Asthma in Australia

2005

Australian Centre for Asthma Monitoring
Woolcock Institute of Medical Research

August 2005
ASTHMA SERIES: Number 2
AIHW cat. no. ACM 6

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

Australian Institute of Health and Welfare
Canberra

ACAM
Australian Centre for Asthma Monitoring

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INSTITUTE *of* MEDICAL RESEARCH

Australian Government
Australian Institute of Health and Welfare

This publication is part of the Australian Institute of Health and Welfare's Asthma Series. A complete list of the Institute's publications is available from the Publications Unit, Australian Institute of Health and Welfare, GPO Box 570, Canberra ACT 2601, or via the Institute's web site (http://www.aihw.gov.au).

ISSN 1448-7594

ISBN 1 74024 487 7

Suggested citation

AIHW Australian Centre for Asthma Monitoring 2005. Asthma in Australia 2005. AIHW Asthma Series 2. AIHW cat. no. ACM 6. Canberra: AIHW.

Australian Institute of Health and Welfare

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Published by Australian Institute of Health and Welfare

Designed and typeset by Levitate Graphic Design

Printed by National Capital Printing

Foreword

The Australian Health Ministers declared asthma as the sixth National Health Priority Area in 1999. A positive outcome of that initiative was the establishment of the Australian System for Monitoring Asthma. The system has enabled placement in the public domain of a range of reliable, up-to-date and useful information about asthma, including this report.

The first baseline *Asthma in Australia* report, released by the Australian Institute of Health and Welfare in 2003, was the most authoritative national report of its kind. It not only presented the most recent statistics available; it also pointed to the strengths and weaknesses of our existing asthma programs, while highlighting potentially fruitful areas of intervention.

The challenge in 2005 was not only to update the vast amount of information contained in the preceding report, but also to make new information and statistics available with a considered perspective of the underlying trends in Australia.

In that vein, the headline numbers in this second report not only indicate a degree of stability in the prevalence of asthma in Australia, but also a continuing decline in mortality. This is undoubtedly good news, but areas of continuing concern remain. In particular, there is evidence that inhaled corticosteroids, which have the potential to do much good for people with asthma, are not well targeted. In particular, many people with asthma who would benefit from using inhaled corticosteroids are not using them and some people are using them at higher doses than is necessary. For more information you will of course have to read the report.

Asthma in Australia 2005 was prepared by the Australian Centre for Asthma Monitoring, a collaborating unit of the Australian Institute of Health and Welfare based at the Woolcock Institute of Medical Research in Sydney. The authors have accessed a wide range of administrative and research data collections held by federal and state and territory agencies, as well as other published data. In the process, several difficult asthma-related data issues, some highly controversial, have been addressed.

The preparation of the report was overseen by a management committee headed by Professor Peter Gibson of the University of Newcastle. The input of committee members in the preparation of the report is gratefully acknowledged.

We also acknowledge the support of the Australian Government Department of Health and Ageing for funding the Australian System for Monitoring Asthma, which includes the preparation and production of this report.

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Acknowledgments

The members of the Management Committee of the Australian System for Monitoring Asthma contributed to the development of this report.

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Highlights

This report brings together data from a wide range of sources to describe the status of asthma in Australia in 2005. It provides information about the number of people who have asthma, who receive various treatments for asthma, who visit their GP or hospitals, or who die due to asthma. It also contains information about the impact of asthma on quality of life, the relationship of asthma to smoking, and how much expenditure there is on health care for asthma in Australia.

The findings of this report confirm that asthma continues to be a common chronic condition among Australians, particularly children. However, over the past five to 10 years, there has been a substantial decline in deaths and hospitalisations for asthma and also in rates of GP consultation for asthma. This has been accompanied by changes in the nature of drug treatment for asthma, and by an increase in expenditure on asthma, particularly for pharmaceuticals.

There is scope for improvement. Many children with asthma have been placed at risk by exposure to environmental tobacco smoke in their homes. There is variation between sections of the community in the outcomes of asthma. Aboriginal and Torres Strait Islander Australians, people from non-English-speaking backgrounds and those living in rural or remote areas and in areas of relative socioeconomic disadvantage fare worse in some aspects of asthma care and outcomes. Overall, inhaled corticosteroid therapy, the cornerstone of drug therapy for asthma, is not optimally targeted. Some people who would benefit from using this treatment regularly are not doing so and others are receiving doses that are higher than they need, with a consequent risk of long-term side effects. Only 3.9% of all people with asthma have used the Asthma 3+Visit Plan, which was introduced to improve structured care for people with moderate or severe asthma in the general practice setting.

Key findings of the report are as follows.

Who is affected by asthma?

- A significant proportion of the Australian population has asthma. Asthma affects 14–16% of children and 10–12% of adults. These rates are high by international standards.
- The prevalence of asthma in Australia increased through the 1980s and 1990s, but evidence suggests there has been no further increase in recent years.
- In primary school-aged children, asthma is more common among boys than among girls. After teenage years, more women have asthma than men.
- Asthma is more common among Indigenous Australians, particularly adults, than among other Australians.
- Asthma is less common among Australians who were born in non-English-speaking countries than among other Australians.

Deaths due to asthma

- The number of deaths due to asthma has continued to decline. In 2003, 314 people died from asthma, representing 0.3% of all deaths. Asthma deaths have decreased in Australia since the early 1980s, but the rate of asthma deaths in Australia is still high in comparison to other countries.
- The risk of dying from asthma is highest in the elderly; however, asthma deaths occur in all age groups.
- Asthma deaths are also more common among people living in less well-off localities in Australia.

Use of health care facilities and services by people with asthma

- Children aged 0 to 4 years are the group that most commonly visits general practitioners or emergency departments or is hospitalised for asthma.
- Since the 1990s, there has been a decline in the rate of general practice visits and hospitalisations for asthma in all age groups. The fall has been most pronounced in children.
- The Asthma 3+ Visit Plan is an incentive scheme designed to promote structured asthma care in general practice. It targets people with moderate or severe asthma. Since its introduction in 2001,

it is estimated that 3.9% of all people with asthma, or 12.9% of people with moderate or severe asthma, have utilised this service.

- Children more frequently attend emergency departments for asthma in the few weeks after the beginning of each school term. On some occasions the rate increases by over 50% at this time. This may be due to increased spread of respiratory infections when children go back to school.
- Aboriginal and Torres Strait Islander Australians have higher rates of hospitalisation for asthma than other Australians. Rates are also higher in people living in remote areas and people living in less well-off localities.
- Hospitalisations for asthma in children are usually very brief (typically one day).
- Very few people admitted to hospital with asthma require treatment with a life support machine.
- Approximately 8% of people who are treated for asthma at an emergency department or in hospital re-attended within 28 days. Re-attendance rates are lower in children and in those aged over 65 years, than in other adults.

Medical care for people with asthma

- Written asthma action plans have been shown to greatly improve the outcomes of asthma and reduce attacks. Despite this, very few children or adults with asthma have these plans.
- Regular use of inhaled corticosteroids can reduce asthma symptoms and prevent severe episodes of worsening of asthma, yet many people who would benefit from using them regularly are not doing so.
- Among those who do use inhaled corticosteroids, some may be taking a higher dose than needed to control their asthma.
- Formulations of inhaled medication which combine inhaled corticosteroids with a long-acting bronchodilator have been available in Australia since 2000. By 2004, 64% of prescribed inhaled corticosteroids were in these combined formulations.

Smoking and asthma

- Despite the known additional health risks, just as many people with asthma smoke as people without asthma. Rates of smoking among people with asthma are highest in young adults and those who live in less well-off localities.
- Overall, around 40% of children who have asthma live with smokers and are likely to be exposed to passive smoke. In less well-off localities, more children with asthma than children without asthma live with smokers.

Impact of asthma on quality of life

- People with asthma report poorer general health and quality of life than people without asthma.
- More people with asthma suffer with anxiety and depression than people without asthma.
- Disturbed sleep is a common problem among both adults and children with asthma.

Expenditure on asthma

- In the 2000–01 financial year, direct health expenditure on asthma was $693 million, which represented 1.4% of total allocated health expenditure.
- The proportion of total health expenditure on asthma is highest among children, particularly boys aged 5 to 14 years, where it was 5.5% of annual health expenditure for that age group in 2000–01.
- More than half of expenditure on asthma is attributable to pharmaceuticals.
- Per capita health expenditure on asthma increased by 21% between 1993–94 and 2000–01 (adjusted for inflation). This was less than the 26% increase in overall health care expenditure over the same period.

Introduction

1

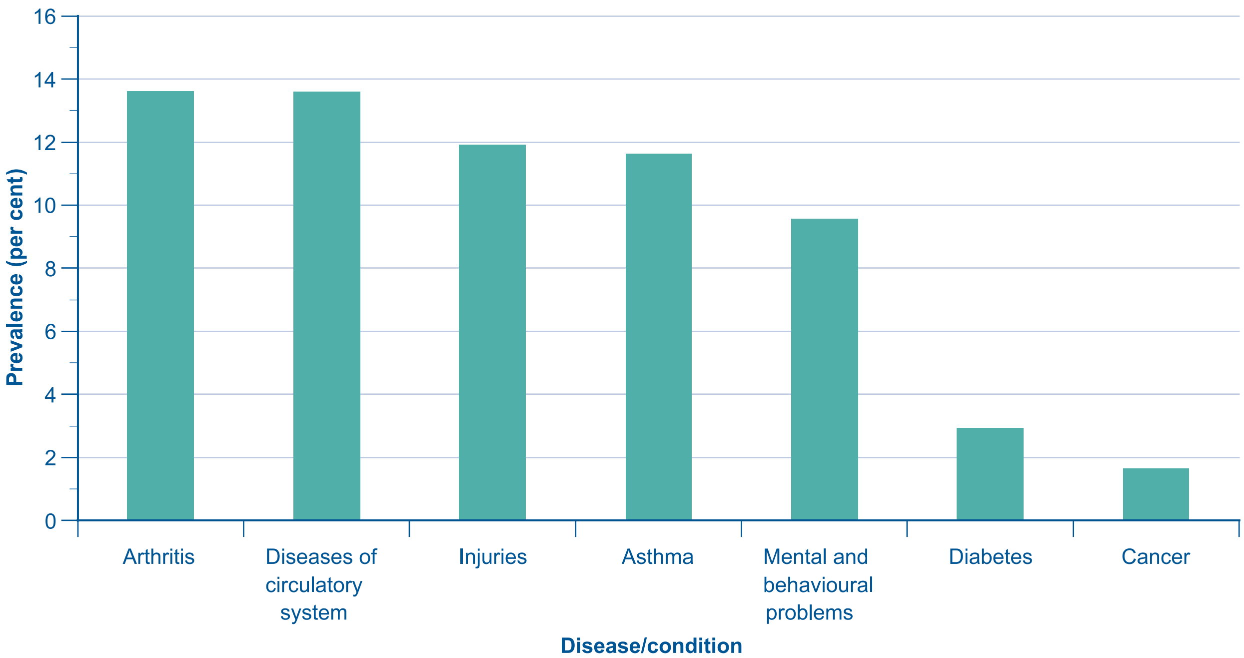
Key points

- Asthma is a chronic disease causing episodes of wheezing, chest tightness and shortness of breath due to widespread narrowing of the airways within the lungs and obstruction to airflow. The underlying problem is usually inflammation of the air passages, which tend to over-react by narrowing too often and too much in response to a wide range of triggers.
- The symptoms of asthma are variable and usually reversible, either spontaneously or with treatment.
- Some asthma-like symptoms occur in people with other diseases, particularly among the elderly and the very young. This causes problems in trying to count the number of people with asthma.
- In the late 1980s, health professionals and consumers concerned about rising prevalence, hospitalisation and mortality attributable to asthma developed a systematic approach to asthma management: the National Asthma Management Plan. In the early 1990s, the National Asthma Campaign was established as a collaboration of consumer groups and health professional bodies with the aim of improving community awareness of the problem of asthma and promoting better asthma management according to the published guidelines.
- In 1999 asthma was made a National Health Priority Area. This has resulted in a number of Australian Government-funded activities and projects to improve asthma management and care and the monitoring of asthma.
- Many state governments and non-government agencies have also implemented activities for consumers and health professionals to encourage improved asthma care.
- This report describes information on the number of people who have asthma, who receive various treatments and management strategies for asthma, who visit their GP, who go to hospital or who die due to asthma. Information has also been included on smoking and asthma, the impact of asthma on quality of life measures, and expenditure in the Australian health system for asthma.
- The report shows differences in these measures between Indigenous and other Australians, men and women, younger and older people, those who are well-off and those less well-off, and people living in major cities, regional centres and the bush.

Asthma is a National Health Priority Area for Australia because it is a common chronic condition with a substantial impact on the community and with clearly defined interventions that can reduce its impact on individuals and the community. In comparison to other National Health Priority Areas in Australia, the prevalence of asthma is similar to that of injuries, moderately less than arthritis and cardiovascular diseases and higher than mental health problems, diabetes and cancer (Figure 1.1).

Figure 1.1

Prevalence of National Health Priority Area diseases, all ages, Australia, 2001



Note: Based on self-reports of respondents. Injuries are those reported the last four weeks. All other conditions are those reported as long-term conditions.

Source: ABS National Health Survey 2001.

This report describes the status of asthma in Australia in 2005 using data from a wide range of sources. It aims to provide health professionals, health planners and policy makers, academics, consumers and interested readers with concise summaries of the latest available data and trends for asthma in Australia.

