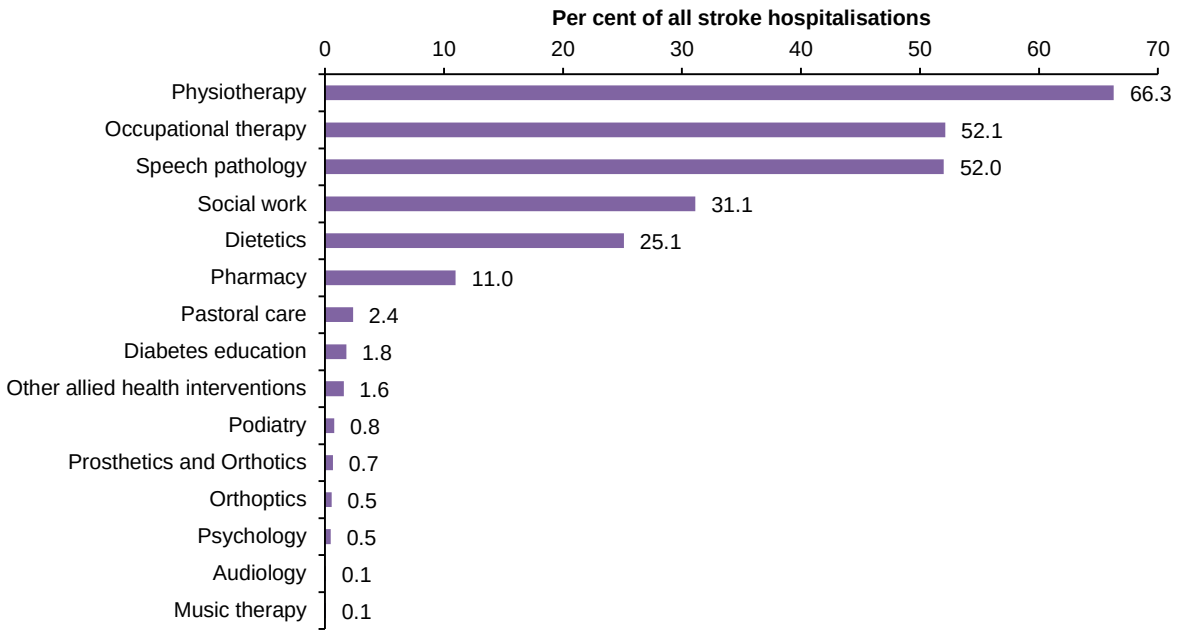
Source: AIHW analysis of the National Hospital Morbidity Database.

Stroke hospitalisations that ended in transfer to another acute hospital or death in hospital were around twice as likely as other stroke hospitalisations to have no procedure undertaken.

Allied health interventions

Allied health interventions were the most common interventions for managing stroke in hospital. The main target of these interventions is to restore secondary functions affected by the stroke, such as bodily and speech functions. Therefore these interventions play an important role in the acute management of stroke.

In 2009–10, 77% of all stroke hospitalisations had at least one allied health intervention. This proportion was higher for hospitalisations with a principal diagnosis of ischaemic stroke (88%) than those with other types of stroke (66%) (Table 3.5). The majority of hospitalisations for stroke received at least one physiotherapy intervention (66%), more than a half had at least one occupational therapy session (52%) and one speech pathology intervention (52%) and a third at least one social work intervention (31%) (Figure 3.6).



Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.6: Proportion of all stroke hospitalisations with at least one allied health intervention, by main type of allied health intervention, 2009–10

Imaging and diagnostic procedures

Imaging procedures are essential to diagnose stroke and its type, and guide subsequent medical and surgical interventions. The National Stroke Guidelines recommend that all stroke patients undergo brain imaging within 24 hours of their admission to hospital (National Stroke Foundation 2010).

Common imaging and diagnostic procedures for stroke are computerised tomography (CT) brain scans and magnetic resonance imaging (MRI) brain scans. CT brain scans use cross-sectional X-rays to generate an image of the brain (AIHW 2011c). This image is used to distinguish between the major types of stroke—blockage or bleeding—to guide treatment. An MRI brain scan uses magnets and radio waves to generate an image of the brain, and show a higher level of detail in soft tissue than CT brain scans.

The majority of hospitalisations for stroke had at least one imaging procedure (71%) undertaken, with higher proportions for ischaemic stroke (77%) and haemorrhagic stroke (72%) (Table 3.5). CT brain scans were the most common imaging procedure, with 65% of stroke hospitalisations having at least one CT brain scan. This procedure was less common for hospitalisation for unspecified type of stroke (53%) compared with haemorrhagic (69%) and ischaemic stroke (68%) (Table 3.5).

Table 3.5: Stroke hospitalisations with at least one main stroke-related procedure, by procedure type, 2009–10

Procedure type	All stroke	Haemorrhagic stroke	Ischaemic stroke	Unspecified stroke
	Percentage of hospitalisations with at least one procedure			
Generalised allied health	*76.6*	*66.6*	*87.8*	*65.5*
Imaging procedures	*71.0*	*71.9*	*77.3*	*56.8*
Head and neck duplex ultrasound	0.6	0.1	0.9	0.8
Heart ultrasound	3.5	0.5	5.7	2.4
CT brain scan	64.7	68.6	68.1	52.7
MRI of the brain	19.8	10.6	30.8	7.9
MRA of the brain	6.3	2.8	10.5	1.8
Chest X-ray	< 0.1	–	< 0.1	–
Head and neck X-ray	< 0.1	–	< 0.1	–
Neck and brain angiography	1.4	2.3	1.3	0.3
Surgical procedures	*3.9*	*10.2*	*1.7*	*0.4*
Carotid endarterectomy	0.6	< 0.1	1.1	0.3
Carotid embolectomy or thrombectomy	0.1	–	0.1	< 0.1
Intracranial vein or artery transcatheter embolisation	0.1	0.3	< 0.1	–
Destruction of intracranial aneurysm or other vascular lesion	2.4	8.1	< 0.1	–
Removal of intracranial haematoma or abscess	0.6	2.0	0.1	–
Carotid artery repair	–	–	–	–
Carotid bypass	0.0	–	0.0	–
Carotid aneurysm graft	–	–	–	–
Carotid resection with reanastomosis	0.1	–	0.2	< 0.1
Carotid transluminal balloon angioplasty	0.1	0.1	0.2	–
Pharmacotherapy	*0.6*	*0.4*	*1.0*	*0.2*
Invasive administration of thrombolytic medicines	0.3	0.3	0.5	0.1
Non-invasive administration of thrombolytic agents	0.3	0.1	0.5	0.1

Notes

1. Main stroke-related procedures were procedures defined as being performed to manage acute stroke event and its complications.
2. Components do not add to 100% because a stroke hospitalisation may have had more than one type of stroke-related procedure undertaken.
3. The coverage for administration of thrombolytics in the National Hospital Morbidity Database is not complete because the administration of medicines is not routinely recorded according to the Australian Coding Standard.
4. X-rays and ultrasound in the National Hospital Morbidity Database are not routinely reported according to the Australian Coding Standard.

Source: AIHW analysis of the National Hospital Morbidity Database.

The second most common imaging procedure was MRI brain scans. Almost 20% of stroke hospitalisations had at least one MRI brain scan, with a higher proportion for ischaemic stroke (31%) than haemorrhagic or unspecified stroke (11% and 8%, respectively) (Table 3.5).

Magnetic resonance angiography (MRA) of the brain was the third most common imaging procedure for hospitalisations for stroke and, in particular, 10% of ischaemic stroke hospitalisations had at least one MRA of the brain (Table 3.5).

Surgical procedures

At least one surgical procedure was performed in almost 4% of all stroke hospitalisations, with a higher proportion being undertaken for haemorrhagic stroke (10%) compared with other types of stroke (Table 3.5). For haemorrhagic stroke hospitalisations, the surgical procedures undertaken most commonly were destruction of an intracranial aneurysm or other vascular lesion (8% of haemorrhagic stroke hospitalisations had at least one of these procedures) and removal of an intracranial haematoma or abscess (2%) (Table 3.5).

Carotid endarterectomy is a procedure used to reduce the risk of stroke caused by the build-up of plaque in the carotid artery. It involves surgically removing atherosclerotic plaques from these arteries in the neck, which supply blood to the brain. In 2009–10, around 0.6%of all stroke hospitalisations (215) involved carotid endarterectomy indicating the preventive nature of the procedure (Table 3.5). In fact, in 2009–10, carotid endarterectomy was mainly performed for hospitalisations with a principal diagnosis of cardiovascular diseases other than stroke or TIA, with 2,488 of these hospitalisations having at least one carotid endarterectomy (Table D3.12).

Thrombolysis

When used to treat stroke, thrombolysis is described as the injection of a chemical agent (rt-PA) into the veins, which significantly reduces the risk of death or complication in patients with ischaemic stroke. Patients need to meet certain criteria to be eligible for this treatment. These criteria include the patient's age, the time from stroke onset to injection and the type of stroke. Tissue plasminogen activator was licensed in October 2003 by the Australian Therapeutic Good Administration for use in a 3-hour window for patients with ischaemic stroke, but, based on further evidence, this window has been extended to 4.5 hours (National Stroke Foundation 2010).

Thrombolysis is not captured comprehensively in the NHMD because its collection is not mandated in the Australian Coding Standard. Furthermore, thrombolysis is more likely to be administered in an emergency department before, rather than after, hospital admission, and when it is performed after admission it is not possible to identify when stroke-specific rt-PA has been used.

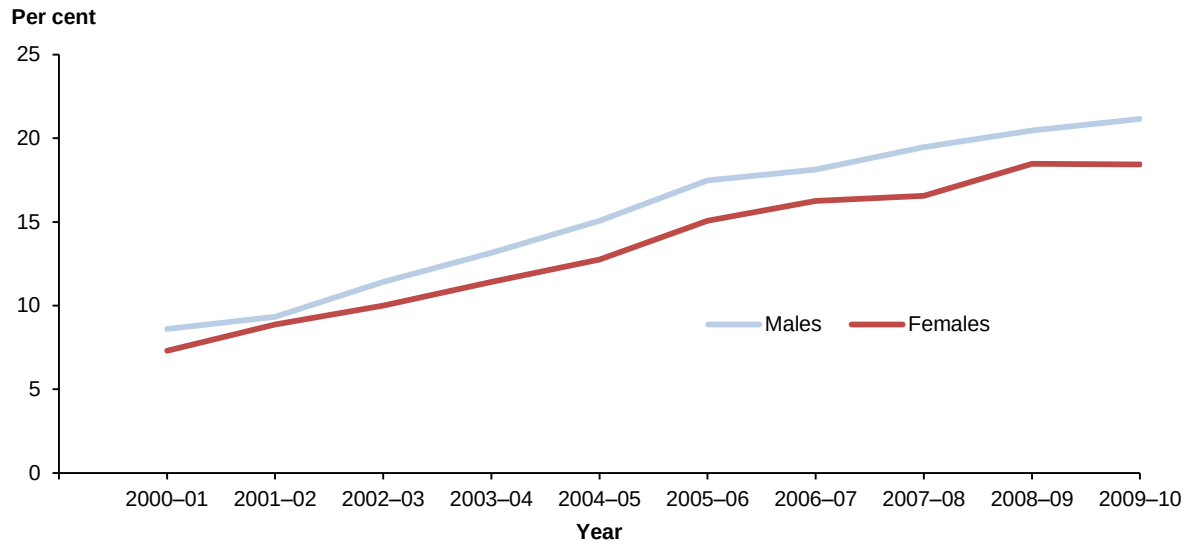
In 2009–10, less than 1% of hospitalisations for stroke were recorded to have had thrombolytic agents administered (Table 3.5).

Changes in main hospital investigations and procedures over time

Magnetic resonance imaging brain scan

Between 2000–01 and 2009–10, the age-adjusted proportion of hospitalisations with a principal diagnosis of stroke that had at least one MRI brain scan undertaken increased substantially from 8% to 20%. Over this period, the magnitude of the increase was similar for females (from 7% in 2000–2001 to 18% in 2009–10) and males (from 9% in 2000–2001 to 21%

in 2009–10) (Table D3.10). Over the 10-year period, males were consistently more likely than females to have had a stroke hospitalisation with at least one MRI brain scan undertaken (Figure 3.7).



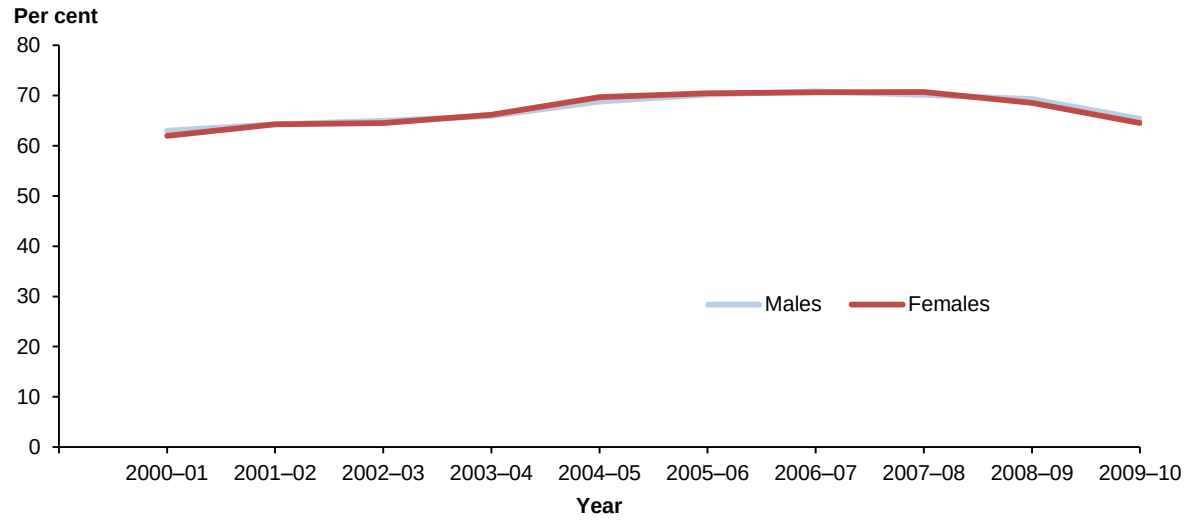
Note: Proportions were age-adjusted to the number of hospitalisations in 2000–01 with a principal diagnosis of stroke.

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.7 Trends in the proportion of stroke hospitalisations with at least one MRI brain scan undertaken, by sex, 2000–01 to 2009–10

Computerised tomography (CT) brain scan

Between 2000–01 and 2006–07, the age-adjusted proportion of hospitalisations with a principal diagnosis of stroke that had at least one CT brain scan undertaken increased from 62% to 71%. However, after 2006–07, the proportion fell and was 65% in 2009–10 (Table D3.11). Over the 10-year period, there was no difference between males and females in the proportion of stroke hospitalisations that had at least one CT brain scan undertaken (Figure 3.8).



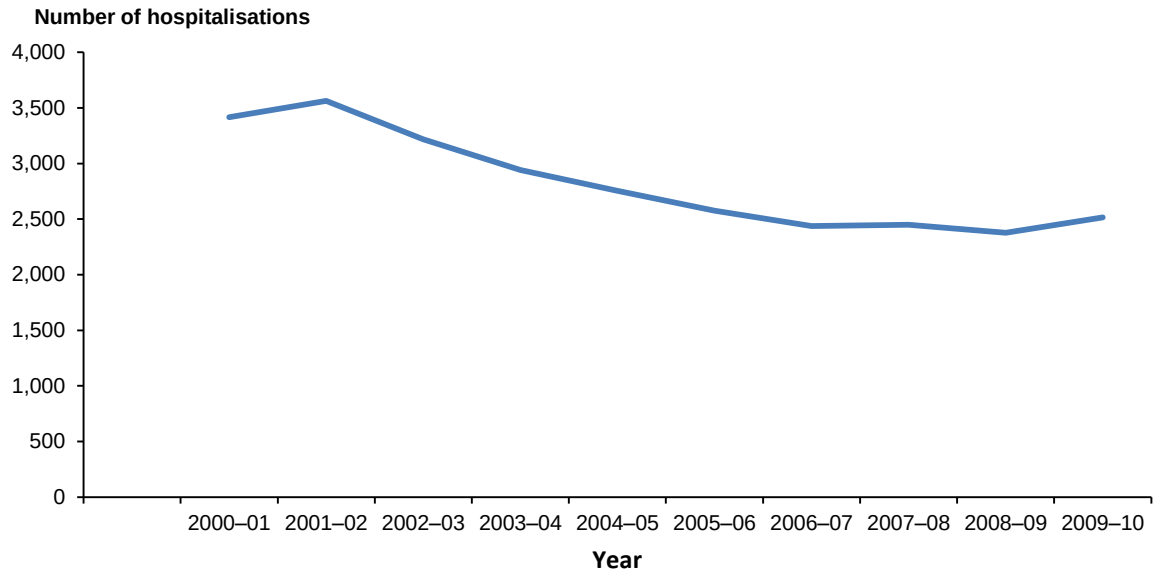
Note: Proportions were age-adjusted to the number of hospitalisations in 2000–01 with a principal diagnosis of stroke.

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.8: Trends in the proportion of stroke hospitalisations with at least one CT brain scan undertaken, by sex, 2000–01 to 2009–10

Carotid endarterectomy

The number of hospitalisations for any principal diagnosis that had at least one carotid endarterectomy undertaken fell from 3,415 in 2000–01 to 2,515 in 2009–10 (Figure 3.9; Table D3.12).



Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 3.9: Trends in the number of hospitalisations with at least one carotid endarterectomy undertaken, 2000–01 to 2009–10

Thrombolysis

Based on the clinical audits conducted by the National Stroke Foundation, the number of patients admitted for ischaemic stroke who received thrombolysis has increased from 461 in 2007 to 1,170 in 2011 (National Stroke Foundation 2011b). This increase could be related to an increase in the number of stroke units offering this service over the same period (from 24% in 2007 to 36% in 2011).

Stroke units and clinical audit

This section focuses on specialised care for stroke delivered in stroke units. The information is based on a recent organisational and clinical audit conducted in 2011. This audit covered a subsample of stroke units in Australia that is large enough to represent the majority of stroke units and their activity in Australia.

What is a stroke unit?

Specialised units dedicated to stroke and staffed with a multidisciplinary team significantly improve the health outcome and recovery of stroke patients (Stroke Unit Trialists' Collaboration 2007). The *Acute Stroke Services Framework 2011* (National Stroke Foundation 2011c), recommends that all hospitals with over 350 acute stroke admissions per year should develop a 'comprehensive stroke centre' with access to advanced capability, while those with over 100 stroke admissions per year should develop a 'primary stroke centre'. A comprehensive stroke centre has a dedicated stroke unit with specialised resources and staff

available 24 hours a day every day of the year. A primary stroke centre has a dedicated stroke unit with clinicians who have: stroke expertise; written stroke protocols for emergency services, acute care and rehabilitation; ability to offer thrombolytic therapy or protocols to transfer appropriate patients to a comprehensive stroke centre; timely neurovascular imaging and timely access to expert interpretation; and coordinated processes for patient transition to ongoing rehabilitation and secondary prevention services.

The minimum criteria for defining a stroke unit are (National Stroke Foundation 2011c):

1. Co-located beds within a geographically defined unit.
2. Dedicated, inter-professional team with members who have a special interest in stroke and/or rehabilitation. The minimum team would consist of medical, nursing and allied health (including occupational therapy, physiotherapy, speech pathology, social work and dietician).
3. Inter-professional team meet at least once per week to discuss patient care.
4. Regular programs of staff education and training relating to stroke, (e.g. dedicated stroke in-service program and/or access to annual national or regional stroke conference).

There are various types of stroke units, with different range of functions and services available—acute stroke units, comprehensive stroke units and stroke rehabilitation units (Table 3.6).

Table 3.6: Main types of stroke units and their characteristics

Type of services	Acute stroke unit	Comprehensive stroke unit	Stroke rehabilitation unit
Admits at stroke onset	✓	✓	X
Access to 24 hour monitoring, CT brain imaging and IV thrombolysis	✓	✓	X
Designated, co-located stroke beds	✓	✓	✓
Admission for hyper-acute and acute management only	✓	X	X
Access to a specialised multidisciplinary team and early rehabilitation	✓	✓	✓
Access to a specialised multidisciplinary team and specialist rehabilitation	X	✓	✓

Source: National Stroke Foundation 2008.

The 2011 National Stroke Audit

The National Stroke Foundation has conducted a National Stroke Audit Program since 2007. The main objective of the audit is to measure adherence to the *Clinical guidelines for stroke management 2010*. Hospitals required to admit and manage people with acute stroke were considered eligible to participate in the 2011 National Stroke Audit, which included two components—an Acute Services Organisational Survey and an Acute Services Clinical Audit (National Stroke Foundation 2011b).

The 2011 Acute Services Organisational Survey examined whether resources such as stroke units, imaging and multidisciplinary teams were available in the participating hospitals to deliver evidence-based stroke care. The self-reported data were provided by a nominated clinician at each hospital (National Stroke Foundation 2011b). The National Stroke

Foundation identified 209 eligible public hospitals, out of which 184 participated in the audit. Four private hospitals also participated, bringing the total number of hospitals audited to 188 (Table 3.7). There were 25,597 patients with acute stroke admitted to these 188 hospitals in the 12 months before the audit.

The 2011 Acute Services Clinical Audit involved the retrospective review of up to 40 consecutive patients admitted to 108 of the 188 hospitals that participated in the organisational audit during a defined timeframe (National Stroke Foundation 2011a). The clinical audit examined processes of care such as diagnostic procedures, early interventions and the way in which the nationally endorsed evidence-based recommendations were delivered. Timing of the delivery of various aspects of care and discharge outcomes was also measured. The 108 hospitals participating in the clinical audit admitted 88% (22,636 patients) of the 25,597 patients with acute stroke admitted to the 188 hospitals participating in the organisational survey. Of these 22,636 acute stroke patients, 3,548 had their clinical records audited against the recommendations of the *Clinical guidelines for stroke management 2010*.

Table 3.7: Participating hospitals and their stroke units in Australia, 2010

	Hospitals participating in the Acute Services Organisational Survey	
State	Number	With stroke units
ACT/NSW	60	32
QLD	34	13
NT	2	1
SA	33	4
Tas	3	2
Vic	37	18
WA	19	4
Total	**188**	**74**
Total stroke admissions in 2011	**25,597**	**20,801**

Source: National Stroke Foundation 2011b.

2011 Acute Services Organisational Survey

The information presented in this section comes from the National Stroke Foundation's 2011 Acute Services Organisational Survey (National Stroke Foundation 2011b).

Characteristics of participating hospitals

Over 40% of hospitals participating in the 2011 Acute Services Organisational Survey (81 out of 188 hospitals) admitted at least 100 stroke patients per year, and 39% of participating hospitals (74 hospitals) reported having a stroke unit. Most (78%) of the 74 stroke units were acute stroke units and a minority were integrated stroke units (20%). However, eight stroke units did not meet the minimum standards for stroke units and six of these stroke units admitted more than 100 stroke patients a year.

Most stroke units were located in urban areas (70 stroke units) and four were in rural areas. Of the 70 stroke units located in urban areas, 80% were in metropolitan areas and the remainder were in regional areas.

Organisation of care

Of the 188 hospitals participating in the organisational audit, 41% had arrangements with ambulance services to facilitate rapid assessment, 58% had protocols to guide the transfer of patients with stroke into or out of the centre and 64% had emergency department protocols for the rapid triage of patients. However, 37% of hospitals that needed to transfer patients with stroke to larger hospitals did not have documented transfer arrangements.

In urban areas, most hospitals (99%) admitting acute stroke patients had access to CT within 24 hours, 91% had access to MRI and 98% had access to Carotid Doppler (an ultrasound scan primarily used to assess the blood flow in the arteries of the neck). However, in rural areas, access to diagnostic imaging was more limited, with 70% of hospitals having access to CT within 24 hours, only 31% having access to MRI and 66% having access to Carotid Doppler.

Overall, 36% of participating hospitals offered thrombolysis in 2011. Among the 74 hospitals with a stroke unit, 74% offered thrombolysis, while 11% of the 114 hospitals with no stroke unit offered thrombolysis.

Just over 60% of hospitals provided routine assessment of patients with stroke for the need for ongoing rehabilitation. Almost one in five (19%) hospitals had access to early supported discharge teams and 76% had access to community-based rehabilitation.

Sixty per cent of hospitals routinely provided a discharge care plan to patients. Only 31% of hospitals reported using protocols for post-discharge review but 72% provided a post-discharge contact to patients.

2011 Acute Services Clinical Audit

The information presented in this section comes from the National Stroke Foundation's 2011 Acute Services Clinical Audit (National Stroke Foundation 2011a).

Type of stroke

Over three-quarters of the 3,548 patients whose medical records were included in the clinical audit had confirmed ischaemic stroke (2,624 patients), while 16% (531 patients) had confirmed intracerebral haemorrhage. Findings from this audit provide insight to the clinical pathways undertaken by stroke patients.

Admission to stroke units

Only 60% of patients with stroke received care in a stroke unit at some time during their admission, although 80% of patients who were admitted to a hospital with a stroke unit received care in the stroke unit. However, 42% of all stroke patients admitted to a stroke unit were not admitted to that unit on the day of their stroke.

Early assessment

The *Clinical guidelines for stroke management 2010* recommend that all patients with suspected stroke should have brain imaging within 24 hours of admission (National Stroke Foundation 2010). Of the patients included in the stroke clinical audit, 89% had brain imaging performed within 24 hours of their admission.

Thrombolysis

As discussed previously, thrombolysis is recommended to be given as early as possible to patients with ischaemic stroke who meet the specific eligibility criteria described in Appendix E (National Stroke Foundation 2010). Almost half (49%) of patients with ischaemic stroke who arrived at hospital within 3 hours of stroke onset were assessed for eligibility for

thrombolysis (365 out of 751 patients). Only 7% of all patients with confirmed ischaemic stroke (2,624 patients), received thrombolysis, but not all of these patients may have been eligible for thrombolysis and/or may not have arrived at hospital within the 4.5-hour timeframe for thrombolysis treatment. Of those who did arrive at hospital within 4.5 hours of stroke onset (864 patients), only 18% (154 patients) received thrombolysis.

Aspirin treatment

The *Clinical guidelines for stroke management 2010* recommend that aspirin should be given within 48 hours of the onset of stroke symptoms if CT/MRI scans exclude haemorrhage (National Stroke Foundation 2010). Of the 2,006 patients with ischaemic stroke who were not contraindicated to receive aspirin or had not already received aspirin before transferring to a participating hospital, 69% received aspirin at some point during their admission and 64% received aspirin within 48 hours of admission.

Assessment and management of the consequences of stroke

The *Clinical guidelines for stroke management 2010* recommended that assessments from allied health professionals (physiotherapist, occupational therapist, speech pathologist, dietitian, social worker and psychologist) take place within 48 hours of admission (National Stroke Foundation 2010).

Most stroke patients had an assessment by a multidisciplinary team of allied health professionals, but many of these assessments were not delivered within the recommended timeframe of 48 hours after presentation. Among patients eligible for assessment, 62% of physiotherapy assessments took place with 48 hours, while 40% of occupational health, 62% of speech pathology and 22% of dietitian assessments were conducted within this timeframe. Less than half of eligible patients were assessed by a social worker during their admission, 43% were assessed by a dietitian and only 6% of patients with mood impairments had a psychological assessment.

Management of complications

The most common stroke complications that occurred during patient admissions were progression of the stroke, fever, urinary tract infection, pneumonia, and depression or anxiety (Table 3.8). In addition, 40% of stroke patients whose continence was assessed and documented had continence problems within the first 72 hours of admission, but only a quarter were provided with a continence management plan.

Table 3.8 Main complications during the admission of stroke patients, 2011

Complications	Number	Per cent
Stroke progression	406	11.0
Fever	442	12.0
Urinary tract infection	313	9.0
Aspiration pneumonia	296	8.0
Depression/anxiety	273	8.0
Falls	199	6.0
Newly diagnosed atrial fibrillation	209	6.0
Malnutrition	161	5.0
Raised intracranial pressure	162	5.0
Shoulder pain	124	3.0
New stroke	102	3.0
Pressure sores	90	3.0
Seizures	87	2.0
Acute myocardial infarction	67	2.0
Deep vein thrombosis	19	1.0
Pulmonary embolism	14	<1.0
Total stroke admissions	**3,548**	

Source: National Stroke Foundation 2011a.

Secondary prevention

With regard to secondary prevention, more than half of all patients received behaviour change education for modifiable risk factors (National Stroke Foundation 2011a). Just over 80% of patients without contraindications were discharged with antihypertensive medications. Among patients with ischaemic stroke, 80% were discharged with lipid-lowering medications and 96% with antithrombotic medications.

Discharge plan

Only half of the patients with stroke received a discharge care plan. Patients admitted to hospitals with 100 or more stroke admissions a year were more likely to have a discharge care plan than those admitted to hospitals with fewer than 100 stroke admissions per year (52% compared with 43%).

Recent changes in stroke unit care

Stroke care in Australia has changed significantly in recent years, with improvements in access to more specialised care and therapies. In addition to reinforcing the development and coverage of more specialised stroke care, the *Clinical Guidelines for Stroke Management 2010* have emphasised the importance of continuity of care for stroke patients, implying better processes between multidisciplinary team within the hospital and also in the community. Results from the organisational audit conducted by the National Stroke Foundation are presented here to illustrate recent changes in coverage and processes in the stroke care system in Australia.

Between 2007 and 2011, the number of stroke units in Australia increased from 54 to 74 and the proportion of patients receiving stroke unit care at any point during their admission

increased from 50% to 60% (National Stroke Foundation 2011a, b). The number of beds dedicated to stroke admissions increased by 40% over the same period (from 391 in 2007 to 549 in 2011). Other significant improvements in stroke services that have taken place between 2007 and 2011 include:

- an increase in both direct and faster access to stroke units for patients as a result of the doubling of the proportion of hospitals with ambulance service arrangements (from 19% in 2007 to 41% in 2011)
- a substantial increase in the proportion of hospitals with emergency department protocols for the rapid triage of patients with acute stroke (from 38% in 2007 to 64% in 2011)
- an increase in the proportion of hospitals with emergency department protocols for transfer of patients to another hospital for care (from 44% in 2007 to 58% in 2011)
- an increase in the proportion of hospitals with access to imaging facilities such as MRI (from 55% in 2007 to 62%) and Carotid Doppler (from 74% in 2007 to 82% in 2011)
- an increase in the proportion of hospitals with access to telehealth for clinical support (from 58% in 2007 to 67% in 2011) and for professional development (from 68% in 2007 to 80% in 2011)
- improvements in communication processes between the hospitals and the community and the care team and the patients and their family.

Despite these improvements, the National Stroke Audit identified several issues for further improvement:

- although access to stroke units increased from 50% in 2007 to 60% in 2011, it still compares poorly with the United Kingdom (90% access) and Scandinavian countries (> 80% access)
- only 58% of stroke patients were admitted to a stroke unit on the day of their stroke in 2011 and this has not improved since 2009 (59%)
- although the proportion of ischaemic stroke patients who arrived within 3 hours of stroke onset and received thrombolysis increased from 6% in 2007 to 20% in 2011, the National Stroke Foundation has recommended that thrombolysis services should be established in all stroke unit hospitals so that eligible patients can be assessed and administered thrombolysis as quickly as possible
- since 2009, there has been no improvement in the proportion of hospitals providing routine assessments for all patients for the need for further rehabilitation (63% in 2009 and 62% in 2011) or in the proportion of hospitals routinely providing a discharge care plan (58% in 2009 and 60% in 2011).

