Australian Institute of
Health and Welfare

Asthma hospitalisations in Australia 2010–11

Australian Government
Australian Institute of Health and Welfare

Authoritative information and statistics to promote better health and wellbeing

Asthma hospitalisations in Australia 2010–11

Australian Institute of Health and Welfare
Canberra
Cat. no. ACM 27

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*.

A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISBN 978-1-74249-475-3

Suggested citation

Australian Institute of Health and Welfare 2013. Asthma hospitalisations in Australia 2010–11. Cat. no. ACM 27. Canberra: AIHW.

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

Media and Strategic Engagement 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 updates the hospitalisation section of *Asthma in Australia 2011,* written by the Woolcock Institute of Medical Research. The author of this report is Alice Crisp.

The report was reviewed by Tomoko Sugiura, Louise York, Lisa McGlynn, George Bodilsen, Michelle Gourley, Jenny Hargreaves, Alison Verhoeven and Teresa Dickinson of the AIHW. The report was also reviewed by members of the Woolcock Institute of Medical Research and members of the National Monitoring of Asthma and Linked Chronic Respiratory Conditions Advisory Group.

This publication was funded by the Australian Government Department of Health and Ageing through the Asthma Management Program.

Abbreviations

ABS	Australian Bureau of Statistics
ACAM	Australian Centre for Asthma Monitoring
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index of Australia
ASGC	Australian Standard Geographical Classification
COPD	chronic obstructive pulmonary disease
DALYs	disability-adjusted life years
ERP	Estimated Resident Population
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian modification
IRSD	Index of Relative Socio-economic Disadvantage
MBS	Medicare Benefits Scheme
NHMD	National Hospital Morbidity Database
NHS	National Health Survey
PBS	Pharmaceutical Benefits Scheme
RPBS	Repatriation Pharmaceutical Benefits Scheme
SEIFA	Socio-Economic Indexes for Areas
SLA	Statistical Local Area

Summary

Asthma is a common chronic condition of the airways, associated with episodes of wheezing, breathlessness, chest tightness and cough. Hospitalisation for asthma is rarely required as most symptoms are managed in the community through medication use and primary health care interventions. However, in cases where asthma exacerbations cannot be managed at home, hospitalisation may be required. This report provides an overview of these asthma hospitalisation patterns over time and across population groups.

In 2010–11 there were 37,830 hospitalisations where asthma was the principal diagnosis. The asthma hospitalisation rate (175 per 100,000 population) is low compared with other countries.

Hospitalisation for asthma decreased between 1998–99 and 2010–11. There was an overall reduction in the rate of hospitalisation for asthma among both children (33%) and adults (45%).

Asthma hospitalisation rates varied across population groups in 2010–11:

- The rate for Indigenous Australians was 2.1 times the rate for Other Australians.
- Among adults, rates were higher in areas that were more remote (83 per 100,000 population in *Major cities* and 214 per 100,000 in *Very remote* regions). This pattern was reversed among children, where rates were lower in areas that were more remote (511 per 100,000 in *Major cities* and 404 per 100,000 in *Very remote* regions).
- Rates were higher among people living in areas with the lowest socioeconomic status (209 per 100,000 population) than for those living in areas with the highest socioeconomic status (134 per 100,000 population).
- Rates for people born in a non-English-speaking country were lower than for those born in an English-speaking country, with the exception of those aged over 65, where the rates were higher.

Children had higher rates of hospitalisation for asthma than adults (495 compared with 92 per 100,000 population) although adults tended to stay in hospital for asthma longer than children: on average, 2.9 days compared with 1.5 days.

One in four people hospitalised with a principal diagnosis of asthma in 2010–11 had an acute respiratory infection recorded as an additional diagnosis.

Direct health expenditure for asthma was $655 million in 2008–09. The pattern of expenditure on asthma differs somewhat from the pattern for diseases overall. Half (50%) of all asthma expenditure in 2008–09 was attributed to prescription pharmaceuticals, (compared to 14% across all diseases) and a substantially lower proportion of asthma expenditure was attributed to admitted patient hospital care (20%), compared with total recurrent health expenditure across all diseases (52%).

1 Introduction

Asthma is a chronic inflammatory condition of the airways, associated with episodes of wheezing, breathlessness, chest tightness and cough. These episodes can be triggered by viral infections, exercise, air pollutants, tobacco smoke or exposure to allergens such as house dust mites, pollens and mould spores.

Asthma is a common condition, affecting one in ten Australians (ABS 2012). It affects certain subsections of the population at a higher rate. Asthma prevalence appears to be higher among Aboriginal or Torres Strait Islanders, and among those living in areas of lower socioeconomic status. Asthma prevalence appears to be higher in *Inner regional* areas than in *Major cities* (ACAM 2011).

Most people who live with asthma will not require hospitalisation in a given year as symptoms can generally be managed through medication use and primary health care interventions. However, hospitalisation may be required when exacerbations cannot be managed in the community.

The rate of hospitalisation among people with asthma in Australia is low compared with other countries. An Australian study found that 3.8% of adults and 4.9% of children with asthma were hospitalised for the condition in the past 12 months (Marks et al. 2007). This was lower than the rates reported in the Global Asthma Insights and Reality surveys conducted in North America, Europe and Asia, where rates ranged from 7.0% for western Europe to 19.1% for central and eastern Europe (Rabe et al. 2004).

This report presents information about asthma hospitalisations in Australia in 2010–11 and looks at how asthma hospitalisation rates vary across different population groups and over time (for the period 1998–99 to 2010–11). Asthma hospitalisation patterns for various population groups are also compared with overall hospitalisation patterns, to shed light on whether variations appear peculiar to asthma or instead could be due to broader factors relating to hospitalisation generally.

In order to shed light on the most severe, life-threatening hospital admissions for asthma, information is provided about invasive mechanical ventilation, an intervention needed when the patient can no longer breathe independently.

Information is also presented on the conditions that commonly coincide with asthma for hospitalised patients, and on health expenditure related to asthma.

2 Hospitalisations for asthma

Hospitalisation for asthma is necessary when asthma exacerbations are life-threatening or cannot be managed at home or in a primary health care setting.

There are a number of factors that will contribute to hospitalisation rates:

- asthma prevalence (the total number of cases of asthma that exist in the community)
- appropriateness of asthma management
- access to primary health care and hospital alternatives
- admission practices (that is, hospital decisions about whether to admit patients or treat them as non-admitted patients)
- the presence of comorbidities that complicate the management of the disease and increase the likelihood of hospitalisation for asthma.

Hospitalisation data

This report presents information about asthma hospitalisations, drawn from the National Hospital Morbidity Database (NHMD), a comprehensive dataset that has records for all episodes of admitted patient care from essentially all public and private hospitals in Australia. The NHMD includes information about 'hospital separations' (Box 1).

This report primarily looks at hospital separations where asthma was the principal diagnosis. The principal diagnosis is the diagnosis established, after study, to be chiefly responsible for occasioning the patient's episode of admitted patient care.

Additional information about the methods and data sources used in this report is presented in Appendix A.

Box 1: Hospital separations

A 'hospital separation' is the term used to refer to an episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation) (AIHW 2012). In this report the terms 'hospitalisation' and 'hospital separation' are used interchangeably.

Hospitalisations in 2010–11

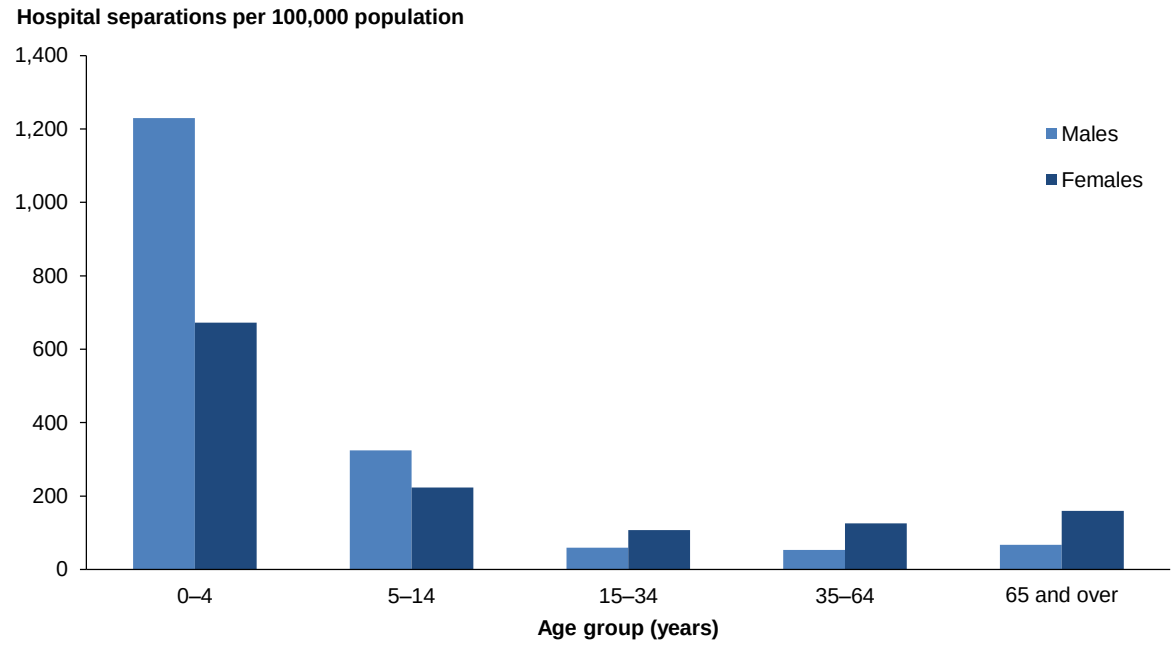
In 2010–11 there were 37,830 hospitalisations where asthma was the principal diagnosis. The overall rate of hospital separation for asthma was 175 per 100,000 population. The rate among children aged 0–14 (495 per 100,000 population) was much higher than the rate among people aged 15 and over (92 per 100,000 population).

The average length of hospital stay among people hospitalised with asthma was 2.1 days in 2010–11. On average, people aged 15 and over tended to stay in hospital longer (2.9 days) than children aged 0–14 (1.5 days).

Population subgroups

Age and sex

In 2010–11 the highest rate of hospital separations for asthma was observed in children aged 0–4, and was much higher for boys in this age group (1,230 per 100,000 population) than for girls (673 per 100,000 population) (Figure 2.1, Appendix table B.1). Boys were also hospitalised for asthma at a higher rate than girls in the 5–14 age group. For persons aged over 15, this trend reversed, with higher hospitalisation rates for women than for men. This result is consistent with the higher prevalence of asthma among boys than girls and the higher prevalence of asthma among women than men, based on self-reported data from the Australian Bureau of Statistics (ABS) National Health Survey (NHS) (ACAM 2011, ABS 2009a). The reasons for these sex differences remain unexplained.