In this introductory chapter, we describe the characteristics of asthma and some of the difficulties inherent in measuring the disease in populations. We then outline the historical background from which this report has arisen and some of the activities that are in place to address asthma in Australia. The last part of this chapter provides an overview of the other sections of this report.

1.1 What is asthma?

It has long been recognised that asthma is characterised by the presence of widespread, variable airflow obstruction and by the respiratory symptoms that accompany this. Over the last 10 to 20 years, there has been increasing recognition that the pathological changes underlying this physiological abnormality are characteristic and essential components of this entity. An important corollary of this understanding is that asthma is a chronic disease. Although it may have intermittent manifestations, it is most helpful to consider the disease in terms of the underlying chronic abnormality, rather than the intermittent or episodic manifestations.

The following descriptive 'definition' of asthma has been adopted by several international expert bodies since 1997: 'Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T lymphocytes, macrophages, neutrophils and epithelial cells. In susceptible individuals this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment.
The inflammation also causes an increase in existing bronchial hyperresponsiveness to a variety of stimuli' (DoHA: Li et al. 2002; GINA 2002; NAC 2002; National Asthma Education and Prevention Program 1997).

While this understanding of the nature of asthma enables clinicians, physiologists, pathologists, and epidemiologists to correctly identify many people with this disease, unfortunately it is not universally applicable. There are several theoretical and practical reasons for this:

- The symptoms are not unique to asthma but are shared by other diseases, particularly in the young and the elderly.
- It is rare in clinical practice or epidemiological studies to have the opportunity to elicit the pathological features of the disease.
- The lung function abnormalities that are characteristic of asthma (reversible airflow obstruction and airway hyperresponsiveness) exist in a continuum: the distinction between asthma and non-asthma in this continuum is arbitrary.
- Asthma symptoms, lung function abnormalities, airway hyperresponsiveness and airway inflammation appear to be independent factors in the description of asthma; therefore, asthma can not be described by any single one of these variables (Rosi et al. 1999).
- The disease is variable over time and hence any or all of the features may not be present on any particular occasion.
- It is rare in clinical practice or epidemiological studies to be able to measure lung function in young children (and this is the age at which most cases first arise and in which most hospitalisations are attributed to asthma).
- Certain disease entities, which share some of the features of asthma, may be classified as a type of asthma or as a separate disease entity (e.g. wheezy bronchitis, virus-associated wheeze, chronic asthma with chronic airflow limitation, and allergic bronchopulmonary aspergillosis).

Particular problems in distinguishing asthma from non-asthma arise in young children, where recurrent virus-associated wheeze and transient early wheeze (Martinez et al. 1998) have been described. Likewise, in the elderly, asthma and chronic obstructive pulmonary disease (COPD) can have similar symptoms and overlapping physiological abnormalities (Kennedy et al. 1990; Peat et al. 1987).

Types of asthma

It is clear that asthma is not a homogeneous disease entity. Several patterns have emerged. Historically, the methods of classifying asthma have reflected the existing disease paradigms.

Most existing guidelines classify patients with asthma as having intermittent or persistent asthma (NAC 2002; National Asthma Education and Prevention Program 1997; Warner & Naspitz 1998). It is not clear whether this distinction represents a fundamental characteristic of the illness, a marker of disease severity or, possibly, a marker of the periodical nature of exposure to triggers. The last may be partially true since intermittent asthma seems to be more common in children, where it is associated with viral infections (Johnston et al. 1995), and in regions where seasonal allergens play an important role as triggers for asthma (Boulet et al. 1983). Nevertheless, the distinction between intermittent and persistent asthma does appear to have long-term prognostic significance, as does the distinction between frequent and infrequent intermittent asthma (Phelan et al. 2002).

Studies of the natural history of asthma have revealed several longitudinal patterns of asthma. For example, the Tucson birth cohort study has identified 'transient early wheeze', which presents with symptoms before age 3 that remit before age 6, 'late onset wheeze', in which children develop wheeze after age 3 years, and 'persistent wheeze', a group of children who have wheeze before age 3 that persists at least until age 6 years (Martinez et al. 1998).

Asthma is also classified according to severity. However, many of the features of asthma are responsive to therapy, particularly with corticosteroids, and hence most 'severity' classifications are actually better described as assessments of disease control. Distinctions are necessarily arbitrary but most classifications are based on the presence and frequency of daytime and night-time symptoms, the frequency of need for bronchodilator (reliever medication), and the level and variability of lung function (NAC 2002; Reddel et al. 2000). Some classifications also incorporate information on the frequency and severity of disease exacerbations.

There are other subgroups among people with asthma that have been separately identified: for example, childhood asthma, exercise-induced asthma, aspirin-sensitive asthma and occupational asthma. While each of these groups has some features that distinguish it from other groups of people with asthma, there is no evidence that these distinctions represent fundamental characteristics of asthma.

Risk factors for asthma

While the underlying causes of asthma are still not well understood, there are several recognised factors that may increase the risk of developing the condition or trigger asthma symptoms in people who already have the condition. Risk factors for asthma may be broadly classified as:

- *constitutional factors* which predispose to the development of asthma or particular outcomes of asthma. The presence of family members with asthma, certain genetic mutations, sex, age group, the presence of an atopic (allergic) disposition are all examples of such factors that serve to identify at-risk individuals and also to generate hypotheses about the underlying mechanisms of the disease. As they cannot be modified by intervention, surveillance of these factors is of limited value; and
- *environmental exposures or other factors* which are associated with an increased risk of acquiring asthma or having certain adverse outcomes of the disease. These exposures serve as potential targets for interventions to prevent the development of asthma or to improve the course of the disease because exposure to such factors can be modified and monitored. Hence, surveillance of these factors may be valuable and informative.

Environmental and other related factors, such as diet and lifestyle, may:

- affect the risk of acquiring asthma;
- change the course of the disease; or
- trigger attacks of airway narrowing and symptoms.

There is a wide range of factors that trigger airway narrowing and symptoms in people with asthma, including exercise, viral infections, irritants (including smoking and indoor and outdoor air pollutants), specific allergens (for example, house dust mites and mould spores), and certain ingested food preservatives. In most cases, apart from viral infections and air pollutants, avoidance of exposure to these factors or control of symptoms before or after exposure is not particularly problematic for people with asthma. Apart from environmental tobacco smoke exposure in children and smoking in adults, which is an irritant exposure, this publication does not report on these factors.

The environmental causes of asthma have been extensively investigated and reviewed (NSW Health Department 1997; Peat 1994; Rural and Regional Health and Aged Care Services Division 2004). The subject remains controversial with conflicting evidence on the effects of exposure to pets and other allergen sources, the protective effects of breast-feeding and other aspects of diet and feeding, overweight and obesity, and the role of infections in childhood. A number of randomised controlled trials evaluating the effects of specific interventions for the prevention of asthma are currently underway. Without clear evidence of an important, avoidable causal role in asthma, these factors are not suitable targets for surveillance and have not been included in this report.

Exposure to occupational allergens has been conclusively linked both to the development of asthma, de novo, and to progression of the disease (Venables & Chan-Yeung 1997). Since this is a potentially avoidable cause of asthma, exposure to occupational allergens and the occurrence of occupational asthma are important targets for surveillance. Unfortunately, there are no comprehensive data on the incidence or prevalence of occupational asthma in Australia at the present time (Baker et al. 2004).

1.2 Responses to asthma in Australia

Historical background

Asthma has long been recognised as a major problem in Australia. In the late 1980s, health professionals, consumers and governments shared a common concern about rising morbidity and mortality attributable to this illness (Health Targets and Implementation Committee 1988; NHMRC 1988). Although inhaled corticosteroids had been available for the treatment of asthma since the early 1970s (Anon. 1972), it was not until around the late 1980s that compelling evidence of their effectiveness in the long-term treatment of asthma became available (Haahtela et al. 1991). Also at this time, consensus developed around the value of a systematic approach to asthma management and Australian respiratory physicians led the world in publishing a national asthma management plan (Woolcock et al. 1989).

It was against this background of rising concern about the problem of asthma, increasing awareness of the value of new approaches to treatment, recognition that information about these new approaches was not being disseminated or implemented, lack of strategies to inform people with asthma, and lack of national coordination that the National Asthma Campaign (NAC) was established (Pierce & Irving 1991). It arose as a collaboration between the Thoracic Society of Australia and New Zealand, the Royal Australian College of General Practitioners, the Pharmaceutical Society of Australia and the Asthma Foundations of Australia, with the aim of improving community awareness of the problem of asthma and promoting better asthma management according to the published guidelines (Woolcock et al. 1989). Among other initiatives, in 1988 the NAC undertook the first national public education campaigns, a mix of television and radio advertising, supported by substantial public relations activities in 1988 (Bauman et al. 1993), 1991, 1992, 1993 (Comino et al. 1997) and 2002 (Whorlow et al. 2003).

During the 1990s it became clear that the NAC's National Asthma Strategy Goals and Targets could not be implemented without Australian Government support. In collaboration with many significant stakeholders in asthma, public health and government, the NAC worked to have asthma made a National Health Priority Area in 1999. Since then both the Australian and state governments have made a significant commitment to addressing the challenges by initiating a range of activities described in the following sections.

Australian Government initiatives

In 1999, Australian Health Ministers designated asthma as a National Health Priority Area. The National Health Priority Action Council and its expert advisory groups oversee the National Health Priority Areas initiative. The National Asthma Reference Group (NARG) is the expert advisory group for asthma.

The Asthma Management Program, which was announced in the 2001–02 Australian Government Budget, aimed at encouraging best practice asthma management. A major specific objective of the Program was to improve the quality of care provided by general practitioners to people with moderate to severe asthma. The four year Program is managed by the Department of Health and Ageing (DoHA).

Approximately two-thirds of the budget for the Asthma Management Program was allocated for payment of financial incentives, through DoHA's Practice Incentives Program (PIP), to encourage GPs to implement the Asthma 3+ Visit Plan. The Plan involves a series of three GP visits by patients with moderate to severe asthma, for the purpose of diagnosis and assessment, patient education, and development and review of a written asthma action plan. The balance of the Program's funds has been made available for a range of other initiatives relating to the Asthma 3+ Visit Plan or to the broader objectives of the Asthma Management Program. These have included, for example:

- the Australian System for Monitoring Asthma;
- an Asthma Community Support and Grants Program;
- the Asthma Innovative Management initiative;
- the Asthma Friendly Schools Program; and
- a range of professional education activities.

Australian System for Monitoring Asthma

At the time of the commencement of the NHPA initiative for asthma, it was recognised that there was a need for a systematic approach to monitoring asthma in Australia. This had also been proposed in the NAC's National Asthma Strategy Implementation Plan. Hence, the Australian Government Department of Health and Ageing funded the Australian Institute of Health and Welfare (AIHW) to establish and manage such a system, which was to include a national monitoring centre. The Australian Centre for Asthma Monitoring (ACAM) was established in February 2002 as a collaborating unit of the AIHW as part of what has become known as the Australian System for Monitoring Asthma (ASMA). ACAM is based at the Woolcock Institute of Medical Research, Sydney. The Centre aims to assist in reducing the burden of asthma in Australia by developing, collating and interpreting data relevant to asthma prevention, management and health policy.

ACAM's tasks have included:

- consulting with a broad range of stakeholders about available asthma data and information needs through two series of state/territory workshops, in 2002 and in 2004;
- advising on the development of national indicators for asthma. After consultations with stakeholders and a review of available data sources, a report and recommendations were published (Baker et al. 2004);
- producing several other reports (all available from <www.asthmamonitoring.org> or <www.aihw.gov.au>):

- *Asthma in Australia 2003* (ACAM 2003) and this update for 2005. Using the recommended national asthma indicator set as a basis, these reports provide up-to-date information on the number of people with asthma in the population, its impact on individuals and the community, risk factors for asthma, a description of current management of asthma at a population level and health service utilisation, and expenditure related to asthma.
- *Measuring the Impact of Asthma on Quality of Life in the Australian Population* (ACAM 2004). This report includes recommendations for measuring quality of life in populations with asthma at a population level.
- *Enhancing Asthma-related Information for Population Monitoring: Asthma Data Development Plan 2005* (ACAM 2005a). This report provides details of the data development required to be able to monitor the national asthma indicators proposed by ACAM in an effective manner.
- *Expenditure and Burden of Disease Due to Asthma in Australia* (ACAM 2005b). This report describes the pattern and distribution of health care expenditure in Australia that is attributable to asthma. It also reports on the burden of asthma in terms of premature death and years of life lived with disability due to asthma.

In the future, ACAM will continue to work with data users and providers to further enhance the value of asthma monitoring data for their broad range of purposes. This may include recommendations for the measurement of new indicators and more detailed analyses of data as they become available.

State government asthma programs

Concurrently with the activities of the Australian Government, some state health authorities have implemented special projects to improve the management of asthma in their jurisdictions based on substantial advances in knowledge about the most effective management of this disease.

New South Wales

In New South Wales, the principal activity of the government in relation to clinical care of patients with asthma is the New South Wales Clinical Services Framework for Chronic Respiratory Disease. This forms part of the Chronic and Complex Care Program, established under the New South Wales Government's Action Plan for Health. Important components of this program include the establishment of agreed state-wide standards of care for patients with asthma and the integration of care across the continuum from hospital to the community setting. The NSW Department of Health also includes asthma as one of the priority areas monitored in its continuous program of health interview surveys. Finally, asthma is a target disease for activities in environmental health, including the issuing of health warnings when high air pollution days are forecast.