Rehabilitation of stroke or its sequelae

Stroke rehabilitation encompasses a range of measures designed to help improve a patient's functioning after a stroke and/or to prevent deterioration of functioning. It aims to maximise a patient's physical, psychological, social and financial independence, and ideally begins the first day after a stroke. Various elements of stroke rehabilitation have been shown to significantly improve outcomes for patients.

Hospitalisation for rehabilitation of stroke and its sequelae

Rehabilitation care is care in which the clinical intent or treatment goal is to improve the functional status of a patient with an impairment, disability or handicap (AIHW 2012e). It is based on a multi-disciplinary rehabilitation plan comprising negotiated goals and indicative timeframes, which are evaluated by a periodic assessment using a recognised functional assessment measure. It includes care provided:

- in a designated rehabilitation unit
- in a designated rehabilitation program
- under the principal clinical management of a rehabilitation physician or, in the opinion of the treating doctor, when the principal clinical intent of care is rehabilitation.

In 2009–10, the total number of hospitalisations for rehabilitation care (excluding rehabilitation for drug or alcohol) was 251,666, of which 10% (25,810) were associated with stroke or its sequelae. Hospitalisations for rehabilitation associated with stroke or its sequelae accounted for 374,826 patient days in 2009–10.

The age-adjusted hospitalisation rate for stroke rehabilitation in males was 1.5 times as high as that of females (131 compared with 90 per 100,000 population) (Table D3.13). A third of hospitalisations for rehabilitation of stroke or its sequelae were for patients aged under 65.

Just over half (52%) of all hospitalisations for rehabilitation of stroke or its sequelae in 2009–10 were in public hospitals (excluding public psychiatric hospitals), while 48% were in private hospitals.

Specialised rehabilitation units

More detailed information on specific rehabilitation outcomes for stroke patients is collected by the Australasian Rehabilitation Outcomes Centre (AROC).

By 2012, the majority of public (101) and private rehabilitation units (83) in Australia had joined AROC (Table 3.9). These rehabilitation centres can be attached to a stroke unit and a hospital or independent from a hospital. They provide rehabilitation services not only for patients with stroke but also to a wide range of patients that may require their services.

Table 3.9: Australasian rehabilitation outcomes centres by state and status, 2012

State	Public	Private	Total
ACT/NSW	48	38	86
Vic	26	22	48
SA	5	3	8
WA	1	2	3
Tas	3	2	5
NT	2	1	3
QLD	16	15	31
Australia	**101**	**83**	**184**

Source: AROC 2011b.

In 2010, there were 6,088 stroke rehabilitation discharge episodes from subacute and non-acute inpatient rehabilitation programs provided by members of the AROC (AROC 2011a). Most of the rehabilitation episodes for stroke were managed by public centres (72%). Most patients (85%) were later discharged to the community, with the remaining 15% staying in the hospital system. Among those discharged to the community, the majority went back to live in their private residence with support. Stroke rehabilitation episodes lasted an average of 30 days. Just over half (54%) of patients admitted to rehabilitation for stroke were males.

The number of rehabilitation episodes for stroke increased substantially between 2000 and 2010 (from 2,314 to 6,088), possibly because of an increase the number of rehabilitation centres that were members of AROC.

4 Stroke treatment in the community

Key findings

- In 2007–08, cerebrovascular problems were managed in general practice at the rate of 0.5 per 100 encounters.
- Between 1998–99 and 2007–08, prescription rates have increased significantly in general practice for the management of cerebrovascular problems.
- Between 1995 and 2009, the supply of many medicines commonly used to prevent or manage stroke has also increased significantly.

The management of stroke in general practice

There is only limited information available on the management of stroke/cerebrovascular diseases in Australian general practice. This section presents information based on results from the BEACH study (Box 4.1). The latest published data available on the management of stroke from the BEACH study are for 2007–08, covering the management of cerebrovascular diseases including stroke.

Box 4.1 The BEACH study of general practice

The Bettering the Evaluation and Care of Health (BEACH) study is conducted by Family Medicine Research Centre at the University of Sydney (in collaboration with the AIHW until June 2011) (AIHW 2012a). BEACH began in April 1998 and each year 1,000 general practitioners participate from a random sample of general practitioners (GPs) who claimed at least 375 general practice Medicare items of service in the previous 3 months. These GPs provide details of about 100,000 GP-patient encounters. Each participating GP completes details for 100 consecutive patient encounters on structured paper encounter forms, and record their patients' diagnosis or a description of the problem managed, as well as the reasons given by the patient for the visit. No information identifying patients is collected. The GPs also provide information about themselves and their practice.

The classification system for health conditions on the BEACH data set is described in Appendix B.

Management rates

The data presented here are for cerebrovascular problems managed in general practice. Cerebrovascular problems include stroke, TIA and other cerebrovascular disease (Britt & Miller 2009).

In 2007–08, the management rate of cerebrovascular problems in general practice was fairly low, with a rate of 0.5 per 100 encounters, of which stroke was managed at a rate of 0.2 per 100 encounters (Table 4.1). This equates to an estimated 514,650 general practice encounters for cerebrovascular problems in 2007–08, of which it is estimated that 240,900 encounters were for stroke (for method, see Appendix C). In comparison, cardiovascular disease overall

was managed at a rate of 17.6 per 100 encounters. The management rate for cerebrovascular problems has remained stable since 1998–99 (Britt & Miller 2009).

Of all cerebrovascular problems managed in 2007–08, stroke/cerebrovascular accident was the most common (48%), followed by TIA (33%) (Table 4.1). There was no difference between males and females in the management rate of cerebrovascular problems, but a higher management rate was found among patients aged 65 and over compared with younger patients (Table 4.2). Between 1998–99 and 2007–08, the management rate for cerebrovascular problems increased slightly for females but was steady for males (Table 4.2). There were no significant changes over time in age-specific management rates for cerebrovascular disease.

Table 4.1: Types of cerebrovascular problems managed in general practice in 2007–08

	Rate per 100 encounters (n=95,898)	95% CI	Change between 1998–99 and 2007–08	Percentage of all problems (n = 145,078)	Change between 1998–99 and 2007–08	Percentage of cerebrovascular problems (n =4 49)	Change between 1998–99 and 2007–08
All cerebrovascular problems	**0.47**	**0.41–0.53**	**steady**	**0.3**	**steady**	**100.0**	**steady**
Stroke/ cerebrovascular accident	0.22	0.18–0.26	steady	0.2	steady	47.7	↑
Transient cerebral ischaemia	0.15	0.12–0.18	steady	0.1	steady	32.6	steady
Other cerebrovascular disease	0.09	0.07–0.12	steady	0.1	steady	19.7	↓

Source: Britt & Miller 2009.

Table 4.2: Management rate of cerebrovascular problems in general practice in 2007–08

	Rate per 100 encounters	95% CI	Change between 1998–99 and 2007–08
All patients			
Males	0.5	0.4–0.6	steady
Females	0.5	0.4–0.6	↑
Age-groups			
<25	–	–	
25–44	0.1	0.0–0.1	steady
45–64	0.3	0.2–0.4	steady
65–74	1.0	0.7–1.2	steady
75+	1.7	1.4–1.9	steady

Source: Britt & Miller 2009.

Treatment and pathology rates

Between 1998–99 and 2007–08, the prescription rate has increased by 34% (from 50 to 67 per 100 cerebrovascular problems managed) (Britt & Miller 2009). This increase was largely

driven by the increase in the medication rate for platelet aggregation inhibitors (excluding heparin) over this period.

In 2007–08, platelet aggregation inhibitors—a type of antithrombotic medicines—were the most commonly prescribed medicines for cerebrovascular problems at a rate of 23 per 100 cerebrovascular problems managed (Table 4.3). In 2007–08, clinical treatments, such as counselling and advice, were used in the treatment of 16 per 100 cerebrovascular problems. The international normalised ratio (INR) blood test—a test of blood clotting for patients on warfarin—was used in 1.4 per 100 cerebrovascular problems managed in 2007–08 (Table 4.3) (Britt & Miller 2009).

Table 4.3: Medication, other treatments and pathology rates (per 100 cerebrovascular problems) in general practice in 2007–08

	Rate per 100 cerebrovascular problems	95% CI	Change between 1998–99 and 2007–08
All medications	67.1	58.5–75.8	↑↑
Prescribed medications	63.3	54.5–72.0	↑↑
Platelet aggregation inhibitors (excl. heparin)	22.7	18.2–27.3	↑↑
HMG CoA reductase inhibitors	5.1	2.7–7.5	↑↑
Phenothiazines with piperazine structure	1.3	0.3–2.4	↑↑
Other treatments	20.4	16.3–24.5	steady
Clinical treatments	16.4	12.6–20.1	steady
Procedures	4.0	2.1–6.0	steady
INR test	1.4	0.1–2.6	↑↑

Source: Britt & Miller 2009.

Comorbidity management rates

In 2007–08, the most common problems associated with the management of cerebrovascular problems were hypertension (19 per 100 cerebrovascular problems managed), followed by diabetes (7 per 100 cerebrovascular problems managed) and lipid disorders (5 per 100 cerebrovascular problems managed) (Table 4.4). The same pattern was observed in 1998–99.

Table 4.4: Other problems management rate (per 100 cerebrovascular problems) in general practice in 2007–08

	Rate per 100 cerebrovascular problems	95% CI	Change between 1998 and 2007–08
Hypertension	18.8	14.5–23.1	steady
Diabetes	6.7	3.8–9.3	steady
Lipid disorders	5.2	3.0–7.5	steady

Source: Britt & Miller 2009.

Referrals, pathology and imaging

Over the period April 1998 to March 2004, GPs referred 14% of patients with cerebrovascular problems to other health professionals and services (AIHW: Senes 2006). Of these referrals, 4% were to hospital, 4% to rehabilitation, 4% to specialists and 1% to other services such as aged-care assessment, home support service and nursing homes.

Over the same 5-year period, pathology tests were ordered for 12% of cerebrovascular encounters. Coagulation tests to monitor the effect of anticoagulation drugs were the most common (4%). Other tests included full blood count (2%) and lipids (1%).

Between April 1998 and March 2004, imaging was requested for 7% of cerebrovascular problems. The most frequent investigations were CT scan of the brain (2%), CT scan of the head (1%), chest X-ray (1%) and Carotid Doppler (1%).

Although these referral, pathology and imaging data for cerebrovascular problems managed by GPs are relatively old, there have been no changes in the rates of referrals to specialists or allied health services, or in ordering rates of pathology or imaging since 2000–01 (Britt & Miller 2009).

Supply of stroke medications in the community

This section examines the current supply of stroke-related medicines in the community and the number of prescriptions based on data for government-subsidised and non-subsidised prescription medicines listed on the Pharmaceutical Benefits Scheme and Repatriation Pharmaceutical Scheme (PBS/RPBS). Note that the use of prescription medicines dispensed to admitted patients in public hospitals are not included (DoHA 2011).

Non-subsidised medicines listed on the PBS/RPBS are those for which the cost is below the patient contribution, capped at $32.90 for general patients and $5.30 for pensioner and concessional patients in 2009. Estimates of non-subsidised PBS/RPBS medicines are calculated from the Pharmacy Guild Survey. For further information see Appendix C.

Note that estimates in this section refer to medicine supply rather than use. The reason is that patients may not fill all prescriptions (and therefore will not be included in these data) or use all the medicines dispensed. In addition, there are some medicines not included on the PBS/RPBS and so these will also not be included here. Note that some of the medicines reported here may be used for a range of different conditions other than stroke, such as medicines commonly used to manage other cardiovascular conditions or their associated risk factors such as high blood pressure and high blood cholesterol.

Medicine supply is expressed as 'defined daily dose per 1,000 population per day (DDD/1,000/day)'. This measure is based on an assumed average dose per day of a medicine used for its main indication (the main reason for which the medicine was prescribed) in adults. The DDD allows comparisons between medicines to be made independently of differences in price, preparation and quantity per prescription. However, the DDD is only a technical unit of use and does not necessarily reflect the recommended or average prescribed dose in Australia (DoHA 2011).

The main group of medicines related to the prevention or treatment of stroke are antithrombotic, blood-pressure lowering and lipid-modifying medicines.

Antithrombotic medicines

Antithrombotic medicines act by preventing the formation of blood clots or by dissolving existing blood clots. These medicines are usually taken over a long period to reduce the risk of subsequent strokes and disability among patients with a history of ischaemic stroke, and to reduce the risk of heart attack and death among people with coronary heart disease (AIHW 2010a). Medicines in this class include antiplatelet agents, such as aspirin, and anticoagulants, such as warfarin. This class also includes thrombolytic drugs, which act by dissolving blood clots. They are given to patients suffering a heart attack or ischaemic stroke. However, thrombolytics are powerful drugs that are always given in hospital or by paramedics, and so do not appear in the Pharmaceutical Benefits Scheme database.

Number of prescriptions

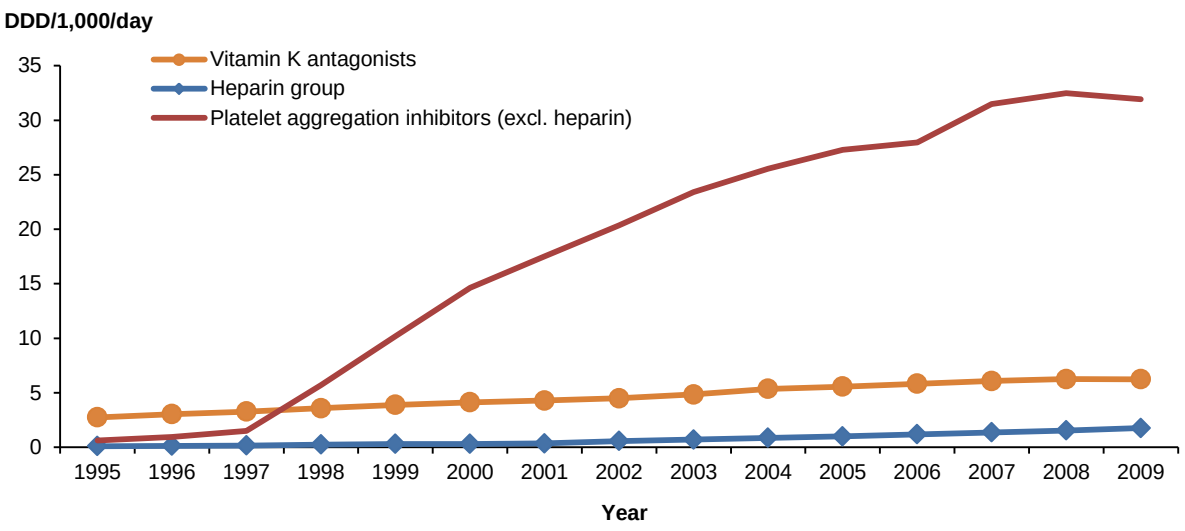
In 2009, 8.4 million prescriptions for antithrombotic medicines were supplied to the Australian population. The most commonly prescribed antithrombotic medicines were platelet aggregation inhibitors (58%), which included aspirin (16%), followed by vitamin K antagonists (37%) and heparin (5%) (Table D4.1).

Between 2001 and 2009, there was a 110% increase in the number of prescriptions for antithrombotic medicines from 4.0 million to 8.4 million. The number of prescriptions for heparin in 2009 was 3.5 times as high as that in 2001 (385,000 compared with 111,000); the number of prescriptions for platelet aggregation inhibitors in 2009 was 2.5 as high as in 2001 (4.9 million compared with 2.0 million); aspirin prescriptions in 2009 were 1.5 times as high as in 2001 (1.4 million compared with 900,000); and vitamin K antagonists prescriptions in 2009 were 1.6 times as high as in 2001 (3.1 million compared with 1.9 million) (Table D4.1).

Daily defined dose per 1,000 per day

In 2009, platelet aggregation inhibitors (excluding heparin) were prescribed at a rate of 32 DDD/1,000/day, heparin was prescribed at a rate of 1.8 DDD/1,000/day and vitamin K antagonists were prescribed at a rate of 6.2 DDD/1,000/day.

Between 1995 and 2009, the supply of antithrombotic medicines in the community increased substantially. This rise was mainly due to the increase in the prescription rate of platelet aggregation inhibitors (excluding heparin) from 0.6 DDD/1,000/day to 32 DDD/1,000/day over the 15-year period (Figure 4.1). This was consistent with the substantial increase in the prescription rate of platelet aggregation inhibitors (excluding heparin) in general practice between 1998–99 and 2007–08, as described above. The prescription rate for vitamin K antagonists also increased between 1995 and 2009, from 2.7 DDD/1,000/day to 6.2 DDD/1,000/day, as did that of heparin, from 0.1 DDD/1,000/day to 1.8 DDD/1,000/day.



Note: Combination medications are excluded.

Sources: AIHW: Senes & Penm 2007 based on data from the Drug Utilisation Sub-Committee Database, DoHA; DoHA 2007; DoHA 2008; DoHA 2009a; DoHA 2009b and DoHA 2011.

Figure 4.1 Trends in the supply of antithrombotic medicines to the community, 1995 to 2009

Blood-pressure-lowering medicines

Blood-pressure lowering medicines, or antihypertensives, are used to treat high blood pressure and have been shown to significantly reduce the number of deaths from stroke and heart attacks. The main types of blood-pressure lowering medicines are (AIHW 2010a):

- diuretics, which increase the rate of urination, leading to a reduction in blood volume
- beta-blockers, which reduce the heart's activity by suppressing certain signals to it that cause it to beat faster and harder
- calcium-channel blockers, which, depending on the type of channel blocker, act on particular ion channels in different parts of the heart and circulation, having the effect of reducing the force of contraction of the heart, reducing both blood pressure and the effects of angina
- renin-angiotensin system agents, which are used to reduce blood pressure by blocking the effects of the renin-angiotensin system: a hormone system of the body that regulates blood pressure.

Number of prescriptions

In 2009, 52.2 million prescriptions for blood-pressure lowering medicines were supplied to the Australian population, representing more than a half of all prescribed medicines (59%) commonly used for stroke. The most frequently prescribed blood-pressure lowering medicines were agents acting on the renin-angiotensin system (58%), followed by calcium channel blockers (19%) and beta-blocking agents (15%) (Table D4.1).

Between 2001 and 2009, the number of prescriptions for blood-pressure lowering medicines increased by 45% from 36.0 million to 52.2 million prescriptions (Table D4.1). Over the 9-year period, the types of blood-pressure lowering medicines with the greatest increases in the number of prescriptions were agents acting on renin-angiotensin system (78% increase), beta-blocking agents (36% increase) and antihypertensives (27% increase). However,

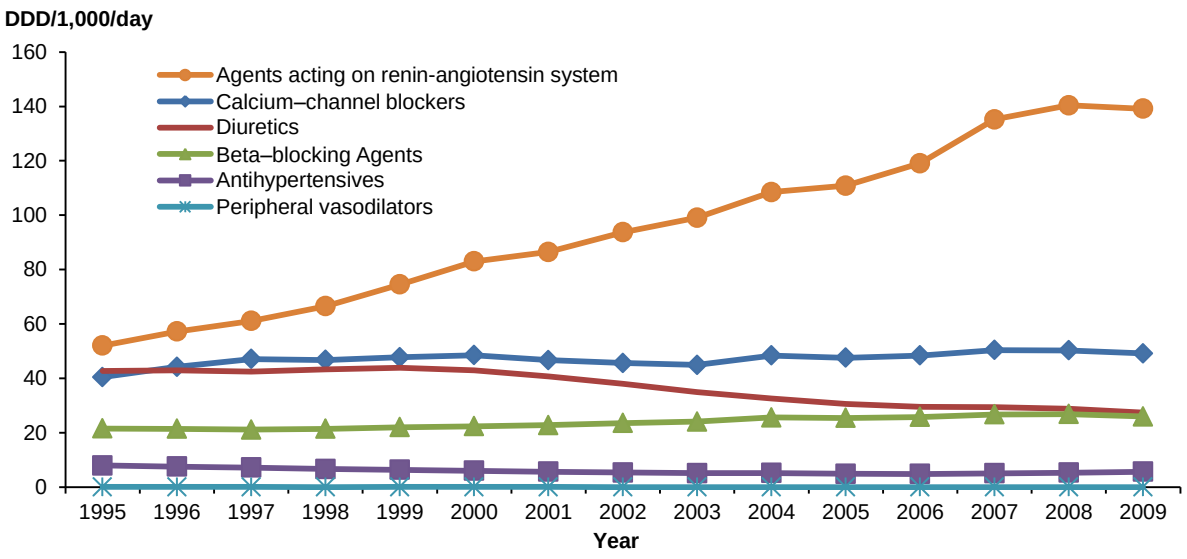
prescription numbers for peripheral vasodilatators, vasoprotective agents and diuretics fell between 2001 and 2009 (Table D4.1).

Daily defined dose per 1,000 per day

It should be noted that the statistics presented below for blood-pressure lowering medicines exclude combination products.

In 2009, prescription rates for the main blood-pressure lowering medicines were 139.1 DDD/1000/day for agents acting on the renin-angiotensin system; 49.2 DDD/1000/day for calcium-channel blockers; 26.0 DDD/1000/day for beta-blockers; 27.4 DDD/1000/day for diuretics; and 5.7 DDD/1000/day for antihypertensives.

Between 1995 and 2009, agents acting on the renin-angiotensin system were the most commonly prescribed blood-pressure lowering medications in the community, with their use increasing by 167% from 52.1 to 139.1 DDD/1000/day over the 14-year period (Figure 4.2). The use of calcium-channel blockers also increased by 22% over this period, as did the use of beta-blockers (a 21% increase). In contrast, over the 14-year period, the use of diuretics fell by 36%, antihypertensives fell by 29% and peripheral vasodilators, which were dispensed infrequently, fell by 87%.



Note: Combination medications are excluded.

Sources: AIHW: Senes & Penm 2007 based on data from the Drug Utilisation Sub-Committee Database, DoHA; DoHA 2007; DoHA 2008; DoHA 2009a; DoHA 2009b and DoHA 2011.

Figure 4.2 Trends in the supply of blood pressure lowering medicines to the community, 1995–2009

Lipid-modifying medicines

Lipid-modifying medicines are used to control blood cholesterol level, which is an important risk factor for those with, or at risk of having, a stroke. Lipid-modifying medicines may act to reduce the levels of blood LDL cholesterol (low-density lipoprotein, the so-called 'bad' cholesterol) and/or to increase the levels of blood HDL cholesterol (high-density lipoprotein, the so-called 'good' cholesterol). They may also be used to reduce high levels of blood triglyceride, a fat that can be associated with the development of heart disease (AIHW

2010a). With respect to stroke, lipid–modifying medicines are used to treat lipid disorders to reduce risk of stroke in people with established cardiovascular disease, and to prevent cardiovascular disease and deaths in people at high risk of stroke due to the presence of multiple risk factors (AIHW: Senes & Penm 2007).

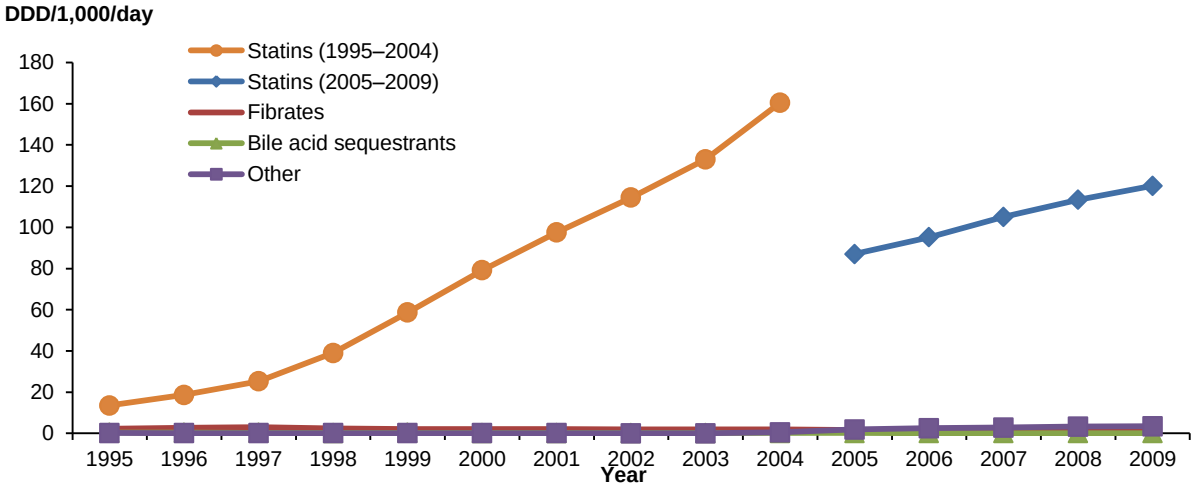
Number of prescriptions

Lipid-modifying medicines are commonly prescribed and, in 2009, there were 24.8 million prescriptions for them supplied to the Australian population, representing an increase of 94% compared with the 12.8 million prescriptions in 2001 (Table D4.1). Statins were the most commonly prescribed lipid-modifying medicines in 2009, with 21.7 million prescriptions. Between 2001 and 2009, the number of prescriptions for statins increased by 76% from 12.3 million to 21.7 million prescriptions.

Daily defined dose per 1,000 per day

In 2009, lipid-modifying medicines were prescribed at a rate of 142.5 DDD/1000/day.

Between 1995 and 2004, there was a 12-fold increase in the use of statins from 13.5 to 160.4 DDD/1000/day (Figure 4.3). The DDDs for some statins changed between 2006 and 2007, and the revised DDD/1,000/day are available from 2005. Between 2005 and 2009, the use of statins increased by 38% from 87 to 120 DDD/1000/day (Figure 4.3). There was little change in the use of fibrates, bile acid sequestrants or nicotinic acid between 1995 and 2009. However, the use of ezetimibe, which was listed on the Pharmaceutical Benefits Scheme in 2003 (DoHA 2005), increased from 0.4 to 3.5 DDD/1,000/day between 2004 and 2009.



Notes

1. Combination medications are excluded.
2. Other serum-lipid-reducing agents include nicotinic acid and ezetimibe.
3. There is a break in the time series for statins because the defined daily dose (DDD) for some statins changed between 2006 and 2007. However, DDD/1,000/day based on the new DDD are available from 2005 and therefore the break in the time series is shown here from 2005.

Sources: AIHW: Senes & Penm 2007 based on data from the Drug Utilisation Sub-Committee Database, DoHA; DoHA 2007; DoHA 2008; DoHA 2009a; DoHA 2009b and DoHA 2011.

Figure 4.3 Trends in the supply of lipid-lowering agents to the community, 1995–2009

5 Managing the consequences of stroke

Key findings

- In 2009, around 285,300 stroke survivors also had a current disability.
- In 2009–10, there were just over 27,000 hospitalisations for rehabilitation care associated with stroke or its sequelae. Over a third of these hospitalisations were for patients aged under 65.
- In 2009–10, one in five Aged–care Assessment Program (ACAP) clients with a complete ACAT assessment (32,725 people) had a diagnosis of cerebrovascular disease or TIA. Compared with other ACAP clients, this group had higher levels of activity limitations, particularly communication and movement.
- In 2009, nearly 75,000 co-resident primary carers provided assistance to people with stroke and disability in Australia. The majority of these carers were female (69%) and nearly two-thirds were aged 60 and over. More than half (58%) spent 40 hours or more per week in their caring role.

Assistance for people with stroke-related disability

In 2009, based on data from the ABS Survey of Disability, Ageing and Carers (SDAC), an estimated 285,312 people had had a stroke and also had a current disability. For almost half (46%) of these people, their disability was caused by stroke (an estimated 131,130 people).

Of all stroke survivors with disability, 88% (250,600 people) lived in households, with the rest living in cared accommodation (i.e. hospitals, nursing homes, aged–care and disability hostels, and other homes). The SDAC collected information on assistance needed by people with disability who were living in households or cared accommodation, as well as information on assistance provided to this group who were living in households. However, information on assistance provided to those living in cared accommodation was not collected because it was assumed that all people living in cared accommodation receive the assistance they require.

Living in households

Among stroke survivors who were living in households and whose disability was caused by stroke, 64% needed assistance with health care, 58% with mobility and 47% with self-care (Table 5.1). At least three-quarters of these stroke survivors received assistance for each of the activities for which assistance was needed (Table 5.2). People with stroke-related disability who were living in households were more likely to need assistance with activities than other people with disability (Table 5.1).

These results are consistent with national Aged–care Assessment Program (ACAP) data for people with cerebrovascular disease or TIA who were clients of ACAP and were assessed by Aged Care Assessment Teams (ACATs) over the period July 2009 to June 2010. ACATs determine eligibility for entry into Australian Government subsidised aged-care; for more details see the section 'Living in cared accommodation' below. In 2009–10, ACAP clients with cerebrovascular disease or TIA had higher levels of activity limitations than other ACAP clients for most activities, particularly communication, movement, moving around

places or away from home, self-care, health-care tasks, social and community participation, and transport (Table D5.1).

Table 5.1: Assistance needed by people with disability who live in households, 2009

	Stroke and disability resulting from stroke (n = 103,963)		Stroke and disability not resulting from stroke (n = 146,637)		Disability but no stroke (n = 3,529,305)	
Area of activity limitation[a]	**Estimated number[b]**	**Per cent**	**Estimated number[b]**	**Per cent**	**Estimated number[b]**	**Per cent**
Mobility	60,275	58.0	52,181	35.6	742,235	21.0
Self-care	48,443	46.6	28,399	19.4	469,567	13.3
Communication	13,450	12.9	*4,279	2.9	193,746	5.5
Health care	66,694	64.2	69,010	47.1	880,721	25.0
Cognitive or emotional tasks	32,443	31.2	21,528	14.7	701,550	19.9
Household chores	54,753	52.7	51,910	35.4	829,141	23.5
Property maintenance	62,977	60.6	64,318	43.9	1,007,137	28.5
Meal preparation	32,893	31.6	17,496	11.9	252,371	7.2
Reading or writing	32,283	31.1	20,575	14.0	268,792	7.6
Private transport	64,491	62.0	56,175	38.3	687,546	19.5

(a) People may need help with more than one type of activity.

(b) Estimates marked with an asterisk have an associated relative standard error (RSE) of between 25% (one asterisk) and 50% (two asterisks) and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record File.

Table 5.2: Assistance received[(a)] by people with disability who live in households, 2009

Area of activity limitation[(b)]	Stroke and disability resulting from stroke		Stroke and disability not resulting from stroke		Disability but no stroke	
	Estimated number[(c)]	Per cent[(d)]	Estimated number[(c)]	Per cent[(d)]	Estimated number[(c)]	Per cent[(d)]
Mobility	48,803	81.0	46,191	88.5	652,047	87.8
Self-care	41,230	85.1	27,696	97.5	440,504	93.8
Communication	10,948	81.4	* 4,279	100.0	119,348	61.6
Health care	52,338	78.5	57,127	82.8	736,975	83.7
Cognitive or emotional tasks	24,242	74.7	15,145	70.3	407,383	58.1
Household chores	41,244	75.3	41,411	79.8	711,874	85.9
Property maintenance	51,484	81.8	49,432	76.9	867,741	86.2
Meal preparation	30,970	94.2	15,925	91.0	236,418	93.7
Reading or writing	31,297	96.9	20,575	100.0	258,069	96.0
Private transport	55,606	86.2	50,914	90.6	636,808	92.6

(a) Only people who needed assistance were asked about assistance received.

(b) People may need help with more than one type of activity.

(c) Estimates marked with an asterisk have an associated relative standard error (RSE) of between 25% (one asterisk) and 50% (two asterisks) and should be interpreted with caution.

(d) Percentages calculated as a proportion of those who need assistance with the activity.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record File.