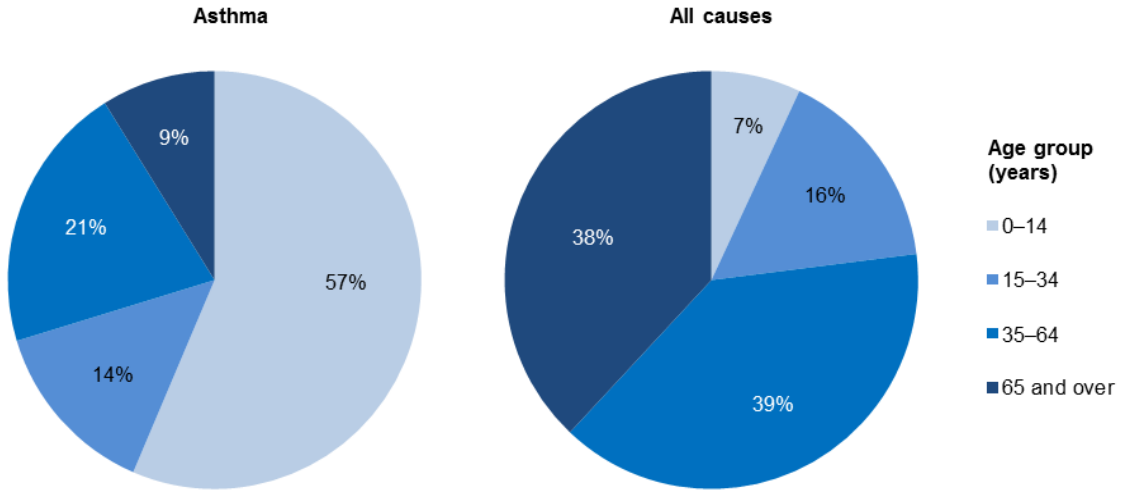
Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.1: Hospital separations for asthma per 100,000 population, 2010–11

Compared with the general hospitalised population, those hospitalised for asthma are much younger. In 2010–11, more than half (57%) of all hospital separations for asthma were for children aged 0–14 (Figure 2.2). The proportion of all-cause hospital separations for children aged 0–14 was only 7%. In contrast, a much smaller proportion of people hospitalised for asthma were aged 65 and over, compared with those who were hospitalised for all causes (9% versus 38%, respectively).



Note: Asthma separations relate to separations where asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.2: Age distribution for hospital separations for asthma and all causes, 2010–11

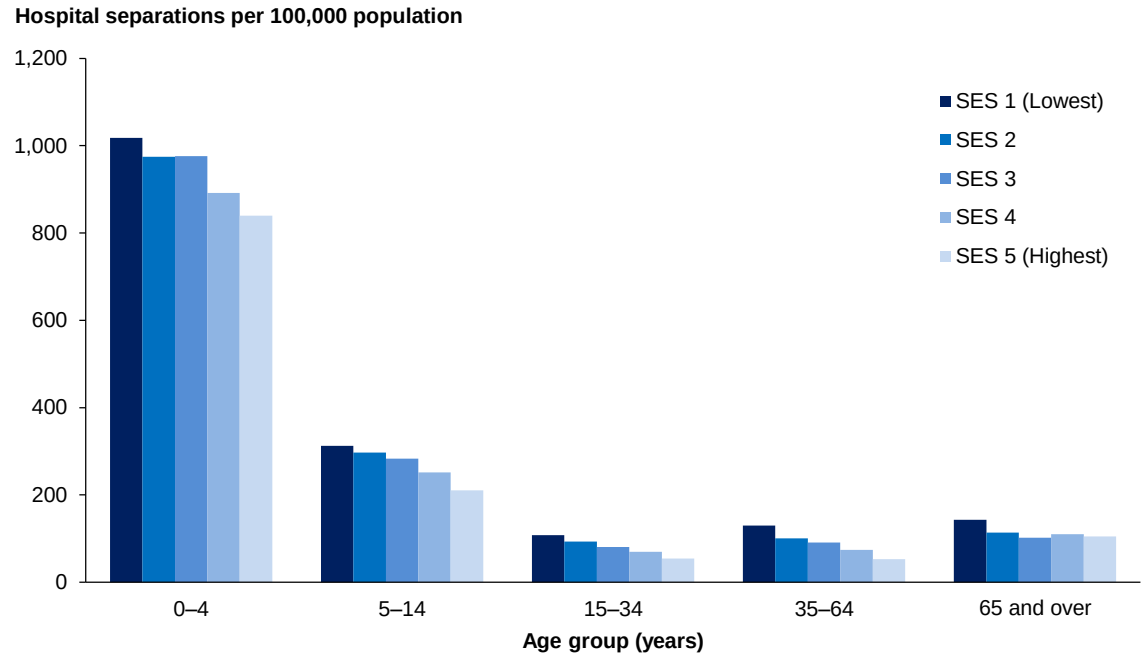
Socioeconomic status

Socioeconomic status (SES) gives an indication of how 'well off' a person or group is. SES takes into account people's access to material and social resources as well as their ability to participate in society.

The NHMD includes data on the patient's area of usual residence and the SES of the area can be estimated using a score based on the Index of Relative Socio-economic Disadvantage (IRSD) developed by the Australian Bureau of Statistics (ABS 2006a). The SES score is divided into five groups, from the lowest ('worst off') to the highest SES ('best off'). For more information, see Appendix A, Section A.3.

People living in areas with lower SES were hospitalised for asthma at a higher rate than those living in areas of higher SES (Figure 2.3). This trend was observed for all age groups although was more noticeable in the younger age groups. Overall, the rate of hospital separations for asthma was higher among those residing in areas with the lowest SES (209 per 100,000 population) compared with those residing in areas with the highest SES (134 per 100,000 population).

For all-cause hospitalisations, there was a small increase in the hospitalisation rates for people living in areas with the lowest SES, compared with those living in other areas (AIHW 2012). The association between the SES of residence and hospitalisation rates therefore appears to be similar, or stronger, for asthma than for hospitalisations overall.



Notes

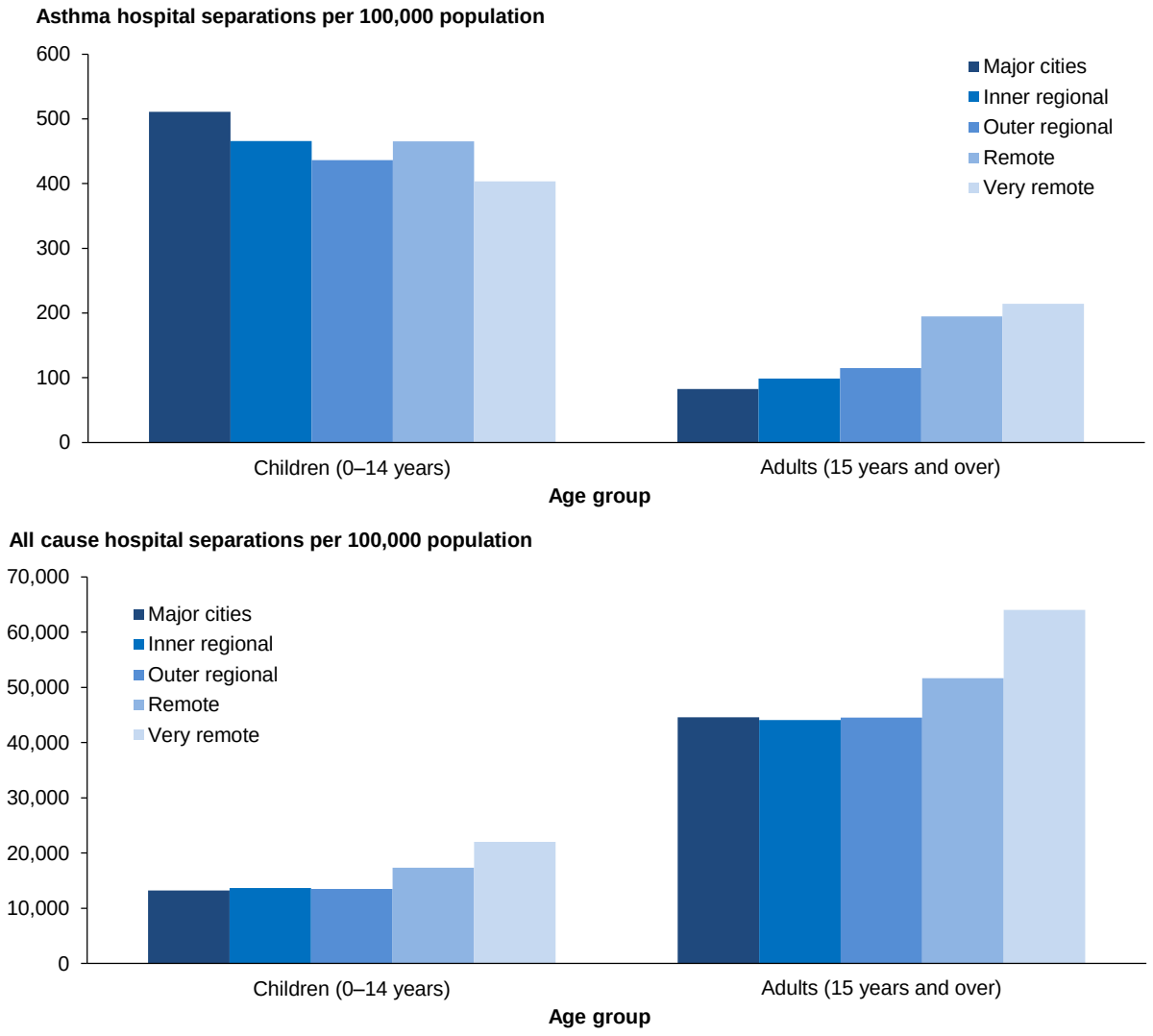
1. Age-standardised to the Australian population as at 30 June 2001.
2. SES refers to socioeconomic status (see Appendix A, Section A.3).
3. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.3: Hospital separations for asthma per 100,000 population, by socioeconomic status, 2010–11

Cities, regions and remote areas

In 2010–11, children aged 0–14 living in *Major cities* had a higher hospitalisation rate for asthma than those living in *Very remote* areas (511 per 100,000 population in *Major cities* and 404 per 100,000 in *Very remote* areas). In contrast, for people aged 15 and over, the hospitalisation rate for asthma was higher in *Very remote* areas than in *Major cities* (214 per 100,000 in *Very remote* areas and 83 per 100,000 in *Major cities*) (Figure 2.4). For all-cause hospitalisations, the hospitalisation rate was highest in *Very remote* areas for both age groups (Figure 2.4). (See Appendix A, Section A.3, for further information about assignment of remoteness areas to hospital data).



Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Asthma hospital separations relate to separations where asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.4: Hospital separations for asthma and all causes per 100,000 population, by remoteness, 2010–11

The average length of stay in hospital for asthma was longer for children (aged 0–14) residing in *Very remote* areas (1.8 days) than in *Major cities* (1.5 days). The opposite trend was observed for adults (aged 15+) where the average length of stay was shorter for those residing in *Very remote* areas (2.5 days) compared to those residing in *Major cities* (3.0 days).

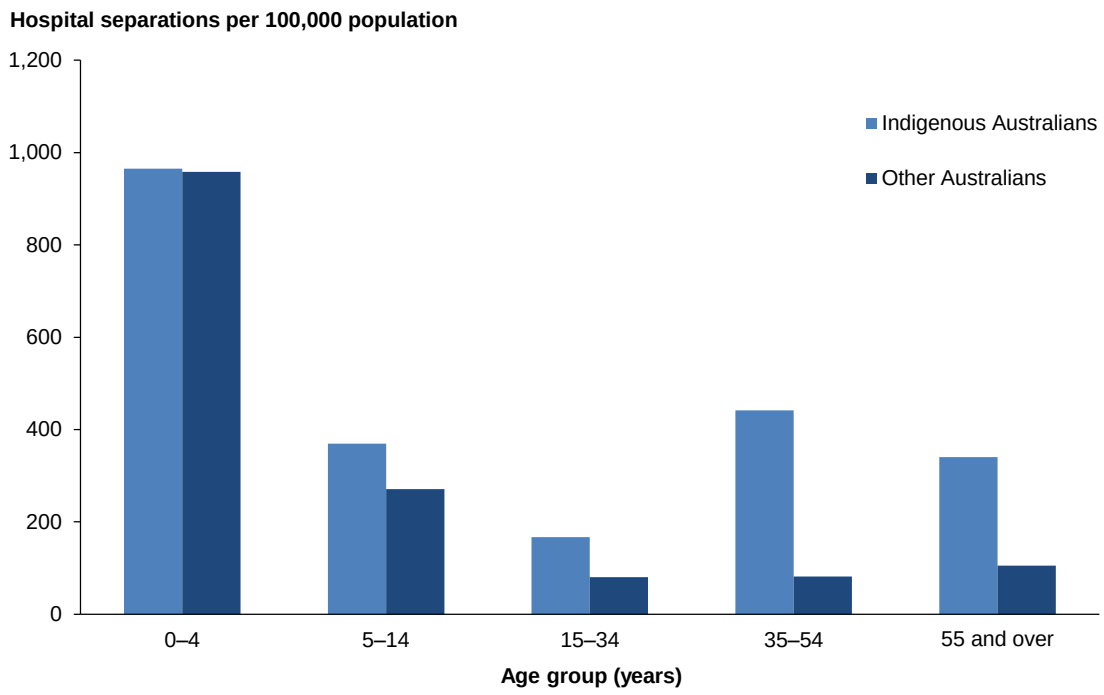
Indigenous Australians

The asthma hospitalisation rate for Indigenous Australians was 2.1 times the rate for Other Australians in 2010–11.

Among both Indigenous Australians and Other Australians, the hospitalisation rate for asthma was highest in children aged 0–4 (Figure 2.5, Appendix table B.3). The asthma hospitalisation rate was very similar for Indigenous Australians and Other Australians in this age group.

Over the age of 5, Indigenous Australians had consistently higher rates of hospitalisation for asthma than Other Australians. This difference was greatest in those aged 35 and over. The asthma hospitalisation rate among Indigenous Australians compared with Other Australians was 5.4 times higher in the 35–54 age group and 3.2 times higher in the 55 and over age group.

For all-cause hospitalisations, higher hospitalisation rates were observed among Indigenous Australians than Other Australians across all age groups except for children aged 5–14, where the hospitalisation rates were similar (AIHW 2012).



Notes

1. Age-standardised to the Australian population as at 30 June 2001. See Appendix table B.4 for the raw numbers.
2. Other Australians include people classified as non-Indigenous plus those for whom Indigenous status was not reported. Indigenous status was not reported in 1.2% of hospital separations in the Other Australians category. For more information on Indigenous identification data see Appendix A, Section A.2.
3. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

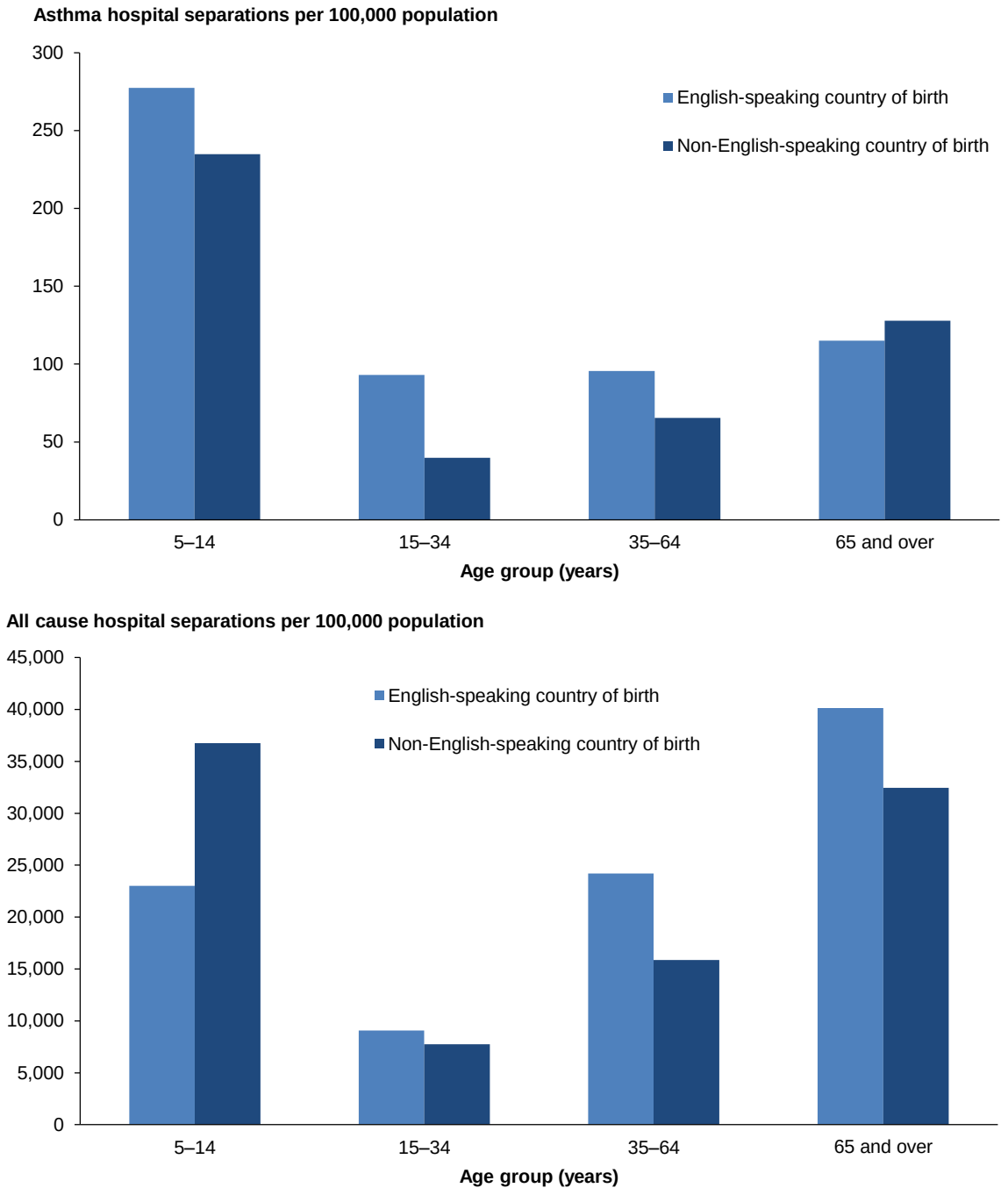
Figure 2.5: Hospital separations for asthma per 100,000 population, by Indigenous status, 2010–11

The average length of stay in hospital for asthma was 2.0 days for Indigenous Australians and 2.1 days for Other Australians.

Country of birth

In all age groups, except for those aged 65 and over, the asthma hospitalisation rate was higher among those born in English-speaking countries than among those born in non-English-speaking countries. For those aged 65 and over this pattern was reversed, although the difference in the hospitalisation rate was small (Figure 2.6) (See Appendix A, Section A.3 for further details about the country of birth analysis).

All-cause hospitalisation rates show a different pattern by country of birth, for all age groups except the 35–64 age group (Figure 2.6). This suggests that the variation in asthma hospitalisation rates by country of birth is caused by factors specific to asthma.



Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. English-speaking countries cover Australia, New Zealand, Canada, United Kingdom, Ireland, United States of America, South Africa and Zimbabwe. Non-English-speaking countries cover all other countries. See Appendix A, Section A.3 for further information.
3. Information was not presented for ages 0–5 due to small numbers.
4. Asthma hospital separations relate to separations where asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.6: Hospital separations for asthma and all causes per 100,000 population, by country of birth, 2010–11