Queensland

Queensland Health has developed the Asthma Health Outcomes Plan 2001–2006, focusing on reducing asthma severity and risk factors and optimising clinical management, as well as improving quality of life and health outcomes for asthma. Asthma among Aboriginal and Torres Strait Islander peoples has been identified as a key health indicator in the Social Determinants of Health 2004 developed within Queensland Health. Asthma is also a target condition in the annual community omnibus survey in Queensland. Currently, Queensland Health is developing a Chronic Disease Prevention and Management Implementation Initiative, which includes asthma.

South Australia

The Department of Health in South Australia has an active surveillance program monitoring key asthma-related variables. South Australia also has a collaborative research program with partners from Department of Health, universities and major teaching hospitals. The program includes the omnibus surveys and the North West Adelaide Health Study (NWAHS), a biomedical cohort study, in which over 4,000 participants are currently being assessed for the second time. Early results from the initial analysis highlight the unidentified asthma burden in older people, indicating the need for an awareness program. In 2003–04, the Department of Human Services provided financial assistance to Asthma South Australia to develop a self-management education program. This proved successful for many people but also highlighted the deficiencies in these programs in meeting the needs of children and carers.

Tasmania

The Tasmanian approach is to embed improved asthma management skills in the clinical/community setting while dealing with acute asthma episode prevention through a range of policies, partnerships and legislative initiatives. Within hospital and ambulances services there are initiatives to improve asthma prevention and management including use of peak flow meters and asthma action plans. Self-management of asthma also forms part of the Department of Health and Human Services' self-management education strategy. The Tasmanian Government funds the Asthma Foundation of Tasmania to assist it in providing specific asthma prevention and management services across the state. The Asthma Foundation has been providing Emergency Asthma Management Training to teachers and childcare staff, assisted by legislation enabling provision of accredited training to undertake emergency administration of medications. Tasmania also has strategies in place to reduce smoking rates and to reduce exposure to particulates in the form of wood smoke emissions.

Victoria

The Department of Human Services in Victoria has established an Asthma Expert Advisory Group, bringing Victorian asthma experts together to advise the Department on relevant health policy and program priorities. An evidence-based review of Public Health Interventions for Asthma has been undertaken to assist policy makers and service deliverers in the planning and delivery of public health asthma prevention and management initiatives.

As a result of this review and advice from the Asthma Expert Advisory Group, a number of key projects have been funded including: the prevention, detection and surveillance of the disease burden arising from occupational asthma; introduction of training in Emergency Asthma Management for staff in disability residential services; smoking prevention projects in Indigenous communities; projects to improve the community care of people with asthma; and reducing hospital admissions for asthma, funded through the Primary Care Partnership (PCP) Strategy and the Hospital Admission Risk Program (HARP). The Victorian Health Information Surveillance System continues to monitor the prevalence and management of asthma in the Victorian population.

Western Australia

In Western Australia, a multi-disciplinary group of experts is developing a Chronic Respiratory Disease Clinical Service Improvement Framework. This evidence-based framework has a specific focus on chronic obstructive airways disease (COPD) and asthma and seeks to standardise best practice care across Western Australia and to realign health care services around the needs of patients and their carers. Membership of this group comprises senior respiratory consultants from the four teaching hospitals, asthma educators, general practitioners (GPs), nurse consultants, physiotherapists, academics and members of the Thoracic Society, Asthma Western Australia, Australian Lung Foundation and corresponding rural representatives.

National Asthma Council Australia

The National Asthma Campaign was renamed the National Asthma Council Australia (NAC) in 2001 and now includes the Australasian Society of Clinical Immunology and Allergy. It continues to play a major role in professional and community education about asthma and working with state and federal governments to develop policy to improve asthma care and asthma research in Australia (DoHA 2003; Whorlow et al. 2003).

In consultation with all relevant stakeholders the NAC and the DoHA are developing the National Asthma Strategy 2, which builds on the earlier National Asthma Strategy and the National Asthma Action Plan and indicates what still needs to be done to improve the community's capacity to prevent asthma and care for people with asthma.

With funding from the DoHA, the NAC continues to provide a range of professional training and support to encourage the use of evidence-based methods of diagnosis and treatment for people with asthma. They are currently working through Divisions of General Practice to train GPs and practice nurses to support the Asthma 3+ Visit Plan and are conducting a virtual roadshow on childhood asthma management for GPs.

The NAC also make available a compendium of information, from consumer fact sheets to scientific reviews of the evidence related to asthma treatments (e.g. 'Inhaled Corticosteroids: A Practical Perspective' for GPs, pharmacists and asthma educators). This information is available in hard copy or via their website at <www.nationalasthma.org.au>.

Asthma Foundations of Australia

The Asthma Foundations of Australia is an association of state-based Asthma Foundations throughout Australia and provides programs and activities that work towards eliminating asthma as a major cause of ill-health and disruption within the community as well as educating people regarding optimum management of the condition.

An important highlight for the Asthma Foundations in 2004 was the 'Be Active for Asthma' campaign, which promoted the message that asthma is a condition that can be successfully managed. It was launched for National Asthma Week in September 2004 with champion swimmer Sam Riley, who has had chronic asthma since childhood, as its patron.

The 'Asthma Friendly Schools' program focuses on education in the school environment about asthma symptoms and triggers and how to manage asthma. By the end of 2004, approximately 7,400 schools had registered in the program and become 'asthma friendly'.

A currently planned activity is the 'Asthma in older Australians' project, which proposes to deliver a general awareness and education program throughout Australia over a 12-month period.

Another important service provided by the Foundations is the Asthma Information Line. This offers independent advice, education, counselling and support for people with asthma and their carers.

1.3 Overview of this report

The complexity that underlies asthma poses major problems in identifying a single health surveillance definition for the disease. For some monitoring purposes there are limitations in the extent to which criteria used for the clinical diagnosis of asthma can be implemented. In particular, in cross-sectional surveys it is usually not possible to observe subjects at the time of disease exacerbations or examine changes over time, both of which are important elements in the clinical diagnostic process. On the other hand, in surveillance studies it is feasible to implement one or more criterion-based measurements and, hence, overcome much of the variability inherent in the clinical diagnostic process.

In the future, it is hoped that improved understanding of the nature of asthma, together with the evolution of data monitoring systems, will mean that the available data will accurately reflect the complex nature of this disease. For this present report, we have taken a pragmatic approach to evaluating and reporting the data that are currently available. While those data may not be ideal, we believe that, interpreted with due care, they do provide a valuable insight into the levels, trends and patterns relating to asthma in Australia in 2005.

The scope of this report is based on the indicator framework for asthma, initially proposed in August 2000 (AIHW 2000) and recently revised (Baker et al. 2004). In this report, we have included a focus chapter on asthma in children (Chapter 2). This draws together information from a range of sources to highlight the specific impacts of asthma in those aged 0 to 18 years. The remainder of the report contains data for all age groups on disease prevalence (Chapter 3), mortality (Chapter 4), health service utilisation (Chapter 5), asthma management including the application of asthma action plans, use of pharmaceuticals and measurement of lung function (Chapter 6), exposure to smoking and environmental tobacco smoke among people with asthma (Chapter 7), quality of life and markers of asthma control (Chapter 8) and expenditure on asthma (Chapter 9). The report describes recent time trends and seasonal patterns in these indicators and, where data are available, examines differences between age groups, between males and females, between socioeconomic groups, and between urban, rural and remote populations. Data for Aboriginal and Torres Strait Islander Australians and for people of culturally and linguistically diverse backgrounds are also presented where these are available. Finally, for some of the indicators, comparisons among states and territories and with selected overseas countries are described.

An outline of data sources, classifications and analysis methods is included in Appendix 1, and Appendix 2 contains statistical data tables. A full description of the data sources can be found in the report *Review of Proposed National Health Priority Area Asthma Indicators and Data Sources* (Baker et al. 2004), available at <www.asthmamonitoring.org>.

Asthma in children

2

Key points

- Estimates of the prevalence of current asthma in children range from 14% to 16%, based on self-report. A higher proportion report recent wheeze and a lower proportion have objective evidence of the airway abnormality that is typical of asthma.
- The prevalence of asthma in children in Australia is high by international standards.
- The prevalence of current asthma is substantially higher among primary school-aged boys than girls. However, among infants, pre-school-aged children, and high-school-aged children, there is no difference between boys and girls in the prevalence of asthma.
- The proportion of GP encounters with children at which asthma is managed as a problem, and the rate of hospital admissions for asthma among children, have both declined since the late 1990s.
- There are large week-to-week fluctuations in the rate of emergency department visits for asthma among children. Rates are up to 50% below the annual average during some weeks of the summer school holiday period. They tend to peak among pre-school and primary school-aged children 2–4 weeks after the end of each school holiday period, particularly during late February. They are also above average during late autumn and winter. These fluctuations are primarily due to respiratory tract infections, the predominant trigger in young children.
- Among children with asthma, infants and pre-school-aged children are much more likely to be admitted to hospital with asthma than older children. However, the majority of admissions in these younger age groups last only 1 day.
- A minority of children with asthma state that they have a written asthma action plan.

Introduction

Compared with many other countries, the prevalence of asthma in Australian children is high. Asthma represents one of the most common reasons that children utilise health care, particularly through emergency department (ED) visits and hospitalisation. The Australian Burden of Disease study identified asthma as the leading cause of burden of disease and injury among children aged 0 to 14 years in 1996 (Mathers et al. 1999). Asthma is a major health issue for children in Australia.

This chapter brings together data on the prevalence, health service utilisation and management of asthma in Australian children. In some instances data presented in later chapters is re-presented here. However, in discussing the spectrum of asthma in childhood, this chapter applies a more developmentally focused age classification. Where possible, data are presented in four childhood age groups: infants (0 to 1 year), pre-school (2 to 4 years), primary school (5 to 11 years) and secondary school (12 to 18 years).

2.1 Prevalence of asthma in children

The 2001 National Health Survey provides the most recent nationwide data for the prevalence of asthma. From this survey it was estimated that 13.8% of children aged 0 to 17 years in Australia had current asthma defined as those who reported ever being diagnosed with asthma and responded 'Yes' to 'Do you still get asthma?' (ABS 2002a). In addition to this nationwide estimate, the prevalence of asthma has also been measured in a number of state, territory or local population-based surveys in Australia. Data on the prevalence of asthma in children from the National Health Survey and these other studies have been summarised in Tables 2.1 and 2.2.

The surveys have used different definitions to identify asthma and this is likely to influence the resulting prevalence estimates. The definition of current asthma applied in most state government surveys were those who reported being diagnosed with asthma and also reported either having had symptoms of, and/or had taken treatment for, asthma in the preceding year. Using this definition, the estimated prevalence of asthma in children in Western Australia (2004), New South Wales (2001), and South Australia (2003–04) was 14.6% (age 0 to 15 years), 15.7% (age 2 to 12 years) and 18.4% (age 2 to 15 years), respectively (Table 2.2).

The differences in prevalence estimates are also likely to be influenced by the different age ranges of survey participants.

The prevalence of wheeze was higher than the prevalence of asthma in children. The extent to which this higher prevalence of wheeze represented undiagnosed asthma, as opposed to non-asthma, viral-associated wheeze, cannot be ascertained from available data. There is some evidence to suggest that the combination of recent wheeze and airway hyperresponsiveness, an abnormal 'twitchiness' of the airways, identifies a population with more persistent features of asthma that is independent of diagnostic and labelling trends. The prevalence of this syndrome among children in the Belmont area of coastal New South Wales was 11.3% in 2002 (Toelle et al. 2004).

Time trends in the prevalence of asthma among children are illustrated in Figure 3.2 of this report. Evidence from repeated surveys consistently suggests that the prevalence of asthma in children increased in the 1980s and 1990s and has peaked in recent years.

Table 2.1
Prevalence of asthma ever being diagnosed in children, Australia, 1999–2004

Location	Survey	Year	Age range	Rates	95% CI
Ever doctor-diagnosed asthma					
Australia	(1)	2001	0 to 17 years	24.8%	23.7–25.9%
NSW	(2)	2001	2 to 12 years	26.4%	25.4–27.4%
Belmont, NSW	(3)	2002	8 to 11 years	31.0%	27.8–34.3%
SA	(4)	2003–04	2 to 15 years	25.0%	22.6–27.4%
		2002–03	2 to 15 years	23.3%	20.9–25.8%
Melbourne, Vic	(5)	2002	6 to 7 years	25.5%	23.7–27.4%
WA	(6)	2004	0 to 15 years	20.2%	17.2–20.8%
	(7)	2001	0 to 12 years	19.7%	17.2–23.3%
Ever had asthma					
ACT	(8)	1999–2001	4 to 6 years	23.5%	22.2–23.8%
Wheeze ever					
Melbourne, Vic	(5)	2002	6 to 7 years	37.1%	34.8–39.5%

Sources: These estimates were obtained from the following surveys and studies: (1) ABS National Health Survey (CURF); (2) NSW Child Health Survey 2001, (Centre for Epidemiology and Research (NSW Department of Health) 2002); (3) Belmont Cohort Study (Toelle et al. 2004); (4) South Australian Monitoring and Surveillance System, Population Research and Outcome Studies Unit, SA Department of Human Services (unpublished data) 2005; (5) International Study on Asthma and Allergies in Childhood (Robertson et al. 2004); (6) Health and Wellbeing Surveillance System, Health Information Centre WA Department of Health (unpublished data) 2005; (7) WA Child Health Survey 2001 (Daly & Roberts 2002); (8) ACT assessment of new primary school entrants (Glasgow et al. 2003).