Among stroke survivors who were living in households and whose disability was caused by stroke, 87% were receiving some type of assistance for core or non-core activities (Table 5.3). In contrast, 69% of those with stroke and disability not caused by stroke, and 53% of those with disability but no stroke, were receiving some type of assistance.

Excluding those who did not need assistance, almost two-thirds (64%) of people with stroke-related disability who were living in households received a combination of informal and formal care, 29% obtained informal help only and 6% received formal assistance only, while 1% received no assistance.

The most common type of assistance provided to people with stroke-related disability who were living in households was assistance from informal providers (93%), followed by assistance from private providers (53%) and government-organised help (40%) (Table 5.4). These stroke survivors were more likely to be receiving assistance from informal providers, government-organised providers and privately organised non-profit providers than stroke survivors with disability not caused by stroke and people with disability but no stroke.

Table 5.3: Type of assistance received for core and non-core activities[a] by people with disability who live in households, 2009

	Stroke and disability resulting from stroke		Stroke and disability not resulting from stroke		Disability but no stroke	
Type of assistance received	Estimated number[b]	Per cent	Estimated number[b]	Per cent	Estimated number[b]	Per cent
Not applicable[a]	12,832	12.3	34,677	23.6	1,506,698	42.7
None	**1,136	1.1	11,137	7.6	139,822	4.0
Informal only	26,199	25.2	31,532	21.5	787,025	22.3
Formal only	*5,455	5.2	16,421	11.2	246,220	7.0
Informal and formal	58,340	56.1	52,870	36.1	849,539	24.1
Total	**103,963**	**100.0**	**146,637**	**100.0**	**3,529,305**	**100.0**

(a) People who do not need assistance with any core or non-core activity.

(b) Estimates marked with an asterisk have an associated relative standard error (RSE) of between 25% (with one asterisk) and 50% (with two asterisks) and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Table 5.4: Assistance providers to people with disability who live in households and receive assistance[a], 2009

	Stroke and disability resulting from stroke		Stroke and disability not resulting from stroke		Disability but no stroke	
Provider	Estimated number	Per cent[b]	Estimated number	Per cent[b]	Estimated number	Per cent[b]
Government organised	36,432	40.5	36,250	36.0	524,642	27.9
Privately organised and non-profit	13,934	15.5	11,392	11.3	165,450	8.8
Privately organised for profit	33,653	37.4	43,090	42.7	695,987	37.0
Informal provider	84,539	93.9	84,402	83.7	1,636,565	86.9

(a) Recipients of care may receive assistance from more than one type of provider concurrently.

(b) Percentage of those receiving assistance.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Living in cared accommodation

In 2009, nearly all (99%) of the estimated 27,167 stroke survivors with stroke-related disability who were living in cared accommodation needed assistance with health care. Similarly, 98% needed assistance with self-care, 94% with mobility, 88% with cognitive or emotional tasks and 72% with oral communication (Table 5.5). Further, these stroke survivors were more likely to need assistance with these activities than those whose

disability was not caused by stroke. They were also more likely to need assistance with these activities than people who had disability but had not had a stroke (Table 5.5).

Table 5.5: Assistance needed by people with disability who live in cared accommodation[(a)], 2009

	Stroke and disability resulting from stroke (n = 27,167)		Stroke and disability not resulting from stroke (n = 7,546)		Disability but no stroke (n = 123,136)	
Area of activity limitation[(b)]	**Estimated number**	**Per cent**	**Estimated number**	**Per cent**	**Estimated number**	**Per cent**
Mobility	25,634	94.4	6,369	84.4	104,797	85.1
Self-care	26,586	97.9	6,778	89.8	113,454	92.1
Communication	19,560	72.0	4,125	54.7	71,489	58.1
Health care	26,984	99.3	7,305	96.8	119,989	97.4
Cognitive or emotional tasks	23,955	88.2	6,275	83.2	102,841	83.5
Reading or writing	22,423	82.5	5,686	75.4	95,216	77.3

(a) Cared accommodation includes hospitals, homes for the aged such as nursing homes and aged-care hostels, cared components of retirement villages and other 'homes' such as children's homes.

(b) People may need help with more than one type of activity.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Community services for stroke survivors

For those who survive a stroke, the course of life may need to change significantly and assistance in aspects of daily living may be needed, depending on any impairment caused by the stroke. Government programs such as Home and Community Care (HACC), Community Aged Care Packages (CACP), Extended Aged Care at Home Packages (EACH) and Day Therapy Centres (DTC) are available mostly to enable frail people to remain in their own home and to prevent them from premature or inappropriate admission to residential care (Box 5.1). Additional assistance to veterans is available through Veterans Home Care, which is provided by the Australian Government Department of Veterans Affairs. Respite care is also available to support carers by providing a break from caring responsibilities.

Aged-care assessments in the community

Before people can access Australian Government-subsidised residential aged-care or aged-care packages, they need to obtain approval for entry into that care from an Aged Care Assessment Team (ACAT). (Box 5.2).

Box 5.1 Main type of community care services

Home and Community Care (HACC)

A range of different service agencies may provide particular types of assistance such as personal care, domestic assistance, nursing care, social support, allied health care, respite care, centre-based day care, meals and other food services, home maintenance, home modification, transport, formal linen services, counselling/support, information and advocacy, assessment, case planning/review and coordination.

Community Aged Care Packages (CACP)

This program provides a coordinated package of care to care recipients with complex needs who are eligible for low-level residential care. Approval must be given by an ACAT before the Australian Government-subsidised coordinated package of care can be provided. Services provided as part of a package include personal care, social support, transport to appointments, home help, meal preparation and gardening. Services are coordinated through a care manager/coordinator.

Extended Aged Care at Home (EACH) packages

This is a coordinated package of care designed for care recipients who are eligible for high-level residential aged–care. Approval must be given by an Aged Care Assessment Team before the Australian Government subsidised coordinated package of care can be provided. Services provided by an EACH package include those available to CACP care recipients plus nursing care and allied health care.

Extended Aged Care at Home Dementia (EACHD) packages

This is a coordinated package of care designed for care recipients who are eligible for high level residential aged-care. Approval must be given by an ACAT before the Australian Government-subsidised coordinated package of care can be provided. Services provided by an EACHD package include those available to EACH care recipients plus additional levels of service to meet the specific needs of care recipients who experience behaviours of concern and psychological symptoms associated with dementia.

Day Therapy Centres (DTC)

Day therapy centres provide a range of therapies, such as physiotherapy, speech therapy and occupational therapy, aimed at helping frail older people regain or retain the physical capacity needed to remain in their own homes or in low-level residential care.

Respite care

Respite care is designed to give a carer a break from their caring duties, and can be centre-based day care, in-home respite care (funded through any of the previous programs or by the National Respite for Carers Program) or can be in the form of residential respite care for the care recipient.

Source: AIHW 2012d.

Although the target group for ACAP is frail older people, access to Australian Government-subsidised aged–care is neither age limited nor means tested. People can self-refer for an assessment, or be referred by medical or health-care professionals. A complete ACAT assessment results in recommendations to the ACAT delegate for the client's most appropriate types of care, including approval for Australian Government-subsidised residential and community aged-care services. Recommendations to use HACC or Veterans' Home Care can also be made, but these programs each have their own assessment process, and an ACAT approval or referral is not required to access them (AIHW 2011d).

Box 5.2: ACAT assessments

An assessment by an Aged Care Assessment Team (ACAT) assessor determines eligibility based on the care needs of individuals. The assessor makes recommendations to the ACAT delegate on the types of assistance and programs appropriate for the individual. The assessor also assesses the living environment considered most appropriate to the long-term care needs of the client (i.e. whether the recommended care setting is in the person's home or in a residential care facility with either a low or high level of care).

Where appropriate, an ACAT delegate approves the type of Australian Government-subsidised aged-care from residential aged-care service, flexible care and community aged-care packages such as CACP, EACH and EACHD. An individual may be approved to receive assistance from more than one type of aged-care program. The ACAT assessment also includes a decision about which of two levels of care is required for an individual. These two levels are low care and high care.

What is low care?

Types of care that may be required for low-care include:

- bathing, eating and other personal care
- communication
- mobility
- continence maintenance.

What is high care?

High-care can require more hours and a greater level of care compared with low-care. High-care includes those services provided for low care, with additional ones that may include:

- nursing services
- therapy services
- basic pharmaceuticals and administration of medication.

Source: AIHW 2011a.

A complete ACAT assessment is defined as an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'. Clients may have more than one complete assessment in the year but this analysis covers the *last* complete assessment for the client in that year. In 2009–10, there were 162,384 clients who had at least one complete assessment by an ACAT team in Australia. One in five of these clients had a diagnosis of a cerebrovascular disease or TIA (32,725). The age distribution of ACAP clients who had cerebrovascular disease or TIA was similar to that of other ACAP clients (Tables D5.2 and D5.3). However, proportionately more ACAP clients with cerebrovascular disease or TIA were males compared with other ACAP clients (45% compared with 36%).

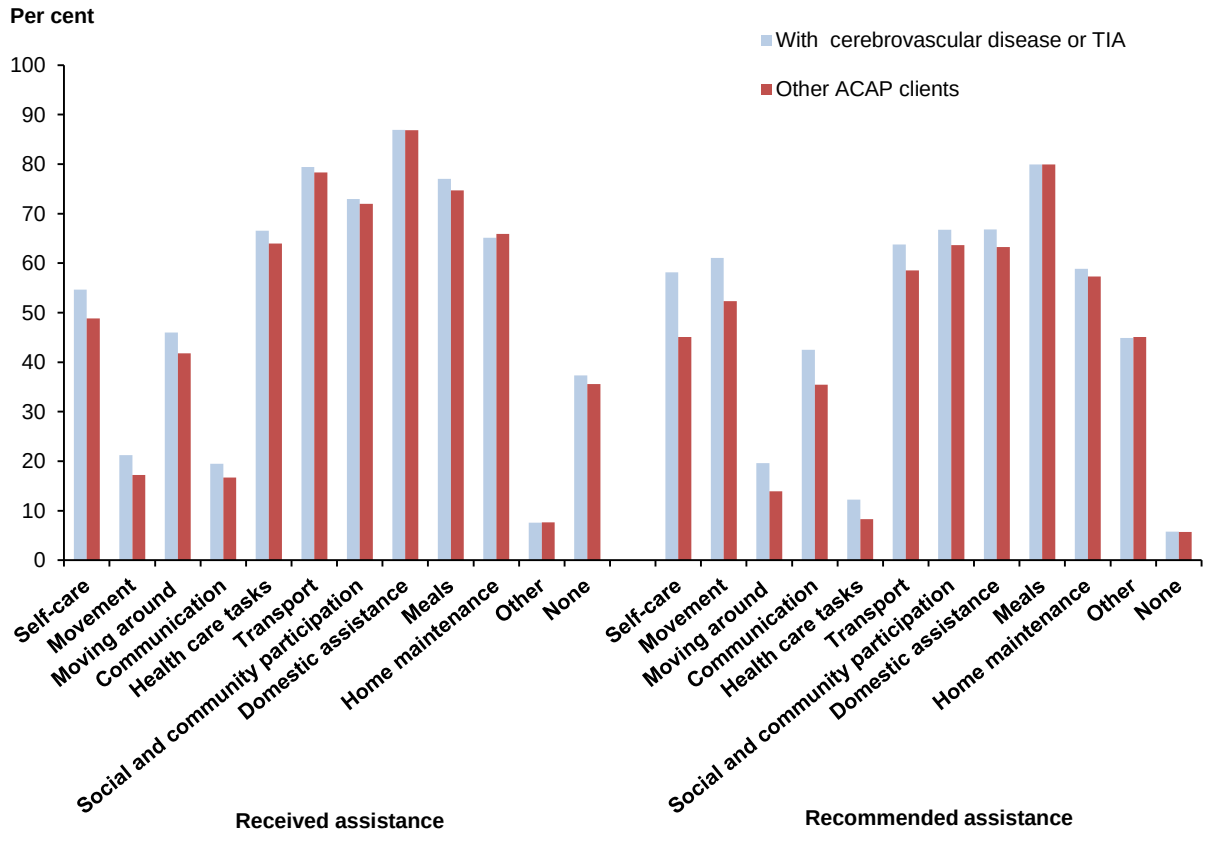
Among ACAP clients with a complete ACAT assessment, the first face-to-face contact setting was more likely to be a hospital setting for those diagnosed with a cerebrovascular disease or TIA, compared with other ACAP clients (42% compared with 33%) (Table D5.4). The majority of ACAP clients with a complete ACAT assessment were usually living independently in a private residence at the time of the assessment (81% of those diagnosed with a cerebrovascular disease or TIA, compared with 82% of the other ACAP clients) (Table D5.5). After the assessment, 47% of ACAP clients diagnosed with cerebrovascular disease or TIA were recommended to live in a private residence or independent living within a

retirement village, compared with 53% of other ACAP clients. A third of ACAP clients diagnosed with cerebrovascular disease or TIA were recommended to live in high-level residential aged–care compared with a quarter of the other ACAP clients (Table D5.5). It should be noted that the ACAP client may not want or agree to live in the residential setting recommended by the ACAT and it is not possible to tell from the ACAP data where a client ends up living.

As previously discussed, ACAP clients with cerebrovascular disease or TIA have higher levels of activity limitations than other ACAP clients for most activities. In 2009–10, at the time of their complete assessment, 37% of ACAP clients with cerebrovascular disease or TIA were not receiving any type of assistance with activities, compared with 36% of other ACAP clients. After the assessment only one in 10 did not receive a recommendation for assistance (Table D5.6).

At the time of assessment, clients diagnosed with cerebrovascular disease or TIA were receiving assistance with activities such as self-care, movement and communication at slightly higher rates than other clients (Figure 5.1, Table D5.6).

After the assessment, formal assistance was recommended more commonly for clients with a diagnosis of cerebrovascular disease or TIA than other clients in most areas of assistance (Figure 5.1). However, it should be noted that ACAP clients may receive assistance from a number of different programs and it is not possible to tell from the ACAP data which programs, if any, provide assistance after the ACAP assessment.



Source: DoHA Ageing and Aged–care Data Warehouse (unpublished).

Figure 5.1: Type of care received by ACAP clients (by diagnosed cerebrovascular disease of TIA status) at the time of the ACAT assessment for 2009–10.

Aged-care appraisals among permanent aged-care residents

The Aged Care Funding Instrument (ACFI) is a funding tool used to assess a resident's dependency or need for care across three care domains: with activities of daily living, with behaviour and with complex health care. Payment of care subsidies to service providers is based on the resident's ratings in each of these three domains. Residents are assessed as having either 'nil' (meaning they have minimal or no need for assistance in that area), 'low', 'medium' or 'high' need for assistance in each of the three domains (Box 5.3).

Box 5.3: The Aged Care Funding Instrument (ACFI)

An assessment undertaken with the ACFI is called an appraisal. Each ACFI appraisal has information on:

- up to three mental or behavioural diagnoses
- up to three other medical diagnoses
- five questions about the need for assistance with activities of daily living: nutrition, mobility, personal hygiene, toileting and continence
- five questions on the need for assistance with the resident's behaviour: cognitive skills, wandering, verbal behaviour, physical behaviour and depression
- two questions on the need for assistance with the use of medication and complex health-care procedures.

The resident's need for assistance in relation to each question is given a rating of A, B, C, or D and corresponds to a score, the scores are then added up and used to categorise the needs as nil, low, medium or high within each of the three domains. Subsidy levels are based on the resident's rating for each of the three funding/care domains (DoHA 2009c).

The ACFI replaced the Resident Classification Scale (RCS) on 20 March 2008 and is used to assess new residents. Existing residents were reappraised using the ACFI on the anniversaries of their RCS appraisals. This transition process is now complete.

Source: AIHW 2011e.

In 2009–10, there were 213,634 permanent aged-care residents with an ACFI appraisal. Of these residents, one in five (42,747) had a diagnosis of cerebrovascular disease or TIA (Table D5.7). In general, the level of care required among residents diagnosed with a cerebrovascular disease was higher than for other residents, in particular for activities of daily living for which 56% of residents with a cerebrovascular disease needed a high level of care compared with 42% of other residents (Table D5.7). A high level of complex health care was needed for 26% of residents with cerebrovascular disease or TIA, compared with 23% of other residents (Table D5.7).

Impact of stroke on primary carers

This section presents information on co-resident primary carers of people with stroke drawn from the 2009 SDAC. The SDAC is the main source of national population data about carers, with information collected about carers and primary carers of care recipients living in the community. Although information on the number of both co-resident (i.e. living in the same household as the care recipient) and non-co-resident carers was collected in the 2009 SDAC, more detailed information was only collected about co-resident carers. Note that the SDAC data on the characteristics of carers reported here relate only to co-resident primary carers

(i.e. they lived with the care recipient with stroke), because the stroke status or any other condition status of people not living in the surveyed household could not be confirmed.

In 2009, there were an estimated 74,965 co-resident primary carers (see Box 5.4) providing assistance to people with stroke and disability in Australia (Table 5.6). The majority of these primary carers were female (69%) and nearly two-thirds were aged 60 and over. Almost three-quarters of co-resident primary carers of people with stroke and disability were a spouse or partner and 21% were a son or daughter (Figure 5.2).

Box 5.4: Primary carers in the ABS Survey of Disability, Ageing and Carers 2009

Primary carer: A person who provides the most informal assistance, in terms of help or supervision, to a person with one or more disabilities or aged 60 and over. The assistance has to be ongoing, or likely to be ongoing, for at least 6 months and be provided for one or more of the core activities (communication, mobility and self-care). In the 2009 SDAC, primary carers only included persons aged 15 and over for whom a personal interview was conducted.

Source: ABS 2011b.

Table 5.6: Co-resident primary carers[(a)] of people with stroke and disability, by sex and age, 2009

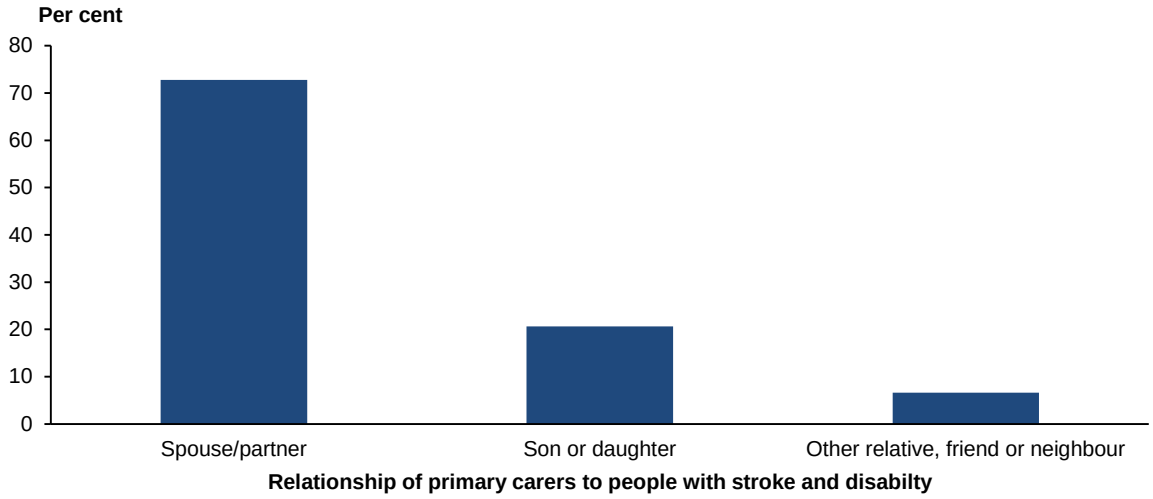
	Estimated number[(b)]			Per cent		
Age group (years)	Males	Females	Persons	Males	Females	Persons
15–49	*4,336	9,154	13,490	18.8	17.6	18.0
50–59	*4,410	9,596	14,006	19.2	18.5	18.7
60–69	6,822	17,033	23,855	29.6	32.8	31.8
70–79	*3,097	11,130	14,227	13.4	21.4	19.0
80+	*4,363	*5,024	9,387	18.9	9.7	12.5
15+[(c)]	**23,028**	**51,937**	**74,965**	**100.0**	**100.0**	**100.0**

(a) Primary carers only include persons aged 15 and over for whom a personal interview was conducted.

(b) Estimates marked with an asterisk have a relative standard error (RSE) of between 25% (one asterisk) and 50% (two asterisks) and should be interpreted with caution.

(c) Components may not add to totals due to rounding

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.



(a) Primary carers only include persons aged 15 and over for whom a personal interview was conducted.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Figure 5.2: Relationship of co-resident primary carers[(a)] to people with stroke and disability, 2009

Table 5.7: Weekly hours of care provided by co-resident primary carers to people with stroke and disability, 2009

	Co-resident primary carers[(a)] of people with disability and stroke	
Hours per week	**Estimated number[(b)]**	**Per cent**
Less than 20 hours	19,183	25.6
20 to less than 40 hours	10,320	13.8
40 hours or more	43,088	57.5
Not stated	*2,374	3.2
Total co-resident primary carers	**74,965**	**100.0**

(a) Primary carers only include persons aged 15 and over for whom a personal interview was conducted.

(b) Estimates marked with an asterisk have a relative standard error (RSE) of between 25% (one asterisk) and 50% (two asterisks) and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

More than half (58%) of co-resident primary carers of people with stroke and disability spent 40 hours or more per week in their caring role (Table 5.7). Although 43% of co-resident primary carers reported that their income had not been affected by their caring role, 21% reported that their income had decreased because of their caring role and another 24% had extra expenses. Almost a third (31%) of co-resident primary carers said that they had difficulty meeting everyday living costs (Table 5.8).

Table 5.8: Effect of caring role on co-resident primary carer's income, living costs and work, 2009

	Co-resident primary carers[(a)] of people with disability and stroke	
	Estimated number[(b)]	Per cent
Effect on financial situation		
Income not affected	32,492	43.3
Income has increased	* 2,803	3.7
Income has decreased	15,830	21.1
Has extra expenses	17,782	23.7
Not stated	*6,057	8.1
Whether has difficulty meeting everyday costs as a result of caring role		
Not applicable (income not affected or increased)	35,295	47.1
Has difficulty meeting everyday living costs	23,239	31.0
Does not have difficulty meeting everyday living costs	10,954	14.6
Not stated	*5,477	7.3
Effect on weekly hours worked since commencing caring role		
Not applicable (unemployed or not in the labour force)	58,635	78.2
Weekly hours worked are unchanged	10,885	14.5
Weekly hours worked are changed	5,445	7.3
Total co-resident primary carers	**74,965**	**100.0**

(a) Primary carers only include persons aged 15 and over for whom a personal interview was conducted.

(b) Estimates marked with an asterisk have a relative standard error (RSE) of between 25% (one asterisk) and 50% (two asterisks) and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Just over three-quarters of co-resident primary carers were not employed, but, among those who were employed, the majority were able to undertake their carer responsibilities without changing the hours they worked (Table 5.8).

The physical and psychological demands of the caring role can lead to adverse effects on the physical health and emotional wellbeing of carers, their personal relationships and participation in social activities (AIHW 2004; Edwards et al. 2008). In 2009, 35% of co-resident primary carers of people with stroke and disability reported that their physical and emotional wellbeing had changed due to their caring role (Table D5.8). Despite this, 71% of co-resident primary carers reported not feeling satisfied due to their caring role, and around a third reported feeling weary or lacking energy and frequently feeling worried or depressed. In the majority of cases, caring for a person with stroke and disability did not affect the personal relationships of carers; nevertheless, 27% of carers reported that they had lost, or were losing, contact with their existing friends (Table D5.9).

Government programs, such as respite care, are available to help reduce the load on carers (AIHW 2012d). In 2009, the majority (82%) of co-resident primary carers of people with stroke and disability had never used respite care and most of them (69%) did not want it (Table 5.9). However, 13% of carers reported that they needed respite care but were not receiving it.

Table 5.9: Need for and use of respite care by co-resident primary carers of people with stroke and disability, 2009

	Co-resident primary carers[(a)] of people with stroke and disability	
	Estimated number[(b)]	**Per cent**
Received respite care in last 3 months and does not need further care	4,717	6.3
Received respite care in last 3 months but needs further care	**1,930	2.6
Did not receive respite care in last 3 months and does not need further care	*3,963	5.3
Did not receive respite care in last 3 months but needs further care	*2,625	3.5
Has never received respite care and does not need or want further care	51,909	69.2
Has never received respite care but needs further care	*9,823	13.1
Total co-resident primary carers	**74,965**	**100.0**

(a) Primary carers only include persons aged 15 and over for whom a personal interview was conducted.

(b) Estimates marked with an asterisk have a relative standard error (RSE) of between 25% (one asterisk) and 50% (two asterisks) and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

6 Social and geographical inequalities for stroke

Key findings

- Stroke has a significant impact on Aboriginal and Torres Strait Islander people. In 2004–05, the estimated prevalence in this group was 1.7 times as high as that of non-Indigenous Australians. In 2009–10, the hospitalisation rate for stroke for Indigenous Australians was twice as high as that of other Australians, and in 2009 the stroke death rate 1.6 times as high as that of non-Indigenous Australians.
- In 2009–10, the age-adjusted stroke hospitalisation rate for people living in *Remote and very remote* areas was 1.4 times as high as that of people living in *Major cities*.
- Inequalities in the impact of stroke also exist by socioeconomic status. Compared with people from the highest socioeconomic group, those from the lowest socioeconomic group had: a prevalence of stroke that was 1.8 times as high in 2007–08; a stroke hospitalisation rate 1.3 times as high in 2009–10; and a stroke death rate 1.2 times as high in 2007.

This chapter examines available information on health inequalities for stroke by Indigenous status, remoteness and socioeconomic groups.

Aboriginal and Torres Strait Islander people

Prevalence

According to self-reported data from the 2004–05 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS), an estimated 1,400 Aboriginal and Torres Strait Islander people (0.3% of the population) had experienced cerebrovascular disease (of which it is expected stroke would be the most common condition) (Table 6.1). There was no difference in the age-adjusted prevalence of cerebrovascular disease between Aboriginal and Torres Strait Islander males and females (AIHW: Penm 2008). After adjusting for differences in the age structure of the Indigenous and non-Indigenous populations, the prevalence of cerebrovascular disease among Aboriginal and Torres Strait Islander people was 1.7 times as high as that for non-Indigenous Australians (Table 6.1).

Table 6.1: Prevalence[(a)] of cerebrovascular disease in Aboriginal and Torres Strait Islander people, by sex, 2004–05

Sex	Number[(b)]	Per cent[(b)]	Standardised prevalence ratio[(c)]
Males	*700	*0.3	*ǂ1.5[(d)]
Females	700	0.3	1.9
Persons	1,400	0.3	1.7

(a) Based on self-reported data.

(b) Estimate with an asterisk has a relative standard error of 25–50% and should be interpreted with caution.

(c) The standardised prevalence ratio is the ratio of the observed number of cases to the number of expected cases if Indigenous Australians had experienced the same age-sex specific prevalence rates as non-Indigenous Australians.

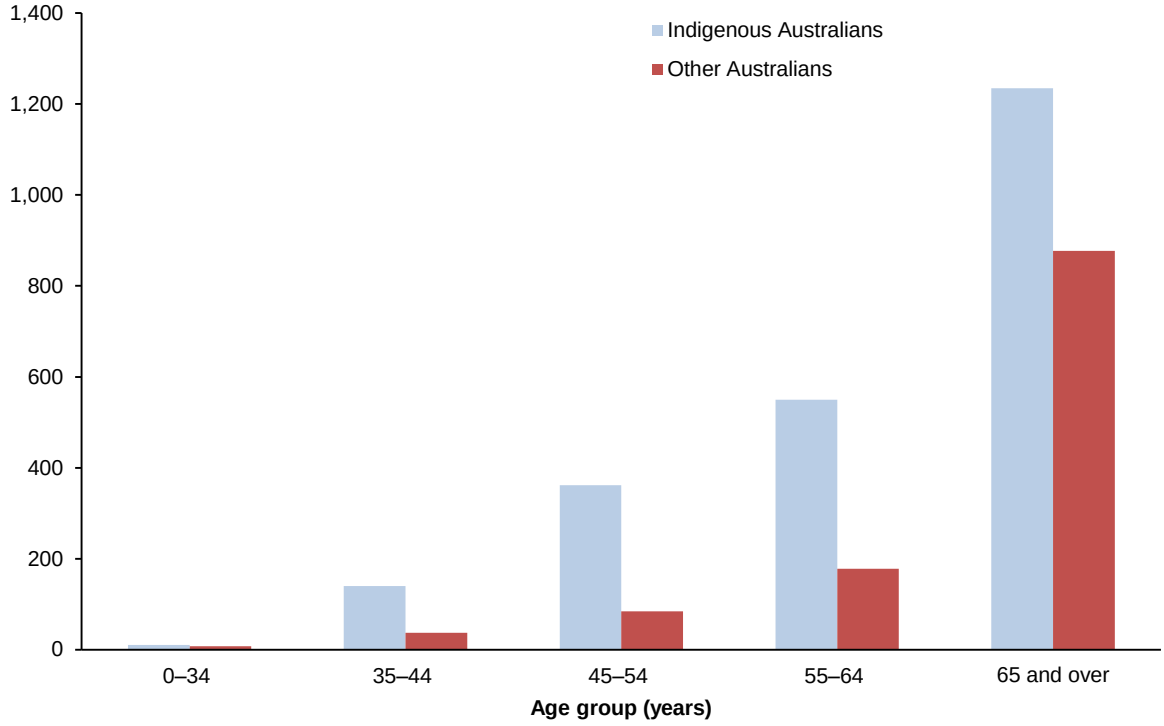
(d) Estimate with ǂ shows that the standardised prevalence ratio is not significantly different from 1.0. That is, the rate for Aboriginal and Torres Strait Islander males is not significantly different from that for non-Indigenous males.

Sources: AIHW: Penm 2008; AIHW analysis of the ABS 2004–05 NATSIHS CURF.

Hospitalisations

Comparisons of hospitalisation rates for stroke between Aboriginal and Torres Strait Islander people and other Australians are based on hospital data from New South Wales, Victoria, Queensland, Western Australia, South Australia and public hospitals in the Northern Territory where the quality of Indigenous identification is considered to be adequate. For further information refer to 'Reporting Indigenous data' in Appendix A.

In 2009–10, the age-adjusted stroke hospitalisation rate in Aboriginal and Torres Strait Islanders people was about twice as high as that of other Australians (284 per 100,000 population compared with 147 per 100,000) (Table D6.1). At all ages, hospitalisation rates for stroke in Aboriginal and Torres Strait Islander people were higher than those of the other Australians, particularly between the ages of 35 and 64 where rates were 3 to 4 times as high (Figure 6.1; Table D6.1).