Trends over time

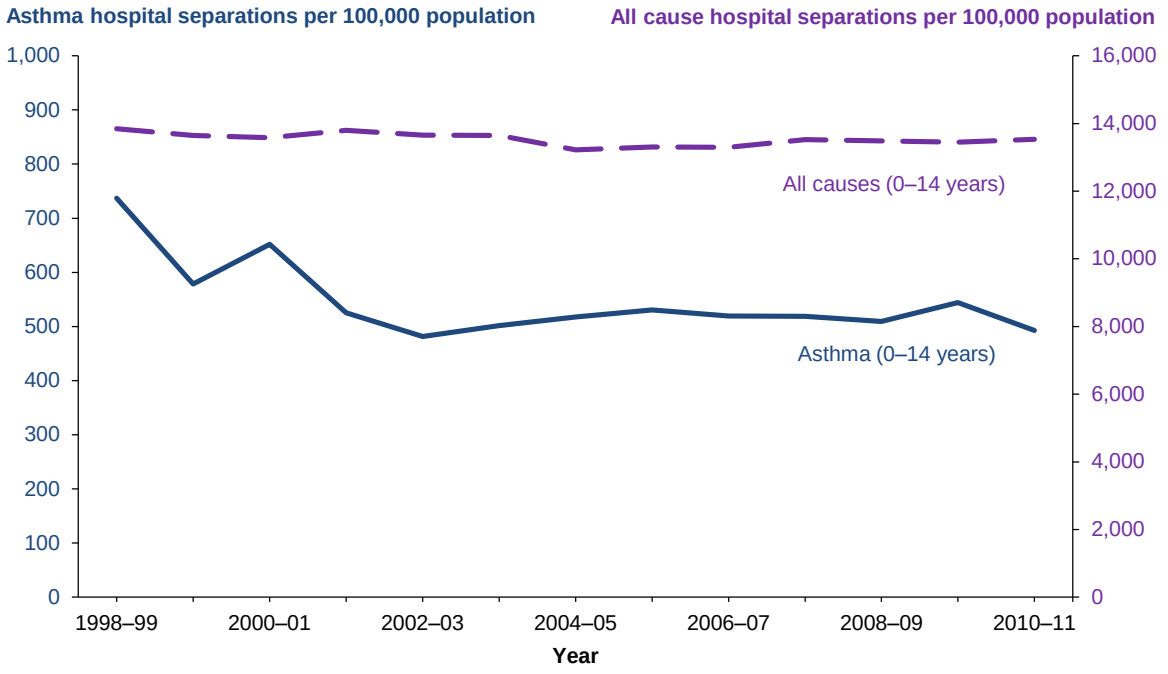
Asthma hospitalisation

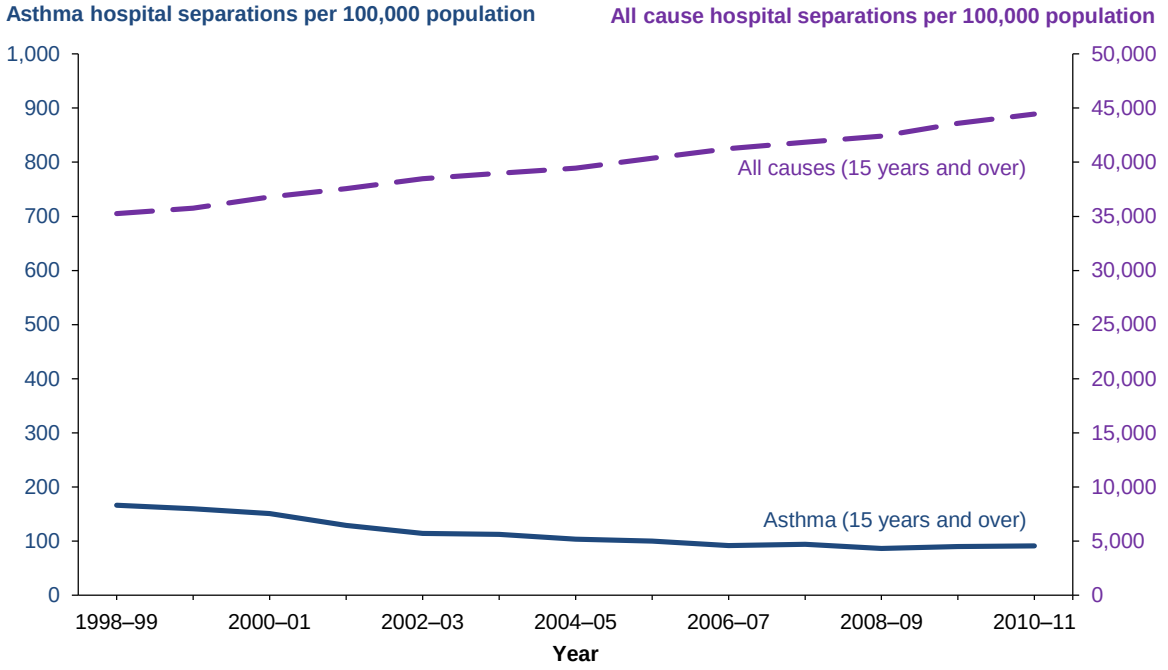
There was a substantial reduction in the age-standardised hospitalisation rate for asthma in both adults (45%) and children (33%) between 1998–99 and 2010–11 (Figure 2.7, Appendix table B.2).

The time trends in rates of hospitalisation for asthma differed from the time trends for all-cause hospitalisations over the same period. Between 1998–99 and 2010–11, all-cause hospitalisations among children remained relatively stable (a decrease of 2%), while among adults the rate increased over time (an increase of 26%). This suggests that the trends in asthma hospitalisation are not merely responding to factors that affect all hospitalisations.

A decrease in the prevalence of asthma over this time period may have played a role in the decrease in asthma hospitalisations. According to National Health Survey (NHS) data, collected by the Australian Bureau of Statistics (ABS), over the time period 2001 to 2007–08, the prevalence of asthma declined among adults by 11% and among children by 27% (ACAM 2011, ABS 2003, ABS 2006b, ABS 2009a).

There are several other factors that may have contributed to the decrease in asthma hospitalisations. Over this time period it is possible that there were improvements in long-term or preventive management of asthma or more effective out-of-hospital management of disease exacerbations. There may have been changes in admission practices, or a decrease in the severity of asthma over this period. It is not possible to attribute the decrease in asthma hospitalisations to any of these factors with certainty.





Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Asthma hospital separations relate to separations where asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 1998–99 to 2009–10. In all editions of ICD-10-AM used, the codes for asthma were J45 and J46.

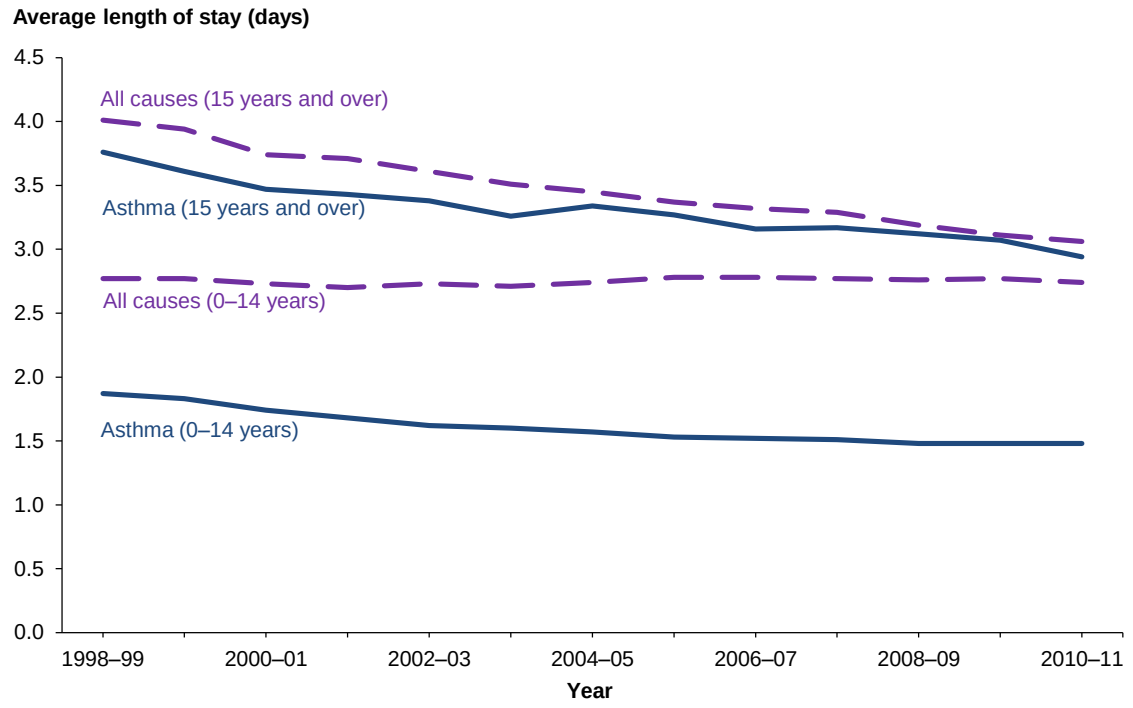
Source: AIHW National Hospital Morbidity Database.

Figure 2.7: Hospital separations for asthma and all causes per 100,000 population, 1998–99 to 2010–11

Length of hospital stay

Trends in the length of stay in hospital may provide information about disease severity. It is also possible that the trends may reflect changes in hospital admission and discharge policies and practices over time.

Among adults, the average length of hospital stay declined between 1998–99 and 2010–11, both for asthma and for all causes. Among children, the average length of stay for asthma decreased after 1998–99 in contrast to the average length of stay for all causes, which remained stable (Figure 2.8).



Note: Asthma separations relate to separations where asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 1998–99 to 2009–10. In all editions of ICD-10-AM used, the codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.8: Average length of hospital stay for asthma and all causes, 1998–99 to 2010–11

Seasonal variation

Analysis of the seasonal variation in asthma hospitalisations provides information about the periods in the year when more hospital resources may be required, and may also provide insight into the factors that contribute to the asthma exacerbations that require hospitalisation.

Among adults, hospitalisation rates for asthma are highest in the winter months and early spring, particularly among those aged 65 and over (Figure 2.9). This may reflect the increase in respiratory infections (such as cold and flu) in winter.

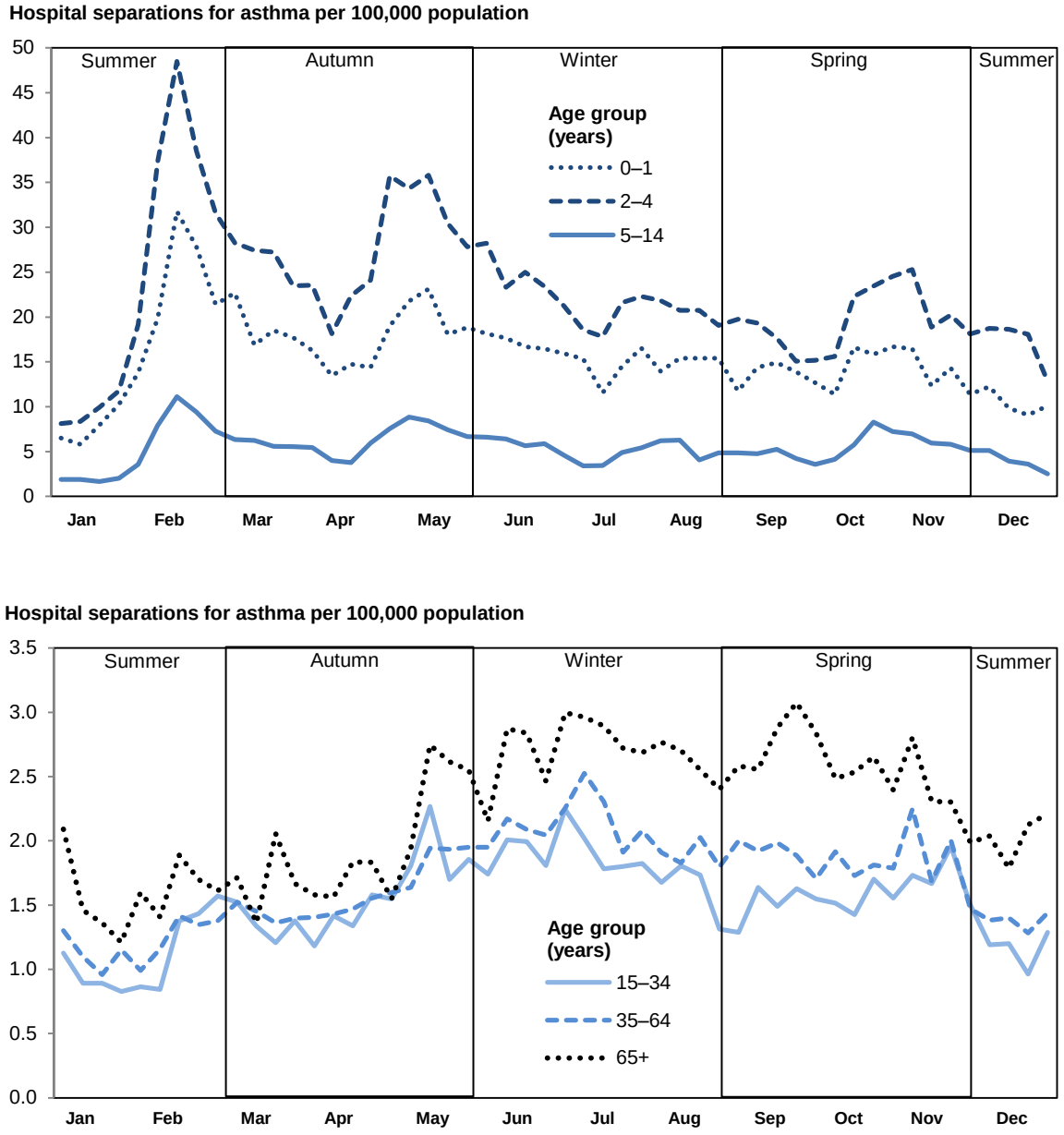
A similar trend has been observed among Canadian adults where hospitalisations for asthma are at their highest levels during the winter months, particularly shortly after Christmas (Johnston 2007).