Table 2.2
Prevalence of current asthma in children, Australia, 1999–2004

Location	Survey	Year	Age range	Rates	95% CI
Ever doctor-diagnosed asthma AND 'Yes' to 'Do you still have/get asthma'?					
Australia	(1)	2001	0 to 17 years	13.8%	12.9–14.7%
Melbourne, Vic	(5)	2002	6 to 7 years	20.0%	18.4–21.8%
Ever doctor-diagnosed asthma AND symptoms of asthma or taken treatment for asthma in last 12 months					
NSW	(2)	2001	2 to 12 years	15.7%	14.7–16.8%
SA	(4)	2003–04	2 to 15 years	18.4%	16.3–20.7%
		2002–03	2 to 15 years	18.0%	15.9–20.4%
WA	(6)	2004	0 to 15 years	14.6%	12.1–17.2%
Does your child have asthma?					
ACT	(7)	1999–2001	4 to 6 years	15.1%	14.4–15.8%
Wheeze or whistling in the chest in last 12 months					
ACT	(7)	1999–2001	4 to 6 years	15.3%	14.6–16.0%
Belmont, NSW	(3)	2002	8 to 11 years	23.7%	20.8–26.8%
Wheeze in last 12 months and airway hyperresponsiveness					
Belmont, NSW	(3)	2002	8 to 11 years	11.3%	8.8–14.3%

Sources: These estimates were obtained from the following surveys and studies: (1) ABS National Health Survey (CURF); (2) NSW Child Health Survey 2001 (Centre for Epidemiology and Research (NSW Department of Health) 2002); (3) Belmont Cohort Study (Toelle et al. 2004); (4) South Australian Monitoring and Surveillance System, Population Research and Outcome Studies Unit, SA Department of Human Services (unpublished data) 2005; (5) International Study on Asthma and Allergies in Childhood (Robertson et al. 2004); (6) Health and Wellbeing Surveillance System, Health Information Centre WA Department of Health (unpublished data) 2005; (7) ACT assessment of new primary school entrants (Glasgow et al. 2003).

International comparisons

The International Study of Asthma and Allergies in Childhood (ISAAC) applied standardised methods and definitions to the measurement of asthma in children. The survey was conducted in 464,000 children aged 13 to 14 years in 155 centres in 56 countries during the early 1990s (ISAAC 1995). There were four Australian centres (Robertson et al. 1998). The prevalence of self-reported wheeze among 13 to 14 year old children in Australia was high compared with most other countries participating in ISAAC (Figure 2.1).

Figure 2.1
World ranking for the percentage of children with self-reported wheeze in the previous 12 month period, age 13 to 14 years

Source: GINA 2004. Copyright Global Initiative for Asthma (GINA). Reproduced with permission.

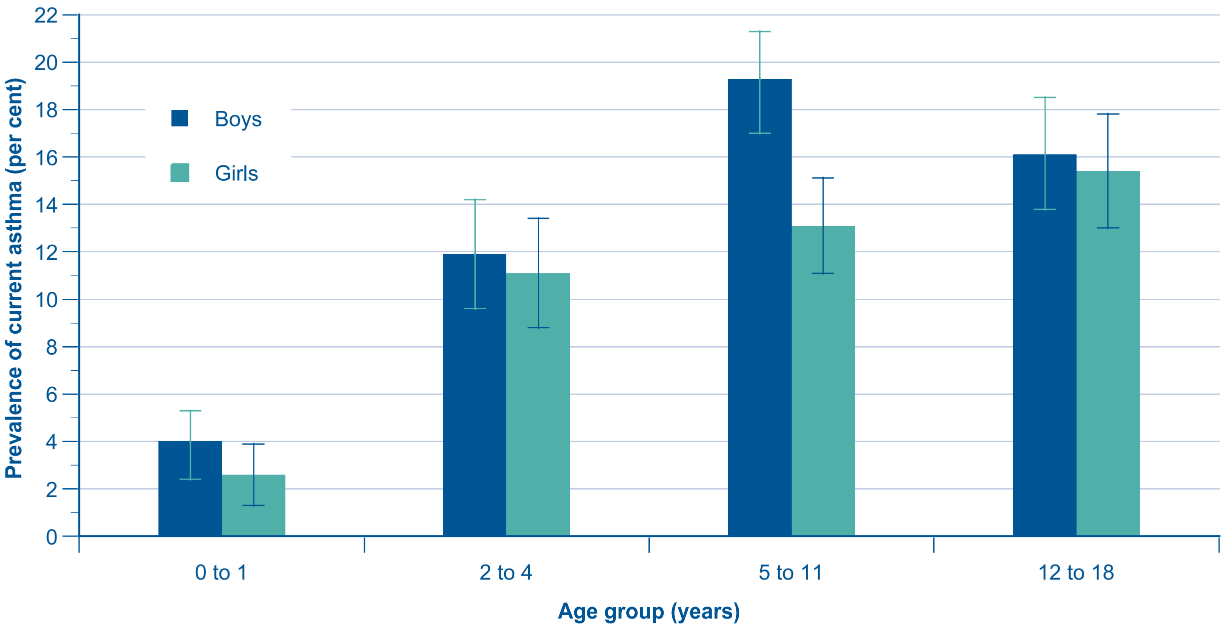
Differentials in the prevalence of current asthma among children

Age and sex

The prevalence of current asthma was substantially higher among primary school-aged boys (5 to 11 years) than girls ($p<0.001$). However, among infants, pre-school-aged children, and high-school-aged children, there was no difference between boys and girls in the prevalence of asthma (Figure 2.2).

Figure 2.2

Prevalence of current asthma, by age group and sex, children aged 0 to 18 years, Australia, 2001



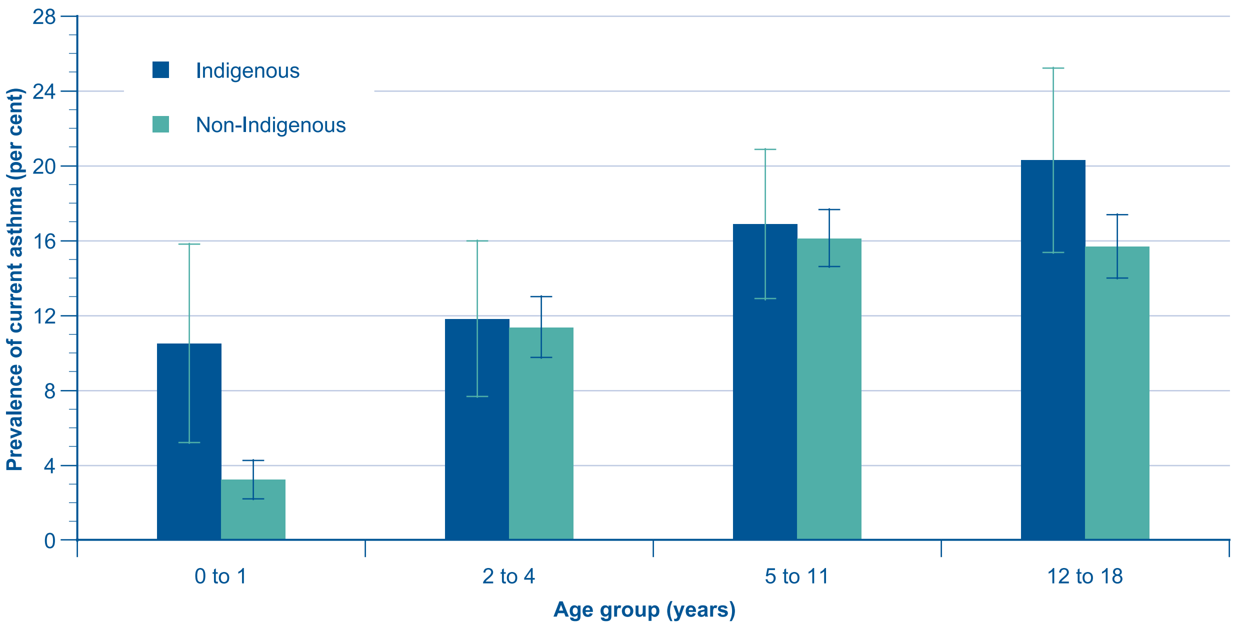
Source: ABS National Health Survey 2001.

Aboriginal and Torres Strait Islander children

Overall, the prevalence of current asthma was higher among Indigenous children (15.8%, Indigenous National Health Survey 2001) than other children (13.8%, National Health Survey 2001). However, this difference was highest among Indigenous infants (Figure 2.3). This is an age at which the diagnosis of asthma is uncertain. Furthermore, the number of Indigenous respondents included in the survey was small. Hence, conclusions on the prevalence of asthma in Indigenous children, based on the Indigenous National Health Survey, need to be treated with some caution.

A number of other surveys have measured the prevalence of asthma in Indigenous children (Table 2.3). These have used various definitions and age groups and have been conducted in a variety of settings. The heterogeneity among the estimates makes it difficult to draw confident conclusions about the prevalence of asthma in Indigenous children, except that most estimates are at least as high as those in other children.

Figure 2.3
Prevalence of current asthma, by age group and Indigenous status, children aged 0 to 18 years, Australia, 2001



Source: ABS National Health Survey 2001.

Table 2.3
Prevalence of asthma in Aboriginal and Torres Strait Islander children, Australia, 1998–2003

Location	Source	Year	Age range	Rates	95% CI (number in survey)
Ever had asthma					
WA	(2)	2001–02	0 to 17 years	23.2%	21.6–24.9% (5,513)
			0 to 3 years	16.8%	14.3–19.5%
			4 to 11 years	25.6%	23.2–28.0%
			12 to 17 years	24.4%	21.4–27.6%
ACT	(3)	1999–01	4 to 6 years	27.6%	21.8–34.2% (203)
Ever diagnosed with asthma by a doctor					
Tropical North, WA	(4)	2000	5 to 17 years	14.7%	8.5–24.2% (90)
Central Desert, WA	(4)	1999	5 to 17 years	2.8%	0.15–17.0% (34)
Ever diagnosed with asthma by a doctor and 'Yes' to 'Do you still have/get asthma?'					
Australia	(1)	2001	0 to 17 years	15.8%	13.4–18.2% (1,828)
ACT	(3)	1999–2001	4 to 6 years	24%	18.1–29.9% (204)
Ever had wheeze					
Remote communities, North Qld	(5)	2003	School age children	12.5%	8.9–16.2% (315)
Ever had wheeze or whistling in the chest					
WA	(2)	2001–02	0 to 17 years	28.0%	26.8–29.2% (5,513)
Ever had asthma ('short wind')					
Remote communities, North Qld	(5)	2003	School age children	12.2%	8.6–15.8% (315)
Remote communities, North Qld	(6)	1999	0 to 17 years	15.8%	14.0–17.6% (1,650)
Wheeze in last 12 months					
Tropical North, WA	(4)	2000	5 to 17 years	18.7%	13.2–30.1% (90)
Central Desert, WA	(4)	1999	5 to 17 years	8.8%	2.3–24.8% (34)
Remote communities, North Qld	(5)	2003	School age children	5.4%	1.9–7.9% (315)
Remote communities, North Qld	(6)	1999	0 to 17 years	12.4%	10.8–14.0% (1,650)
Wheeze or whistling in the chest in last 12 months					
ACT	(3)	1999–2001	4 to 6 years	20.8%	15.5–26.6% (207)

Sources: (1) ABS, National Health Survey 2001 (Indigenous CURF); (2) Zubrick et al. 2004; (3) ACT assessment of new primary school entrants (Glasgow et al. 2003); (4) Verheijden et al. 2002; (5) Valery et al. 2005; (6) Valery et al. 2001.