Notes

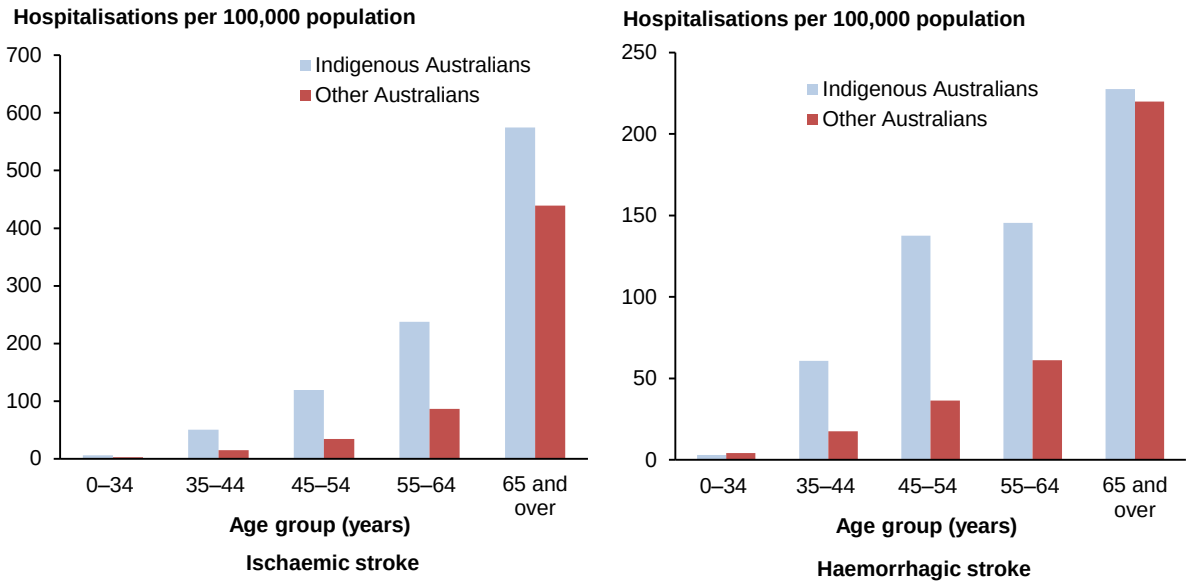
1. Age-standardised to the Australian population as at 30 June 2001.
2. Hospitalisations from New South Wales, Victoria, Queensland, Western Australia, South Australia and Northern Territory (public hospitals only).

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 6.1: Stroke hospitalisation rates, by Indigenous status and age, 2009–10

In 2009–10, ischaemic stroke was the most common type of stroke for both Aboriginal and Torres Strait Islanders people and other Australians but the age-adjusted ischaemic stroke rate for Indigenous people was 1.7 times as high as that for other Australians (122 hospitalisations per 100,000 population compared with 71 per 100,000) (Table D6.1). The age-adjusted rate of haemorrhagic stroke for Indigenous people was also 1.7 times as high as that for other Australians (72 hospitalisations per 100,000 population compared with 43 per 100,000). At all ages, hospitalisation rates for both ischaemic and haemorrhagic stroke were higher in Indigenous people than other Australians (Figure 6.2).

It is possible to examine trends in hospitalisations for stroke by Indigenous status over the period 2004–05 to 2009–10 based on hospital data from New South Wales, Victoria, Queensland, Western Australia, South Australia and public hospitals in the Northern Territory. Over this period, the age-adjusted rate of stroke hospitalisations among Indigenous women fell by 7% while for Indigenous men it rose by 10%. Among Other Australians, the rates for men and women fell by 8% and 7%, respectively.



Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Hospitalisations from New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory (public hospitals only).

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 6.2: Ischaemic and haemorrhagic stroke hospitalisation rates, by Indigenous status and age, 2009–10

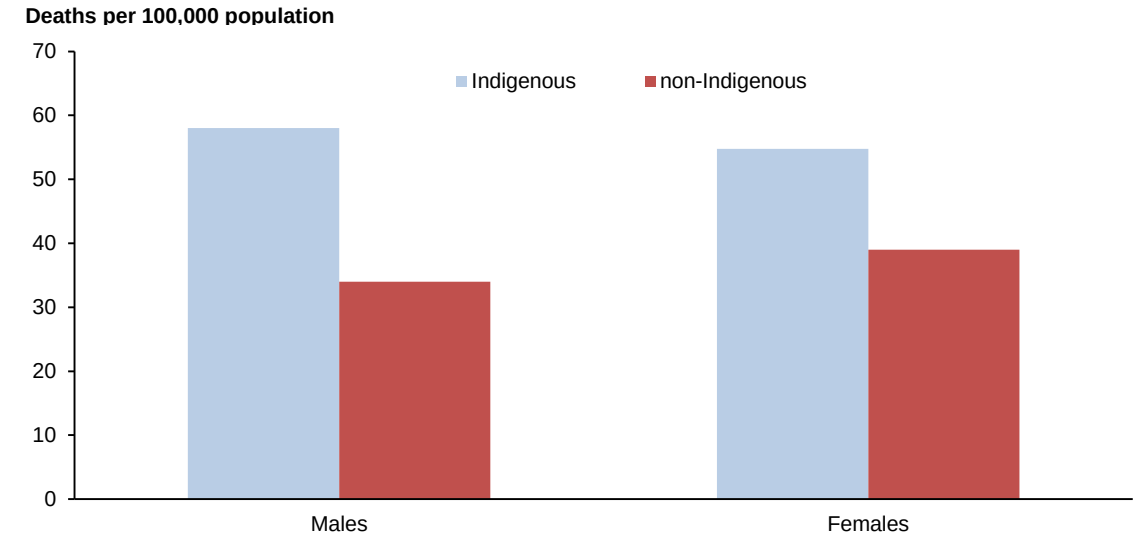
Deaths

Indigenous identification in deaths data is considered of sufficient quality for national reporting for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only. For further information refer to 'Reporting Indigenous data' in Appendix A.

Over the period 2006–2010, in the jurisdictions for which the Indigenous identification is considered to be sufficiently reliable for national reporting, the age-adjusted rate of deaths with an underlying cause of stroke among Indigenous people (56.2 per 100,000 population) was 1.5 times as high as that for non-Indigenous Australians (37.1 per 100,000 population) (Table D6.2). Indigenous males had a stroke death rate that was 1.7 times as high as that for non-Indigenous males, while the stroke death rate among Indigenous females was 1.4 times as high as that for non-Indigenous females (Figure 6.3).

Stroke death rates were higher among Indigenous people than non-Indigenous Australians across all age groups, with Indigenous people aged 35–44 and 45–54 having rates that were 5 times as high as non-Indigenous Australians of the same age (Figure 6.4; Table D6.3).

It is not possible to examine trends in stroke deaths by Indigenous status due to changes in the coding of Indigenous status and the quality of Indigenous identification by state and territory on the National Mortality Database over time.

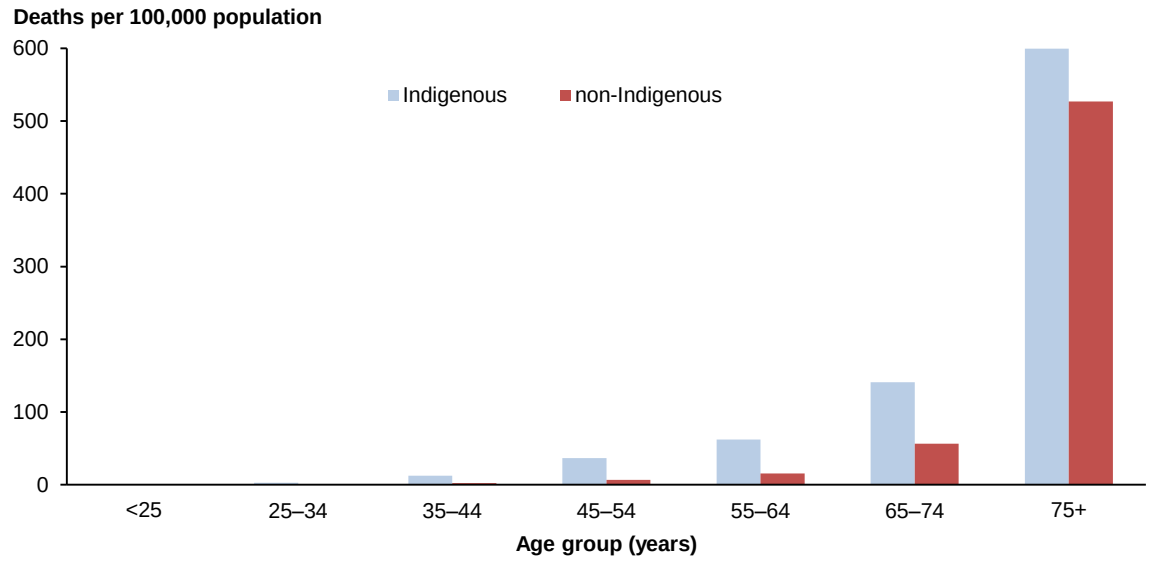


Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only.
3. Queensland deaths data for 2010 have been adjusted to minimise the impact of late registration of deaths on mortality indicators by excluding deaths registered in Queensland in 2010 that occurred in Queensland before 2007.

Source: AIHW analysis of the AIHW National Mortality Database.

Figure 6.3: Stroke death rates, by Indigenous status and sex, 2006–2010



Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only.
3. Queensland deaths data for 2010 have been adjusted to minimise the impact of late registration of deaths on mortality indicators by excluding deaths registered in Queensland in 2010 that occurred in Queensland before 2007

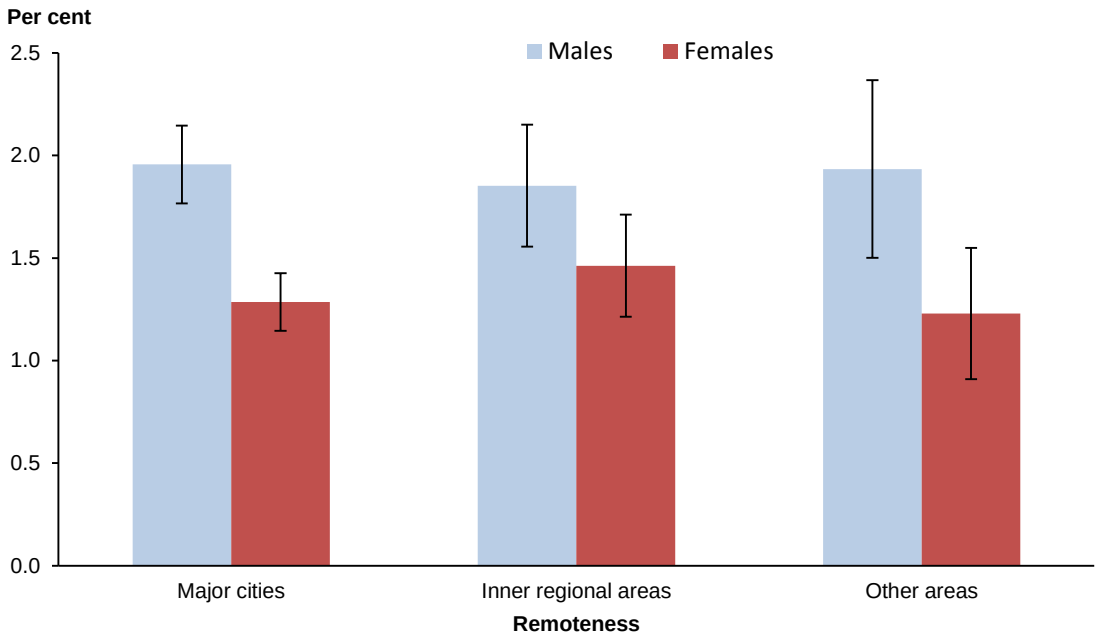
Source: AIHW analysis of the AIHW National Mortality Database.

Figure 6.4: Stroke death rates, by Indigenous status and age, 2006–2010

Remoteness

Prevalence

In 2009, the prevalence of stroke was similar across remoteness areas for both males and females (Figure 6.5). Although the prevalence of stroke was higher in males than females in all remoteness areas, the difference was only statistically significant for *Major cities* (2.0% compared with 1.3%) (Table D6.4).

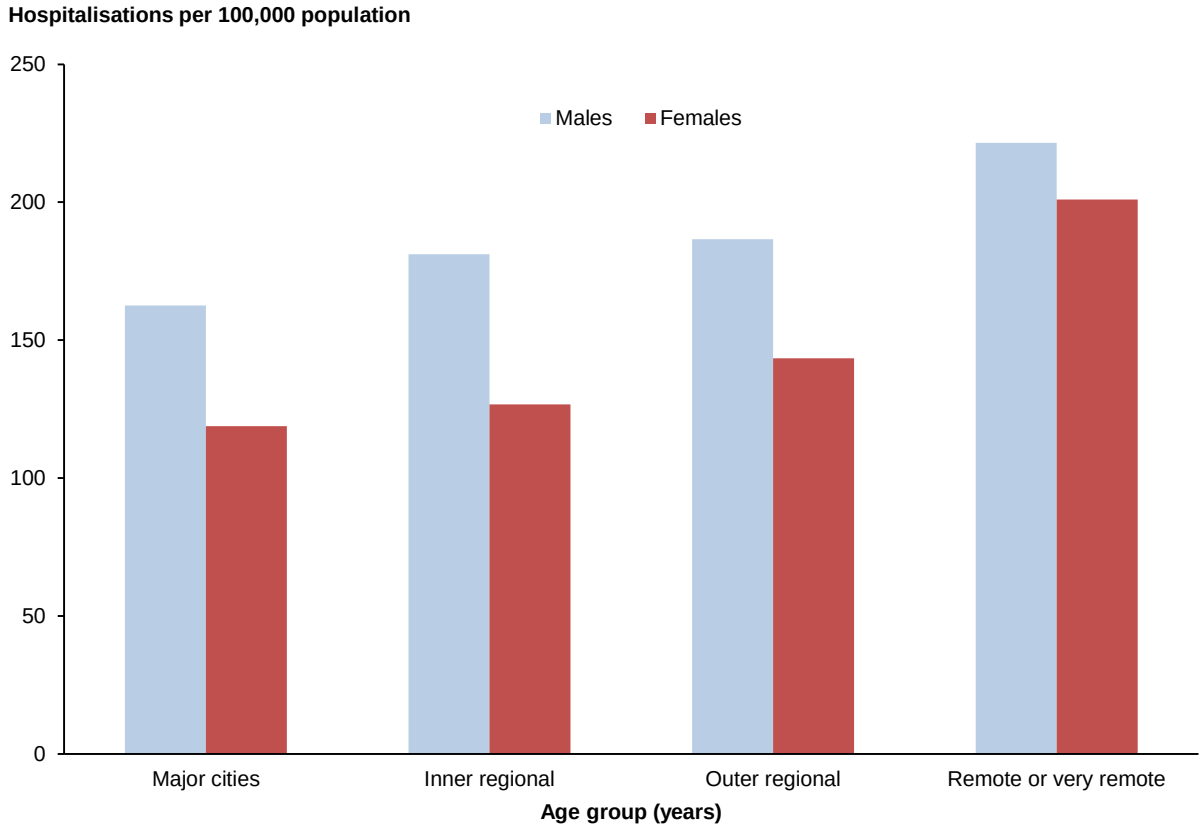


Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record File.

Figure 6.5: Stroke prevalence, by remoteness and sex, 2009

Hospitalisations

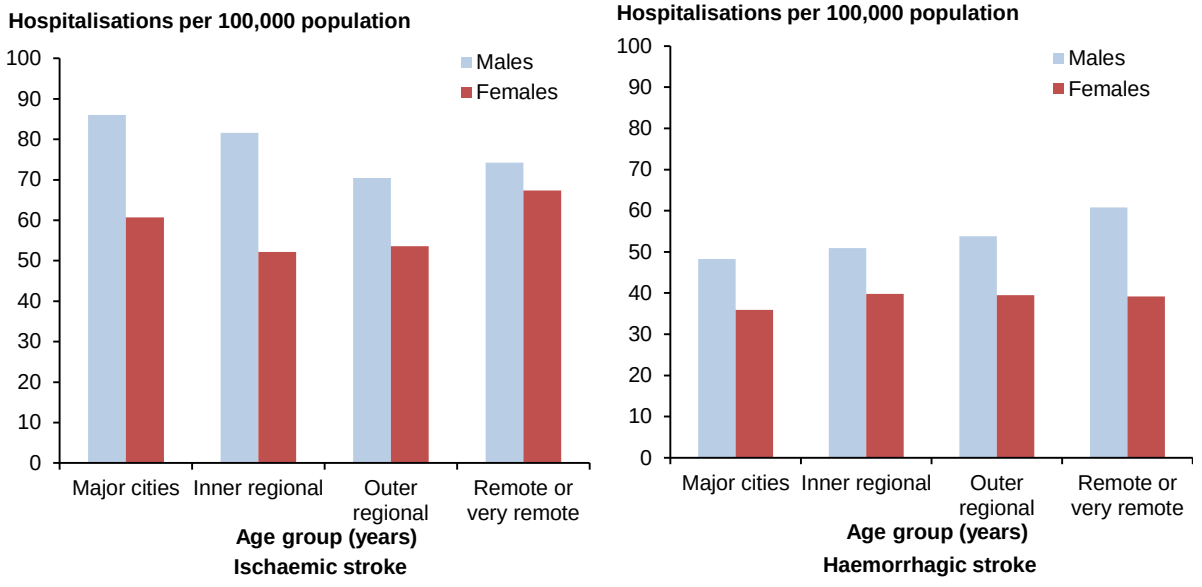
In 2009–10, the age-adjusted stroke hospitalisation rate for people living in *Remote and very remote* areas (212 hospitalisations per 100,000 population) was 1.5 times as high that of people living in *Major cities* (139 per 100,000) (Table D6. 5). Similar patterns were observed for males and females (Figure 6.6). A similar pattern was found for haemorrhagic stroke, with a higher age-adjusted hospitalisation rate in *Remote and very remote* areas (51 hospitalisations per 100,000 population) than in *Major cities* (41 per 100,000) (Table D6.5). This inequality in the hospitalisation rate of haemorrhagic stroke by remoteness was particularly striking for males, for whom the age-adjusted rate in *Remote and very remote* areas was 1.3 times as high as that in *Major cities* (61 haemorrhagic stroke hospitalisations per 100,000 population compared with 48 per 100,000) (Figure 6.7). However, for ischaemic stroke, age-adjusted hospitalisation rates were higher for people living in *Major cities* than people living in *Remote and very remote* areas (Figure 6.7).



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

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 6.6: Stroke hospitalisation rates, by remoteness of patient's usual residence and sex, 2009–10



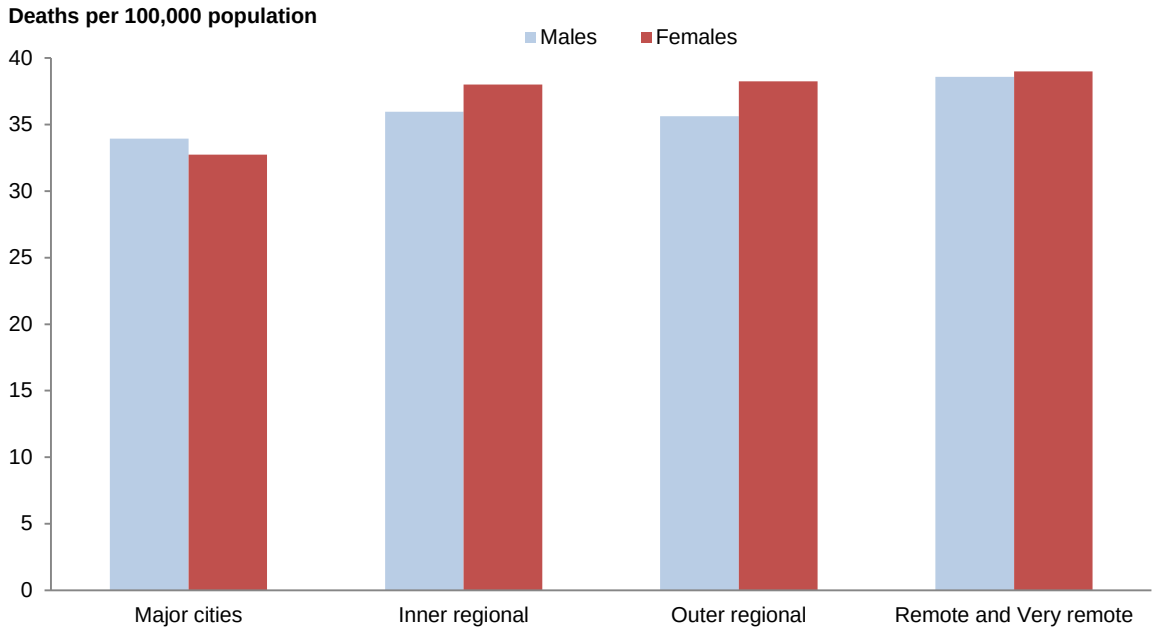
Note: Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 6.7: Hospitalisation rate for main types of stroke by remoteness in 2009–10

Deaths

In 2006–2010, the age-adjusted stroke death rate was 34 per 100,000 population for people living *Major cities* compared with rates of 37 to 38 per 100,000 for people living in *Inner regional*, *Outer regional* and *Remote and very remote* areas (Table D6.6). A similar pattern was observed for both males and females (Figure 6.8).



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

Source: AIHW analysis of the AIHW National Mortality Database.

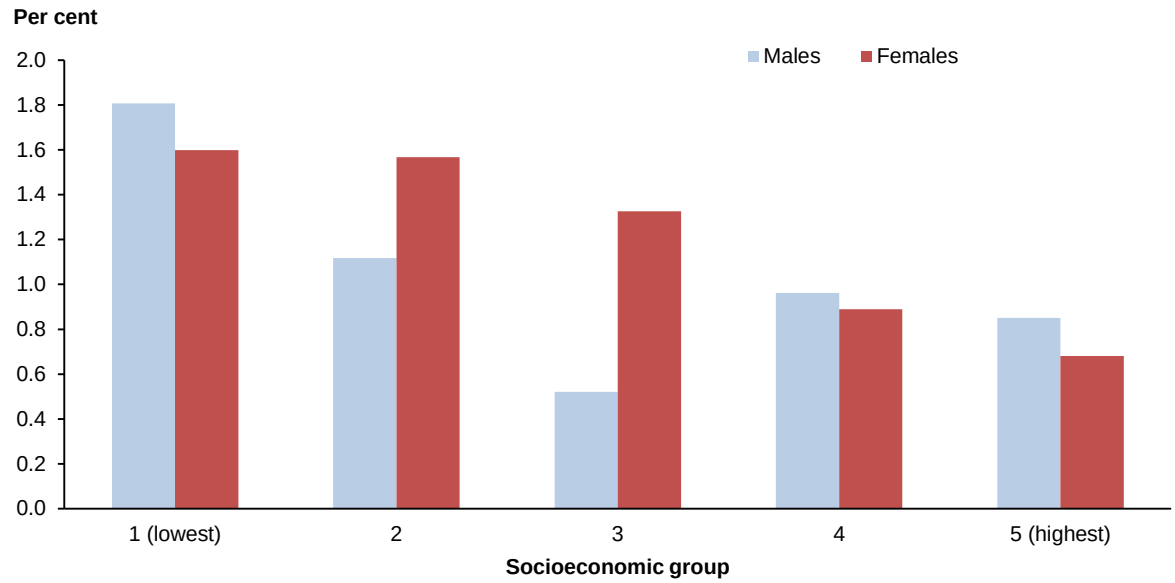
Figure 6.8: Stroke death rates, by remoteness and sex, 2006–2010

Socioeconomic status

Prevalence

The ABS 2009 SDAC database does not include a variable for socioeconomic group that is derived from the Socio-Economic Indexes for Areas (SEIFA) index (see Appendix A for more information about the SEIFA index). Therefore data from the ABS 2007–08 National Health Survey (NHS) have been included here to provide information about stroke prevalence by socioeconomic group. It should be noted that the 2007–08 NHS only collected information from people living in private dwellings and not from those living in cared accommodation, and this could affect results by socioeconomic status.

In 2007–08, people in the lowest socioeconomic group had a prevalence of stroke that was 1.8 times as high as those in the highest socioeconomic group (1.7% compared with 0.9%). For females, the prevalence rate of stroke increased with decreasing socioeconomic position (Figure 6.9, Table D6.7). However for males, although those in the lowest socioeconomic group had the highest stroke prevalence (1.8%), those in the middle-ranked group had a lower prevalence rate of stroke (0.5%) than those in the highest socioeconomic group (0. 9%) (Figure 6.9).



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

Source: AIHW 2011c.

Figure 6.9: Stroke prevalence, by socioeconomic group and sex, 2007–08

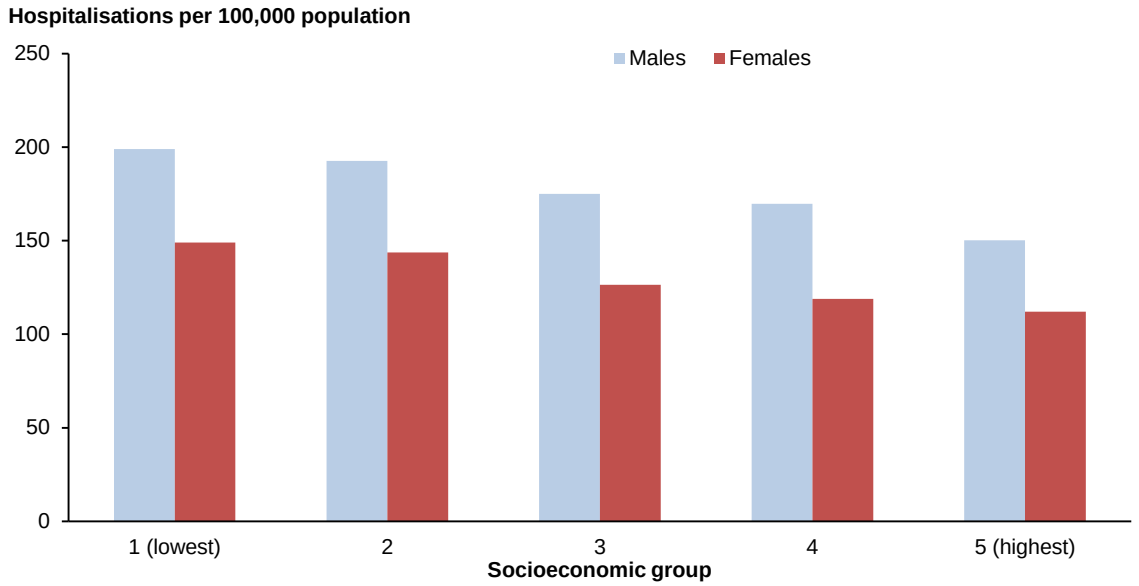
Hospitalisations

In 2007–08, the age-adjusted hospitalisation rate for stroke declined with increasing socioeconomic status for both males and females (Figure 6.10). The age-adjusted stroke hospitalisation rate for people in the lowest socioeconomic group was 1.3 times as high as that of those in the highest socioeconomic group (173 stroke hospitalisations per 100,000 population compared with 130 per 100,000) (Table D6.8).

Deaths

In 2007, for both males and females, there was an inverse relationship between the age-adjusted stroke death rate and socioeconomic status, with rates highest for those in lowest socioeconomic group and lowest for those in the highest socioeconomic group (Figure 6.11, Table D.6.9). There was little difference in the age-adjusted rates between males and females in any socioeconomic group (Table D6.9).

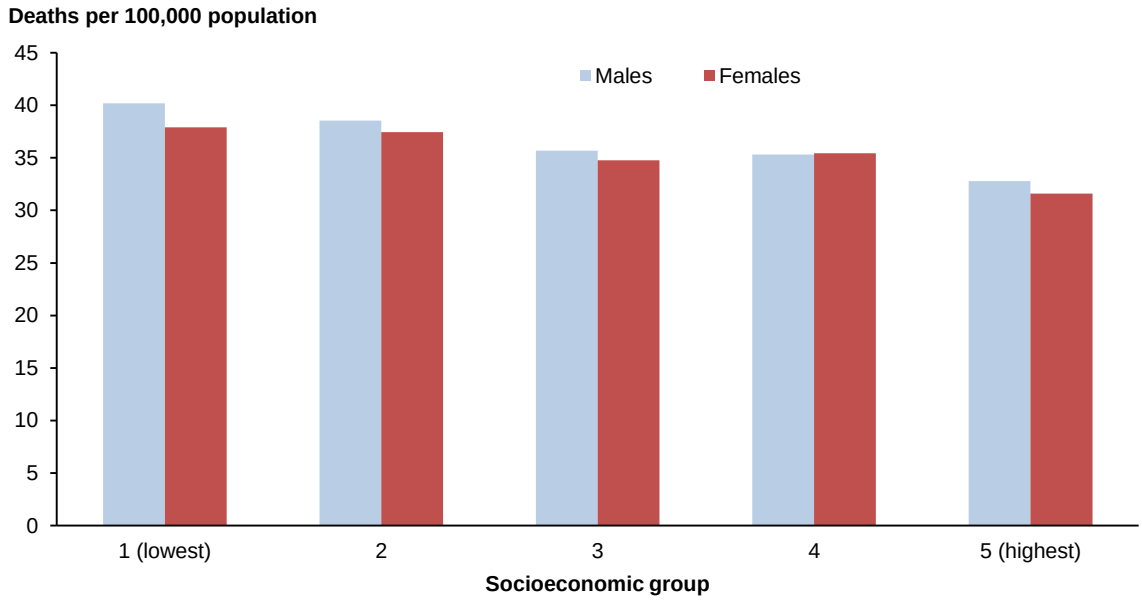
There is evidence that socioeconomic inequality is increasing over time for stroke mortality in Australia. Although stroke death rates declined for both males and females in all socioeconomic groups between 1979–1983 and 2004–2006, it declined at a slower rate in the lowest socioeconomic group (compared with the highest socioeconomic group (Page et al. 2011).



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

Source: AIHW analysis of the National Hospital Morbidity Database.

Figure 6.10: Hospitalisation rate for stroke by socioeconomic group, 2007–08



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

Source: AIHW analysis of the AIHW National Mortality Database.

Figure 6.11: Stroke death rates, by socioeconomic group and sex, 2007

7 Discussion

Stroke poses a significant burden on patients and their families, as well as on the health system and aged-care services. It is associated with serious outcomes for patients and their carers. Stroke caused around 8,300 deaths in Australia in 2010, accounting for 23 deaths each day and 6% of all deaths in that year. One in seven stroke hospitalisations ended in death. In 2009, there were an estimated 375,800 survivors of stroke, and one in every three survivors had a disability caused by stroke.

Overall, in 2009–10, there were over 35,300 hospitalisations with a principal diagnosis of stroke and 25,800 hospitalisations for rehabilitation care associated with stroke or its sequelae. Importantly, people with stroke stay in hospital much longer than average—the average length of stay for stroke hospitalisations, excluding same day hospitalisations, was 10.4 days compared with 5.9 days for all hospitalisations in 2009–10 (AIHW 2011b). Hospitalisations for stroke and subsequent rehabilitation took up 706,189 patient days in 2009–10. The effect of this is that, although stroke hospitalisations accounted for 0.7% of all hospitalisations for that year, they represented almost 3% of all patient days.

Most stroke survivors live at home, with only 9% in cared accommodation in 2009. This is also the case for people disabled as a result of stroke, 21% of whom live in cared accommodation. Many stroke survivors are able to avoid moving into residential care because a range of community services is available to assist them. In 2009, it was estimated that around 133,100 people with stroke and disability received formal assistance, either on its own or in combination with informal assistance, while around 57,700 people received informal assistance only.

The role of an Aged Care Assessment Team (ACAT) is to assess the care needs of frail older people and to assist them in gaining access to the most appropriate types of care, including approval for Australian Government-subsidised aged-care services. In 2009–10, one in five Aged Care Assessment Program (ACAP) clients with a complete ACAT assessment (32,725 people) had a diagnosis of cerebrovascular disease or TIA. Compared with other ACAP clients, those with cerebrovascular disease or TIA were much more likely to require high-level residential care, suggesting greater care needs.

One in five permanent aged-care residents with an Aged Care Funding Instrument (ACFI) appraisal (around 42,700 people) also had a diagnosis of cerebrovascular disease or TIA in 2009–10. Compared with other permanent aged-care residents with an ACFI appraisal, those with cerebrovascular disease or TIA needed a higher level of care, particularly for activities of daily living.