Among children, the peaks for hospitalisations attributed to asthma occur in late summer and autumn (Figure 2.9). The reason for these seasonal peaks may be related to a high incidence of respiratory infections in children related to the return to school after the holidays or, alternatively, to seasonal variations in air pollution.

Studies conducted overseas have also observed increased asthma hospitalisation rates in children in early autumn, with consistent timing after school holidays (Johnston 2007; Johnston et al. 2005; Van Dole et al. 2009). A Canadian study reported large peaks of hospitalisation for asthma 2 to 3 weeks after school return from summer vacation in Canada, Sweden, England and Scotland. Similar seasonal patterns of hospitalisation for asthma have been observed in New Zealand following school return after summer vacation (Johnston & Sears 2006).

The post-summer holiday peak for asthma among children may be related to viral infections and allergen exposure, perhaps enhanced by the increase in social contacts at this time (Lincoln et al. 2006) and reduced compliance with asthma treatment during the summer period (Spahn et al. 2009; Van Dole et al. 2009). Other factors have been considered, including weather changes and airborne pollutants.

Seasonal weather variation differs across Australia: from southern Australia where there are distinctive seasonal changes to the tropical north where the four seasons are less well defined. As the majority of Australia's population live in regions where there are distinct seasons, the trends in Figure 2.9 are likely to reflect this experience.



Notes

1. Data are for admissions (not separations).
2. Data are averaged over two calendar years: 2009 and 2010.
3. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a) for 2010–11, and the 6th edition was used for the years 2008–09 and 2009–10. In both editions of ICD-10-AM used, the codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 2.9: Seasonal variation in hospital admission rates for asthma, 2009–2010

3 Asthma comorbidities

Comorbidities when asthma is the principal diagnosis

The presence of one or more additional health conditions (comorbid conditions) in people with asthma is a common occurrence and can complicate the management of the disease and compromise quality of life. This section investigates the presence of comorbidities in people hospitalised with a principal diagnosis of asthma.

In the NHMD, an additional diagnosis is a condition or complaint that either coexists with the principal diagnosis or arises during the episode of care. Additional diagnoses are recorded if the conditions affect patient management. In this section additional diagnoses are used as a measure of comorbidities.

It is important to note that the comorbidity information in this section is likely to under-represent the prevalence of the comorbid conditions because only conditions which affect the care of the hospitalised patients are recorded in the NHMD.

In 2010–11, 41% of patients hospitalised with a principal diagnosis of asthma had at least one comorbidity recorded during their hospital stay. The proportion of patients hospitalised for asthma with at least one comorbidity increased with age from 37% among those aged 0–14 to 59% among those aged 65 and over (Table 3.1). More females (45%) than males (38%) hospitalised for their asthma had at least one comorbid condition.

The presence of comorbidity is associated with a longer length of stay in hospital. In 2010–11 the average length of stay for asthma was 2.7 days among those with at least one comorbidity compared with 1.5 days for those with no comorbidity.

Table 3.1: Comorbidities in people hospitalised with asthma, 2010–11

	0–14 years	15–34 years	35–64 years	65 years and over	All ages
Comorbidity	**Proportion of all asthma separations (%)**				
Acute respiratory infections	26.0	22.6	22.5	24.3	24.7
Other upper respiratory conditions	0.3	0.7	1.6	1.5	0.7
COPD	0.0	0.4	1.4	1.7	0.5
Bronchiectasis	0.0	0.4	0.7	2.1	0.4
Any respiratory disease	27.3	27.0	29.0	31.9	28.0
Any endocrine, nutritional or metabolic disease	1.7	7.8	12.1	15.1	5.9
Any circulatory disease	0.2	1.5	5.4	19.2	3.2
Any comorbidity	36.6	39.2	47.6	58.7	41.3

Notes

1. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.
2. Comorbidities were classified using ICD-10-AM as follows: acute respiratory infections (J00–J22); chronic obstructive pulmonary disease (COPD) (J40–J44); bronchiectasis (J47); other upper respiratory conditions (includes allergic rhinitis, chronic sinusitis, chronic laryngitis) (J30–J39); any respiratory disease (J00–J99); any endocrine, nutritional or metabolic disease (includes diabetes) (E00–E89); any circulatory disease (I00–I99).

Source: AIHW National Hospital Morbidity Database.

Respiratory comorbidities

Acute respiratory infections occurred frequently as an additional diagnosis for children and adults hospitalised with asthma. Approximately one in four people hospitalised with a principal diagnosis of asthma in 2010–11 in all age groups (23–26%) had an acute respiratory infection recorded as an additional diagnosis (Table 3.1; See Box 2 for a brief description of key respiratory conditions presented in Table 3.1).

As not all cases of respiratory infection may be reported, for example because they have resolved before the hospital admission, it is likely that these data under-represent the role of respiratory infections as triggers for exacerbations leading to hospitalisation. Prospective studies have indicated that respiratory viral infections are associated with around 80% of asthma exacerbations in children (Johnston et al. 1995) and up to 75% in adults (Wark et al. 2002).

Other obstructive lung disease often coexists with a diagnosis of asthma, particularly among older people. Among people aged 65 and over who were hospitalised with asthma, approximately 2% had COPD and 2% had bronchiectasis as reported comorbid conditions (Table 3.1).

Box 2: Respiratory conditions

- Acute respiratory conditions include the common cold, influenza (a viral infection characterised by fever, sore throat, muscle pains, headache and cough), bronchitis (inflammation of the airways leading to cough and phlegm production), sinusitis (inflammation of the sinus cavities) and laryngitis (inflammation of the larynx, or 'voice box').
- Other upper respiratory conditions include allergic rhinitis (hay fever), chronic sinusitis and chronic laryngitis.
- Chronic obstructive pulmonary disease (COPD) includes emphysema (a long-term lung disease) and chronic bronchitis.
- Bronchiectasis is a condition characterised by an abnormal widening of the lungs' air passages. This allows infections to start. It has a number of causes, including cystic fibrosis, low antibody levels and infections such as tuberculosis, whooping cough and measles.

Other comorbidities

Among young adults aged 15–34 who were hospitalised with asthma, endocrine, nutritional and metabolic diseases (such as diabetes) were common comorbidities (8%). The prevalence of these diseases as an additional diagnosis increased with age, to 12% for those aged 35–64, and 15% among those aged 65 and over. Circulatory diseases were a particularly common comorbidity among those aged 65 and over, with 19% of asthma separations having a circulatory disease listed as an additional diagnosis (Table 3.1).

Principal diagnoses when asthma is an additional diagnosis

In addition to the 37,830 hospitalisations in 2010–11 where asthma was the principal diagnosis, asthma was an additional diagnosis in 15,547 hospital separations.

For patients with an additional diagnosis of asthma in 2010–11, the most common principal diagnosis was acute respiratory infection, including influenza and bronchitis (ICD-10-AM codes J00–J22) (See Box 2). Separations with this principal diagnosis accounted for 31% of separations where asthma was recorded as an additional diagnosis.

The most common principal diagnosis associated with an additional diagnosis of asthma among people aged 0–14 and 35 and over was an acute respiratory infection.

Among people aged 15–34 the most common principal diagnoses associated with an additional diagnosis of asthma were pregnancy, childbirth and puerperium (the six weeks after childbirth) (ICD-10-AM codes O00–O99). Separations with these principal diagnoses accounted for 40% of separations where asthma was recorded as an additional diagnosis. Presumably, this reflects the relative importance of these conditions as causes of hospitalisation in this age group.

4 Invasive mechanical ventilation

A small proportion of people with severe exacerbations of asthma either stop breathing altogether or decrease their breathing to such an extent that they are at risk of stopping breathing. This represents a severe, imminently life-threatening event which can only be averted by the introduction of artificial mechanical ventilation via an endotracheal tube ('breathing tube') attached to a positive pressure ventilator, otherwise known as a 'life support machine'. This procedure is sometimes referred to as invasive mechanical ventilation to distinguish it from non-invasive forms of ventilation used in less severe circumstances. Both invasive and non-invasive mechanical ventilation are also referred to as 'assisted ventilation'.

Information about invasive mechanical ventilation provides insights into the prevalence of severe, life-threatening asthma. This section presents data relating to the use of invasive mechanical ventilation among patients with a principal diagnosis of asthma. A list of all the procedure codes included in these analyses is provided in Appendix A, Section A.2.1.

Between 2005–06 and 2010–11, invasive mechanical ventilation occurred in 1,554 hospital separations with a principal diagnosis of asthma.

Population subgroups

Age and sex

The rate of hospital separations for asthma that were associated with provision of invasive mechanical ventilation was highest among young and middle-age adults and lowest for children. Patients aged 65 and over were less likely than those aged 15–64 to have undergone invasive mechanical ventilation during an asthma hospitalisation (Figure 4.1).

Among children, the rate of invasive mechanical ventilation did not differ between boys and girls. Above the age of 15, the rate of invasive mechanical ventilation was higher for males than females (Figure 4.1).