2.2 Health service use for asthma among children

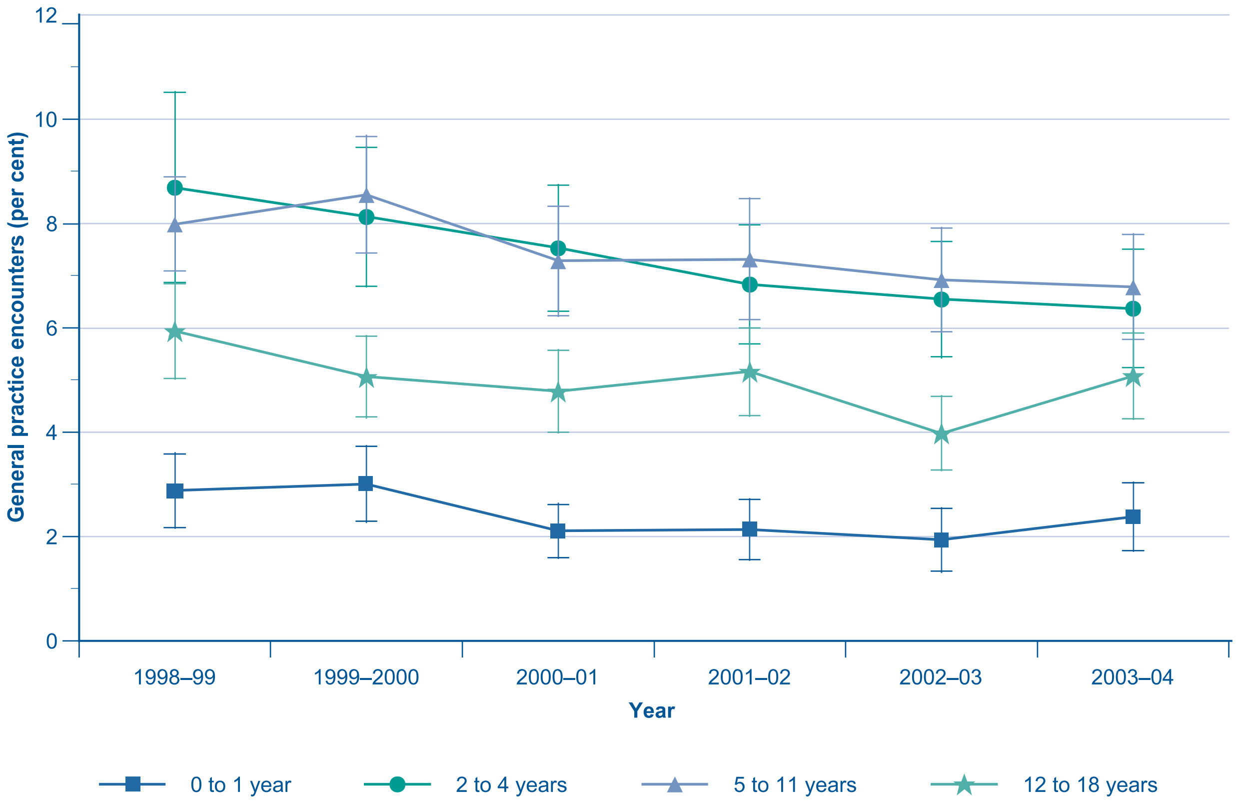
Health care utilisation for asthma commonly occurs as a consequence of an exacerbation of the disease. Less severe exacerbations of asthma are commonly managed at encounters with the patient's GP, while more severe exacerbations often result in visits to the emergency department and, sometimes, admission to hospital. Hence, data on the utilisation of these services for asthma can be used to monitor trends in the frequency and severity of exacerbations of asthma among children.

General practice encounters for asthma among children

General practice encounters include visits to GPs for routine review and the prescription of maintenance pharmaceutical therapy as well as the management of worsening asthma symptoms and asthma exacerbations. The estimates of asthma-related general practice encounters for children in this section are based on data from the Bettering the Evaluation and Care of Health (BEACH) survey (AIHW GPSCU 2002). These data do not distinguish visits for routine asthma care from those for exacerbations of asthma.

The proportion of general practice encounters for children where asthma was a problem managed gradually declined in all age groups during the period April 1998 to March 2004 (Figure 2.4).

Figure 2.4
Proportion of general practice encounters for asthma, by age group, children aged 0 to 18 years, Australia, April 1998 to March 2004



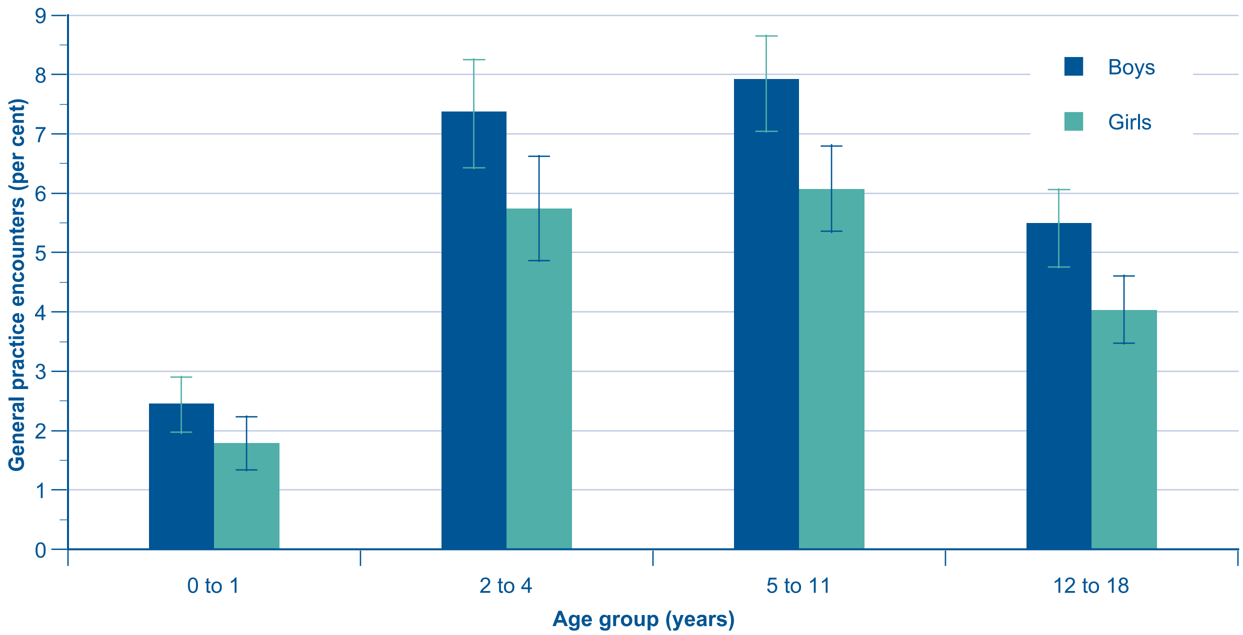
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March.

Source: BEACH Survey of General Practice.

The proportion of GP encounters at which asthma was managed was highest in pre-school and primary school-aged children (Figure 2.5). Consistent with the prevalence of asthma, there were more GP encounters for asthma for boys than girls during the period 2001–04 (Figure 2.5). This difference was apparent in all childhood age groups and was most pronounced in school-aged children.

Figure 2.5

Proportion of general practice encounters for asthma, by age group and sex, children aged 0 to 18 years, Australia, April 2001 to March 2004



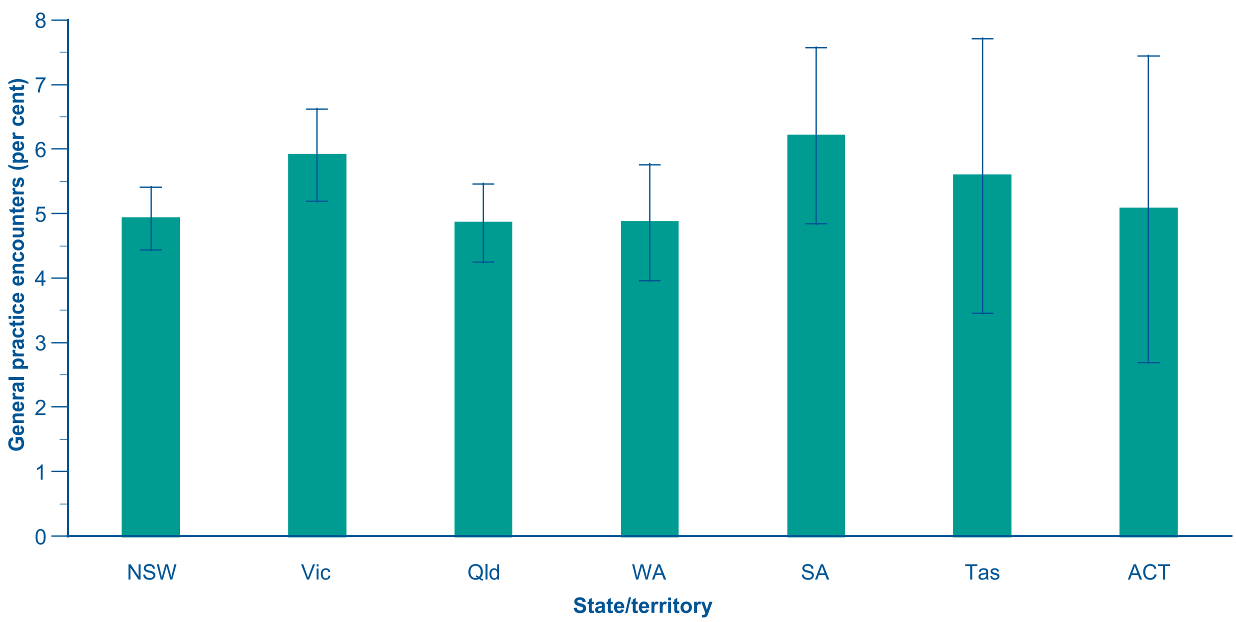
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March.

Source: BEACH Survey of General Practice.

The rates of asthma-related GP encounters for children did not differ significantly between states (Figure 2.6; see also Appendix 2, Table A2.1).

Figure 2.6

Proportion of general practice encounters for asthma, by state and territory, children aged 0 to 18 years, Australia, April 2001 to March 2004

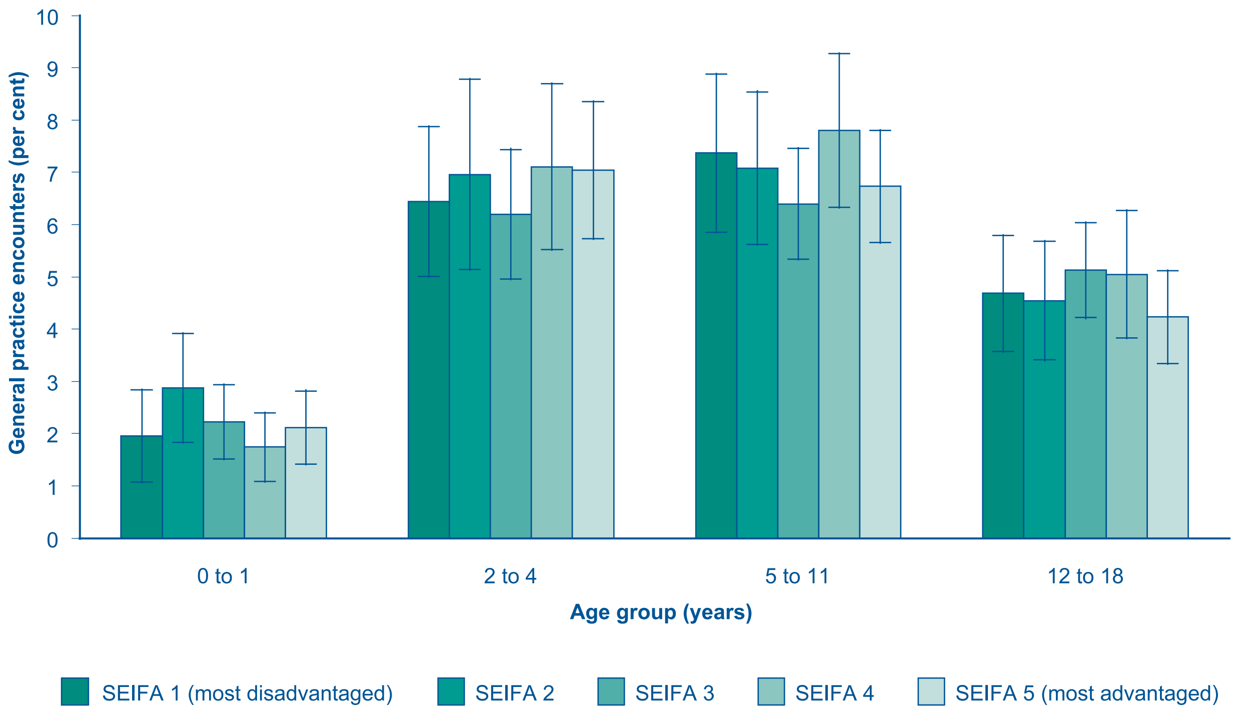


Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March. Northern Territory data excluded as the numbers are too small to produce reliable estimates.

Source: BEACH Survey of General Practice.

The proportion of GP encounters for asthma was not related to the level of socioeconomic disadvantage of the child's location of residence (Figure 2.7).

Figure 2.7
Proportion of general practice encounters for asthma, by age group and socioeconomic status, children aged 0 to 18 years, Australia, April 2001 to March 2004



Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March.

Source: BEACH Survey of General Practice.

Visits by children to hospital emergency departments for asthma

Emergency departments (EDs) are a key provider of urgent health care for children with exacerbations of asthma. In 2000–01, 67% of visits for exacerbations of asthma were among children aged 0 to 15 years (Kelly et al. 2003). Although most visits to EDs for asthma are precipitated by exacerbations, sometimes families use EDs as the major source of primary care. On the other hand, some families seek urgent care for exacerbations from their GP. Despite these limitations, rates of ED attendance are a good indicator of rates of moderate to severe exacerbations of asthma.