Informal caregivers play an important part in the care of stroke survivors. In 2009, there were an estimated 75,000 co-resident primary carers providing assistance to people with stroke and disability in Australia. The majority of these primary carers were female (69%) and nearly two-thirds were aged 60 and over. More than half of co-resident primary carers spent 40 hours or more each week in their caring role and, for about one in five, their caring responsibilities adversely affected their income. Despite the heavy workload of caring for a person with stroke, most primary carers had never used respite care and did not want it. However, one in eight carers who had not received respite care said they needed it.

Stroke imposes a significant financial burden on the health system. In 2008–09, total health-care expenditure for stroke in Australia was around $606 million, which accounted for 8% of

total health-care expenditure for all cardiovascular disease ($7.7 billion) and 0.5% of total health-care expenditure ($113.6 billion). Hospital-admitted patients accounted for 92% of the health expenditure for stroke.

There are inequalities in the impact of stroke across population groups, with higher prevalence rates in Aboriginal and Torres Strait Islander people compared with non-Indigenous Australians, and in people from the lowest socio-economic group compared with those from the highest socio-economic group.

Stroke and the recurrence of stroke are highly preventable (Hankey 2011; Vecchione 2011; Silver 2012; National Stroke Foundation 2010). Reducing the prevalence of modifiable risk factors, such as high blood pressure, physical inactivity, smoking, abdominal obesity, poor diet and increased alcohol intake, could prevent many strokes. In people who have had TIAs, rapid access to investigations and starting preventive measures immediately are essential.

Encouragingly, a few local Australian studies have shown that stroke incidence and event rates have been declining over time (Islam et al. 2008; Marsden et al. 2010), and this may be the result of improved primary and secondary prevention (Rothwell et al. 2004). However, due to lack of national stroke incidence data, we do not know with certainty that this is happening Australia-wide.

National data also show that the death rate from stroke in Australia has fallen by about 70% since 1979. This decline has been attributed in part to a reduction in risk factors such as tobacco smoking and high blood pressure, as well as to improvements in medical treatment for stroke (Gillum 1997; National Stroke Foundation 2010; OECD 2011). However, although the average rate of decline in stroke death rates has accelerated over time for people aged 55 and over, it has slowed for those aged 35–54.

The care of stroke patients also seems to be improving. The number of stroke units in public hospitals increased from 54 to 74 between 2007 and 2011. In addition, hospitals with stroke units in 2011 were more likely to have rapid triage and rapid assessment of patients with acute stroke, on-site access to diagnostic equipment, care protocols in place and rehabilitation services.

Another encouraging finding is that, in 2009, the majority of people with stroke and disability who live at home and needed assistance with core activities, such as health care, self-care, mobility, transport, household chores and property maintenance, were receiving the necessary assistance.

However, there are a number of apparent gaps in treatment:

- In Australia in 2011, 39% of hospitals participating in the National Stroke Foundation's Acute Services Organisational Survey had a stroke unit. This is an improvement compared with the 19% of public hospitals that had a stroke unit in 2004 (Cadilhac et al. 2006). However, it compares poorly with some countries such as Sweden where 83% of hospitals have stroke units. In Norway and Sweden, 60–70% of patients are cared for in stroke care units (Moon et al. 2003; Rudd & Matchar 2004).
- Timeliness in receiving hospital care for ischaemic stroke patients is a crucial factor in accessing access to thrombolysis, a drug treatment that can significantly improve the outcomes if administered within at least 4.5 hours of stroke onset. In 2011, thrombolysis was only given to 18% of ischaemic stroke patients arriving within the required timeframe (National Stroke Foundation 2011a).

- The guidelines recommend that a CT scan of the brain be performed in all stroke patients within 24 hours of the onset of symptoms. Based on hospital statistics this diagnostic procedure was used at least once in only two-thirds of hospitalisations for stroke. However, this may not accurately reflect whether or not patients had a scan because the number of procedures may be an underestimate resulting from the limitations of hospital data collections. For example, the CT scan could have been performed in the emergency department before the patient was admitted, and therefore not be recorded in the hospital data, or the patient may have died during transfer to a hospital that had the facility.
- In 2011, only half of stroke patients received a discharge care plan, despite the fact that this is seen as an essential component of stroke management (National Stroke Foundation 2011a).
- There appears to be limited awareness among the general public of the signs and symptoms of stroke, or what to do about them if they developed any symptoms, even after national awareness campaigns have been run (Spark et al. 2011). Not being able to identify that a person is having a stroke can lead to delays in presentation for treatment and result in worse outcomes. However, there is evidence that stroke awareness campaigns can improve knowledge of stroke warning signs in the population (Trobbiani et al. 2012; Spark et al. 2011).

There are also gaps in our knowledge:

- With the exception of the National Stroke Foundation's audit data, there are no national data on the time elapsed between onset of stroke symptoms, presentation to hospital and start of emergency care. Nor are there national data on the uptake of clinical guidelines or on medications given in acute care or at discharge.
- It is difficult to ascertain the extent of formal care services actually delivered to stroke survivors because there is a myriad of programs, with data held in separate collections and the diagnoses of users are not recorded in some cases. Record linkage of these collections would be complex but potentially valuable.
- There are no regular, up-to-date national data on the incidence of stroke that would allow us to determine incidence trends over time. Data linkage would enable this.

Appendix A Methods and definitions

Age-specific rates

Age-specific rates are calculated by dividing the number of cases occurring in each specified age group by the corresponding population in the same age group, expressed as a rate (e.g. number per 100,000 persons). Information on the populations used in this report in provided in the section on population data 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. This is the case with CVD, which is occurs more often among the elderly. Age-standardisation is used in this report when comparing rates across different periods of time, different geographical areas, different socioeconomic groups or other different populations. The direct method of age-standardisation is used throughout this report.

Direct age-standardisation

This method of age-standardisation is used when the population under study is large and the age-specific rates can be reliably estimated. The calculation of direct age-standardised rates consists of three steps:

Step 1: Calculate the age-specific rate for each age group.

Step 2: Calculate the expected number of cases in each age group by multiplying the age-specific rates by the corresponding standard population for each age group.

Step 3: Sum the expected number of cases in each age group and divide this sum by the total of the standard population to give the age-standardised rate.

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 population data for more information.

Average annual rate of change

Log linear modelling is used to estimate the average annual percentage change, taking into account all points in the time series in ensuring that a rate of zero will never be predicted.

The formula is:

$\log_e(R_t) = \text{constant} + \alpha t$, where t is the time period (years), R_t is the observed rate in year t, and α is the estimated average annual rate of change (increase or decrease).

Significance testing

The observed value of a rate may vary because of the influence of chance and natural variation. Therefore, to provide an approximate indication of whether two rates are statistically different, 95% confidence intervals can be calculated, and significant differences highlighted.

A 95% confidence interval describes a span of numbers around the estimate that has a 95% chance of including the true value. When comparing two groups, if the two confidence intervals do not overlap, the reader can be confident that the difference between the groups is real, and not due to chance.

Confidence intervals were calculated for survey data in this report.

Calculation of confidence intervals for survey data

The delete-a-group Jackknife weight replication method was used to derive the standard error of estimates for the 2009 SDAC, 2004–05 NATSHIS and the 2007–08 NHS surveys.

The variability between these replicate estimates (denoting X (w) for group number w) is used to measure the SE of the original weighted estimate X, using the formula:

$$SE(X) = \sqrt{\left(\frac{(w-1)}{w} \times \sum\left(X_{(w)} - X\right)\right)^2}$$

Where w = the number of replicate weights

$X_{(w)}$ = estimate obtained using replicate weights for replicate group w

X = estimate from using full sample weights

Standard error of the ratio of two number estimates

Once the standard error for the number estimates was produced, the standard error for the proportion was derived as follows:

$$\mathrm{SE}\left(\frac{X}{Y}\right) = \mathrm{RSE}\left(\frac{X}{Y}\right) \times \left(\frac{X}{Y}\right)$$

where $\mathrm{RSE}\left(\frac{\mathrm{X}}{\mathrm{Y}}\right)$ is calculated as shown below.

Relative standard error of estimates (number and ratio)

The relative standard error (RSE) of an estimate is a measure of the percentage errors likely to have occurred due to sampling. The RSE of an estimate is calculated as follows:

$$\mathrm{RSE(X)\%} = \left(\frac{\mathrm{SE}}{\mathrm{Estimate}}\right) \times 100$$

Caution should be used when a RSE is between 25% and 50% and estimates with a RSE above 50% are considered unreliable.

The relative standard error for the proportion was derived from the standard error of both the estimate for the numerator (X) and the denominator (Y) as follows:

$$\mathrm{RSE}\left(\frac{\mathrm{X}}{\mathrm{Y}}\right) = \sqrt{\mathrm{RSE(X)}^2 - \mathrm{RSE(Y)}^2}$$

Where X is a subset of Y and Y is a survey estimate of the number of people in a group.

Confidence interval for estimates (number and ratio)

The 95% confidence interval around the proportion estimates (P) or number estimates was derived as follows:

$$\mathrm{UCL} = \mathrm{X} + 1.96 \times \mathrm{SE(X)}$$

$$\mathrm{LCL} = \mathrm{X} - 1.96 \times \mathrm{SE(X)}$$

$$\mathrm{UCL} = \mathrm{P} + 1.96 \times \mathrm{SE}\left(\frac{\mathrm{X}}{\mathrm{Y}}\right)$$

$$\mathrm{LCL} = \mathrm{P} - 1.96 \times \mathrm{SE}\left(\frac{\mathrm{X}}{\mathrm{Y}}\right)$$

Where UCL = upper confidence limit

LCL = lower confidence limit

As with all statistical comparisons, care should be exercised in interpreting the results. A non-significant difference between two rates may indicate no true difference, or could indicate that numbers of observations are too small to detect a true statistically significant difference. Judgment should be exercised in deciding whether the size of the difference observed is of practical importance.

Reporting deaths

Data on deaths in this report are sourced from the AIHW National Mortality Database (see Appendix C). Unless otherwise specified, the cause of death identified in this report is based on the 'underlying cause'—the disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury. Any other condition or event that is not the underlying cause, but is still considered to contribute to the death, is known as an associated cause. In Australia, the underlying cause is derived from information on the death certificate, using an automated process.

In this report, death data are collated according to the year of registration of the death and not the year of death. Although, for the most part, year of death and registration coincide, deaths at the end of each calendar year may be held over until the following year, as will deaths in which the cause requires further examination by a coroner. Typically around 5% of deaths are held over from one year to the next for processing.

See the section below on 'Population data used in this report' for information on the population used to calculate death rates in this report.

Comparability factors

In processing deaths from 1 January 1997, Australia adopted the use of the automated coding system and introduced ICD-10 codes (see Appendix B). As a result, there is a break in the

underlying cause of death series between 1996 and 1997. Comparability factors have been calculated that can be applied to deaths data coded using ICD-9 (1979–1996) to make them comparable with data coded to ICD-10 (from 1997 onwards). A comparability factor of 0.83 was applied to the observed number of deaths for stroke (ICD-10 codes I60–I64) for the period 1979–1996. This comparability factor was calculated at the population level—that is, the same comparability factor was applied to the number of stroke deaths for each age and sex group combination.

Reporting hospitalisations

Information on hospitalisations in Australia is contained in the AIHW NHMD (see Appendix C for more information). 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 (e.g. from acute to rehabilitation). The same person can have multiple 'separations' within the same hospitalisation period and, because the database is event based, it is currently not possible to track individuals. 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. Note also that some care types, such as unqualified neonates, hospitalised boarders and organ procurement hospitalisations, are not included in the count of hospital separations.

There are two distinct types of diagnoses recorded in the database—principal and additional. The principal diagnosis is the diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care. The principal diagnosis is usually a disease, injury or poisoning, but can also be the specific care or service provided for a current condition (e.g. dialysis for kidney disease), or other reasons for hospitalisation. Unless stated otherwise, hospitalisation rates presented in this report refer to the principal diagnosis. The additional diagnosis is a condition or complaint that coexists with the principal diagnosis or arises during the episode of care.

Additional diagnoses should be interpreted as conditions that affect patient management in terms of requiring any of the following:

- commencement, alteration or adjustment of therapeutic treatment
- diagnostic procedures
- increased clinical care and/or monitoring.

Additional diagnoses form the basis of the analyses of comorbidity presented in this report.

Also note that the principal diagnosis is determined at the end of the hospitalisation episode. It is therefore possible for the principal diagnosis to be different from the complaint that caused a person to present to hospital. Hospitals data therefore report the condition a patient was hospitalised *with*, rather than the condition they were hospitalised *for*.

See the section below for information on 'The population data used in this report' to calculate hospitalisation rates in this report.

Comparability factors

The NHMD adopted the use of the automated coding system and introduced ICD-10 coding in the 1998–99 financial year (see Appendix B). As a result, there is a break in the underlying cause of death series between 1997–98 and 1998–99. Unlike for deaths data, no comparability

factors are available for hospitalisation data. It is important to be aware of the potential for coding changes to have affected the trends in hospitalisations presented in this report.

Reporting Indigenous data

Reporting Indigenous death and hospitalisation data are problematic because of the under-identification of Indigenous Australians in these databases. Not all states and territories in Australia are able to report the Indigenous status of patients in their death and hospitalisation data accurately. In this report, data on Indigenous deaths and hospitalisations were limited to specific jurisdictions (based on the patient's state of usual residence) because these are the ones that have been judged to have sufficiently accurate Indigenous identification.

Deaths

The ABS has assessed the quality of Indigenous deaths in death registration data by state and territory in the Census Data Enhancement Indigenous Mortality Quality Study. This study involved linking Census records with death registration records to examine differences in reporting of Indigenous status across two data sets. This assessment indicates that the Indigenous identification rate is 87% or higher in New South Wales, Queensland, Western Australia and the Northern Territory, and around 65% for the remaining jurisdictions. Historically, Indigenous identification in South Australia, Western Australia and the Northern Territory has been of sufficient quality to include in analyses from 1991 onwards. Queensland was included in analyses from 1998 onwards and, in 2010, a decision was made to include data from New South Wales from 2001 onwards.

Hospitalisations

In February 2010, the AIHW released a report on the quality of Indigenous identification in hospital separations data (AIHW 2010c). The report recommended that, from 2004–05, the level of Indigenous identification in hospitalisations data was acceptable for analysis purposes (i.e. the level of Indigenous identification was 80% or greater) for data from New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory (public hospitals only). Data are reported based on the state or territory of the patient's usually residence for these six jurisdictions. As at June 2010, the proportion of the Indigenous population covered by these six jurisdictions was 96% (ABS 2009b).

Reporting data by remoteness

Comparisons of region in this report use the Australian Standard Geographical Classification (ASGC). The ASGC is a classification system developed by the ABS that groups Australian regions into six areas, called remoteness areas, based on their distance from major population centres and services. The six remoteness areas are:

- *Major cities*
- *Inner regional*
- *Outer regional*
- *Remote*
- *Very remote*
- *Migratory*

Data from *Migratory* areas are not analysed in this report. Also, throughout the report *Remote* and *Very remote* areas are grouped together to allow sufficient numbers for analysis. The boundaries of the different remoteness areas are re-drawn after each Census to account for changes to available services and population change. The remoteness areas used in this report are based on the 2006 Census.

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 SEIFA index of relative socioeconomic disadvantage 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.

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

It is important to note that the index of relative socioeconomic disadvantage relates to the average disadvantage of all people living in a SLA, not to the level of disadvantage of a specific individual. Because the population of many areas covers a broad range of socioeconomic disadvantage, these measures will generally underestimate the true effect of disadvantage on health.

The index of relative socioeconomic disadvantage values used in this report are based on the 2006 Census. These values have been mapped to the 2007 year SLA boundaries for both death and hospitalisation analyses.

Population data used in this report

Population data are used throughout this report to calculate rates. The population data used are estimated resident populations (ERPs) derived from the ABS Census of Population and Housing. ERPs adjust Census data to add people missed by the Census and people overseas on Census night, and to remove overseas visitors. In between census years, the ERPs are updated using indicators of population change such as deaths, births and net migration. The ERPs used in this report are based on the 2006 Census.

Where a rate is calculated for a calendar year (e.g. with death data), the population used is the ERP as reported at 30 June of that year. Where a rate is calculated for a financial year (e.g. with hospitalisation data), the population used is the ERP for 31 December of the year in the middle of the span. For example, to calculate the hospitalisation rate of the 2007–08 financial year, the population from 31 December 2007 is used.

Throughout this report, rates of deaths and hospitalisations are age-standardised. In these cases, the standard population used to calculate the age-standardised rate is the Australian ERP as at 30 June 2001.

Aboriginal and Torres Strait Islander population

Australia's Indigenous population is calculated from the Census and uses ERPs as described above. The Aboriginal and Torres Strait Islander population used to calculate Indigenous death and hospitalisation rates in this report are the 30 June *Experimental Estimates and Projections for Aboriginal and Torres Strait Islander people by states and territories, 2006–2021 – Series B* (ABS 2009).

Remoteness area population

For both deaths and hospitalisations, the remoteness area populations used to calculate rates in this report are the ERPs at 30 June for the given year. In the case of hospitalisations, which are reported by financial year, the population used is from the beginning of the relevant financial year. For example, hospitalisation rates by region in 2007–08 would use the remoteness area ERP for 30 June 2007.

Population of socioeconomic areas

Populations of socioeconomic areas used in this report are derived from 2007 estimates of SLA populations (as at 30 June of that year). SLAs are ranked according to their score on the index of relative socioeconomic disadvantage, and then divided into five roughly equal groups based on their population. That is, the 20% of the population with the highest relative disadvantage score are allocated to the first group, the next 20% to the second, and so on. The same populations were used to calculate rates for both deaths and hospitalisations.

Defined daily dose per 1,000 population per day

The information in this section describing defined daily dose per 1,000 population per day comes from *Australian statistics on medicines 2009* (DoHA 2011).

To classify medicines in Australia, the Drug Utilisation Sub-Committee (DUSC) and the Department of Health and Ageing (DoHA) have adopted the anatomical therapeutic chemical (ATC) code as recommended by the WHO. The international unit of drug utilisation adopted by the DUSC to accompany the classification is the defined daily doses, per thousand population per day (DDDs/1000/day). The defined daily dose is established by the Nordic Council on Medicines and the WHO Drug Utilisation Research Group on the basis of the assumed average dose per day of the drug, when used for its main indication by adults.

The DDDs/1000/day figure is calculated from prescription data in the following way:

$$\frac{N \times M \times Q \times 1000}{DDD \times P \times D}$$

Where:

N is the number of prescriptions dispensed in the year

M is the drug mass in each unit (tablet, capsule, injection, pack, etc.) (e.g. milligrams or grams, expressed in the same unit as DDD)

Q is the average dispensed quantity (i.e. number of units) per prescription

P is the mid-year Australian population for the year of data collection

D is the number of days in the year.

The DDDs/1000/day can be calculated over other time periods such as monthly or quarterly.

For PBS items, the mass amount (M) is the amount of active drug contained in an individual dose unit (e.g. tablet, capsule, suppository, etc.). Non-PBS items are estimated from the Pharmacy Guild survey. The data from the survey does not include information on the quantity supplied per prescription, therefore the mass amount for non-subsidised items is the total amount of active drug contained in the pack.

For prescriptions forwarded for subsidy, the average quantity dispensed (Q), is available from Medicare Australia data. For prescriptions that are priced under the general co-payment, the quantity is assumed to be the average quantity of the subsidised prescriptions for that drug (i.e. as concession, safety net and Veterans Affairs (Repatriation) prescriptions). For private prescriptions, the quantity dispensed is assumed to be the retail pack size.

For a chronically administered drug, the DDDs/1000/day figure indicates how many people, per 1000 of the population, may, in theory, have received a standard dose (as defined by the DDD) daily.

For drugs used intermittently, such as anti-infectives, usage expressed in DDDs/1000/day may similarly give a rough estimate of the average proportion of the population using these drugs every day. To estimate the number of patients treated during the year supplementary information, such as the average duration of treatment, is necessary.

Appendix B Classifications

Anatomical therapeutic chemical (ATC) classification

ATC codes are used in this report to classify medicines. This classification groups medicines according to the body organ or system they act upon, their therapeutic characteristics and their chemical characteristics. A complete list of the medicine classes included in this report is shown in Table B1.

Table B1: Anatomic therapeutic chemical medicine classes included in this report

ATC code	Description
B01	**Antithrombotic agents**
B01AA	Vitamin K antagonists
B01AB	Heparin group
B01AC	Platelet-aggregation inhibitors (excluding heparin)
B01AC06	Aspirin
B02	**Antihaemorrhagics**
C01	**Cardiac therapy agents**
C01B	Antiarrhythmics
C01DA	Nitrates
C02	**Antihypertensives**
C03	**Diuretics**
C07	**Beta-blocking agents**
C08	**Calcium-channel blockers**
C09	**Renin-angiotensin system agents**
C10	**Lipid-modifying agents**

International Classification of Disease (ICD) codes

Mortality

Australia uses the International Statistical Classification of Diseases and Related Health Conditions for coding causes of death. Analyses in this report of the years between 1987 and 1996 used the Ninth Revision (ICD-9); analyses after 1996 used the Tenth Revision (ICD-10). ICD-10 classifications for coding deaths are updated annually.

Morbidity

For hospital diagnoses and procedures, a slightly different classification, modified for Australia, is used. However, this classification does not affect the codes used in this report. In this report, hospital data up to 1997–98 used the ICD-9-CM (International Classification of Diseases and Related Health Conditions, Ninth Revision, Clinical Modification) classification. After 1997–98, the ICD-10-AM classification (International Statistical

Classification of Diseases and Related Health Conditions, Tenth Revision, Australian Modification) was used. 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, noting that not all procedures are surgical. ICD and ACHI codes are routinely updated about every 2 years.

Details of the ICD codes used for diagnosis and procedures in this report are shown in Tables B2 and B3.

Table B2: International Classification of Disease (ICD) codes for cerebrovascular disease, stroke and TIA

Disease codes	ICD-9 and ICD-9-CM codes	ICD-10 and ICD-10-AM codes
Cerebrovascular disease	430–438	I60–I69
Stroke	430–434,436	I60–I64
Haemorrhagic stroke	430–432	I60–I62
Subarachnoid haemorrhage	430	I60
Intracerebral haemorrhage	431	I61
Other non-traumatic intracranial haemorrhage	432	I62
Ischaemic stroke (i.e. cerebral infarction)	433	I63
Stroke not specified as haemorrhage or infarction	436	I64
TIA	435	G45
Rehabilitation for stroke and its sequelae		Z500, Z501, Z504,Z505,Z506, Z507,Z508,Z509' as principal diagnosis with I60–I69 as associated diagnosis (excluding I69.8)

Table B3: Australian Classification of Health Interventions (ACHI) codes for procedures in hospital data

Procedure codes	ACHI code (7th edition)
Generalised allied health	**Block 1916**
Dietetics	95550–00
Social work	95550–01
Occupational therapy	95550–02
Physiotherapy	95550–03
Podiatry	95550–04
Speech pathology	95550–05
Audiology	95550–06
Orthoptics	95550–07
Prosthetics and orthotics	95550–08
Pharmacy	95550–09
Psychology	95550–10
Pastoral care	95550–12
Music therapy	95550–13
Diabetes education	95550–14
Other allied health interventions	95550–11
Imaging procedures	
Duplex ultrasound of cranial, carotid or vertebral vessels	55274–00,55280–00
Heart ultrasound	55113–00,55118–00,55130–00
CT brain scan	56001–00,56007–00,56010–02,56010–03
MRI of the brain	90901–00,90901–09
MRA of head or neck	90902–00
Chest X-ray	58509–00,58500–00,58506–00
Cerebral angiography	59970–02
Surgical procedures	
Carotid endarterectomy	33500–00
Carotid embolectomy or thrombectomy	33800–00
Intracranial vein or artery transcatheter embolisation	35321–02,35321–08
Destruction of intracranial aneurysm or other vascular lesion	39815–00, 90033–00,39812–00,39806–00,39800–00
Removal of intracranial haematoma or abscess	39603–00,39603–01
Carotid artery repair	33827–00,33830–00
Carotid bypass	32700–00,32700–01,32700–05,32700–06
Carotid aneurysm graft	33100–00
Carotid resection with reanastomosis	32703–00
Carotid transluminal balloon angioplasty	35307–00,35307–01
Pharmacotherapy	
Invasive administration of thrombolytic medicines	35317–00,35319–00,35320–00
Non-invasive administration of thrombolytic agents	96196–01,96199–01, 96200-01, 96201-01, 96202-01, 96203-01, 96205-01, 96205-01, 96206-01, 96209-01

Source: NCCH 2008

Classifications from other sources

Details of the classifications and codes from other data sources used in this report are shown in Table B4.

Table B4: Classifications and codes from other data sources used in this report

Data	Disease or procedure	Classification	Code
Disability and carers	Stroke	SDAC	923 (equivalent to ICD-10 code I64)
Aged–care Assessment Program	Cerebrovascular disease	ACAP	0910–0916 (equivalent to ICD-10-AM codes I60–I69)
	TIA	ACAP	0605 (equivalent to ICD-10-AM codes G45–G46)
Aged–care Funding Instrument	Cerebrovascular disease	ACAP	0910–0916 (equivalent to ICD-10-AM codes I60–I69)
	TIA	ACAP	0605 (equivalent to ICD-10-AM codes G45–G46)
Bettering the Evaluation and Care of Health	General practice stroke/cerebrovascular encounters	ICPC-2/ICPC-2-PLUS	K90/K90002 (2004–05 to 2010–2011)
	Transient ischaemic attack (TIA)	ICPC-2	K89 (1998–2011)
2007–08 National Health Survey	Cerebrovascular disease/stroke	ICD10	19396 (equivalent to ICD-10-AM codes I60–I69)

Appendix C Main data sources

ABS National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) (2004–05)

The NATSIHS is conducted by the ABS to obtain national information on the health of Indigenous Australians, their use of health services and health-related aspects of their lifestyle. The 2004–05 survey collected information from a sample of 10,439 people (about one in 45 of the total Indigenous population) from all states and territories, including *Remote and very remote* areas, from August 2004 to July 2005.

Information about the data quality of the 2004–05 NATSIHS can be found in Chapter 7 of the ABS publication *National Aboriginal and Torres Strait Islander Health Survey: users' guide* (ABS cat. no. 4715.0.55.004).

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4715.0.55.0042004-05?OpenDocument>.

ABS National Health Survey (NHS) (2007–08)

The 2007–08 NHS was conducted by the ABS in all states and territories and across all age groups. One adult (aged 18 or over) and one child (where applicable) for each sampled dwelling were included in the survey. The survey was designed to obtain national benchmarks on a wide range of health issues, and to enable change in health to be monitored over time—similar surveys were conducted by the ABS in 2001 and 2004–05. Information was collected about the health status of the population; health-related aspects of lifestyle and other health risk factors; and the use of health services and other actions people had recently taken for their health.

Information about the data quality of the 2007–08 NHS can be found in Chapter 7 of the ABS publication *National Health Survey: users' guide – electronic publication, 2007-08* (ABS cat. no. 4363.0.55.001)
<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4363.0.55.001Main%20Features82007-08?opendocument&tabname=Summary&prodno=4363.0.55.001&issue=2007-08&num=&view>.

ABS Surveys of Disability, Ageing and Carers (SDAC) (1998, 2003 and 2009)

These surveys were conducted by the ABS to collect information about: people of all ages with a disability; older people (aged 60 and over); and people who provide assistance to older people and people with disabilities. The surveys included people in both private and non-private dwellings, including people in establishments where care is provided, but excluded those in correctional institutions.

The 2009 SDAC collected information from a sample of 64,213 persons for the household component and 9,470 persons for the cared-accommodation component over the period April to December 2009. The final sample sizes for the 2003 survey were 36,241 for the household component and 5,145 for the cared-accommodation component, and the sample

was conducted from June to November 2003. The 1998 SDAC was conducted from March to May 1998, and collected data from a sample of 37,580 persons for the household component and 5,716 persons for the cared-accommodation component.

The SDAC data presented in this report for 2009 were extracted from the SDAC 2009 confidentialised unit record file (CURF). To protect confidentiality, some records were removed from the CURF by the ABS before making it available for analysis (ABS 2011a). Therefore, data shown in this report may not exactly match those in ABS published reports.

The data quality declaration for the 2009 SDAC can be found in the ABS publication *Disability, ageing and carers, Australia: summary of findings, 2009* (ABS cat. no. 4430.0) <http://www.abs.gov.au/Ausstats/abs@.nsf/0/FB632AC7C773292BCA2577FA0011C48D?OpenDocument>.

Information about the data quality of the 2003 SDAC can be found in the ABS information paper *Disability, ageing and carers, Australia: user guide, 2003* (ABS cat. no. 4431.0.55.001) <http://www.ausstats.abs.gov.au/ausstats/free.nsf/0/87ED9753078BFCECCA256F6F00771DAE/$File/4431055001_2003.pdf>.

Information about the data quality of the 1998 SDAC can be found in the ABS technical paper *Survey of Disability, Ageing and Carers, Australia: Confidentialised unit record file, 1998* (ABS 1999).

Definitions for main concepts in the Surveys of Disability, Ageing and Carers

The definitions used in the 1998, 2003 and 2009 SDACs for the main concepts relating to disability and to what constituted a household or establishment are provided below (ABS 2011b).

Cared accommodation: The cared-accommodation component covered residents of hospitals, nursing homes, aged-care and disability hostels and other homes such as children's homes, who had been, or were expected to be, living there for at least 3 months.

Carer: A person of any age who provides any informal assistance, in terms of help or supervision, to persons with disabilities or long-term conditions or persons who are elderly (i.e. aged 60 and over). This assistance has to be ongoing, or likely to be ongoing, for at least 6 months. Assistance to a person in a different household relates to 'everyday types of activities', without specific information on the activities. Where the care recipient lives in the same household, the assistance is for one or more of the following activities:

- cognition or emotion
- communication
- health care
- household chores
- meal preparation
- mobility
- property maintenance
- reading or writing
- self-care
- transport.

Core activities: include communication, mobility and self-care.

Disability: A person has a disability if they report they have a limitation, restriction or impairment, which has lasted, or is likely to last, for at least 6 months and restricts everyday activities. This includes, for example:

- loss of sight (not corrected by glasses or contact lenses)
- loss of hearing where communication is restricted, or an aid to assist with, or substitute for, hearing is used
- speech difficulties
- shortness of breath or breathing difficulties causing restriction
- chronic or recurrent pain or discomfort causing restriction
- blackouts, fits, or loss of consciousness
- difficulty learning or understanding
- incomplete use of arms or fingers
- difficulty gripping or holding things
- incomplete use of feet or legs
- nervous or emotional condition causing restriction
- restriction in physical activities or in doing physical work
- disfigurement or deformity
- mental illness or condition requiring help or supervision
- long-term effects of head injury, stroke or other brain damage causing restriction
- receiving treatment or medication for any other long-term conditions or ailments and still being restricted
- any other long-term conditions resulting in a restriction.

Formal assistance/providers: Help provided to persons with one or more disabilities by:

- organisations or individuals representing organisations (whether profit making or non-profit making, government or private) or
- other persons (excluding family, friends or neighbours as described in Informal assistance/providers) who provide assistance on a regular, paid basis and who were not associated with any organisation.

Household: A group of two or more related or unrelated people who usually reside in the same dwelling and who make common provision for food and other essentials for living; or a person living in a dwelling who makes provision for his or her own food and other essentials for living without combining with any other person. Thus a household may consist of:

- one person
- one family
- one family and related individual(s)
- related families with or without unrelated individual(s)
- unrelated families with or without unrelated individual(s)
- unrelated individuals.