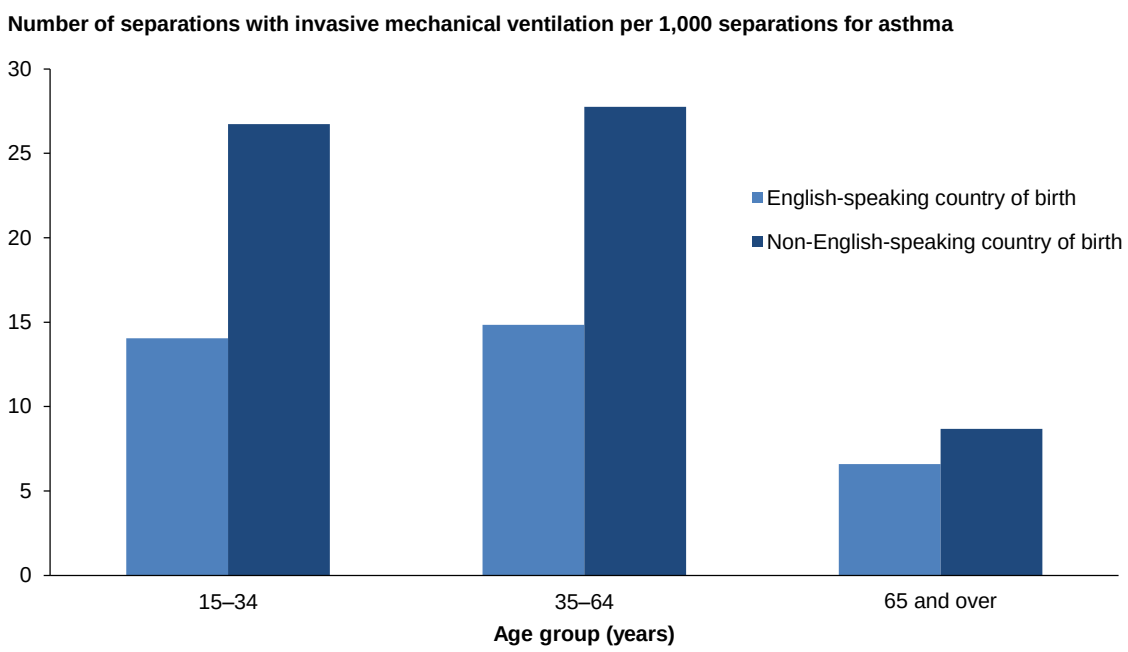
Note: Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 2005–06 to 2009–10. In all editions of ICD-10-AM used, the codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 4.1: Rate of hospital separations for asthma with invasive mechanical ventilation, 2005–06 to 2010–11

Country of birth

People aged 15 and over born in a non-English-speaking country were more likely to have invasive mechanical ventilation during a hospital separation for asthma than those of the same age who were born in an English-speaking country (Figure 4.2). This may reflect more severe disease or, possibly, delayed implementation of effective treatment for exacerbations in adults who were born in a non-English-speaking country.



Notes

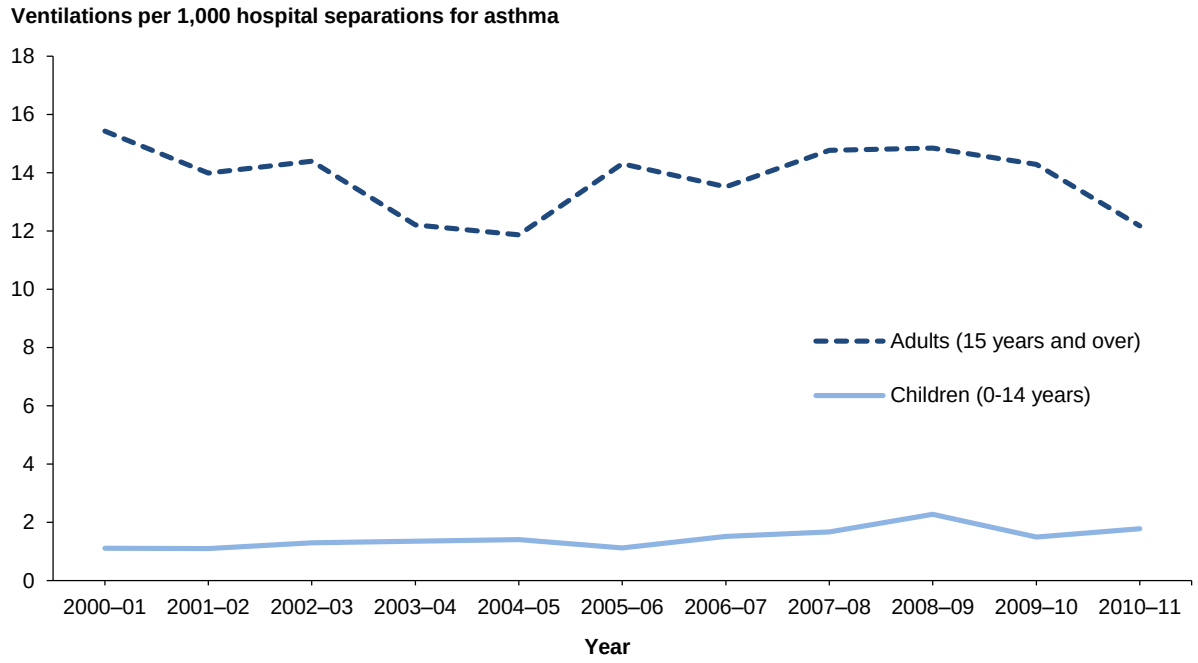
1. English-speaking countries cover Australia, New Zealand, Canada, United Kingdom, Ireland, United States of America, South Africa and Zimbabwe. Non-English-speaking countries cover all other countries.
2. Information was not presented for ages 0–14 due to small numbers.
3. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 2005–06 to 2009–10. In all editions of ICD-10-AM used, the codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 4.2: Rate of hospital separations for asthma with invasive mechanical ventilation, by country of birth, 2005–06 to 2010–11

Trends over time

For those aged 15 and over, there were fluctuations in the rate of invasive mechanical ventilation between 2000–01 and 2010–11, with an overall decline from 15.4 to 12.2 ventilations per 1,000 separations for asthma (Figure 4.3). Over the same period, there was little change in the proportion of separations for children aged 0–14 who received invasive mechanical ventilation during a hospital stay for asthma, with a rate of 1.1 ventilations per 1,000 separations for asthma in 2000–01 and 1.8 ventilations per 1,000 separations for asthma in 2010–11 (Figure 4.3). This observed trend for children needs to be treated with caution as the provision of mechanical ventilation for this age group was so infrequent.



Note: Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 2000–01 to 2009–10. In all editions of ICD-10-AM used, the codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Figure 4.3: Proportion of hospital separations for asthma with invasive mechanical ventilation, 2000–01 to 2010–11

The decrease in the asthma hospitalisation rate over this time period (Figure 2.7) led to a decrease in the rate of ventilations per population for those aged 15 and over. For this age group, the age-standardised rate of invasive mechanical ventilation declined from 2.3 per 100,000 population in 2000–01 to 1.1 per 100,000 in 2010–11. For children aged 0–14 the age-standardised rate of invasive mechanical ventilation showed little variation over the same time period, with a rate of 0.7 per 100,000 population in 2000–01 and 0.9 per 100,000 population in 2010–11. As previously mentioned, this observed trend for children needs to be treated with caution as the provision of mechanical ventilation for this age group was so rare.

5 Health expenditure on asthma

Estimating health expenditure on asthma

Direct health expenditure is a term used to describe the amount spent on health care services. In this report, data from the AIHW Disease Expenditure Database 2008–09 are used to describe direct health expenditure for asthma and all conditions in Australia. This database contains estimates of expenditure by disease category, age group and sex for hospital admitted patient services, out-of-hospital medical services, prescription pharmaceuticals and 'other' expenditure (See Box 3 for more detailed information about each category of expenditure).

Box 3: Health sectors in the Disease Expenditure Database 2008–09

- 'Hospital admitted patient services' comprises expenditure on public and private hospital services for admitted patients (same-day as well as overnight admissions). This category also includes expenditure for medical services provided to private admitted patients in hospitals.
- 'Out-of-hospital medical services' comprises expenditure on care in the community from General Practitioners as well as specialists, and from imaging and pathology services. Specifically, it includes Medicare Benefits Scheme (MBS) unreferred attendances, imaging, pathology, specialist, other medical MBS and any other medical services expenditure for 2008–09 that has not been counted elsewhere.
- 'Prescription pharmaceuticals' includes expenditure on benefit paid pharmaceuticals (Pharmaceutical Benefits Scheme (PBS) and Repatriation Pharmaceutical Benefits Scheme (RPBS) pharmaceuticals); under co-payment prescriptions; and private prescriptions.
- 'Other' expenditure comprises expenditure on optometrical services, dental, community mental health and public health cancer screening. The category 'other' is not applicable for asthma but is applicable for total recurrent health expenditure.

The method used in estimating the direct health expenditure in the AIHW Disease Expenditure Database is generally a 'top–down' approach (except in the case of hospital admitted patient services data) where total expenditure across the health system is estimated and then allocated to the relevant conditions. Although this method yields consistency, good coverage, and totals that add up to known expenditures, it is not as sensitive or accurate for any specific disease as may be provided by a detailed 'bottom–up' analysis of actual costs incurred by patients with that disease.

A 'bottom-up' approach in allocating disease expenditure, however, faces several practical difficulties. For example, expenditure, such as capital expenses or expenses for general aids and medical appliances, cannot be attributed to specific conditions. There is also a lack of available data that would enable linkage of broad expenditure costs to a particular disease for items such as over-the-counter pharmaceuticals and non-admitted patient services. In the AIHW Disease Expenditure Database 2008–09, expenditure that was not able to be allocated by disease includes: capital expenditure; non-admitted patient hospital services; over-the-counter drugs; other health practitioner services (except optometry); community health services expenditure (except community mental health); expenditure on public health programs (except cancer screening programs); health administration; health aids and

appliances; and patient transport (ambulance). As a result, approximately 70% of total direct health expenditure was allocated by disease (AIHW 2010), providing conservative estimates of direct expenditure by disease.

Although it is not without shortcomings, the AIHW Disease Expenditure Database provides a broad picture of the use of health system resources classified by disease. AIHW continue to improve the methodology used to produce these estimates.

For more information about the AIHW Disease Expenditure Database, refer to Appendix A, Section A.2.3, and the data quality statement available at: <http://meteor.aihw.gov.au/content/index.phtml/itemId/512599>.

Direct health expenditure on asthma

In 2008–09, estimated direct health expenditure attributable to asthma was $655 million, accounting for 0.9% of total allocated health expenditure in that year.

Approximately $128 million of estimated direct health expenditure attributable to asthma was for admitted patient hospital care. The pattern of expenditure on asthma differs somewhat to the pattern for diseases overall. A substantially lower proportion of asthma expenditure was attributed to admitted patient hospital care (20%) compared with total recurrent health expenditure across all diseases (52%). Half (50%) of all asthma expenditure in 2008–09 was attributed to prescription pharmaceuticals, compared to 14% across all diseases (Figure 5.1, Appendix table B.5). This is consistent with the fact that asthma is a condition predominantly treated and managed in the community through primary health care and medication use.