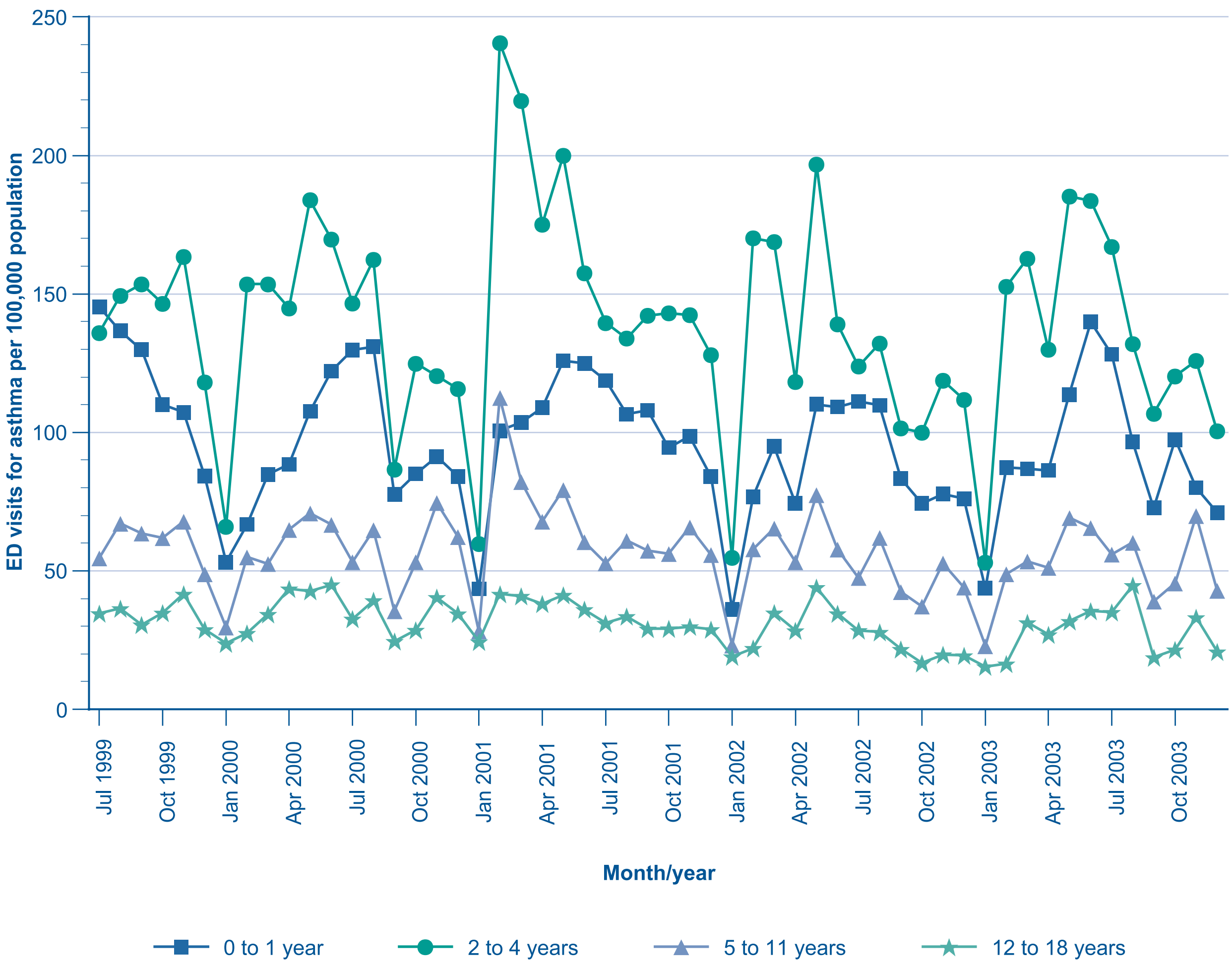
In this section, data on ED visits for children are derived from the New South Wales Emergency Department Data Collection and the Victorian Emergency Minimum Dataset. It should be noted that population coverage of the EDs included in these datasets is not complete. Hence, estimated population-based attendance rates, which are based on the total population of children in the two states, are an underestimate of the true attendance rates in the areas covered.

Trends over time

Despite very pronounced monthly fluctuations in asthma-related ED visits by children, there was no overall time trend evident over the period from mid-1999 to 2003 (Figure 2.8). A particularly notable peak occurred in February 2001 in all childhood age groups. It was most evident in pre-school and primary school-aged children. Less pronounced February peaks also occurred in other years and also in May and June of most years.

Figure 2.8

Emergency department visits for asthma per 100,000 population, by month and age group, children aged 0 to 18 years, New South Wales and Victoria, July 1999 to December 2003



Note: Data are aggregated from July 1999 to December 2003 for New South Wales and Victoria combined since population data for age 0 to 1 year were only available to December 2003.

Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services; Australian Bureau of Statistics.

Seasonal variation

Weekly variation in the rate of ED visits for asthma does not show a strictly seasonal pattern (Figure 2.9). In all age groups the lowest rates of presentation were in December and January. However, February, the last month of summer, had the highest rate of ED visits for pre-school and primary school-aged children and this increased rate extended into early autumn. Rates of ED visits were also above average from mid-May (late autumn) to the end of August (end of winter), except for a brief period of lower rates in school-aged children during July, which coincided with school holidays. In fact, rates tended to be lower among school-aged children during, and immediately after, most school holiday periods. However, rates of ED visits were above average 2–4 weeks after each return to school. Apart from December and January and the school holiday periods, the other time of low rates of ED visits was early to mid-spring (September and October), in all childhood age groups.

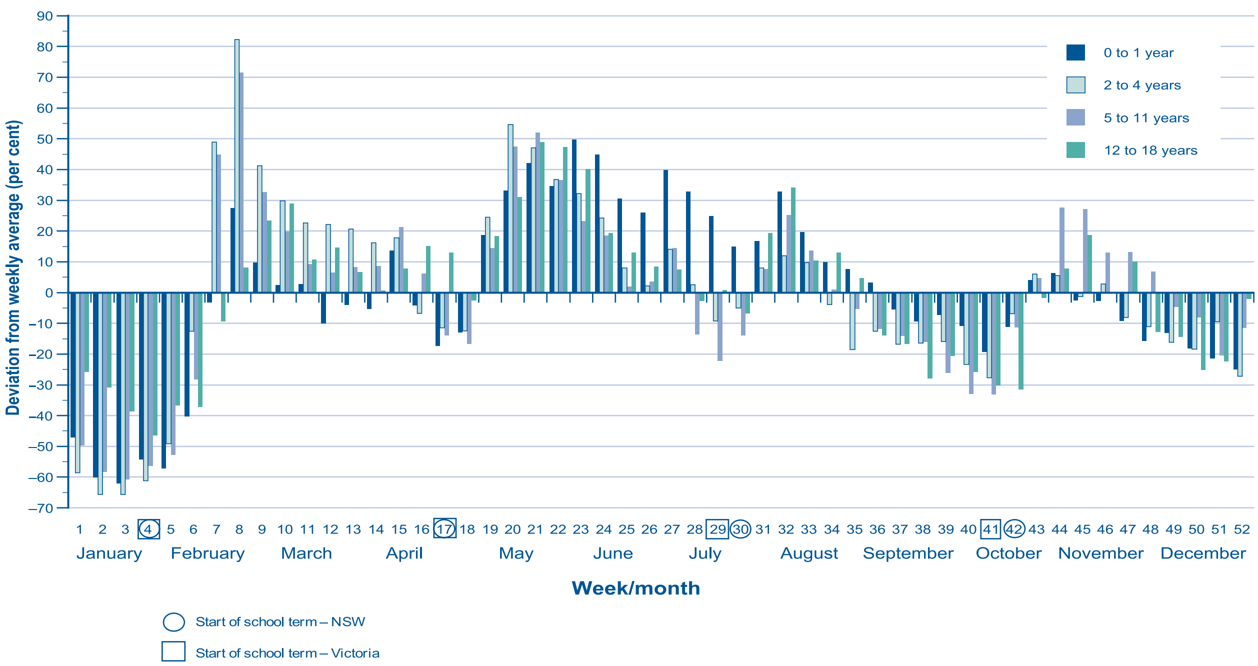
Among infants, the rate of ED visits for asthma was higher than average during the winter months and, unlike other age groups, this higher rate persisted for infants until the beginning of spring in September. There was also a smaller peak in February, which occurred a week or two after the peak observed in children aged 2 to 11 years.

Among adolescent children (12 to 18 years) the deviations from average were more moderate than among other age groups. Unlike other childhood age groups, the number of visits in February was not above average in this older age group, although a slightly later and more modest increase occurred in early March.

These findings are broadly consistent with other studies that report the lowest rates in summer months, and the highest in autumn and winter (Gergen et al. 2002; Silverman et al. 2003). In northern hemisphere countries, a peak in ED visits has also been reported in September (Garty et al. 1998; Johnston et al. 2005). In the northern hemisphere, September corresponds to the return to school for children after their summer holidays. In Australia, this event occurs in late January or early February. In New South Wales, peaks in ED visits for asthma in February have been previously noted (Lister et al. 2001). The predominant trigger for asthma symptoms in young children is viral respiratory tract infections (Johnston et al. 1995). It has been suggested that the return to pre-school and school could precipitate increased transmission of viral respiratory tract infections and a subsequent increase in exacerbations of asthma among susceptible children (Johnston et al. 2005). Direct evidence for this explanation is not yet available.

Figure 2.9

Average weekly deviation from average number of emergency department visits attributed to asthma, children aged 0 to 18 years, New South Wales and Victoria, 1999–2004

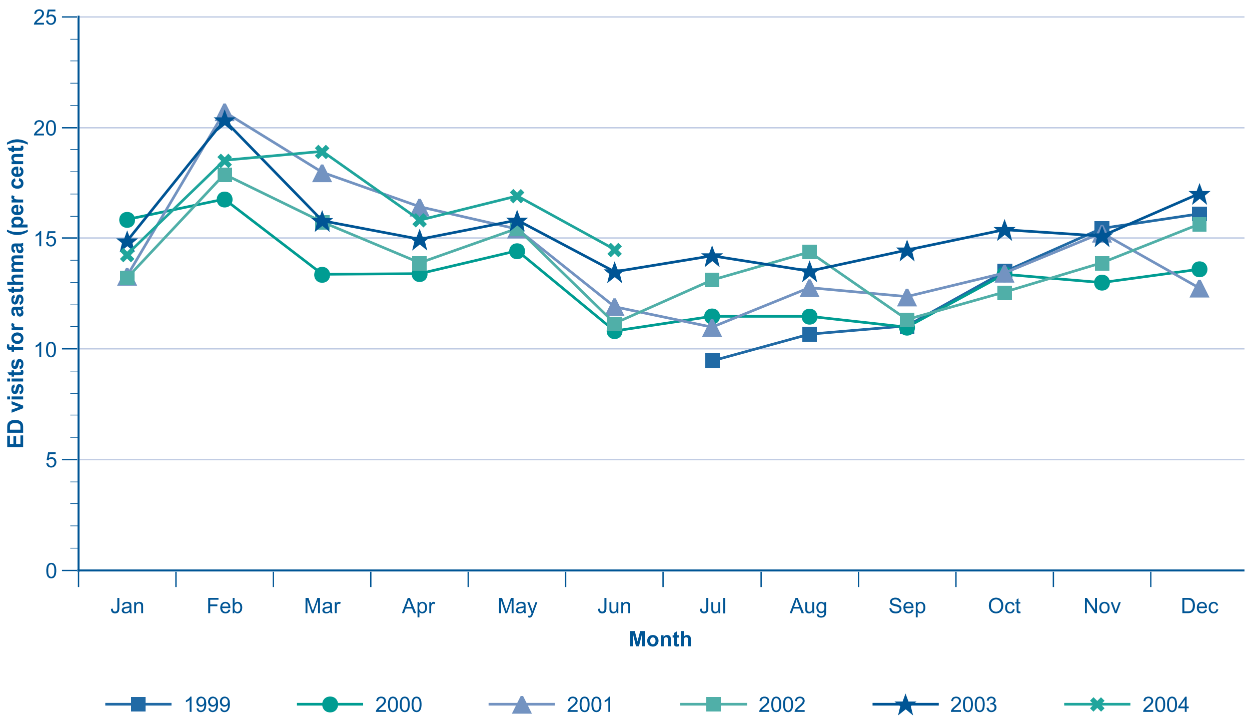


Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

Previous analyses in New South Wales have used triage status to explore ED visits for severe asthma (Lincoln & Muscatello 2001). Triage status is the status assigned to patients at initial presentation to ED. It represents the nurse's assessment of the degree of urgency with which the patient should be medically assessed and, hence, broadly reflects the severity or acuity of the presenting problem. Using these data we have defined 'severe asthma' as cases that were assigned triage category 1: 'resuscitation' or 2: 'emergency'. These cases receive medical attention within 10 minutes. Some caution is required in interpreting triage status as a marker of severity. There is likely to be substantial variation in the way in which this label is applied, since it is based on preliminary assessment and is designed to prioritise care, not assess severity. Furthermore, the assignment of triage status may be influenced by the workload within the ED at the time the assignment is made. The monthly proportion of ED visits for severe asthma, as defined above, among children in New South Wales and Victoria, by year, during the period 1999–2004 revealed no consistent difference between childhood age groups, in the proportion assessed as having severe asthma. The overall pattern was consistent in all years, and indicates that February, the month with the highest number of ED visits for asthma among children, also had the highest proportion of severe cases (Figure 2.10). Interestingly, the lowest proportion of severe cases, in all years, occurred during the winter months (June to August) despite this being a time when the rate of ED visits for asthma was higher than average. This indicates that the peak in asthma ED visits observed among children in February was higher in both rate and severity than at other times of the year. On the other hand, the higher rate of ED visits for asthma in winter months included a higher proportion of patients with less severe presentations, as assessed by triage status.