Informal assistance/providers: Informal assistance is unpaid help or supervision that is provided to persons with one or more disabilities or persons aged 60 and over living in households. It only includes assistance that is provided because of a person's disability or because they are older. Informal assistance may be provided by family, friends or neighbours. For this survey, any assistance received from family or friends living in the same household was considered to be informal assistance regardless of whether or not the provider was paid. It does not include providers whose care is privately organised (see Formal assistance/providers).

Levels of core activity limitation: core activity limitation levels are based on whether a person needs help, has difficulty, or uses aids or equipment with any of the core activities. A person's overall level of core activity limitation is determined by their highest level of limitation in these activities. The four levels of limitation are:

- profound: the person is unable to do, or always needs help with, a core activity task
- severe: the person sometimes needs help with a core activity task, has difficulty understanding or being understood by family or friends or can communicate more easily using sign language or other non-spoken forms of communication.
- moderate: the person needs no help but has difficulty with a core activity task
- mild: the person needs no help and has no difficulty with any of the core activity tasks, but uses aids and equipment, cannot easily walk 200 metres, cannot walk up and down stairs without a handrail, cannot easily bend to pick up an object from the floor, cannot use public transport, can use public transport but needs help or supervision, needs no help or supervision but has difficulty using public transport.

Long-term condition: A disease or disorder which has lasted or is likely to last for at least 6 months; or a disease, disorder or event (e.g. stroke, poisoning, accident etc.) which produces an impairment or restriction which has lasted or is likely to last for at least 6 months. This includes conditions resulting from accidents or injuries, lasting for at least 6 months. The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10), was used in the 1998, 2003 and 2009 surveys as the basis for the coding of long-term conditions.

Primary carer: A person who provides the most informal assistance, in terms of help or supervision, to a person with one or more disabilities or aged 60 and over. The assistance has to be ongoing, or likely to be ongoing, for at least 6 months and be provided for one or more of the core activities (communication, mobility and self-care). In the 2009 SDAC, primary carers only included persons aged 15 and over for whom a personal interview was conducted.

Specific limitation or restriction: People were identified as having a specific limitation or restriction if they needed assistance, had difficulty, or used aids or equipment to do selected tasks relating to the core activities—self-care, mobility and communication; or if their participation in schooling or employment was restricted because of their condition.

Aged Care Assessment Program

ACAP data for the period 2009–10, as provided by the Department of Health and Ageing, are used in Chapter 5 of this report. Under the ACAP, which is funded by the Australian Government, the care needs of clients are assessed to determine and facilitate access to aged care services appropriate to their needs. These assessments are carried out by a multi-

disciplinary Aged Care Assessment Team (ACAT) (or an Aged Care Assessment Service (ACAS) in Victoria), which is comprised of a range of health and other professionals.

As part of the ACAT assessment, up to 10 health conditions that have an impact on the person's 'need for assistance with activities of daily living and social participation' can be recorded (Department of Health and Ageing 2011). The condition with the greatest impact on the person's need for assistance is designated the 'main health condition'. Reported conditions are coded using the ACAP data dictionary health condition code list, which is based on the ICD-10-AM (Department of Health and Ageing 2011).

In this report, a person was considered to have cerebrovascular disease or TIA if this condition was recorded as the main or another health condition. The ACAP health condition codes used to identify a person with cerebrovascular disease or TIA are provided in Table B4 of Appendix B. ACAP clients can have more than one assessment during a reporting period. For this report, when clients had more than one assessment during the financial year (2009–10), data on the most recently completed assessment were used.

Further information about the ACAP can be found in the *ACAP Program Data Dictionary* (Department of Health and Ageing 2011) and on the DoHA website <www.health.gov.au>.

Aged Care Funding Instrument

Information collected through the ACFI is used extensively in this report. The ACFI was introduced by the Australian Government in March 2008 as a resource allocation tool for funding places in residential aged care facilities that receive subsidies from the Australian Government (DoHA 2009). It replaced the Resident Classification Scale which had been in use since 1 October 1997.

Following admission to a subsidised residential aged care facility as a permanent resident, an ACFI appraisal is undertaken, with the requirements stating that this appraisal be conducted between 8 days and 2 months of the resident entering care (DoHA 2009).

Data from ACFI appraisals that were valid in 2009–10 were used in Chapter 5 of this report. Almost all (99%) permanent residents of Australian Government-subsidised aged care facilities in 2009–10 had been assessed using the ACFI tool and thus these data cover virtually all permanent residents in such facilities. ACFI appraisals generally don't expire and the majority of permanent residents receive only one ACFI appraisal during a reporting period of 12 months or more. However, re-appraisals sometimes occur for reasons such as a major change in care needs. For residents who were appraised more than once in 2009–10, the most recent appraisal was used in the data presented in this report.

Note that the ACFI data do not capture information about people:

- in residential aged care facilities that were not subsidised by the Australian Government
- in residential care places under the Multi-Purpose Service Program or the National Aboriginal and Torres Strait Islander Flexible Aged Care Program
- who accessed respite care in residential aged care facilities.

The ACFI includes 12 questions about assessed care needs, with these questions falling into one of three funding domains: 'Activities of daily living', 'Behaviour characteristics' and 'Complex health care needs'. The responses to the questions are used to determine the classification for funding and the overall classification as a 'low care' or 'high care' resident. See Box 5.3 for further information. Because the ACFI is a funding tool, the questions about

care needs are focussed on those needs that most contribute to the cost of individual care, not on all areas in which a resident may require care.

The ACFI form includes a Medical diagnosis checklist which allows for the reporting of up to 3 medical diagnoses that impact on the resident's care needs. The health condition codes used to identify a person with cerebrovascular disease or TIA in the ACFI dataset are provided in Table B4 of the Appendix B.

Further information can be found in the ACFI users' guide (Department of Health and Ageing 2009) and on the webpage <http://www.health.gov.au/acfi>.

Department of Health and Ageing 2009. Aged Care Funding Instrument (ACFI) user guide. Publication no 6281. Canberra: DoHA.

Department of Health and Ageing 2011. Aged Care Assessment Program data dictionary, version 2.2. Canberra: DoHA.

DoHA 2009. The residential care manual. Canberra: DoHA.

AIHW Disease Expenditure Database

A comprehensive database that allocates health expenditure estimates by condition types, by disease category, area of expenditure, and by age and sex.

This report provides direct health expenditure on stroke under three categories:

- Admitted patient hospital services covering the expenditure on services provided to an admitted patient, including expenditure on medical services delivered to private admitted patients in hospitals.
- Prescription pharmaceuticals including prescriptions subsidised under government schemes (e.g. the Pharmaceutical Benefits Scheme and Repatriation Pharmaceutical Benefits Scheme), private prescriptions and under co-payment prescriptions. Pharmaceuticals dispensed in hospitals were included in the estimates of hospital costs.
- Out-of hospital medical services comprising medical services primarily funded under the Medical Benefits Schedule, such as primary health visits, pathology and specialist services. Practice Incentive Payments are also included. In addition, medical services funded by DVA, compulsory motor vehicle third party insurance, workers compensation insurance, private health insurance funds and the Australian Government premium rebates allocated to medical services, as well as Medicare co-payments and other out-of-pocket payments are all included. In-hospital medical expenditure for private patients was not included here but as part of admitted patient hospital services.

Estimated out-of-hospital medical services and prescription pharmaceuticals costs for stroke used in this report are derived using the BEACH survey in conjunction with data from a number of other sources including the Medicare Benefits Schedule (Medicare) data, Pharmaceutical Benefits Scheme, Repatriation Pharmaceutical Benefits Scheme, and script volumes for private and under co-payment drugs. The BEACH data were collected by the Family Medicine Research Centre of the University of Sydney under a previous collaboration with the AIHW. For out-of-hospital medical services, the BEACH survey data were aggregated over 3 years to estimate the proportion of GP encounters in which stroke was a 'problem managed'. This proportion was then applied to the Medicare data for the reference year. For prescription pharmaceuticals, the BEACH survey data were aggregated over 3 years to allocate expenditure on prescription drugs to each disease group, based on the

problems managed in the GP encounter that related to the prescribing of a particular drug. The Anatomical Therapeutic Chemical Classification System classification codes were mapped to codes for prescription drugs used in the BEACH survey. Due to the use of this methodology, time series comparisons for both out-of-hospital medical services and prescription pharmaceuticals should be treated with caution.

AIHW National Hospital Morbidity Database

The NHMD is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. It is a comprehensive data set that has records for all episodes of admitted patient care from essentially all public and private hospitals in Australia.

The data supplied are based on the National Minimum Data Set (NMDS) for Admitted Patient Care and include 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 counting unit for the NHMD is the 'separation'. 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 (e.g. from acute care to rehabilitation).

The NHMD contains records from 1993–94 to 2010–11. For each reference year, the NHMD includes records for admitted patient separations between 1 July and 30 June.

Since 1998–99, diagnoses in the NHMD have been coded to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) by clinical coders in each hospital, based on the diagnoses recorded in the patient's medical record. The diagnosis is recorded for each hospital episode and is specific to that episode. The diagnosis-related hospital morbidity data presented in this report mainly cover the financial year from 1 July 2009 to 30 June 2010, but trends are reported for the period 1 July 1998 to 30 June 2010. In 2009–10, diagnoses and external causes of injury, were recorded using the Sixth Edition of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian modification (ICD-10-AM) (NCCH 2008).

Separations for which the care type was reported as 'newborn without qualified days', and records for 'hospital boarders' and 'posthumous organ procurement' have been excluded from statistics on hospital separations reported here.

Procedures for 2009–10 were classified, coded and reported to the NHMD by all states and territories, using the Sixth Edition of the Australian Classification of Health Interventions (ACHI) (NCCH 2008).

One or more procedures can be reported for each separation, but procedures are not undertaken for all hospital admissions, so only some of the separation records include procedure data.

The data quality statement for the AIHW NHMD can be found at on the AIHW's Metadata Online Registry (METeOR)—National Hospital Morbidity Database Data Quality Statement: 2010-11.

AIHW National Mortality Database

The mortality data included in this report were provided by the Registries of Births, Deaths and Marriages, the ABS and the National Coronial Information System. These data are maintained at the AIHW in the National Mortality Database.

The National Mortality Database contains coded causes of death from the information documented by the medical practitioner certifying the death or by a coroner. Registration of deaths is the responsibility of the state and territory Registrars of Births, Deaths and Marriages. These data are then collated and coded by the ABS to the International Statistical Classification of Diseases and Related Health. Since 1997, deaths in Australia have been coded to the Tenth Revision of the International Classification of Diseases (ICD-10).

Data on deaths from stroke (ICD-10 I60–I64) and TIA (G45) in this report have been identified based on the 'underlying cause'—the disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury. In Australia, the underlying cause is derived from information on the death certificate, using an automated process.

In addition, the death data presented in this report have been collated according to the *year of registration of the death* and cover the period 1 January 1979 to 31 December 2010. It should be noted that deaths data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

The data quality statements underpinning the AIHW National Mortality Database can be found in the following ABS publications: ABS Quality declaration summary for *Causes of death 2010* (Cat. no. 3303.0) <http://www.abs.gov.au/Ausstats/abs@.nsf/0/D4A300EE1E04AA43CA2576E800156A24?OpenDocument> and ABS Quality declaration summary for *Deaths, Australia 2010* (ABS cat. no. 3302.0) <http://www.abs.gov.au/Ausstats/abs@.nsf/0/9FD0E6AAA0BB3388CA25750B000E3CF5?OpenDocument.>

Drug Utilisation Sub-Committee database (DUSC)

The data on the supply of stroke medications in the community included in this report are from the DUSC database, which database is held at the DoHA, and monitors the community (i.e. non-public hospital) use of prescription medicines in Australia (DoHA 2011). The DUSC database combines information on prescriptions subsidised by the PBS, the RPBS and an estimate from the Pharmacy Guild Survey of those prescriptions that are not subsidised (i.e. private prescriptions and PBS prescriptions priced under the general patient co-payment threshold).

The Pharmacy Guild Survey collects dispensing information each month from a random sample of about 370 pharmacies that are members of the Pharmacy Guild throughout Australia (DoHA 2011). The pharmacies in the survey are selected to be representative of the population of operational pharmacies with regard to PBS dispensing volume and geographical location.

Information on drugs prescribed in public hospitals and on highly specialised drugs available to outpatients through public hospital pharmacies under section 100 of the *1953 National Health Act* are not included in the DUSC database.

The Bettering the Evaluation and Care of Health (BEACH) program

BEACH is a continuous national study of general practice activity in Australia. Data presented here were collected by the Family Medicine Research Centre of the University of Sydney, in collaboration with the AIHW. BEACH began in April 1998 and involves changing random samples of about 1,000 GPs per year, each of whom records details about 100 consecutive patient encounters. To be eligible to participate, GPs must have claimed at least 375 general practice Medicare items in the previous 3 months. Data include information about the GP encounter, the problems managed and the treatments delivered. BEACH encounter data are weighted to be representative of all encounters and adjustments are made in analyses to allow for the tendency for patients to cluster around an individual GP or practice.

National extrapolation of the number of problems managed at general practice encounters for cerebrovascular disease in this report were based on the following method as described by Britt & Miller (2009):

National estimate of problems managed = Number of cerebrovascular problems per 100 encounters in 2007–08 × Total number of GP services claimed through Medicare in 2007–08 (rounded to the nearest 100,000; i.e. 109.5 million GP MBS items).

For more details on the method see Britt & Miller (2009).

World Health Organization Global Health Observatory

The international comparisons data presented in this report have come from the World Health Organization (WHO) Global Health Observatory data repository. This data repository provides access to over 50 data sets on priority health topics, including mortality and burden of diseases, the Millennium Development Goals (child nutrition, child health, maternal and reproductive health, immunisation, HIV/AIDS, tuberculosis, malaria, neglected diseases, water and sanitation), non-communicable diseases and risk factors, epidemic-prone diseases, health systems, environmental health, violence and injuries, and equity, among others.

Appendix D Supplementary tables

Table D2.1: Estimated number and rate of stroke events, by sex, 1997 to 2009

	Number of stroke events			Stroke events per 100,000 population[(a)]		
Year	Males	Females	Persons	Males	Females	Persons
1997	15,543	16,335	31,878	213.3	162.6	186.1
1998	15,193	16,156	31,349	203.1	156.5	177.9
1999	15,829	16,508	32,337	205.1	154.9	178.0
2000	15,904	16,927	32,831	200.0	153.6	175.1
2001	15,883	16,771	32,654	192.2	147.3	168.2
2002	15,648	16,707	32,355	184.3	142.6	162.1
2003	15,867	16,601	32,468	181.6	138.5	158.7
2004	15,815	16,714	32,529	175.9	136.9	155.3
2005	16,028	16,267	32,295	171.8	129.7	149.8
2006	16,432	16,588	33,020	170.9	129.3	149.1
2007	16,536	16,700	33,236	166.2	126.1	145.4
2008	16,833	17,137	33,970	164.2	126.3	144.5
2009	16,679	16,999	33,678	157.3	122.5	139.5

(a) Age-standardised to the Australian population as at 30 June 2001.

Sources: AIHW analysis of the National Hospital Morbidity Database and the AIHW National Mortality Database.

Table D2.2: Stroke prevalence, by age and sex, 2009

	Number			Per cent (95% CI)		
Age group (years)	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
0–44	9,546	10,350	19,896	0.1 (0.1–0.2)	0.2 (0.1–0.2)	0.2 (0.1–0.2)
45–54	15,311	15,325	30,637	1.1 (0.8–1.3)	1.0 (0.7–1.3)	1.0 (0.8–1.3)
55–64	33,215	29,494	62,709	2.8 (2.2–3.3)	2.4 (1.9–2.9)	2.6 (2.2–3.0)
65–74	63,069	27,170	90,240	8.4 (7.1–9.7)	3.5 (2.7–4.2)	5.9 (5.2–6.6)
75–84	64,457	49,953	114,410	14.5 (12.6–16.4)	9.3 (8.0–10.5)	11.6 (10.4–12.8)
85+	20,199	37,668	57,867	16.8 (13.5–20.1)	15.2 (13.1–17.3)	15.7 (14.1–17.3)
All ages	**205,798**	**169,961**	**375,759**	**2.0 (1.8–2.1)**	**1.6 (1.5–1.7)**	**1.8 (1.7–1.9)**
All ages ASR%[(a)]				**1.9 (1.8–2.1)**	**1.3 (1.2–1.4)**	**1.6 (1.5–1.7)**
Aged 65+ years (per cent)	**71.8**	**67.5**	**69.9**			

(a) ASR for age-standardised rate to the Australian population as at 30 June 2001.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record File.

Table D2.3: Stroke prevalence, by sex, 1998, 2003 and 2009

	Number			Per cent[(a)] (95% CI)		
Year	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
1998	131,535	150,532	282,067	1.7 (1.5–1.9)	1.5 (1.4–1.7)	1.6 (1.5–1.7)
2003	178,334	168,377	346,711	2.0 (1.7–2.2)	1.5 (1.3–1.7)	1.7 (1.6–1.9)
2009	205,798	169,961	375,759	1.9 (1.8–2.1)	1.3 (1.2–1.4)	1.6 (1.5–1.7)

(a) Age-standardised to the Australian population as at 30 June 2001.

Sources: AIHW analysis of ABS 1998, 2003 and 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record Files.

Table D2.4: Prevalence of disability resulting from stroke, by age and sex, 2009

	Number			Proportion of people with stroke (per cent with 95% CI)		
Age group (years)	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
0–44	3,317	3,838	7,154	34.7 (15.4–54.1)	37.1 (17.3–56.9)	36.0 (22.0–49.9)
45–54	4,012	5,812	9,824	26.2 (12.7–39.7)	37.9 (21.7–54.1)	32.1 (22.0–42.2)
55–64	12,677	6,430	19,107	38.2 (27.9–48.4)	21.8 (12.8–30.8)	30.5 (22.6–38.3)
65–74	21,639	7,257	28,895	34.3 (28.3–40.3)	26.7 (16.7–36.7)	32.0 (27.2–36.9)
75–84	23,204	15,618	38,822	36.0 (29.0–43.0)	31.3 (26.7–35.8)	33.9 (29.1–38.8)
85+	10,137	17,190	27,327	50.2 (37.6–62.8)	45.6 (38.9–52.3)	47.2 (40.6–53.9)
All ages	**74,984**	**56,145**	**131,130**	**36.4 (32.9–40.0)**	**33.0 (29.0–37.1)**	**34.9 (32.1–37.7)**
Percentage aged 65+	**73.3**	**71.4**	**72.5**			

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record File.

Table D2.5: Prevalence of disability resulting from stroke, by sex, 1998, 2003 and 2009

	Number			Per cent[(a)] (95% CI)		
Year	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
1998	56,144	69,295	125,439	43.2 (36.6–49.9)	46.1 (40.1–52.0)	45.1 (40.8–49.3)
2003	78,323	68,084	146,406	44.8 (40.1–49.5)	39.6 (34.2–45.1)	42.2 (37.9–46.6)
2009	74,984	56,145	131,130	36.8 (33.0–40.6)	32.4 (28.6–36.1)	35.0 (32.4–37.7)

(a) Age-standardised to the estimated number of people with stroke in 2003.

Sources: AIHW analysis of ABS 1998, 2003 and 2009 Survey of Disability, Ageing and Carers Confidentialised Unit Record Files.

Table D2.6: Stroke deaths, by age and sex, 2010

	Number of deaths			Deaths per 100,000 population		
Age group (years)	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
< 25	8	5	13	0.2	0.1	0.2
25–34	17	13	30	1.1	0.8	1.0
35–44	43	44	87	2.8	2.8	2.8
45–54	93	97	190	6.2	6.4	6.3
55–64	224	151	375	17.9	11.9	14.9
65–74	493	393	886	62.4	48.0	55.1
75–84	1,133	1,317	2,450	256.3	239.9	247.3
85+	1,238	3,035	4,273	946.9	1191.2	1108.4
All ages	**3,249**	**5,055**	**8,304**			
All ages (crude rate)				**29.6**	**45.6**	**37.6**
All ages (age-standardised rate)[(a)]				**30.9**	**31.4**	**32.1**

(a) Age-standardised to the Australian population as at 30 June 2001; age-standardised rates have been calculated using finer age groups than those shown.

Note: Data for 2010 are preliminary and are subject to further revision.

Source: Analysis of the AIHW National Mortality Database.

Table D2.7: Stroke deaths, by type of stroke, age and sex, 2010

Type of stroke/ age group (years)	Number of deaths			Deaths per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
Haemorrhagic stroke[a]						
0–54	126	131	257	1.5	1.6	1.6
55–64	127	116	243	10.2	9.1	9.6
65–74	219	189	408	27.7	23.1	25.4
75–84	381	418	799	86.2	76.2	80.6
85+	261	460	721	199.6	180.5	187.0
All ages	**1,114**	**1,314**	**2,428**	**10.2**	**11.8**	**11.0**
All ages (age-standardised rate)[d]				**10.3**	**10.5**	**9.4**
Ischaemic stroke[b]						
0–54	21	16	37	0.3	0.2	0.2
55–64	41	9	50	3.3	0.7	2.0
65–74	70	40	110	8.9	4.9	6.8
75–84	131	148	279	29.6	27.0	28.2
85+	130	324	454	99.4	127.2	117.8
All ages	**393**	**537**	**930**	**3.6**	**4.8**	**4.2**
All ages (age-standardised rate)[d]				**3.7**	**3.8**	**3.4**
Stroke not specified as haemorrhage or infarction[c]						
0–54	14	12	26	0.2	0.1	0.2
55–64	56	26	82	4.5	2.0	3.3
65–74	204	164	368	25.8	20.0	22.9
75–84	621	751	1,372	140.5	136.8	138.5
85+	847	2,251	3,098	647.9	883.5	803.6
All ages	**1,742**	**3,204**	**4,946**	**15.9**	**28.9**	**22.4**
All ages (age-standardised rate)[d]				**16.9**	**17.2**	**19.3**

(a) ICD-10 I60–I62.

(b) ICD-10 I63.

(c) ICD-10 I64.

(d) Age-standardised to the Australian population as at 30 June 2001; age-standardised rates have been calculated using finer age groups than those shown for people aged 65 and over.

Note: Data for 2010 are preliminary and are subject to further revision.

Source: Analysis of the AIHW National Mortality Database.

Table D2.8: Stroke deaths, by sex, 1979 to 2010

	Number of deaths			Deaths per 100,000 population[(a)]		
Year	Males	Females	Persons	Males	Females	Persons
1979	4,916	6,773	11,689	107.7	99.0	103.2
1980	5,109	6,957	12,066	108.0	98.8	103.8
1981	4,981	7,094	12,075	105.6	97.5	101.6
1982	5,061	7,306	12,367	103.6	97.2	101.0
1983	4,520	6,518	11,038	89.5	84.0	87.3
1984	4,379	6,346	10,725	83.8	79.2	82.1
1985	4,462	6,758	11,220	83.4	81.1	83.1
1986	4,297	6,385	10,682	76.7	73.5	75.7
1987	4,328	6,265	10,593	76.1	70.3	73.5
1988	4,301	6,217	10,518	73.4	67.7	70.7
1989	4,306	6,295	10,601	70.9	66.6	69.2
1990	4,143	6,274	10,417	66.0	64.7	66.4
1991	4,169	6,086	10,255	64.5	60.8	63.1
1992	4,215	6,131	10,346	63.0	59.0	61.5
1993	4,179	6,312	10,491	61.0	58.5	60.3
1994	4,457	6,459	10,916	63.7	57.7	60.8
1995	4,348	6,455	10,803	59.5	55.6	57.9
1996	4,427	6,575	11,002	58.7	54.6	56.9
1997	3,745	5,381	9,126	57.0	51.9	54.6
1998	3,688	5,391	9,079	54.5	50.3	52.5
1999	3,673	5,466	9,139	52.5	49.1	51.0
2000	3,638	5,367	9,005	50.2	46.3	48.3
2001	3,530	5,194	8,724	46.6	43.0	44.9
2002	3,575	5,403	8,978	45.6	43.3	44.8
2003	3,605	5,401	9,006	44.6	42.2	43.8
2004	3,510	5,236	8,746	42.3	39.9	41.4
2005	3,347	4,848	8,195	38.6	35.9	37.4
2006	3,348	5,147	8,495	37.1	37.0	37.5
2007	3,469	5,162	8,631	37.1	35.7	36.7
2008	3,473	5,319	8,792	36.0	35.7	36.3
2009	3,296	4,975	8,271	33.0	32.5	33.2
2010	3,249	5,055	8,304	31.4	32.1	32.2

(a) Age-standardised to the Australian population as at 30 June 2001.

Notes

1. Death rates for 1979–1996 have been adjusted to ICD-10 standards using a comparability factor of 0.83.
2. Data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only.
3. Data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

Sources: Analysis of the AIHW National Mortality Database; AIHW 2010b.

Table D2.9: Estimated health expenditure on stroke by area of expenditure, age and sex, 2008–09 ($ million)

Age (years)	Sex	Hospital-admitted patients[a]	Out-of-hospital medical services	Prescription pharmaceuticals[b]	Total expenditure allocated for stroke[c]
		$ million			
0–4	Males	1.0	0.0	0.0	1.0
	Females	0.7	0.0	0.6	1.2
	All persons	1.6	0.0	0.6	2.2
5–14	Males	0.7	0.0	0.0	0.7
	Females	0.6	0.0	0.0	0.6
	All persons	1.3	0.0	0.0	1.3
15–24	Males	2.2	0.0	0.0	2.2
	Females	2.4	0.0	0.0	2.4
	All persons	4.6	0.0	0.0	4.6
25–34	Males	5.9	0.3	0.0	6.2
	Females	3.8	0.0	0.0	3.8
	All persons	9.7	0.3	0.0	10.0
35–44	Males	11.1	0.6	0.1	11.8
	Females	12.4	0.2	0.0	12.7
	All persons	23.5	0.8	0.2	24.5
45–54	Males	25.6	0.5	0.3	26.3
	Females	21.6	0.6	0.8	22.9
	All persons	47.2	1.0	1.1	49.3
55–64	Males	43.0	2.1	2.4	47.5
	Females	27.5	1.1	0.8	29.4
	All persons	70.5	3.2	3.2	76.9
65–74	Males	57.9	2.6	2.5	63.0
	Females	41.6	1.7	2.8	46.1
	All persons	99.5	4.3	5.2	109.0
75–84	Males	71.0	2.8	6.2	80.1
	Females	78.0	4.7	5.4	88.0
	All persons	149.0	7.5	11.6	168.1
85+	Males	37.6	0.7	1.9	40.2
	Females	66.1	2.6	2.0	70.8
	All persons	103.8	3.3	3.9	111.0
Total	**Males**	**256.0**	**9.6**	**13.4**	**279.0**
	Females	**254.5**	**11.0**	**12.3**	**277.8**
	All persons	**510.5**	**20.6**	**25.7**	**556.8**

(a) Includes private medical services provided in hospital.

(b) Includes all pharmaceuticals for which a prescription is needed, including private prescriptions and under co-payment prescriptions but excludes highly specialised drugs. Also excludes over-the-counter medicines such as vitamins and minerals, first aid and wound care products, pain-killers and a number of complementary health products sold in both pharmacies and other retail outlets.

(c) Does not include expenditure on research.

Source: AIHW Disease Expenditure Database.

Table D2.10: Estimated health-care expenditure on stroke, per person, by age, sex and area of expenditure, 2008–09 ($)

Age (years)	Sex	Admitted patients[a]	Out-of-hospital medical services	Prescription pharmaceuticals[b]	Total expenditure allocated for stroke[c]
		$ per person[d]			
0–4	Male	1.4	0.0	0.0	1.4
	Female	1.0	0.0	0.8	1.8
	All persons	1.2	0.0	0.4	1.6
5–14	Male	0.5	0.0	0.0	0.5
	Female	0.4	0.0	0.0	0.4
	All persons	0.5	0.0	0.0	0.5
15–24	Male	1.4	0.0	0.0	1.4
	Female	1.6	0.0	0.0	1.6
	All persons	1.5	0.0	0.0	1.5
25–34	Male	3.9	0.2	0.0	4.1
	Female	2.5	0.0	0.0	2.5
	All persons	3.2	0.1	0.0	3.3
35–44	Male	7.1	0.4	0.1	7.6
	Female	7.9	0.2	0.0	8.1
	All persons	7.5	0.3	0.1	7.9
45–54	Male	17.3	0.3	0.2	17.8
	Female	14.4	0.4	0.5	15.3
	All persons	15.8	0.4	0.4	16.5
55–64	Male	35.4	1.7	2.0	39.1
	Female	22.5	0.9	0.6	24.0
	All persons	28.9	1.3	1.3	31.6
65–74	Male	77.9	3.5	3.3	84.6
	Female	53.6	2.2	3.6	59.4
	All persons	65.5	2.8	3.4	71.8
75–84	Male	164.0	6.6	14.4	184.9
	Female	143.2	8.6	9.9	161.7
	All persons	152.4	7.7	11.9	172.0
85+	Male	312.0	5.7	15.8	333.5
	Female	275.6	10.9	8.4	294.9
	All persons	287.8	9.2	10.9	307.8
Total	**Male**	23.8	0.9	1.3	26.0
	Female	23.5	1.0	1.1	25.6
	All persons	23.7	1.0	1.2	25.8

(a) Includes private medical services provided in hospital.

(b) Includes all pharmaceuticals for which a prescription is needed, including private prescriptions and under co-payment prescriptions but excludes highly specialised drugs. Also excludes over-the-counter medicines such as vitamins and minerals, first aid and wound care products, pain-killers and a number of complementary health products sold in both pharmacies and other retail outlets.

(c) Does not include expenditure on research.

(d) Based on the December 2008 estimated resident Australian population.

Source: AIHW Disease Expenditure Database.

Table D3.1: Stroke[(a)] hospitalisations, by age and sex, 2009–10

	Number of hospitalisations			Hospitalisations per 100,000		
Age-group (years)	Males	Females	Persons	Males	Females	Persons
<25	185	155	340	5.0	4.4	4.7
25–34	230	191	421	14.7	12.4	13.5
35–44	622	617	1,239	40.0	39.0	39.5
45–54	1,545	1,167	2,712	103.5	76.8	90.0
55–64	2,967	1,631	4,598	239.6	130.1	184.5
65–74	4,323	2,659	6,982	558.8	331.0	442.7
75–84	5,651	5,444	11,095	1288.4	995.5	1125.8
85+	2,843	5,115	7,958	2233.6	2048.5	2111.0
All ages	*18,366*	*16,979*	*35,345*	*168.4*	*154.1*	*161.2*
Age-standardised rates				**171.7**	**125.0**	**147.0**

(a) Principal diagnosis of stroke defined using ICD-10-AM codes I60 to I64.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.2: Ischaemic stroke[(a)] hospitalisations, by age and sex, 2009–10

	Number of hospitalisations			Hospitalisations per 100,000		
Age-group (years)	Males	Females	Persons	Males	Females	Persons
<25	50	49	99	1.3	1.4	1.4
25–34	88	85	173	5.6	5.5	5.6
35–44	256	226	482	16.5	14.3	15.4
45–54	685	407	1,092	45.9	26.8	36.2
55–64	1,569	651	2,220	126.7	51.9	89.1
65–74	2,259	1,301	3,560	292.0	161.9	225.7
75–84	2,789	2,797	5,586	635.9	511.4	566.8
85+	1,323	2,544	3,867	1039.4	1018.8	1025.8
All ages	*9,019*	*8,060*	*17,079*	*82.7*	*73.1*	*77.9*
Age-standardised rates				**84.0**	**58.9**	**70.9**

(a) Principal diagnosis of ischaemic stroke defined using the ICD-10-AM code I63 .