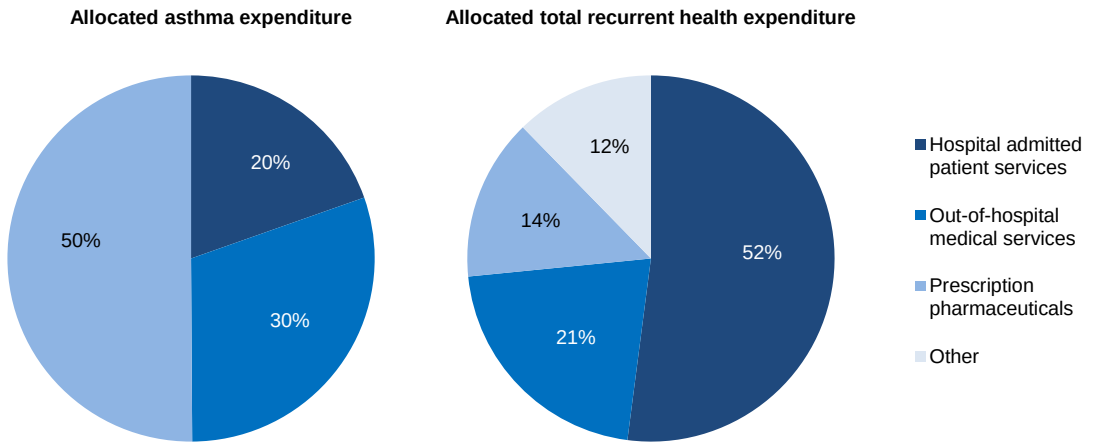


Figure 5.1: Allocated asthma expenditure and total recurrent health expenditure, by sector, 2008–09

Note: Refer to Box 3 for more information on the health sectors.

Source: AIHW disease expenditure database.

Other impacts of asthma

Direct health expenditure for asthma is only one component of the economic burden of asthma. Other costs, such as productivity loss due to the impact of asthma on labour force

participation and costs incurred by families and carers of people with asthma, are not reflected in the direct health expenditure estimates. At present, there are little data on these other aspects of the economic burden of asthma.

One alternative approach to quantifying the economic impact of asthma, and of other diseases more broadly, is the 'burden of disease' approach, which was used in the Global Burden of Disease Study (IHME 2013). In this approach, the impact of disease is quantified in terms of impact on survival (measured by 'years of life lost') and impact on functional capacity (measured by 'years of life disabled'). The combined effect of both of these impacts is summarised as disability-adjusted life years (DALYs), which quantify the burden attributable to a specific disease. One DALY represents one year of lost 'good health'. It is a summary measure that reflects the overall impact of a particular disease due to morbidity and mortality (Mathers et al. 1999).

In 2003, asthma was estimated to account for 2.4% of the total disease burden in Australia as measured by DALYs (Begg et al. 2007, AIHW: ACAM 2009).

Latest estimates from the 2010 Global Burden of Disease Study showed that, worldwide, asthma accounted for 2.3% of years lived with disability attributable to non-communicable diseases (Vos et al. 2012) and 1.7% of DALYs attributable to non-communicable diseases (Murray et al. 2012).

Appendix A: Methods and data sources

This appendix provides information on the methods and data sources used in this report. Information is provided about the population subgroup analysis.

A.1 Analysis methods

A.1.1 Rates

In this report, rates per 100,000 population per year were calculated, using relevant ABS Estimated Resident Population (ERP) data.

Data from the NHMD cover financial year periods. For analysis in this report, the 30 June denominator population at the start of the financial year was used.

For analysis of seasonality, the weekly admission rates were calculated for 2009, using the 30 June 2009 population as the denominator, and for 2010, using the 30 June 2010 population as the denominator. The results for these two years were then averaged.

Age-standardised rates

Age-standardised rates were used in this report to adjust for differences in population age structures when comparing rates for different periods of time, or for population subgroups. Direct age-standardisation was used.

Age-standardised rates were calculated using the following formula:

$$\text{Age standardised rate (ASR)} = \sum(r_i P_i)/\sum P_i$$

Where:

- r_i is the sex- and age-group specific rate for sex and age group *i* in the population being studied
- P_i is the population of age group *i* in the standard population

The Australian population as at 30 June 2001 was the standard population in all analyses (ABS 2008).

A.1.2 Exclusions

In all analysis presented in this report, separations were excluded if care type was coded as 7.3 (*Newborn* with no qualified days), 9 (*Posthumous organ procurement*) or 10 (*Hospital boarder*).

Separations were excluded from the analysis if age was not reported.

Separations where sex was unspecified were included, unless the data were broken down by sex, in which case separations where sex was unspecified were excluded. Separations where sex was unspecified cover separations where sex was indeterminate, not stated or inadequately described.

In the country of birth analysis, country of birth code 0 was not defined, and was therefore excluded from the analysis. This affected 0.05% of asthma hospitalisations.

In the analysis of additional diagnoses (when asthma was the principal diagnosis), the following additional diagnoses were excluded:

- symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00–R99)
- injury, poisoning and certain other consequences of external causes (S00–T98)
- factors influencing health status and contact with health services (Z00–Z99)
- codes for special purposes (U00–U99).

A.2 Data sources

A.2.1 Hospital data

The National Hospital Morbidity Database (NHMD) contains data on episodes of care for patients admitted to hospital, including demographic, procedural and length-of-stay information. Public and private hospitals provide data for hospital separations to state and territory health authorities which are then provided to AIHW for inclusion in the NHMD. The data are collated in financial year periods.

The hospital separations data do not include episodes of non-admitted patient care provided in emergency departments or outpatient clinics. Patients in these settings may be admitted subsequently, with the care provided to them as admitted patients being included in the NHMD.

It should be noted that the data analysed for this report are based on episodes and not individuals and, hence, may include multiple episodes for the same person.

For the analysis of the average length of stay in hospital, a same-day patient is allocated a length of stay of one day. The length of stay for an overnight patient is calculated by subtracting the date the patient is admitted from the date of separation and deducting days the patient was on leave.

A data quality statement for the NHMD for 2010–11 can be found at: <http://meteor.aihw.gov.au/content/index.phtml/itemId/511338>.

Hospital diagnosis codes

Principal and additional diagnoses were coded using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 1998–99 to 2009–10.

Mechanical ventilation

Procedures were recorded using the seventh edition of the Australian Classification of Health Interventions (ACHI) (NCCH 2010b).

The procedure codes based on ACHI that have been included in these analyses are:

- Invasive ventilation
  - 13882-00—Management of continuous ventilatory support ≤24 hours
  - 13882-01—Management of continuous ventilatory support >24 hours <96 hours

- 13882-02—Management of continuous ventilatory support ≥96 hours
- 13857-00—Continuous ventilatory support, initiation outside of ICU
- 13879-00—Continuous ventilatory support, initiation in ICU

A.2.2 Population data

This report uses population data sourced from the ABS. These population estimates are referred to as estimated resident populations.

The estimated resident populations used in this report are based on the 2006 Census of Population and Housing. The ABS collects the Census data and makes the following adjustments:

- All respondents in the census are placed in their state/territory, SLA, and postcode of usual residence. Overseas visitors counted in the census are excluded.
- An adjustment is made for people missed in the census (approximately 2%).
- Australians temporarily overseas on census night (these are not counted in the census) are added to the usual residence census count adjusted for undercount.

Estimated resident populations are then updated each year from the census date using indicators of population change such as births, deaths and net migration. More information is available from <www.abs.gov.au>.

A.2.3 Expenditure data

Expenditure data used in this report were obtained from the Australian Institute of Health and Welfare's Disease Expenditure Database. This report considers recurrent health expenditure that has been allocated by health sector and disease.

The expenditure that was not able to be allocated by disease includes capital expenditure, non-admitted patient hospital services, over-the-counter drugs, all other health practitioner services excluding optometry, community health expenditure (except community mental health), expenditure on public health programs (except cancer screening programs), health administration, health aids and appliances and research.

Estimates in the AIHW Disease Expenditure Database are derived by combining information from the National Hospital Morbidity Database, the National Public Hospital Establishments Database, the Health Expenditure Database, the National Hospital Cost Data Collection and the Bettering the Evaluation and Care of Health survey of General Practice activity.

A data quality statement for the AIHW Disease Expenditure Database, 2008–09, can be found at: <http://meteor.aihw.gov.au/content/index.phtml/itemId/512599>.

A.3 Population subgroup analysis

Aboriginal and Torres Strait Islander Australians

'Indigenous Australians' refers to people who identify themselves as being of Aboriginal or Torres Strait Islander origin. In this report information about hospitalisations among Indigenous Australians was compared with that for 'Other Australians', a category covering non-Indigenous Australians, as well as those whose Indigenous status was not stated.

Hospitalisation data from all states and territories were used in this analysis. This approach was recommended in the report 'Indigenous identification in hospital separations data: Quality report' (AIHW 2013).

An estimated 88% of Indigenous patients were correctly identified in Australian public hospital admission records in 2011–12 (AIHW 2013). This is one year after the analysis presented here.

The population counts used in this analysis were drawn from the experimental projections, series B, calculated by the ABS (ABS 2009b).

Country of birth

The Department of Immigration and Multicultural and Indigenous Affairs (DIMIA) developed a classification from 1996 census data, which places every country into one of four groups based on the relative English proficiency of recent arrivals to Australia (DIMA 2001).

In this report the category 'English-speaking countries' correspond to countries in the DIMIA English proficiency group 1, namely Australia, New Zealand, the United Kingdom, Ireland, the United States of America, Canada, Zimbabwe or South Africa. These are the main countries from which Australia receives overseas settlers who are likely to speak English. 'Non-English-speaking countries' cover all other countries. This corresponds to the DIMIA English proficiency countries in the remaining groups 2 to 4.

Socioeconomic status

The SEIFA Index of Relative Socio-economic Disadvantage (IRSD) is one of five indexes developed by the ABS to measure socioeconomic characteristics associated with geographic locations (ABS 2006a), based on information from the Australian Census of Population and Housing. Each index summarises information relating to a variety of social and economic characteristics associated with families and households, personal education qualifications and occupation.

This report uses the SEIFA IRSD index as it provides a summary score for a range of key socioeconomic variables that are related to health status, including household income and resources; education; occupation; fluency in English; and Indigenous status. The index is constructed so that relatively advantaged areas have high index values.

Individual records were classified into quintiles of socioeconomic status according to the SEIFA index value associated with the Statistical Local Area (SLA) of usual residence of the patient. The quintiles were calculated using the population-based method, so that each quintile will contain approximately 20% of the population. Quintile 1 (SES 1) includes households with the lowest socioeconomic status and quintile 5 (SES 5) includes households with the highest socioeconomic status.

It is important to note that the index reflects the relative disadvantage of all people living in an area, not of an individual. Therefore, this measure probably under-represents the true inequality in health at the individual level.