Figure 2.10

Monthly percentage of emergency department visits for asthma that were for severe asthma, children aged 0 to 18 years, New South Wales and Victoria, July 1999 to June 2004

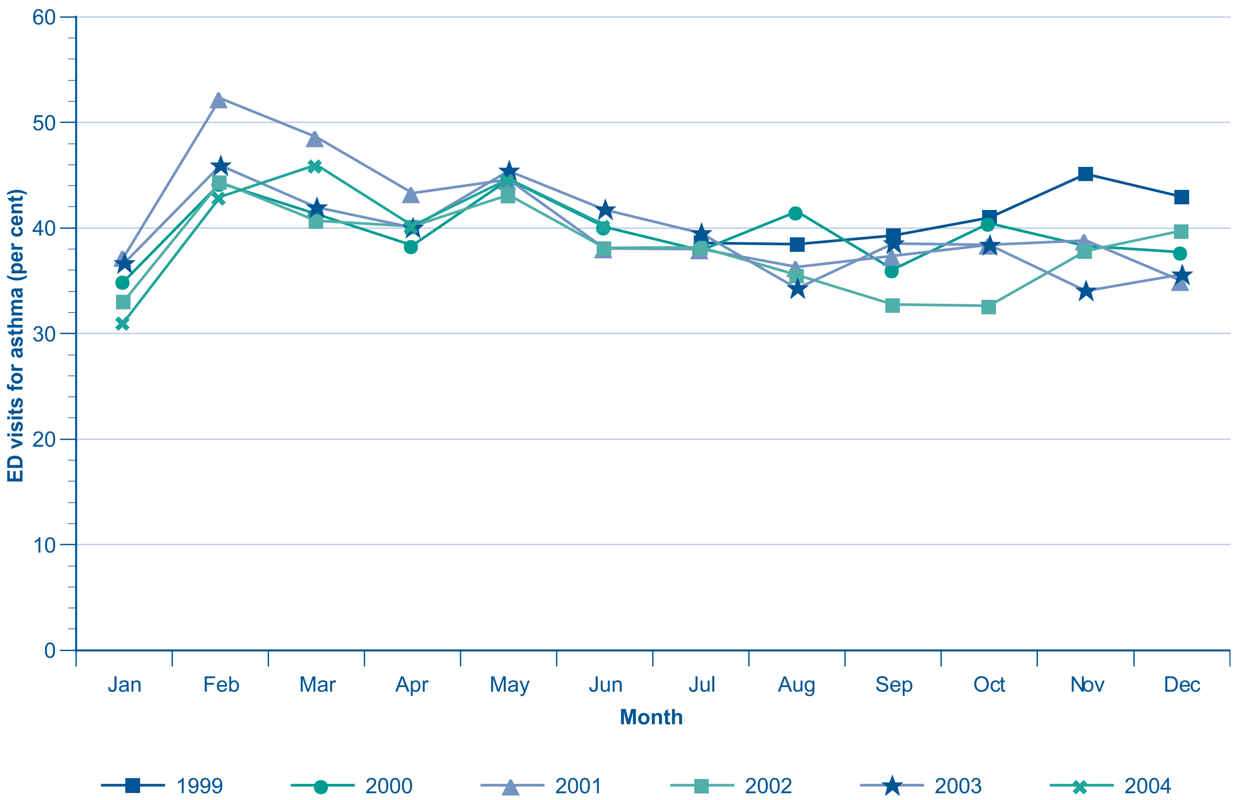


Note: 'Severe asthma' was defined as an ED visit assessed as triage category 1 (resuscitation) or 2 (emergency), and requiring medical attention within 10 minutes (Lincoln & Muscatello 2001).

Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

An alternative means of identifying ED visits for more severe asthma exacerbations is to analyse those ED visits for asthma that resulted in hospital admission. Children whose outcome status from an ED visit is 'admission to hospital' are likely to have more severe asthma than children who are discharged home from the ED. Using admission to hospital as a marker for severe asthma it was observed that a higher proportion of ED visits for asthma resulted in admission in February of most years, and to a lesser extent in May (Figure 2.11). The lowest proportion occurred in January. This is consistent with data using triage status to identify ED visits for severe asthma (Figure 2.10).

Figure 2.11
Monthly percentage of emergency department visits for asthma that resulted in admission to hospital, children aged 0 to 18 years, New South Wales and Victoria, July 1999 to June 2004



Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services

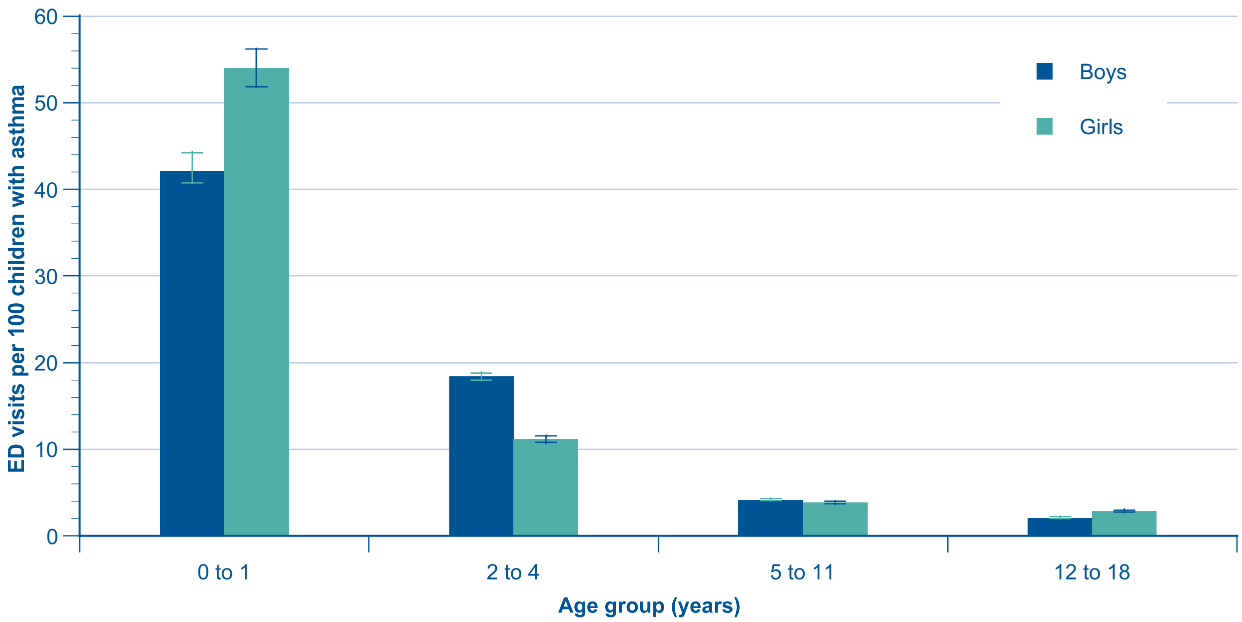
Age and sex

Relative to the prevalence of asthma in each age group, rates of ED visits for asthma were much higher in infants than in older children. Rates decreased with increasing age.

Among infants aged 0 to 1 year, the rate of ED visits for asthma, expressed as a proportion of the number of infants who have asthma, was higher for girls than boys. This was reversed among children aged 2 to 4 years. In this age group boys with asthma were more likely to visit EDs due to asthma. Among children with asthma who were aged 5 years and over, the likelihood of visiting EDs for asthma did not differ between males and females (Figure 2.12; see also Appendix 2, Table A2.2).

Figure 2.12

Emergency department visits for asthma per 100 children with asthma, by age group and sex, children aged 0 to 18 years, New South Wales and Victoria, 1999–2004



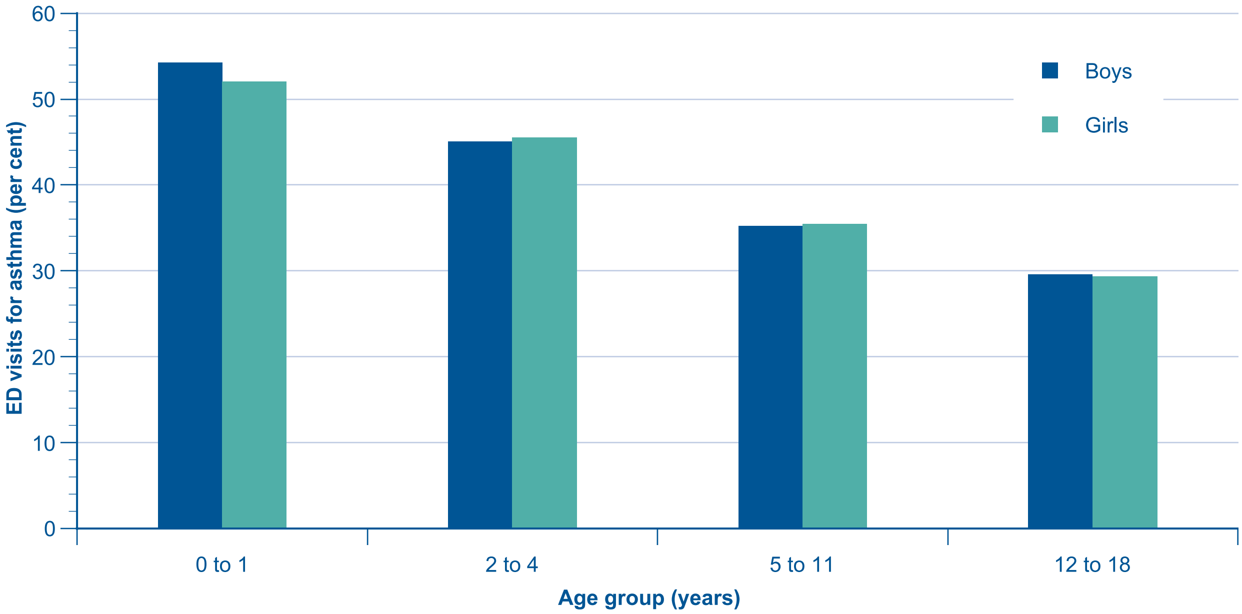
Note: Data are aggregated from July 1999 to June 2004 and include average ED presentations for asthma for New South Wales and Victoria combined.

Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services; ABS National Health Survey 2001.

Infants visiting EDs due to asthma were more likely to be admitted to hospital than older children (Figure 2.13; p trend<0.001). During the period 1999–2004, 53.5% of infants aged 0 to 1 year who were taken to an ED for asthma were then admitted to hospital. Among children aged 12 to 18 years, around 29.5% were admitted to hospital as a result of the ED visit. This may reflect the fact that younger children are more likely to be presenting with their first episode of asthma. It may also reflect a greater sense of caution in dealing with younger children.

Figure 2.13

Emergency department visits for asthma resulting in admission to hospital, by age group and sex, children aged 0 to 18 years, New South Wales and Victoria, 1999–2004



Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

Hospitalisations for asthma in children

Asthma represents one of the most common reasons for admission to hospital in childhood. Hospitalisation for asthma reflects severe exacerbations. Most admissions to hospital for asthma occur via the ED. As noted in the previous section, 30% to 50% of children who visit EDs for asthma are admitted to hospital (Figure 2.13). Admission rates from EDs are higher in the younger age groups.

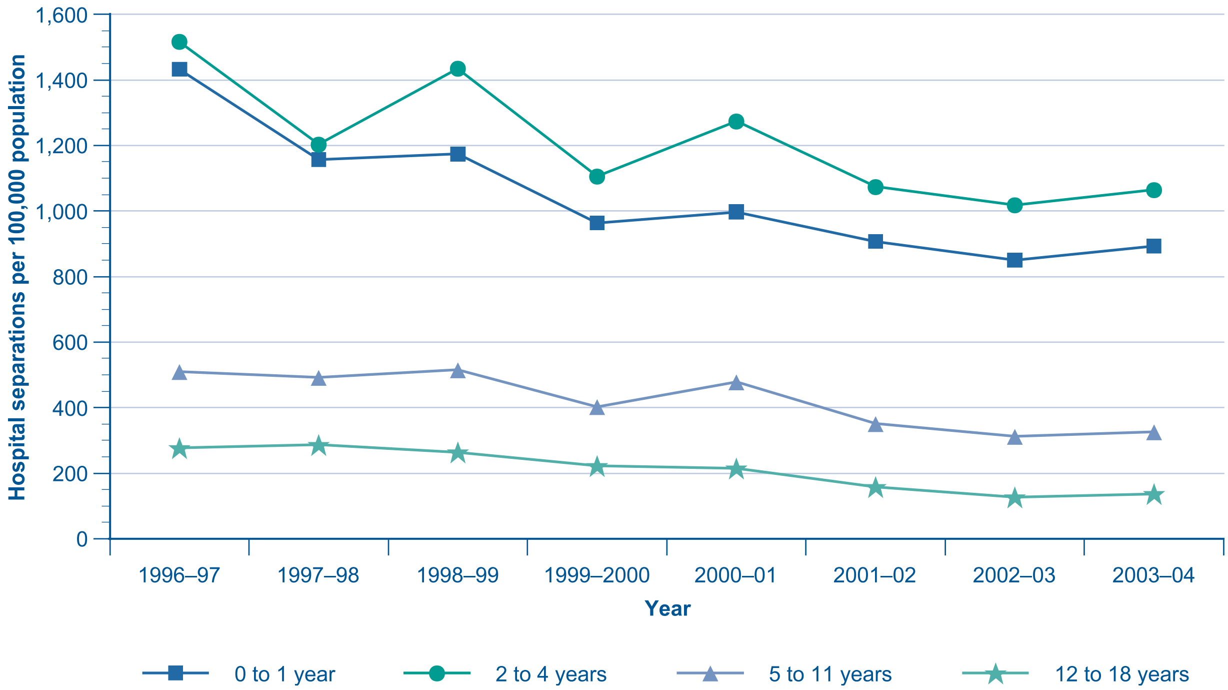
In this section, we use data from the National Hospital Morbidity Database (AIHW) to investigate hospital utilisation for asthma among children. The term ‘hospital separation’ is used to refer to the formal process by which a hospital records the completion of treatment and/or care for an admitted patient. Each separation represents one episode of hospitalisation (or admission).