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.3: Haemorrhagic stroke[(a)] hospitalisations, by age and sex, 2009–10

Type of haemorrhagic stroke/ age group (years)	Number of hospitalisations			Hospitalisations per 100,000		
	Males	Females	Persons	Males	Females	Persons
Intra-cerebral and other non-traumatic haemorrhagic stroke						
<25	77	53	130	2.1	1.5	1.8
25–34	52	35	87	3.3	2.3	2.8
35–44	142	96	238	9.1	6.1	7.6
45–54	338	189	527	22.6	12.4	17.5
55–64	644	326	970	52.0	26.0	38.9
65–74	1,016	562	1,578	131.3	70.0	100.1
75–84	1,393	1,114	2,507	317.6	203.7	254.4
85+	635	883	1,518	498.9	353.6	402.7
All ages	*4,297*	*3,258*	*7,555*	*39.4*	*29.6*	*34.5*
Age-standardised rates				**40.3**	**24.3**	**31.6**
Subarachnoid haemorrhagic stroke						
<25	48	36	84	1.3	1.0	1.2
25–34	71	54	125	4.5	3.5	4.0
35–44	143	193	336	9.2	12.2	10.7
45–54	266	368	634	17.8	24.2	21.0
55–64	250	348	598	20.2	27.8	24.0
65–74	178	253	431	23.0	31.5	27.3
75–84	112	242	354	25.5	44.3	35.9
85+	35	93	128	27.5	37.2	34.0
All ages	*1,103*	*1,587*	*2,690*	*10.1*	*14.4*	*12.3*
Age-standardised rates				**9.9**	**13.2**	**11.6**
All haemorrhagic stroke						
<25	125	89	214	3.4	2.5	3.0
25–34	123	89	212	7.9	5.8	6.8
35–44	285	289	574	18.3	18.3	18.3
45–54	604	557	1,161	40.4	36.6	38.5
55–64	894	674	1,568	72.2	53.8	62.9
65–74	1,194	815	2,009	154.3	101.4	127.4
75–84	1,505	1,356	2,861	343.1	247.9	290.3
85+	670	976	1,646	526.4	390.9	436.6
All ages	*5,400*	*4,845*	*10,245*	*49.5*	*44.0*	*46.7*
Age-standardised rates				**50.2**	**37.5**	**43.3**

(a) Principal diagnosis of haemorrhagic stroke defined using ICD-10-AM codes I60 to I62.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.4: Unspecified stroke[(a)] hospitalisations, by age and sex, 2009–10

	Number of hospitalisations			Hospitalisations per 100,000		
Age-group (years)	Males	Females	Persons	Males	Females	Persons
<25	10	17	27	0.3	0.5	0.4
25–34	19	17	36	1.2	1.1	1.2
35–44	81	102	183	5.2	6.4	5.8
45–54	256	203	459	17.1	13.4	15.2
55–64	504	306	810	40.7	24.4	32.5
65–74	870	543	1,413	112.5	67.6	89.6
75–84	1,357	1,291	2,648	309.4	236.1	268.7
85+	850	1,595	2,445	667.8	638.8	648.6
All ages	*3,947*	*4,074*	*8,021*	*36.2*	*37.0*	*36.6*
Age-standardised rates				**37.5**	**28.7**	**32.8**

(a) Principal diagnosis of unspecified stroke defined using ICD-10-AM code I64.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.5: Transient ischaemic attack[(a)] hospitalisations, by age and sex, 2009–10

	Number of hospitalisations			Hospitalisations per 100,000		
	Males	Females	Persons	Males	Females	Persons
Age-groups						
<25	19	32	51	0.5	0.9	0.7
25–34	82	75	157	5.2	4.9	5.1
35–44	277	270	547	17.8	17.1	17.4
45–54	706	606	1,312	47.3	39.9	43.5
55–64	1,367	982	2,349	110.4	78.3	94.3
65–74	1,890	1,507	3,397	244.3	187.6	215.4
75–84	2,310	2,397	4,707	526.7	438.3	477.6
85+	1,177	2,037	3,214	924.7	815.8	852.6
All ages	*7,828*	*7,906*	*15,734*	*71.8*	*71.7*	*71.8*
Age-standardised rates				**72.9**	**59.2**	**65.5**

(a) Principal diagnosis of transient ischaemic attack defined using ICD-10-AM code G45.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.6: Hospitalisations with a principal diagnosis of stroke[(a)], by sex, 1998–99 to 2009–10

	Number of hospitalisations			Hospitalisations per 100,000 population[(b)]		
Year	Males	Females	Persons	Males	Females	Persons
1998–99	15,655	15,503	31,158	202	150	173
1999–00	16,494	15,981	32,475	207	150	176
2000–01	16,780	16,566	33,346	204	151	175
2001–02	16,636	16,386	33,022	196	145	168
2002–03	16,654	16,264	32,918	191	140	163
2003–04	16,852	16,564	33,416	187	140	162
2004–05	17,015	16,415	33,435	184	136	158
2005–06	17,826	16,529	34,355	186	133	158
2006–07	17,635	16,837	34,476	179	132	154
2007–08	17,991	16,954	34,945	178	130	153
2008–09	18,500	17,086	35,586	178	129	152
2009–10	18,366	16,979	35,345	172	125	147

(a) Principal diagnosis of stroke defined using ICD-10-AM codes I60 to I64.

(b) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.7: Hospitalisations with a principal diagnosis of ischaemic and haemorrhagic stroke[(a)], by sex, 1998–99 to 2009–10

	Hospitalisation per 100,000 population[(b)]					
	Ischaemic stroke			Haemorrhagic stroke		
Year	Males	Females	Persons	Males	Females	Persons
1998–99	87.7	61.4	73.6	47.2	40.0	43.2
1999–00	91.2	63.4	76.3	49.9	39.1	44.0
2000–01	90.2	62.0	74.9	50.0	39.6	44.2
2001–02	86.9	60.4	72.6	49.0	39.0	43.4
2002–03	82.8	58.3	69.8	50.4	38.1	43.5
2003–04	83.5	58.5	70.2	49.9	39.9	44.3
2004–05	83.0	58.2	70.0	48.5	38.6	42.9
2005–06	86.7	58.6	71.9	50.1	38.0	43.5
2006–07	85.3	60.2	72.2	50.6	38.8	44.2
2007–08	86.0	59.8	72.3	49.2	38.1	43.0
2008–09	83.7	58.4	70.4	50.6	37.6	43.5
2009–10	84.0	58.9	70.9	50.2	37.5	43.3

(a) Principal diagnoses of ischaemic and haemorrhagic stroke defined using ICD-10-AM codes I60 to I63.

(b) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.8: Hospitalisations with a principal diagnosis of unspecified type stroke[(a)], by sex, 1998–99 to 2009–10

	Hospitalisations per 100,000 population[(b)]		
Year	Males	Females	Persons
1998–99	66.8	48.8	56.7
1999–00	65.6	47.3	55.3
2000–01	63.5	48.9	55.7
2001–02	60.2	45.2	51.9
2002–03	57.3	43.9	50.0
2003–04	53.9	42.0	47.4
2004–05	52.1	39.1	45.1
2005–06	49.2	36.8	42.5
2006–07	43.2	33.4	38.1
2007–08	42.7	32.5	37.3
2008–09	43.4	32.9	37.8
2009–10	37.5	28.7	32.8

(a) Principal diagnosis of unspecified stroke defined using ICD-10-AM code I64.

(b) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.9: Hospitalisations with a principal diagnosis of transient ischaemic attack[(a)], by sex, 1998–99 to 2009–10

	Hospitalisations per 100,000 population[(b)]		
Year	Males	Females	Persons
1998–99	79.5	58.1	67.7
1999–00	76.8	56.9	65.8
2000–01	75.4	57.5	65.5
2001–02	73.8	58.0	65.1
2002–03	71.5	57.0	63.6
2003–04	69.0	55.2	61.5
2004–05	67.8	52.2	59.4
2005–06	68.7	55.9	61.7
2006–07	71.3	55.2	62.6
2007–08	70.6	56.9	63.3
2008–09	72.8	58.0	64.9
2009–10	72.9	59.2	65.5

(a) Principal diagnosis of transient ischaemic attack defined using ICD-10-AM code G45.

(b) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.10: Hospitalisations with a principal diagnosis of stroke[(a)] that had at least one MRI brain scan[(b)], by sex, 2000–01 to 2009–10

	Number of hospitalisations that had at least one MRI brain scan			Percentage of all stroke hospitalisations[(c)]		
Year	Males	Females	Persons	Males	Females	Persons
2000–01	1,581	1,076	2,657	8.6	7.3	8.0
2001–02	1,676	1,283	2,959	9.3	8.9	9.1
2002–03	2,054	1,450	3,504	11.4	10.0	10.7
2003–04	2,401	1,731	4,132	13.1	11.4	12.4
2004–05	2,762	1,911	4,673	15.1	12.8	13.9
2005–06	3,337	2,292	5,629	17.5	15.1	16.4
2006–07	3,410	2,507	5,918	18.1	16.3	17.3
2007–08	3,717	2,551	6,268	19.5	16.6	18.1
2008–09	4,007	2,920	6,927	20.5	18.5	19.6
2009–10	4,101	2,881	6,982	21.2	18.4	19.9

(a) Principal diagnosis of stroke defined using ICD-10-AM codes I60 to I64.

(b) MRI brain scan defined as per the ACHI version 6 codes 90901–00, 90901–09 was counted once only for one hospitalisation with a principal diagnosis of stroke even if several MRI brain scans could have been performed during one hospitalisation.

(c) Age-standardised to the number of hospitalisations in 2000–01 with a principal diagnosis of stroke.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.11: Hospitalisations with a principal diagnosis of stroke that had at least one computerised tomography (CT) brain scan[(a)], by sex, 2000–01 to 2009–10

	Number of hospitalisations that had at least one CT brain scan			Percentage of all stroke hospitalisations[(b)]		
Year	Males	Females	Persons	Males	Females	Persons
2000–01	10,667	10,154	20,821	63.0	62.0	62.4
2001–02	10,734	10,440	21,174	64.3	64.3	64.2
2002–03	10,882	10,409	21,291	64.9	64.5	64.7
2003–04	11,160	10,904	22,064	65.9	66.2	66.1
2004–05	11,761	11,356	23,119	68.8	69.7	69.2
2005–06	12,526	11,611	24,137	70.2	70.5	70.3
2006–07	12,522	11,820	24,345	70.9	70.7	70.8
2007–08	12,611	11,934	24,545	70.1	70.7	70.4
2008–09	12,805	11,662	24,467	69.3	68.6	68.9
2009–10	12,012	10,869	22,881	65.3	64.5	64.9

(a) Principal diagnosis of stroke defined using ICD-10-AM codes I60 to I64.

(b) CT brain scan, defined as per the ACHI version 6 codes 56001–00,56007–00,56010–02,56010–03, was counted once only for one hospitalisation with a principal diagnosis of stroke even if several CT brain scans could have been performed during one hospitalisation.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.12: Hospitalisations with at least one carotid endarterectomy[a], by principal diagnosis, 2000–01 to 2009–10

Year	Number of hospitalisations with at least one carotid endarterectomy		
	CVD[b] or TIA as principal diagnosis	Other principal diagnosis	All
2000–01	3,311	104	3,415
2001–02	3,377	187	3,564
2002–03	3,185	33	3,218
2003–04	2,902	40	2,942
2004–05	2,719	35	2,754
2005–06	2,527	49	2,576
2006–07	2,401	36	2,437
2007–08	2,422	27	2,449
2008–09	2,348	28	2,376
2009–10	2,488	27	2,515

(a) Carotid endarterectomy, defined as per the ACHI version 6 codes 33500–00, was counted once only for one hospitalisation with a principal diagnosis of stroke even if several carotid endarterectomies could have been performed during on hospitalisation.

(b) Principal diagnosis of CVD and TIA defined using ICD-10-AM codes I00 to I99 and G45.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D3.13: Hospitalisations for rehabilitation[a] for stroke and its sequelae[b], by age and sex, 2009–10

	Number of hospitalisations			Hospitalisations per 100,000 population		
	Males	Females	Persons	Males	Females	Persons
Age-groups						
<25	74	59	133	2.0	1.7	1.8
25–34	175	216	391	11.2	14.0	12.6
35–44	370	485	855	23.8	30.6	27.3
45–54	1,539	1,048	2,587	103.1	68.9	85.9
55–64	2,690	1,789	4,479	217.3	142.7	179.7
65–74	3,889	2,300	6,189	502.7	286.3	392.4
75–84	3,878	3,547	7,425	884.2	648.6	753.4
85+	1,652	2,099	3,751	1297.9	840.6	995.0
All ages	**14,267**	**11,543**	**25,810**	**130.8**	**104.7**	**117.7**
Age-standardised rates				**131.2**	**89.6**	**108.6**
Rate ratio (ASR male/ASR female)				**1.5**		

(a) Principal diagnosis of rehabilitation defined using ICD-10-AM codes Z500, Z501 and Z504–Z509.

(b) Associated diagnosis of stroke and its sequelae defined using ICD-10-AM codes I60–I64 and I69 (excluding I69.8) with a principal diagnosis of rehabilitation defined using ICD-10-AM codes Z500, Z501 and Z504–Z509.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D4.1: Number of prescriptions of stroke medicines by year

	Prescriptions supplied in the community				
	2001		2009		Change (2001–2009)
Medicine groups	**Number**	**Per cent**	**Number**	**Per cent**	**Per cent**
Antithrombotic agents	*4,010,826*	*100.0*	*8.413,091*	*100.0*	*109.8*
Vitamin K antagonist	1,897,839	47.3	3,105,114	36.9	63.6
Heparin group	110,518	2.8	385,053	4.6	248.4
Platelet aggregation inhibitors					
Aspirin	943,906	23.5	1,357,176	16.1	43.8
Other agents than aspirin	1,057,680	26.4	3,560,033	42.3	236.6
Other antithrombotic agents	883	< 0.1	5,715	0.1	547.2
Antihaemorrhagic agents	*22,698*	*100.0*	*37,549*	*100.0*	*65.4*
Cardiac therapy	*3,907,524*	*100.0*	*3,602,877*	*100.0*	*-7.8*
Antiarrhytmics	575,489	14.7	593,852	16.5	3.2
Nitrates	2,589,152	66.3	1,943,809	54.0	-24.9
Other vasodilatators agents	112,120	2.9	238,217	6.6	112.5
Other cardiac therapeutic agents (glycosides, adrenergic agents and other cardiac preparations)	630,763	16.1	826,999	23.0	31.1
Blood-pressure-lowering agents	*35,973,617*	*100.0*	*52,242,178*	*100.0*	*45.2*
Antihypertensives	940,161	2.6	1,199,632	2.3	27.6
Diuretics	3,317,558	9.2	2,851,123	5.5	-14.1
Peripheral vasodilatators	8,646	< 0.1	3,530	< 0.1	-59.2
Vasoprotective agents	118,410	0.3	62,286	0.1	-47.4
Beta-blocking agents	5,869,542	16.3	8,003,071	15.3	36.3
Calcium-channel blockers	8,637,257	24.0	9,722,359	18.6	12.6
Renin-angiotensin system agents	17,082,043	47.5	30,400,177	58.2	78.0
Lipid-modifying agents	*12,778,930*	*100.0*	*24,819,117*	*100.0*	94.2
TOTAL	**56,693,595**		**89,114,812**		

Sources: DoHA 2004, 2011.

Table D5.1: Activity limitations, by diagnosed cerebrovascular disease/TIA status[(a)], for ACAP clients with a complete[(b)] ACAT assessment, 1 July 2009 to 30 June 2010

	ACAP clients with cerebrovascular disease/TIA[(a)]		Other ACAP clients[(c)]	
Activity limitation	**Number**	**Per cent**	**Number**	**Per cent**
Self-care	25,725	78.6	89,832	69.3
Movement activities	12,556	38.4	35,752	27.6
Moving around places at or away from home	21,861	66.8	73,775	56.9
Communication	8,996	27.5	25,196	19.4
Health-care tasks	27,760	84.8	101,381	78.2
Transport	30,540	93.3	115,516	89.1
Activities involved in social and community participation	29,074	88.8	108,969	84.0
Domestic assistance	28,561	87.3	113,540	87.6
Meals	26,610	81.3	101,526	78.3
Home maintenance	23,254	71.1	91,655	70.7
Other	1,809	5.5	7,071	5.5
None	140	0.4	1031	0.8
Unable to determine	38	0.1	387	0.3
Not stated/inadequately described	263	0.8	1,338	1.0
Total ACAP clients with complete assessment	**32,725**	**100.0**	**129,659**	**100.0**

(a) A client's diagnosed cerebrovascular disease/TIA status is based on the last complete ACAT assessment conducted during the 2009–10 financial year.

(b) A complete ACAT assessment is an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'.

(c) Other ACAP clients are ACAP clients with health conditions other than cerebrovascular diseases or TIA or with no other health conditions.

Source: AIHW analysis of DoHA Ageing and Aged Care Data Warehouse (unpublished).

Table D5.2: Diagnosed cerebrovascular disease/TIA status[a] of ACAP clients with a complete[b] ACAT assessment, by age and sex, 1 July 2009 to 30 June 2010

Sex/age group[c] (years)	ACAP clients with a diagnosis of cerebrovascular disease or TIA[d]	Other ACAP clients[e]	All ACAP clients with a complete assessment	ACAP clients with a diagnosis of cerebrovascular disease or TIA[d]	Other ACAP clients[e]	All ACAP clients with a complete assessment
	Number[d]			Per cent		
Males						
0–49	54	244	298	0.4	0.5	0.5
50–54	78	306	384	0.5	0.6	0.6
55–59	150	524	674	1.0	1.1	1.1
60–64	406	1,167	1,573	2.7	2.5	2.5
65–69	802	2,485	3,287	5.4	5.3	5.3
70–74	1,521	4,269	5,790	10.2	9.1	9.3
75–79	2,493	7,359	9,852	16.8	15.6	15.9
80–84	3,872	11,893	15,765	26.1	25.2	25.4
85–89	3,588	11,706	15,294	24.1	24.8	24.7
90+	1,899	7,196	9,095	12.8	15.3	14.7
Total	**14,863**	**47,149**	**62,012**	**100**	**100**	**100**
Females						
0–49	39	228	267	0.2	0.3	0.3
50–54	59	288	347	0.3	0.3	0.3
55–59	125	543	668	0.7	0.7	0.7
60–64	273	1,310	1,583	1.5	1.6	1.6
65–69	615	2,896	3,511	3.4	3.5	3.5
70–74	1,191	5,860	7,051	6.7	7.1	7.0
75–79	2,417	11,129	13,546	13.5	13.5	13.5
80–84	4,390	20,309	24,699	24.6	24.6	24.6
85–89	5,219	23,188	28,407	29.2	28.1	28.3
90+	3,532	16,755	20,287	19.8	20.3	20.2
Total	**17,860**	**82,506**	**100,366**	**100.0**	**100.0**	**100.0**

(a) A client's diagnosed cerebrovascular disease/TIA status is based on the last complete ACAT assessment conducted during the 2009–10 financial year. A complete ACAT assessment is an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'.

(b) Age as at 30 June 2010.

(c) A diagnosis of cerebrovascular disease or TIA is defined as at least one ACAP health condition code of 0605 or 0910-0916.

(d) Other ACAP clients are ACAP clients with health conditions other than cerebrovascular diseases or TIA or with no other health conditions.

(e) Excludes clients whose sex was not stated or inadequately described, i.e. 2 ACAP clients with a diagnosis of cerebrovascular disease or TIA and 4 other ACAP clients.

Source: AIHW analysis of DoHA Ageing and Aged Care Data Warehouse (unpublished).

Table D5.3: Diagnosed cerebrovascular disease/TIA status[a] of ACAP clients with a complete[b] ACAT assessment, by age, 1 July 2009 to 30 June 2010

Sex/age group[c] (years)	ACAP clients with a diagnosis of cerebrovascular disease or TIA[d]	Other ACAP clients[e]	All ACAP clients with a complete assessment	ACAP clients with a diagnosis of cerebrovascular disease or TIA[d]	Other ACAP clients[e]	All ACAP clients with a complete assessment
	Number			Per cent		
Persons						
0–49	93	472	565	0.3	0.4	0.3
50–54	137	594	731	0.4	0.5	0.5
55–59	275	1,067	1,342	0.8	0.8	0.8
60–64	679	2,477	3,156	2.1	1.9	1.9
65–69	1,417	5,381	6,798	4.3	4.2	4.2
70–74	2,712	10,129	12,841	8.3	7.8	7.9
75–79	4,910	18,489	23,399	15.0	14.3	14.4
80–84	8,264	32,203	40,467	25.3	24.8	24.9
85–89	8,807	34,895	43,702	26.9	26.9	26.9
90+	5,431	23,952	29,383	16.6	18.5	18.1
Total	**32,725**	**129,659**	**162,384**	**100.0**	**100.0**	**100.0**

(a) A client's diagnosed cerebrovascular disease/TIA status is based on the last complete ACAT assessment conducted during the 2009–10 financial year..

(b) A complete ACAT assessment is an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'.

(c) Age as at 30 June 2010.

(d) A diagnosis of cerebrovascular disease or TIA is defined as at least one ACAP health condition code of 0605 or 0910-0916.

(e) Other ACAP clients are ACAP clients with health conditions other than cerebrovascular diseases or TIA or with no other health conditions.

Source: AIHW analysis of DoHA Ageing and Aged Care Data Warehouse (unpublished).

Table D5.4: First face-to-face contact setting by diagnosed cerebrovascular disease/TIA status[(a)] for ACAP clients with a complete ACAT assessment[(a)], 1 July 2009 to 30 June 2010

	ACAP clients with a diagnosis of cerebrovascular disease or TIA[(c)]	Other ACAP clients[(d)]	All ACAP clients with a complete assessment	ACAP clients with a diagnosis of cerebrovascular disease or TIA[(c)]	Other ACAP clients[(d)]	All ACAP clients with a complete assessment
Contac setting	**Number**			**Per cent**		
Private residence/ other community	16,906	79,115	96,021	51.7	61.0	59.1
Hospital (acute care)	8,292	25,632	33,924	25.3	19.8	20.9
Other hospital inpatient setting	5,494	16,846	22,340	16.8	13.0	13.8
Residential aged-care service	2,014	7,869	9,883	6.2	6.1	6.1
Not stated/ inadequately described[(b)]	19	197	216	0.1	0.2	0.1
Total	**32,725**	**129,659**	**162,384**	**100.0**	**100.0**	**100.0**

(a) A client's diagnosed cerebrovascular disease/TIA status is based on the last complete ACAT assessment during the 2009–10 financial year. A diagnosis of cerebrovascular disease or TIA is defined as at least one ACAP health condition code of 0605 or 0910-0916.

(b) Recorded for people who were permanent residents of residential aged–care services, hospitals or other institutional settings at the time of assessment.

(c) A complete ACAT assessment is an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'.

(d) Other ACAP clients are the people with health conditions other than cerebrovascular diseases or TIA or with no other health conditions.

Source: AIHW analysis of DoHA Ageing and Aged Care Data Warehouse (unpublished).

Table D5.5: Usual residence at assessment and recommended long-term care setting, by diagnosed cerebrovascular disease/TIA status[a], for ACAP clients with a complete ACAT assessment[b], 1 July 2009 to 30 June 2010

	Residence at the assessment		Recommended residence	
Residence types	**ACAP clients with a diagnosis of cerebrovascular disease or TIA[c]**	**Other ACAP clients[d]**	**ACAP clients with a diagnosis of cerebrovascular disease or TIA[c]**	**Other ACAP clients[d]**
		Number		
Private residence	26,538	106,044	15,321	68,612
Independent living within a retirement village	2,997	12,077	1,037	4,721
Supported community accommodation	446	1,911	181	916
Residential aged-care—low level	1,947	6,601	5,026	21,929
Residential aged-care—high level	226	655	10,941	32,624
Hospital	72	243	7	87
Other institutional care	58	262	16	69
Other	416	1,621	180	635
Not stated/inadequately described	25	245	16	66
Total	**32,725**	**129,659**	**32,725**	**129,659**
		Per cent		
Private residence	81.1	81.8	46.8	52.9
Independent living within a retirement village	9.2	9.3	3.2	3.6
Supported community accommodation	1.4	1.5	0.6	0.7
Residential aged-care—low level	5.9	5.1	15.4	16.9
Residential aged-care—high level	0.7	0.5	33.4	25.2
Hospital	0.2	0.2	< 0.1	0.1
Other institutional care	0.2	0.2	< 0.1	0.1
Other	1.3	1.3	0.6	0.5
Not stated/inadequately described	0.1	0.2	< 0.1	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**

(a) A client's diagnosed cerebrovascular disease/TIA status is based on the last complete ACAT assessment conducted during the 2009–10 financial year.

(b) A complete ACAT assessment is an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'.

(c) A diagnosis of cerebrovascular disease or TIA is defined as at least one ACAP health condition code of 0605 or 0910-0916.

(d) Other ACAP clients are the people with health conditions other than cerebrovascular diseases or TIA or with no other health conditions.

Source: AIHW analysis of DoHA Ageing and Aged Care Data Warehouse (unpublished).

Table D5.6: Current and recommended assistance with activities, by diagnosed cerebrovascular disease/TIA status[a], for persons with a complete ACAT assessment[b], 1 July 2009 to 30 June 2010

	Current assistance[c]		Recommended assistance[d]	
Type of activity	ACAP clients with a diagnosis of cerebrovascular disease or TIA[e]	Other ACAP clients[f]	ACAP clients with a diagnosis of cerebrovascular disease or TIA[e]	Other ACAP clients[f]
			Number	
Self-care	16,662	59,680	12,631	46,786
Movement	6,467	21,009	4,064	12,426
Moving around places at or away from home	14,011	51,073	8,789	31,706
Communication	5,946	20,376	2,536	7,391
Health-care tasks	20,295	78,195	13,195	52,326
Transport	24,217	95,725	13,806	56,855
Activities involved in social and community participation	22,235	88,004	13,824	56,523
Domestic assistance	26,490	106,151	16,541	71,433
Meals	23,485	91,304	12,178	51,219
Home maintenance	19,853	80,577	9,289	40,304
Other	2,314	9,370	1,190	5,105
None	11,378	43,486	2,119	8,863
Unable to determine	10,370	41,152	203	965
Not stated/inadequately described	23	97	125	559
Not applicable[g]	2,242	7,444	12,033	40,300
Total ACAP clients	**32,725**	**129,659**	**32,725**	**129,659**
			Per cent	
Self-care	50.9	46.0	38.6	36.1
Movement	19.8	16.2	12.4	9.6
Moving around places at or away from home	42.8	39.4	26.9	24.5
Communication	18.2	15.7	7.7	5.7
Health-care tasks	62.0	60.3	40.3	40.4
Transport	74.0	73.8	42.2	43.8
Activities involved in social and community participation	67.9	67.9	42.2	43.6
Domestic assistance	80.9	81.9	50.5	55.1
Meals	71.8	70.4	37.2	39.5
Home maintenance	60.7	62.1	28.4	31.1
Other	7.1	7.2	3.6	3.9
None	34.8	33.5	6.5	6.8
Unable to determine	31.7	31.7	0.6	0.7
Not stated/inadequately described	0.1	0.1	0.4	0.4
Not applicable[g]	6.9	5.7	36.8	31.1
Total ACAP clients	**100.0**	**100.0**	**100.0**	**100.0**

(continued)

Table D5.6 (continued): Current and recommended assistance with activities, by diagnosed cerebrovascular disease/TIA status[(a)], for persons with a complete ACAT assessment[(b)], 1 July 2009 to 30 June 2010

(a) A client's diagnosed cerebrovascular disease/TIA status is based on the last complete ACAT assessment conducted during the 2009–10 financial year.

(b) A complete ACAT assessment is an assessment where the reason for ending the assessment was 'Assessment complete—care plan developed'.

(c) Current assistance includes formal and informal assistance.

(d) Recommended assistance includes only formal assistance with a higher representation of people hospitalised for stroke and assessed at their discharge.

(e) A diagnosis of cerebrovascular disease or TIA is defined as at least one ACAP health condition code of 0605 or 0910-0916.

(f) Other ACAP clients are people with health conditions other than cerebrovascular diseases or TIA or with no other health conditions.

(g) Includes clients who were permanent residents of residential aged-care services, hospitals or other institutional settings at the time of assessment.

Source: AIHW analysis of DoHA Ageing and Aged Care Data Warehouse (unpublished).

Table D5.7: Level of assistance needed in each ACFI care domain, by diagnosed cerebrovascular disease/TIA status[(a)], for permanent aged-care residents with an ACFI appraisal, 1 July 2009 to 30 June 2010

ACFI care domain	Residents with a diagnosis of cerebrovascular disease or TIA[(b)]	Other residents[(c)]
	Number	
Activities of daily living		
High	23,786	72,094
Medium	11,056	49,031
Low care	6,725	41,439
Nil	1,180	8,323
Behaviour		
High	18,810	78,560
Medium	11,757	41,814
Low care	8,148	31,633
Nil	4,032	18,880
Complex health care		
High	11,158	39,009
Medium	13,543	53,103
Low care	14,249	57,200
Nil	3,797	21,575
Total residents with an ACFI appraisal	**42,747**	**170,887**

(continued)

Table D5.7 (continued): Level of assistance needed in each ACFI care domain, by diagnosed cerebrovascular disease/TIA status[(a)], for permanent aged-care residents with an ACFI appraisal, 1 July 2009 to 30 June 2010

	Per cent	
Activities of daily living		
High	55.6	42.2
Medium	25.9	28.7
Low care	15.7	24.2
Nil	2.8	4.9
Behaviour		
High	44.0	46.0
Medium	27.5	24.5
Low care	19.1	18.5
Nil	9.4	11.0
Complex health care		
High	26.1	22.8
Medium	31.7	31.1
Low care	33.3	33.5
Nil	8.9	12.6
Total residents with an ACFI appraisal	**100.0**	**100.0**

(a) Residents' diagnosed cerebrovascular disease/TIA status is based on the most recent ACFI appraisal conducted during or before the 2009–10 financial year.

(b) A diagnosis of cerebrovascular disease or TIA is defined as at least one ACAP health condition code of 0605 or 0910-0916.

(c) Includes residents with no health condition impacting on care needs (i.e. both Mental and Behavioural and medical code lists have 0) and residents for whom both the mental and behavioural and medical code lists were blank.

Source: AIHW analysis of DoHA Ageing and Aged Care Data (unpublished).