Cities, regional and remote areas

This report uses the remoteness classification based on the 2006 Australian Standard Geographical Classification (ASGC). The ASGC was derived by the ABS from information collected in the 2006 Census of Population and Housing. The remoteness classification uses Accessibility/Remoteness Index of Australia (ARIA) scores to determine remoteness areas.

This index is calculated based on how distant a place is by road from urban centres of varying sizes, and therefore provides a relative indication of how difficult it might be for residents to access certain services, such as health care and education (ABS 2006c).

Individual hospitalisation records were classified according to the ASGC remoteness level associated with the SLA of usual residence of the patient.

There are five remoteness areas in this classification: *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote* (ABS 2006c).

Appendix B: Additional tables

Table B.1 Hospital separations for asthma per 100,000 population, 2010–11

	0–4 years	5–14 years	15–34 years	35–64 years	65 years and over	All ages
Males	1,230	325	60	53	67	**172**
Females	673	223	107	126	160	**175**
Persons	**958**	**275**	**83**	**90**	**117**	**175**

Notes:

1. Age-standardised to the Australian population as at 30 June 2001.
2. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Table B.2 Hospital separations for asthma and all causes per 100,000 population, 1998–99 to 2010–11

	Asthma			All causes		
	0–14 years	15 years and over	All ages	0–14 years	15 years and over	All ages
1998–99	738	167	**284**	13,853	35,583	**31,120**
1999–00	579	161	**247**	13,664	36,105	**31,496**
2000–01	653	152	**255**	13,622	37,142	**32,312**
2001–02	525	130	**211**	13,796	37,910	**32,957**
2002–03	482	115	**191**	13,668	38,801	**33,639**
2003–04	502	113	**193**	13,661	39,311	**34,043**
2004–05	518	104	**189**	13,235	39,812	**34,354**
2005–06	535	101	**190**	13,393	40,761	**35,140**
2006–07	522	92	**181**	13355	41654	**35,842**
2007–08	524	95	**183**	13632	42230	**36,357**
2008–09	515	87	**175**	13624	42857	**36,853**
2009–10	548	90	**184**	13527	44004	**37,744**
2010–11	495	92	**175**	13,580	44,819	**38,403**

Notes:

1. Age-standardised to the Australian population as at 30 June 2001.
2. Asthma hospital separations relate to separations where asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) 7th edition (NCCH 2010a) for 2010–11, and earlier editions were used for the years 1998–99 to 2009–10. In all editions of ICD-10-AM used, the codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Table B.3: Hospital separations for asthma per 100,000 population, by Indigenous status, 2010–11

	Indigenous	Other Australians	All Australians
0–4	965	958	**958**
5–14	370	271	**275**
15–34	167	81	**83**
35–54	442	82	**89**
55 and over	340	105	**108**
All ages	**366**	**171**	**175**

Notes

1. Age-standardised to the Australian population as at 30 June 2001.
2. Other Australians include people classified as non-Indigenous plus those for whom Indigenous status was not reported. Indigenous status was not reported in 1.2% of hospital separations in the Other Australians category. For more information on Indigenous identification data see Appendix A, Section A.2.
3. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Table B.4: Number of hospital separations for asthma by Indigenous status

Age group (years)	Indigenous	Not Indigenous	Not stated	All Australians
0–4	667	12,981	169	**13,817**
5–14	477	6,942	84	**7,503**
15–34	312	4,771	60	**5,143**
35–54	526	4,896	52	**5,474**
55 and over	180	5,633	80	**5,893**
All ages	**2,162**	**35,223**	**445**	**37,830**

Notes

1. For more information on Indigenous identification data see Appendix A, Section A.2.
2. Asthma was the principal diagnosis. Asthma was classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), 7th edition (NCCH 2010a). The codes for asthma were J45 and J46.

Source: AIHW National Hospital Morbidity Database.

Table B.5: Allocated asthma expenditure and total recurrent health expenditure, by sector, 2008–09

	Asthma expenditure		Total recurrent health expenditure	
Health sector	**$ (million)**	**Per cent**	**$ (million)**	**Per cent**
Prescription pharmaceuticals	328	50.1	10,583	14.2
Out-of-hospital medical expenses	198	30.3	15,871	21.4
Admitted patients	128	19.6	38,675	52.1
Other	-	-	9,116	12.3
Total allocated expenditure	**655**	**100.0**	**74,245**	**100.0**

Note: Refer to Chapter 5, Box 3 for more information on the health sectors.

Source: AIHW Disease Expenditure Database.

Glossary

Additional diagnosis	In the NHMD, an additional diagnosis is a condition or complaint that either coexists with the principal diagnosis or arises during the episode of care. Additional diagnoses are recorded if the conditions affect patient management
Age-standardisation	A method of removing the influence of age when comparing populations with different age structures.
Comorbidity	When a person has two or more health problems at the same time.
Hospital separation	An episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation).
Incidence	The number of new cases (of a disease, condition or event) in a population in a given time period
Indigenous Australians	People who identify themselves as being of Aboriginal or Torres Strait Islander origin.
Other Australians	A category covering non-Indigenous Australians, as well as those whose Indigenous status was not stated.
Prevalence	The number or proportion (of a disease, condition or event) present in a population at a given time.
Principal diagnosis	In the NHMD, the diagnosis established, after study, to be chiefly responsible for occasioning the patient's episode of admitted patient care.

References

ABS (Australian Bureau of Statistics) 2003. National health survey: users' guide, 2001. ABS cat. no. 4363.0.55.001. Canberra: ABS.

ABS 2006a. Information paper: an introduction to Socio–Economic Indexes for Areas (SEIFA). ABS cat. no. 2039.0. Canberra: ABS.

ABS 2006b. National health survey: users' guide — electronic publication, 2004–05. ABS cat. no. 4363.0.55.001. Canberra:ABS.

ABS 2006c. Statistical geography volume 1 — Australian Standard Geographical Classification (ASGC), July 2006. ABS cat. no. 1216.0. Canberra: ABS.

ABS 2008. Australian historical population statistics, 2008. ABS cat. no. 3105.0.65.001. Canberra: ABS.

ABS 2009a. National health survey: users' guide — electronic publication, 2007–08. ABS cat. no. 4363.0.55.001. Canberra: ABS.

ABS 2009b. Experimental estimates and projections, Aboriginal and Torres Strait Islander Australians: 1991 to 2021. ABS cat. no. 3238.0. Canberra: ABS.

ABS 2012. Australian Health Survey: first results, 2011–12. ABS cat. no. 4364.0.55.001. Canberra: ABS.

AIHW (Australian Institute of Health and Welfare): ACAM (Australian Centre for Asthma Monitoring) 2009. Burden of disease due to asthma in Australia 2003. AIHW Cat. no. ACM 16. Canberra: AIHW.

AIHW 2010. Health expenditure Australia 2008–09. Health and welfare expenditure series no. 42. Cat. no. HWE 51. Canberra: AIHW.

AIHW 2012. Australian hospital statistics 2010–11. Health services series no. 43. Cat. no. HSE 117. Canberra: AIHW.

AIHW 2013. Indigenous identification in hospital separations data: quality report. Cat. no. IHW 90. Canberra: AIHW.

ACAM 2011. Asthma in Australia 2011: with a focus chapter on chronic obstructive pulmonary disease. Asthma series no. 4. Cat. no. ACM 22. Canberra: AIHW.

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.

DIMA (Department of Immigration and Multicultural Affairs) 2001. English proficiency 1996 census. Statistical report no. 30. Canberra: DIMA.

IHME (Institute for Health Metrics and Evaluation) 2013. The global burden of disease: generating evidence, guiding policy. Seattle: University of Washington.

Johnston NW 2007. The similarities and differences of epidemic cycles of chronic obstructive pulmonary disease and asthma exacerbations. Proceedings of the American Thoracic Society 4(8):591–6.

Johnston NW, Johnston SL, Duncan JM, Greene JM, Kebadze T, Keith PK et al. 2005. The September epidemic of asthma exacerbations in children: a search for etiology. Journal of Allergy & Clinical Immunology 115(1):132–8.

Johnston NW & Sears MR 2006. Asthma exacerbations 1: epidemiology. Thorax 61(8):722–8.

Johnston SL, Pattemore PK, Sanderson G, Smith S, Lampe F, Josephs L et al. 1995. Community study of role of viral infections in exacerbations of asthma in 9–11 year old children. BMJ 310(6989):1225–9.

Lincoln D, Morgan G, Sheppeard V, Jalaludin B, Corbett S & Beard J 2006. Childhood asthma and return to school in Sydney, Australia. Public Health 120(9):854–62.

Marks GB, Abramson MJ, Jenkins CR, Kenny P, Mellis CM, Ruffin RE et al. 2007. Asthma management and outcomes in Australia: A nation-wide telephone interview survey. Respirology 12(2):212–9.

Mathers C, Vos T & Stevenson C 1999. The burden of disease and injury in Australia. Cat. no. PHE 17. Canberra: AIHW.

Murray CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C et al. 2012. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 380(9859):2197–223.

NCCH (National Centre for Classification in Health) 2010a. The international statistical classification of diseases and related health problems, 10th revision, Australian modification (ICD-10-AM), Tabular list of diseases and alphabetic index of diseases. 7th edn. Sydney: University of Sydney.

NCCH 2010b. The Australian Classification of Health Interventions (ACHI) — Seventh Edition — Tabular list of interventions and Alphabetic index of interventions. Sydney: University of Sydney.

Rabe KF, Adachi M, Lai CK, Soriano JB, Vermeire PA, Weiss KB et al. 2004. Worldwide severity and control of asthma in children and adults: the global asthma insights and reality surveys. Journal of Allergy & Clinical Immunology 114(1):40–7.

Spahn J, Sheth K, Yeh W-S, Stempel DA & Stanford R 2009. Dispensing of fluticasone/salmeterol combination in the summer and asthma-related outcomes in the fall. Journal of Allergy & Clinical Immunology 124(6):1197–203.

Van Dole KB, Swern AS, Newcomb K & Nelsen L 2009. Seasonal patterns in health care use and pharmaceutical claims for asthma prescriptions for preschool- and school-aged children. Annals of Allergy, Asthma & Immunology 102(3):198–204.

Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M et al. 2012. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 380(9859):2163–96.

Wark PA, Johnston SL, Moric I, Simpson JL, Hensley MJ & Gibson PG 2002. Neutrophil degranulation and cell lysis is associated with clinical severity in virus-induced asthma. European Respiratory Journal 19(1):68–75.

List of tables

List of figures

This report provides an overview of hospitalisation patterns over time and across population groups. Asthma hospitalisation rates decreased between 1998–99 and 2010–11, by 33% for children and 45% for adults. The rate of hospitalisation for asthma among Indigenous Australians was 2.1 times the rate for Other Australians. Asthma hospitalisation rates were also higher for people living in areas with lower socioeconomic status.