Table D5.8: Effects of caring role on co-resident primary carer's health and wellbeing, 2009

	Co-resident primary carers of people with stroke and disability	
	Number	**Per cent**
Whether physical/emotional wellbeing changed due to caring role		
Physical or emotional wellbeing has changed due to caring role	25,947	34.6
Physical or emotional wellbeing has not changed due to caring role	43,429	57.9
Not stated	*5,588	7.5
Whether feels satisfied due to caring role		
Feels satisfied due to caring role	16,378	21.8
Does not feel satisfied due to caring role	52,999	70.7
Not stated	*5,588	7.5
Whether feels weary or lacks energy due to caring role		
Feels weary or lacks energy due to caring role	24,975	33.3
Does not feel weary or lack energy due to caring role	44,401	59.2
Not stated	*5,588	7.5
Whether frequently feels angry or resentful due to caring role		
Frequently feels angry or resentful due to caring role	9,657	12.9
Does not frequently feel angry or resentful due to caring role	59,719	79.7
Not stated	*5,588	7.5
Whether frequently feels worried or depressed due to caring role		
Frequently feels worried or depressed due to caring role	25,292	33.7
Does not frequently feel worried or depressed due to caring role	44,084	58.8
Not stated	*5,588	7.5
Whether has had a stress-related illness due to caring role		
Has been diagnosed with a stress-related illness due to caring role	10,934	14.6
Has not been diagnosed with a stress-related illness due to caring role	58,443	78.0
Not stated	*5,588	7.5
Total co-resident primary carers	**74,965**	**100.0**

Notes

1. Estimates marked with an asterisk have an associated relative standard error (RSE) of between 25% and 50% and should be interpreted with caution.
2. Estimates marked with two asterisks have an associated relative standard error (RSE) of more than 50% and should be interpreted with caution

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Table D5.9: Effects of caring role on co-resident primary carer's relationships, 2009

	Co-resident primary carers of people with stroke and disability	
	Number	**Per cent**
Effect on relationship with main recipient of care		
Relationship unaffected	36,358	48.5
Brought closer together	19,423	25.9
Relationship strained	13,538	18.1
Not stated	*5,646	7.5
Effect on relationship with partner		
Not applicable (main recipient is partner)	49,424	65.9
Relationship unaffected	7,992	10.7
Brought closer together	*5,938	7.9
Lack time alone together	**1,595	2.1
Relationship strained	**1,188	1.6
Has no spouse or partner	*3,565	4.8
Not stated	*5,262	7.0
Effect on relationship with co-resident family members		
Relationships unaffected	19,251	25.7
Brought closer together	*3,002	4.0
Less time to spend with them	*5,438	7.3
Relationships strained	*3,595	4.8
Relationships affected in another way	**619	0.8
Has no other co-resident family members	36,810	49.1
Not stated	*6,250	8.3
Effect on friendships		
Friendships unaffected	39,697	53.0
Circle of friends has increased	**802	1.1
Circle of friends has changed	7,303	9.7
Lost or losing touch with existing friends	20,313	27.1
Not stated	6,850	9.1
Total co-resident primary carers	**74,965**	**100.0**

Notes

1 Estimates marked with an asterisk have an associated relative standard error (RSE) of between 25% and 50% and should be interpreted with caution.

2 Estimates marked with two asterisks have an associated relative standard error (RSE) of more than 50% and should be interpreted with caution.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Table D6.1: Age-specific hospitalisation rates by main types of stroke and Indigenous status[(a)] in 2009–10

	Hospitalisation rates per 100,000 population					
	Indigenous			Other Australians		
Type of stroke/ age group (years)	Males	Females	Persons	Males	Females	Persons
All stroke						
0–34	10.6	9.9	10.2	7.7	6.7	7.2
35–44	148.6	131.3	139.6	37.9	37.0	37.4
45–54	421.0	307.0	361.5	97.6	70.9	84.1
55–64	535.9	561.4	549.4	235.0	121.3	177.8
65 and over	1,338.1	1,156.9	1,234.7	949.4	816.3	877.0
Crude rate	127.1	127.6	127.4	168.5	153.0	160.7
ASR[(b)]	**306.0**	**266.2**	**284.2**	**164.1**	**132.4**	**147.5**
Rate ratio (Indigenous/Other Australians)	**1.9**	**2.0**	**1.9**			
Ischaemic stroke						
0–34	4.8	6.6	5.6	2.5	2.5	2.5
35–44	37.9	61.3	50.1	16.3	13.4	14.8
45–54	167.5	74.8	119.1	43.3	25.3	34.2
55–64	203.8	267.3	237.5	125.4	47.6	86.3
65 and over	702.2	478.7	574.7	472.8	410.8	439.1
Crude rate	52.8	52.4	52.6	83.2	72.9	78.0
ASR[(b)]	**139.3**	**108.8**	**122.1**	**80.7**	**62.7**	**71.3**
Rate ratio (Indigenous/Other Australians)	**1.7**	**1.7**	**1.7**			
Haemorrhagic stroke						
0–34	3.7	2.2	3.0	4.7	3.6	4.1
35–44	88.5	35.0	60.7	17.0	18.0	17.5
45–54	154.7	122.0	137.6	38.2	34.4	36.3
55–64	188.7	106.9	145.3	70.4	52.0	61.2
65 and over	198.7	249.3	227.6	250.3	194.3	219.9
Crude rate	41.9	32.9	37.4	49.4	43.8	46.6
ASR[(b)]	**79.9**	**64.7**	**72.2**	**48.2**	**38.5**	**43.0**
Rate ratio (Indigenous/Other Australians)	**1.7**	**1.7**	**1.7**			

(a) Based on patients usually resident in New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory; excludes private hospitals in the Northern Territory.

(b) Age-standardised to the Australian population as at 30 June 2001; age-standardised rates have been calculated using finer age groups than those shown for people aged 35–64.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D6.2: Stroke deaths, by Indigenous status[a] and sex, 2006–2010

	Number of deaths[b]		Deaths per 100,000 population[c]	
	Males	**Females**	**Males**	**Females**
Indigenous	189	225	58.0	54.8
Non-Indigenous	11,918	18,094	34.0	39.0
Rate ratio (Indigenous/ non- Indigenous)			**1.7**	**1.4**

(a) Excludes people whose Indigenous status was not stated or was inadequately described.

(b) Queensland deaths data for 2010 have been adjusted to minimise the impact of late registration of deaths on mortality indicators by excluding deaths registered in Queensland in 2010 that occurred in Queensland prior to 2010.

(c) Age-standardised to the Australian population as at 30 June 2001.

Notes

1. Data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only.

2. Data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

Source: AIHW National Mortality Database.

Table D6.3: Stroke deaths, by Indigenous status[a] and age, 2006–2010

	Number of deaths[b]		Number per 100,000 population	
Age group (years)	**Indigenous**	**Non-Indigenous**	**Indigenous**	**Non-Indigenous**
0–24	10	52	0.7	0.2
25–34	9	90	2.7	0.9
35–44	37	258	12.3	2.4
45–54	75	699	34.9	6.8
55–64	74	1,318	61.6	15.6
65–74	71	2,982	135.2	56.4
75+	138	24,611	591.0	526.9
All ages[c]	**414**	**30,012**	**17.2**	**40.6**
All ages ASR (per cent)[d]			**56.2**	**37.1**
Rate ratio (Indigenous/ non- Indigenous)			**1.5**	

(a) Excludes people whose Indigenous status was not stated or was inadequately described.

(b) Queensland deaths data for 2010 have been adjusted to minimise the impact of late registration of deaths on mortality indicators by excluding deaths registered in Queensland in 2010 that occurred in Queensland before.

(c) Includes people of unknown age at death.

(d) Age-standardised to the Australian population as at 30 June 2001.

Notes

1. Data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only.

2. Data for 2009 and 2010 are revised and preliminary data respectively and are subject to further revision.

Source: AIHW National Mortality Database.

Table D6.4: Stroke prevalence, by remoteness and sex, 2009

	Number			Per cent[(a)] (95% CI)		
Remoteness	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Major cities	135,716	113,666	249,382	2.0 (1.8–2.1)	1.3 (1.1–1.4)	1.6 (1.5–1.7)
Inner regional areas	47,309	41,443	88,752	1.9 (1.6–2.1)	1.5 (1.2–1.7)	1.7 (1.5–1.8)
Other areas	22,774	14,851	37,625	1.9 (1.5–2.4)	1.2 (0.9–1.5)	1.6 (1.3–1.9)

(a) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of ABS 2009 Survey of Disability, Ageing and Carers Basic Confidentialised Unit Record File on CD-ROM.

Table D6.5: Stroke hospitalisation rates, by main types of stroke and remoteness of patient's residence, 2009–10

	Hospitalisations per 100,000 population[(a)]		
Remoteness of usual residence	Males	Females	Persons
All stroke			
Major cities	162.5	118.8	139.1
Inner regional	181.1	126.7	152.6
Outer regional	186.6	143.4	165.0
Remote or very remote	221.5	201.0	212.3
Rate ratio (Remote, very remote/ Major cities)	**1.4**	**1.7**	**1.5**
Ischaemic stroke			
Major cities	86.0	60.7	72.8
Inner regional	81.6	52.1	66.2
Outer regional	70.4	53.6	62.3
Remote or very remote	74.2	67.4	71.0
Rate ratio (Remote, very remote/ Major cities)	**0.9**	**1.1**	**1.0**
Haemorrhagic stroke			
Major cities	48.3	35.9	41.4
Inner regional	50.9	39.8	45.1
Outer regional	53.8	39.5	46.4
Remote or very remote	60.8	39.2	50.7
Rate ratio (Remote, very remote/ Major cities)	**1.3**	**1.1**	**1.2**

(a) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW analysis of the National Hospital Morbidity Database.

Table D6.6: Stroke deaths, by remoteness and sex, 2006–2010

	Number of deaths[a]			Deaths per 100,000 population[b]		
Remoteness	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
Major cities	10,850	16,696	27,546	33.9	32.7	33.6
Inner regional	3,912	6,150	10,062	36.0	38.0	37.7
Outer regional	1,686	2,422	4,107	35.6	38.2	37.7
Remote and very remote	312	330	642	38.6	39.0	39.6

(a) The number of stroke deaths in 2006–2010 by remoteness areas does not add to the total number of stroke deaths (42,493) for the 5-year period because some deaths could not be allocated to a remoteness area.

(b) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW National Mortality Database.

Table D6.7: Stroke prevalence, by socioeconomic group and sex, 2007–08

	Number			Per cent[a]		
Socioeconomic group	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
1st quintile (lowest)	35,923	36,967	72,890	1.8	1.6	1.7
2nd quintile	24,137	35,317	59,454	1.1	1.6	1.4
3rd quintile	11,190	29,941	41,131	0.5	1.3	1.0
4th quintile	18,639	17,572	36,210	1.0	0.9	1.0
5th quintile (highest)	19,407	15,558	34,964	0.9	0.7	0.9

(a) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW 2011c.

Table D6.8: Stroke hospitalisations, by socioeconomic group and sex, 2007–08

	Number of hospitalisations			Hospitalisations per 100,000 population[a]		
Socioeconomic group	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
1st quintile (lowest)	4,251	3,902	8,153	199.0	149.0	172.7
2nd quintile	4,227	3,957	8,184	192.7	143.7	166.8
3rd quintile	3,423	3,135	6,558	175.0	126.5	149.4
4th quintile	2,840	2,840	5,928	169.6	118.9	142.5
5th quintile (highest)	2,861	3,027	5,888	150.1	112.1	129.6
Rate ratio (lowest versus highest)				1.3	1.3	1.3

(a) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW 2011c.

Table D6.9: Stroke deaths, by socioeconomic group and sex, 2007

Socioeconomic group	Number of deaths			Deaths per 100,000 population[(a)]		
	Males	Females	Persons	Males	Females	Persons
1st quintile (lowest)	803	1,110	1,913	40.2	37.9	39.2
2nd quintile	799	1,161	1,960	38.5	37.5	38.3
3rd quintile	654	952	1,606	35.7	34.8	35.6
4th quintile	596	935	1,531	35.3	35.4	35.8
5th quintile (highest)	601	989	1,590	32.8	31.6	32.6

(a) Age-standardised to the Australian population as at 30 June 2001.

Source: AIHW 2011c.

Appendix E

Thrombolysis exclusion/inclusion criteria

Indications

- Onset of ischaemic stroke within the preceding 3 hours.
- Measurable and clinically significant deficit on NIH Stroke Scale examination.
- Patient's computed tomography (CT) scan does not show haemorrhage or non-vascular cause of stroke.
- Patient's age is > 18.

Absolute contraindications

- Uncertainty about time of stroke onset (e.g. patients awaking from sleep).
- Coma or severe obtundation with fixed eye deviation and complete hemiplegia.
- Only minor stroke deficit, which is rapidly improving.
- Seizure observed or known to have occurred at onset of stroke.
- Hypertension: systolic blood pressure greater or equal to 185 mmHg or diastolic blood pressure > 110 mmHg on repeated measures before study.
- Clinical presentation suggestive of subarachnoid haemorrhage even if the CT scan is normal.
- Presumed septic embolus.
- Patient has received heparin within the last 48 hours and has elevated PTT or has known hereditary or acquired haemorrhagic diathesis (e.g. PT or APTT greater than normal).
- INR > 1.5.
- Platelet count < 100,000/uL.
- Serum glucose < 2.8 mmol/L or > 22.0 mmol/L.

Relative contraindications (the benefits should outweigh the risk if the fowling criteria are true to use the rt-PA)

- Severe neurological impairment with NIH Stroke Scale score > 22.
- Age > 80s.
- CT evidence of extensive middle cerebral artery (MCA) territory infarction (sulcal effacement or blurring of grey-white junction in greater than a third of MCA territory).
- Stroke or serious head trauma within the past 3 months where the risks of bleeding are considered to outweigh the benefits of therapy.
- Major surgery within the last 14 days.
- Patient has known history of intracranial haemorrhage, subarachnoid haemorrhage, known intracranial arteriovenous malformation or previously known intracranial neoplasm such that, in the opinion of the clinician, the increased risk of intracranial bleeding would outweigh the potential benefits of treatment.
- Suspected recent (within 30 days) myocardial infarction.

(continued)

- Recent (within 30 days) biopsy of a parenchymal organ or surgery that, in the opinion of the responsible clinician, would increase the risk of unmanageable bleeding (e.g. uncontrolled by local pressure).
- Recent (within 30 days) trauma with internal injuries or ulcerative wounds.
- Gastrointestinal or urinary tract haemorrhage within the last 30 days or any active or recent haemorrhage that, in the opinion of the responsible clinician, would increase the risk of unmanageable bleeding (e.g. uncontrolled by local pressure).
- Arterial puncture at non-compressible site within the last 7 days.
- Concomitant serious, advanced or terminal illness or any other condition that, in the opinion of the responsible clinician, would pose a risk to treatment.

Source: 2010 Clinical Guidelines for Stroke Management. The National Heart Foundation.

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 and is accepted as such by the community in which he or she lives.

Age-specific rate: A rate for a specific age group. The numerator and denominator relate to the same age group.

Age-standardisation: A method of removing the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, 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 *unstable angina* and *cardiovascular disease.*

Associated cause(s) of death: Any condition(s), diseases and injuries—other than the *underlying cause*—considered to contribute to a death. See also *cause of death.*

Blood cholesterol: Fatty substance produced by the liver and carried by the blood to supply the rest of the body. Its natural function is to supply material for cell walls and for steroid hormones, but if levels 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 ÷ m^2. For both men and women, underweight is a BMI below 18.5, acceptable weight is from 18.5 to less than 25, overweight is 25 and above (includes obese), and obese is 30 and over.

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.*

Cause of death: From information reported on the medical certificate of cause of death, each death is classified by the underlying cause of death according to rules and conventions of the Tenth Revision of the International Classification of Diseases. The underlying cause is defined as the disease that initiated the train of events leading directly to death. Deaths from injury or poisoning are classified according to the circumstances of the violence that produced the fatal injury, rather than to the nature of the injury. See also *underlying cause of death*.

Cerebral infarction: see also *ischaemic stroke.*

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*.

Circulatory system: The heart and the blood vessels, comprising the system that circulates blood around the body to supply oxygen and nutrients to all body tissues and to carry away waste products from them. Also known as the cardiovascular system.

Comorbidity: When a person has two or more health problems at the same time.

Confidence interval (CI): A statistical term describing a range (interval) of values within which we can be 'confident' that the true value lies, usually because it has a 95% or higher chance of doing so.

Crude death rate: The number of deaths in a given period divided by the size of the corresponding population indexed to 100,000.

Disability-adjusted life year (DALY): A year of healthy life lost, either through premature death or equivalently through living with disability due to illness or injury. It is the basic unit used in *burden of disease and injury* estimates.

Disease: A physical or mental disturbance involving *symptoms* (such as pain or feeling unwell), dysfunction or tissue damage, especially if these *symptoms* and *signs* form a recognisable clinical pattern.

Haemorrhagic stroke: Is a type of *stroke* caused by the rupture bleeds of an artery in the brain or its surrounding.

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*.

Highly specialised medicines: Under Section 100 of the National Health Act, certain medicines can be supplied to community patients only through hospitals because only hospitals can provide the facilities and staff necessary for the appropriate use of the drugs. These drugs are funded by the Australian Government separately from the Pharmaceuticals Benefits Scheme.

Hypertension: See *high blood pressure*.

Ischaemic stroke: a type of *stroke* due to a reduced or blocked supply of blood in the brain. Also known as *cerebral infarction*.

Incidence: The number of new cases (of an illness or event, and so on) occurring during a given period. Compare with *prevalence*.

International Classification of Diseases: The World Health Organization's internationally accepted classification of death and disease. The Tenth Revision (ICD-10) is currently in use. In this report, causes of death classified before 1979 under previous revisions have been reclassified to ICD-10 by the AIHW. ICD-10-AM is the Australian modification of ICD-10, used for diagnoses and procedures recorded for patients admitted to hospitals.

Length of stay: Duration of hospital stay, calculated by subtracting the date the patient is admitted from the day of separation. All leave days, including the day the patient went on leave, are excluded. A same-day patient is allocated a length of stay of 1 day.

Medicare: A national, government-funded scheme that subsidises the cost of personal medical services for all Australians and aims to help them afford medical care.

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*.

Organisation for Economic Co-operation and Development (OECD): An organisation of 30 developed countries, including Australia.

Other Australians: People who are not of Aboriginal or Torres Strait Islander descent, or whose status is not known.

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

Patient days: The number of full or partial days of stay for patients who were admitted for an episode of care and who underwent separation during the reporting period. A patient who is admitted and separated on the same day is allocated one patient day.

Pharmaceutical Benefits Scheme (PBS): A national, government-funded scheme that subsidises the cost of a wide range of pharmaceutical drugs, and that covers all Australians to help them afford standard medications.

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

Prevalence: The number or proportion (of cases, instances, and so forth) present in a population at a given time. Compare with *incidence*.

Principal diagnosis: The diagnosis listed in hospital records to describe the problem that was chiefly responsible for the patient's episode of care in hospital.

Private hospital: A privately owned and operated institution, catering for patients who are treated by a doctor of their own choice. Patients are charged fees for accommodation and other services provided by the hospital and relevant medical and allied health practitioners.

Public hospital: A hospital controlled by a state or territory health authority. In Australia, public hospitals offer free diagnostic services, treatment, care and accommodation to all Australians who need them.

Quintile: A group derived by ranking the population of people or elements according to specified criteria and dividing it into five equal parts. The term can also mean the cut-points that make these divisions—that is, the 20th, 50th and 75th percentiles—but the first use is the more common one.

Risk factor: Any factor which 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 patients: Admitted patients who are admitted to hospital and separated on the same day.

Section 100 medicines: See *highly specialised medicines*.

Separation: The formal process by which a hospital records the completion of an episode of treatment and/or care for an admitted patient.

Statistical significance: An indication from a statistical test that an observed difference or association may be significant or 'real' because it is unlikely to be due just to chance. A statistical result is usually said to be 'significant' if it would occur by chance only once in 20 times or less often.

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.

Thrombolysis: Emergency 'clot-busting' drug treatment for a *heart attack* or *a stroke.*

Thrombosis: Clotting of blood, with the term usually applied to clotting within a blood vessel due to disease, as in a *heart attack* or *stroke*.

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.

Underlying cause of death: The condition, disease or injury initiating the sequence of events leading directly to death; that is, the primary or main cause. Compare with *associated cause(s) of death.*

References

ABS (Australian Bureau of Statistics) 1999. Technical paper: survey of disability, ageing and carers, Australia: confidentialised unit record file, 1998. Canberra: ABS.

ABS 2009a. 2007–08 National Health Survey: summary of results. ABS cat. no. 4364.0. Canberra: ABS.

ABS 2009b. Experimental estimates and projections, Aboriginal and Torres Strait Islander Australian, 1991–2021. ABS cat. no. 3238.0. Canberra: ABS.

ABS 2011a. Basic confidentialised unit record file: disability, ageing and carers, 2009. ABS cat. no. 4330.0.00.001. Canberra: ABS.

ABS 2011b. Disability, ageing and carers, Australia: user guide 2009. ABS cat. no. 4431.0.55.001. Canberra: ABS.

AIHW (Australian Institute of Health and Welfare) 2004. Carers in Australia: assisting frail older people and people with a disability. Cat. no. AGE 41. Canberra: AIHW.

AIHW 2008. Diabetes: Australian facts 2008. Diabetes series no. 8. Cat. no. CVD 40. Canberra: AIHW.

AIHW 2010a. Cardiovascular medicines and primary health care: a regional analysis. Cardiovascular disease series no. 32. Cat. no. CVD 48. Canberra: AIHW.

AIHW 2010b. GRIM (General Record of Incidence of Mortality) books. Canberra: AIHW.

AIHW 2010c. Indigenous identification in hospital separations data—quality report. Health Services Series no. 35. Cat. no. HSE 85. Canberra: AIHW.

AIHW 2011a. 2010 National Drug Strategy Household Survey report. Drug statistics series no. 25. Cat. no. PHE 145. Canberra: AIHW.

AIHW 2011b. Australian hospital statistics 2009–10. Health services series no. 40. Cat. no. HSE 107. Canberra: AIHW.

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

AIHW 2011d. Pathways in aged care: do people follow recommendations? Cat. no. AUS 137. Canberra: AIHW.

AIHW 2011e. Residential aged care in Australia 2009–10: a statistical overview. Aged care statistics series no. 35. Cat. no. AGE 66. Canberra: AIHW.

AIHW 2012a. Australia's health 2012. Australia's health series no. 13. Cat. no. AUS 156. Canberra: AIHW.

AIHW 2012b. Australian hospitals statistics 2010–11. Health services series no. 43. Cat. no. HSE 117. Canberra: AIHW.

AIHW 2012c. Health expenditure Australia 2010–11. Health and welfare expenditure series no. 47. Cat. no. HWE 56. Canberra: AIHW.

AIHW 2012d. National aged care programs. Canberra: AIHW. Viewed 17 July 2012, <http://www.aihw.gov.au/national-aged-care-programs/>.

AIHW 2012e. Rehabilitation care (admitted care). Viewed 27 July 2012, <http://meteor.aihw.gov.au/content/index.phtml/itemId/270174>.

AIHW: Penm 2008. Cardiovascular disease and its associated risk factors in Aboriginal and Torres Strait Islander peoples 2004–05. Cardiovascular disease series no. 29. Cat. no. CVD 41. Canberra: AIHW.

AIHW: Senes 2006. How we manage stroke in Australia. Cat. no. CVD 31. Canberra: AIHW.

AIHW: Senes & Penm 2007. Medicines for cardiovascular health: are they used appropriately? Cardiovascular disease series no. 27. Cat. no. 36. Canberra: AIHW.

Anderson CS, Jamrozik KD, Burvill PW, Chakera TM, Johnson GA & Stewart-Wynne EG 1993. Ascertaining the true incidence of stroke: experience from the Perth Community Stroke Study, 1989–1990. The Medical Journal of Australia 158:80–4.

AROC (Australasian Rehabilitation Outcomes Centre) 2011a. The AROC annual report: the state of rehabilitation in Australia in 2010. Wollongong: AROC.

AROC 2011b. Australasian Rehabilitation Outcomes Centre. Viewed 24 July 2012, <http://ahsri.uow.edu.au/aroc/whatisaroc/index.html>.

Begg S, Vos T, Barker B, Stevenson C, Stanley L & Lopez A 2007. The burden of disease and injury in Australia 2003. Cat no PHE 82. Canberra: AIHW.

Bray JE, Mosley I, Bailey M, Barger B & Bladin C 2011. Stroke public awareness campaigns have increased ambulance dispatches for stroke in Melbourne, Australia. Stroke: A Journal of Cerebral Circulation 42:2154–7.

Briffa T, Nedkoff L, Knuiman M, Norman P, Hung J, Hankey G et al. (forthcoming). Downward trend in the prevalence of hospitalisation for atherothrombotic disease. International Journal of Cardiology.

Britt H & Miller G (eds) 2009. General practice in Australia, health priorities and policies 1998 to 2008. Canberra: AIHW.

Cadilhac DA, Lalor EE, Pearce DC, Levi CR & Donnan GA 2006. Access to stroke care units in Australian public hospitals: facts and temporal progress. Internal Medicine Journal 36:700–4.

DoHA (Department of Health and Ageing) 2004. Australian statistics on medicines 2001–2002. Canberra: DoHA.

DoHA 2005. Australian statistics on medicines 2003. Canberra: DoHA.

DoHA 2007. Australian statistics on medicines 2004–05. Canberra: DoHA.

DoHA 2008. Australian statistics on medicines 2006. Canberra: DoHA.

DoHA 2009a. Australian statistics on medicines 2007. Canberra: DoHA.

DoHA 2009b. Australian statistics on medicines 2008. Canberra: DoHA.

DoHA 2009c. The residential care manual. Canberra: DoHA.

DoHA 2011. Australian statistics on medicines 2009. Canberra: DoHA.

Edwards D, Higgins DJ, Gray M, Zmijewski N & Kingston M 2008. The nature and impact of caring for family members with a disability in Australia. Research Report No. 16. Melbourne: Australian Institute of Family Studies.

Gillum RS, C, 1997. The end of the long-term decline in stroke mortality in the United States? Stroke 28:1527–9.

Guidelines Subcommittee 1999. World Health Organization—International Society of Hypertension guidelines for the management of hypertension. Journal Of Hypertension 17:151–83.

Hankey GJ 2011. Stroke: fresh insights into causes, prevention, and treatment. The Lancet Neurology 10:2–3.

Islam MS, Anderson CS, Hankey GJ, Hardie K, Carter K, Broadhurst R et al. 2008. Trends in incidence and outcome of stroke in Perth, Western Australia during 1989 to 2001: the Perth Community Stroke Study. Stroke: A Journal of Cerebral Circulation 39:776–82.

Jamrozik K, Broadhurst RJ, Lai N, Hankey GJ, Burvill PW & Anderson CS 1999. Trends in the incidence, severity, and short-term outcome of stroke in Perth, Western Australia. Stroke: A Journal Of Cerebral Circulation 30:2105–11.

Kwan J, Hand P & Sandercock P 2004. A systematic review of barriers to delivery of thrombolysis for acute stroke. Age And Ageing 33:116–21.

Marsden DL, Spratt NJ, Walker R, Barker D, Attia J, Pollack M et al. 2010. Trends in stroke attack rates and case fatality in the Hunter region, Australia 1996-2008. Cerebrovascular Diseases (Basel, Switzerland) 30:500–7.

Moon L, Moise P, Jacobzone S & the ARD-Stroke Experts Group 2003. Stroke care in OECD countries: a comparison of treatment, costs and outcomes in 17 Countries. OECD Health Working Papers no. 5. Paris: OECD.

NCCH (National Centre for Classification in Health) 2008. The international statistical classification of diseases and related health problems, Tenth Revision, Australian modification (ICD-10-AM), Australian Classification of Health Interventions (ACHI) and Australian Coding Standards (ACS), 6th edn. Sydney: University of Sydney.

National Stroke Foundation 2008. National Stroke Audit: post-acute services. Melbourne: National Stroke Foundation.

National Stroke Foundation 2010. Clinical guidelines for stroke management 2010. Melbourne: National Stroke Foundation.

National Stroke Foundation 2011a. National Stroke Audit—Acute Services Clinical Audit Report 2011 Melbourne: National Stroke Foundation.

National Stroke Foundation 2011b. National Stroke Audit —Acute Services Organisational Survey Report 2011. Melbourne: National Stroke Foundation.

National Stroke Foundation 2011c. The acute stroke services framework. Melbourne: National Stroke Foundation.

National Stroke Foundation 2012a. What is a stroke? Viewed 26 July 2012, <http://strokefoundation.com.au/what-is-a-stroke/>.

National Stroke Foundation 2012b. Effects of a stroke. Viewed 26 July 2012, <http://strokefoundation.com.au/what-is-a-stroke/effects-of-stroke/>.

National Stroke Foundation 2012c. Types of stroke. Viewed 20 September 2012, <http://strokefoundation.com.au/what-is-a-stroke/types-of-stroke/>.

Nedkoff L, Briffa T, Knuiman M, Hung J, Norman P, Hankey G et al. 2012. Temporal trends in the incidence and recurrence of hospitalised atherothrombotic disease in an Australian population, 2000–07: data linkage study. Heart (2012).

O'Donnell MJ, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P et al. 2010. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. The Lancet 376:112–23.

OECD (Organisation for Economic Co-operation and Development) 2011. Health at a glance 2011: OECD Indicators. Paris: OECD Publishing.

Page A, Lane A, Taylor R & Dobson A 2011. Trends in socioeconomic inequalities in mortality from ischaemic heart disease and stroke in Australia, 1979–2006. European Journal of Cardiovascular Prevention & Rehabilitation. October 17.

Rothwell PM, Coull AJ, Giles MF, Howard SC & et al. 2004. Change in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire, UK from 1981 to 2004 (Oxford Vascular Study). The Lancet 363:1925–33.

Rudd A & Matchar D 2004. Health policy and outcome research in stroke. Stroke 35:397–400.

Silver B 2012. An evidence-based approach to stroke prevention: important advances in the last decade. Medicine and Health Rhode Island 95:77–8.

Spark JI, Blest N, Sandison S, Puckridge PJ, Saleem HA & Russell DA 2011. Stroke and transient ischaemic attack awareness. The Medical Journal of Australia 195:16–9.

Stroke Unit Trialists' Collaboration 2007. Organised inpatient (stroke unit) care for stroke. Cochrane Database Syst Review Oct 17 (4):CD000197.

Thrift AG, Dewey HM, Macdonell RA, McNeil JJ & Donnan GA 2000. Stroke incidence on the east coast of Australia: the North East Melbourne Stroke Incidence Study (NEMESIS). Stroke: A Journal Of Cerebral Circulation 31:2087-92.

Thrift AG, Dewey HM, Sturm JW, Paul SL, Gilligan AK, Srikanth VK et al. 2006. Greater incidence of both fatal and nonfatal strokes in disadvantaged areas: the Northeast Melbourne Stroke Incidence Study. Stroke: A Journal Of Cerebral Circulation 37:877–82.

Thrift AG, Dewey HM, Sturm JW, Srikanth VK, Gilligan AK, Gall SL et al. 2009. Incidence of stroke subtypes in the North East Melbourne Stroke Incidence Study (NEMESIS): differences between men and women. Neuroepidemiology 32:11–8.

Thrift AG, Tong B, Senes S, Waters A-M & Lalor E 2012. No evidence for an epidemic of stroke with the ageing of the population. Neuroepidemiology 38:268–73.

Trobbiani K, Freeman K, Arango M, Lalor E, Jenkinson D & Thrift AG (forthcoming). Comparison of stroke warning sign campaigns in Australia, England, and Canada. International Journal of Stroke.

Vecchione M 2011. Primary stroke prevention and community education. Medicine and Health Rhode Island 94:369–71.

WHO (World Health Organization) 2004. The World Health Report 2004—Changing history. Geneva: WHO.

WHO 2008. The global burden of disease 2004 update. Geneva: WHO.

WHO 2012. Global Health Observatory Data Repository. Viewed 19 July 2012, <http://apps.who.int/ghodata/>.

Wu CM, McLaughlin K, Lorenzetti DL, Hill MD, Manns BJ & Ghali WA 2007. Early risk of stroke after transient ischemic attack: a systematic review and meta-analysis. Archives of Internal Medicine 16:2417–22.

List of tables

List of figures

This report presents a comprehensive picture about, and the latest data on, stroke and how it is managed in Australia. It examines the impact of stroke on patients, their carers, the health system and aged care services.

The report includes information on incidence, prevalence, hospitalisation, disability, treatment and deaths. Stroke trends and inequalities in the management of the condition in Australia are also examined. In addition, the report contains international comparisons and identifies data gaps.