In 2002–03, there were 20,466 hospital separations for asthma among children aged 0 to 18 years. This represents just over half of all separations for asthma (55%).

Trends over time

Overall, hospitalisations for asthma among children have been on a decreasing trend since 1996–97 (Figure 2.14). This trend was observed in all age groups and was steeper when hospital bed utilisation was expressed as patient-days hospitalised for asthma (see Figure 5.22), reflecting the coinciding reduction in average length of stay for children admitted with asthma.

Figure 2.14
Hospital separations for asthma per 100,000 population, children aged 0 to 18 years, Australia, 1996–2004



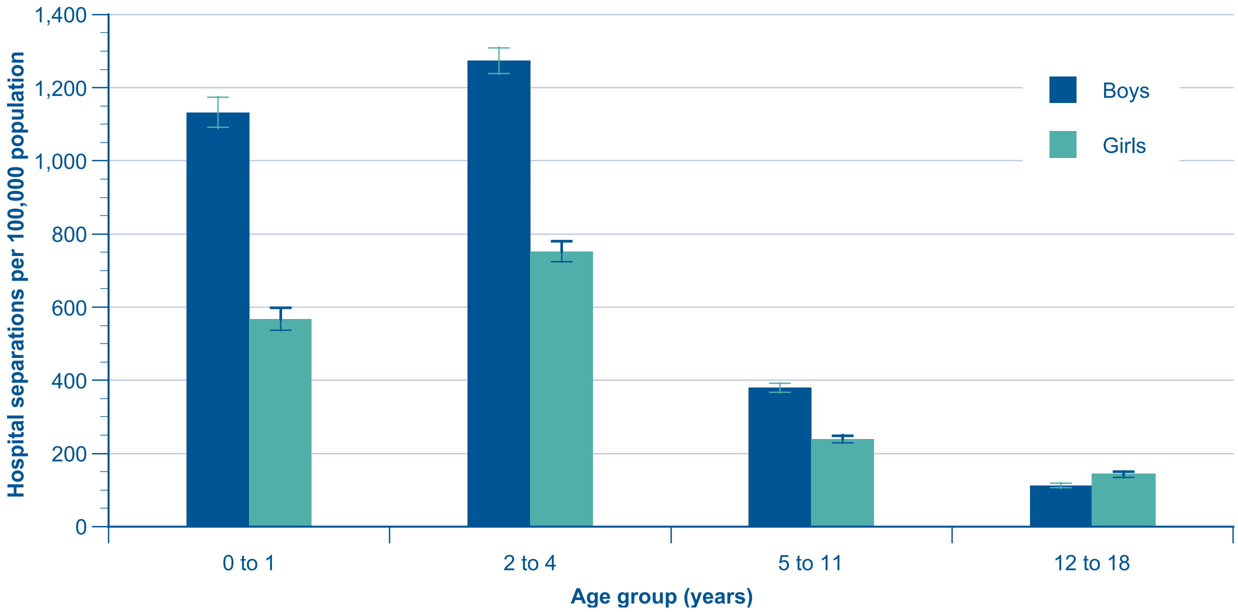
Note: Age standardised to the Australian population as at 30 June 2001. Asthma classified according to ICD-9-CM code 493 and ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Age and sex

Age and sex rates of hospital separation for asthma were much higher in infants and pre-school children than in school-aged children (Figure 2.15). In this younger age group, the rates were almost two times higher in boys than in girls. The male predominance was less marked in primary school-aged children. This pattern was reversed in the 12 to 18 year age group, with females having a slightly higher rate of hospitalisation than males.

Figure 2.15
Hospital separations for asthma per 100,000 population, by age group and sex, children aged 0 to 18 years, Australia, 2002–03



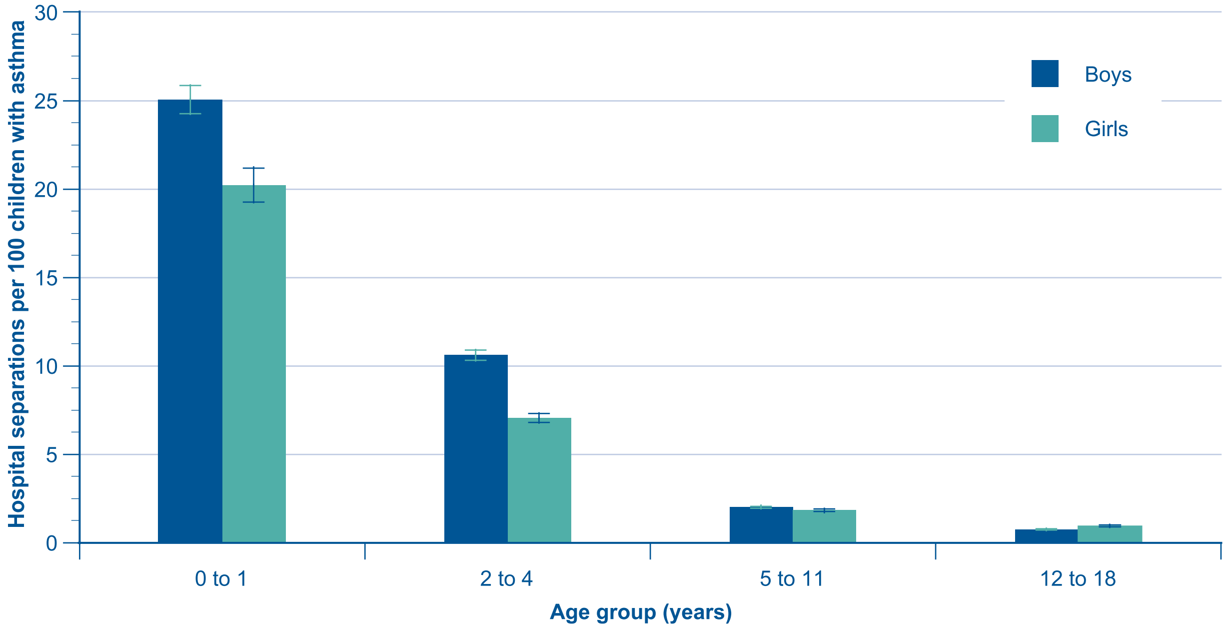
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

The differences in hospitalisation rates for boys and girls are partially explained by differences in disease prevalence. As shown in Figure 2.2, a higher prevalence of current asthma was reported among boys than girls in the 2001 ABS National Health Survey. In Figure 2.16, hospitalisations for asthma have been expressed as a rate per 100 children with current asthma, as estimated by the 2001 ABS National Health Survey, for each age and sex group. Young children with asthma were much more likely to be admitted to hospital because of asthma than older children (Figure 2.16; see also Appendix 2, Table A2.3). Among infant boys there were an estimated 25 hospital separations per 100 boys with asthma in the 2002–03 financial year in this age group. This implies that most of the age-related differences in separation rates noted in Figure 2.15 were attributable to a higher case-admission rate (i.e. a higher likelihood of admission to hospital in those with asthma) in younger children. However, the gender differences are less marked when separation rates are adjusted for prevalence rates. Most of the higher rate of hospitalisation for asthma among pre-school-aged boys is attributable to the higher prevalence of asthma among boys in this age group. Nevertheless, there remains evidence of a higher case-admission rate in pre-school-aged boys. As noted previously, in relation to admission from EDs, high case-admission rates in young children may reflect the fact that many presentations with asthma in this age group are the first.

Figure 2.16

Hospital separations for asthma per 100 children with asthma, by age group and sex, children aged 0 to 18 years, Australia, 2002–03



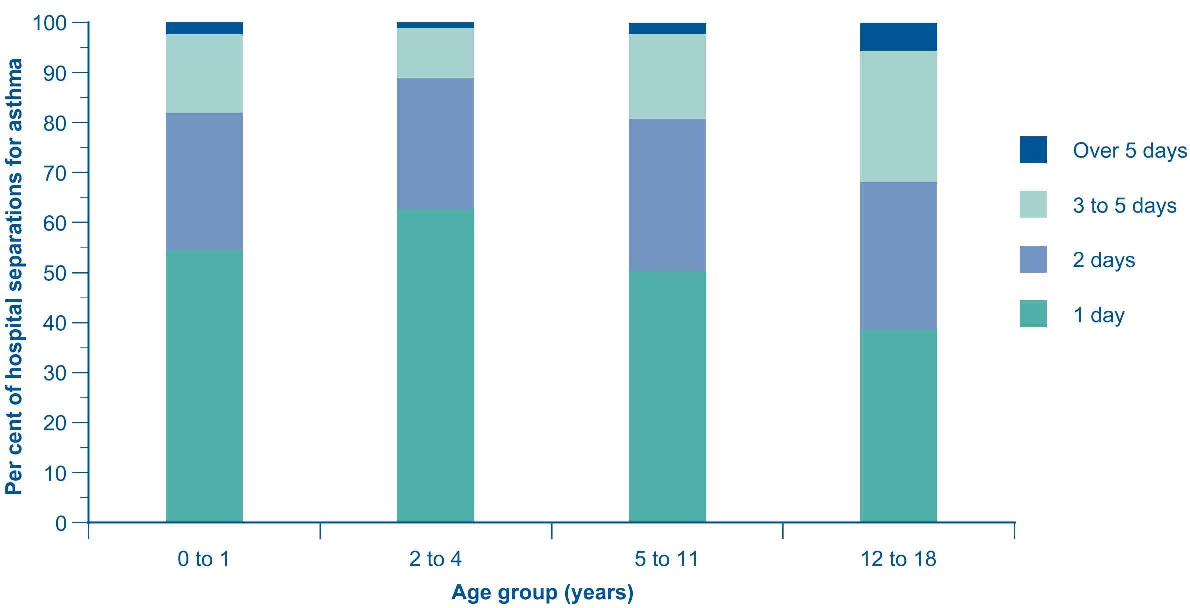
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; ABS National Health Survey 2001.

While children aged 12 to 18 years were less likely to be admitted to hospital, when they were admitted they tended to have longer hospital stays than children in younger age groups. Children aged 2 to 4 years had the highest rates of same day hospital episodes of care (Figure 2.17).

Figure 2.17

Relative frequency of length of stay for asthma, by age group, children aged 0 to 18 years, Australia, 2002–03



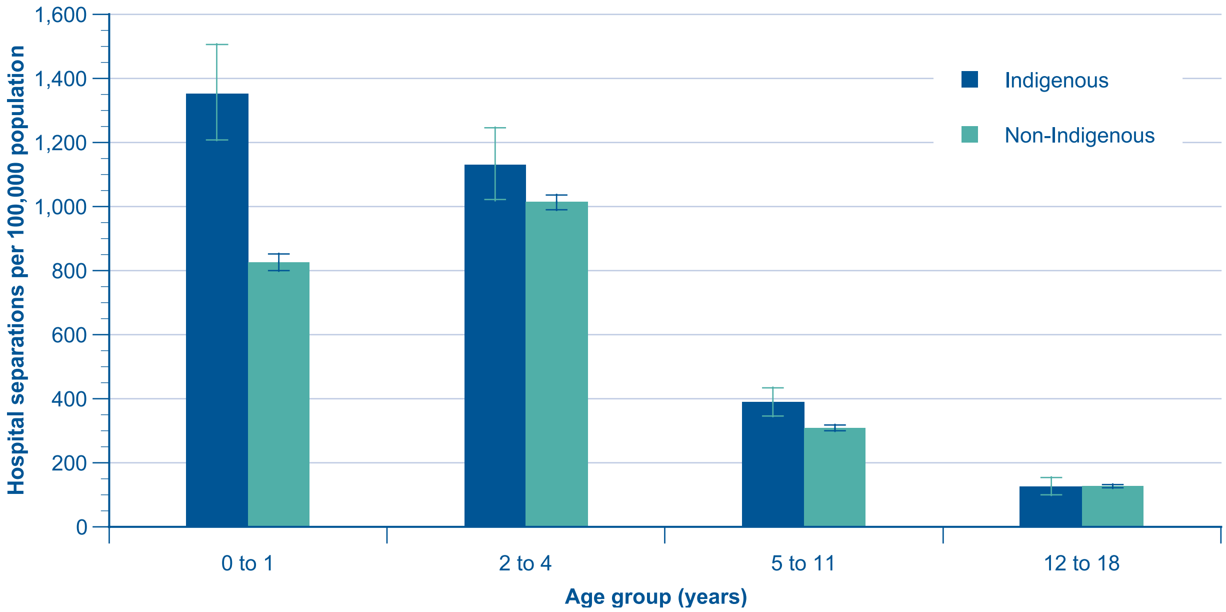
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Source: AIHW National Hospital Morbidity Database.

Aboriginal and Torres Strait Islander children

Indigenous children aged 0 to 1 year had a much higher rate of hospitalisation than other children, however, this difference was less evident in older children (Figure 2.18). It should be noted that hospitalisation rates for Aboriginal and Torres Strait Islander Children are likely to be an underestimate of the true hospitalisation rates due to under enumeration of Indigenous Australians in most states and territories. Only three jurisdictions are considered reliable; Northern Territory, Western Australia and South Australia.

Figure 2.18
Hospital separations for asthma per 100,000 population, by Indigenous status, children aged 0 to 18 years, Australia, 2002–03



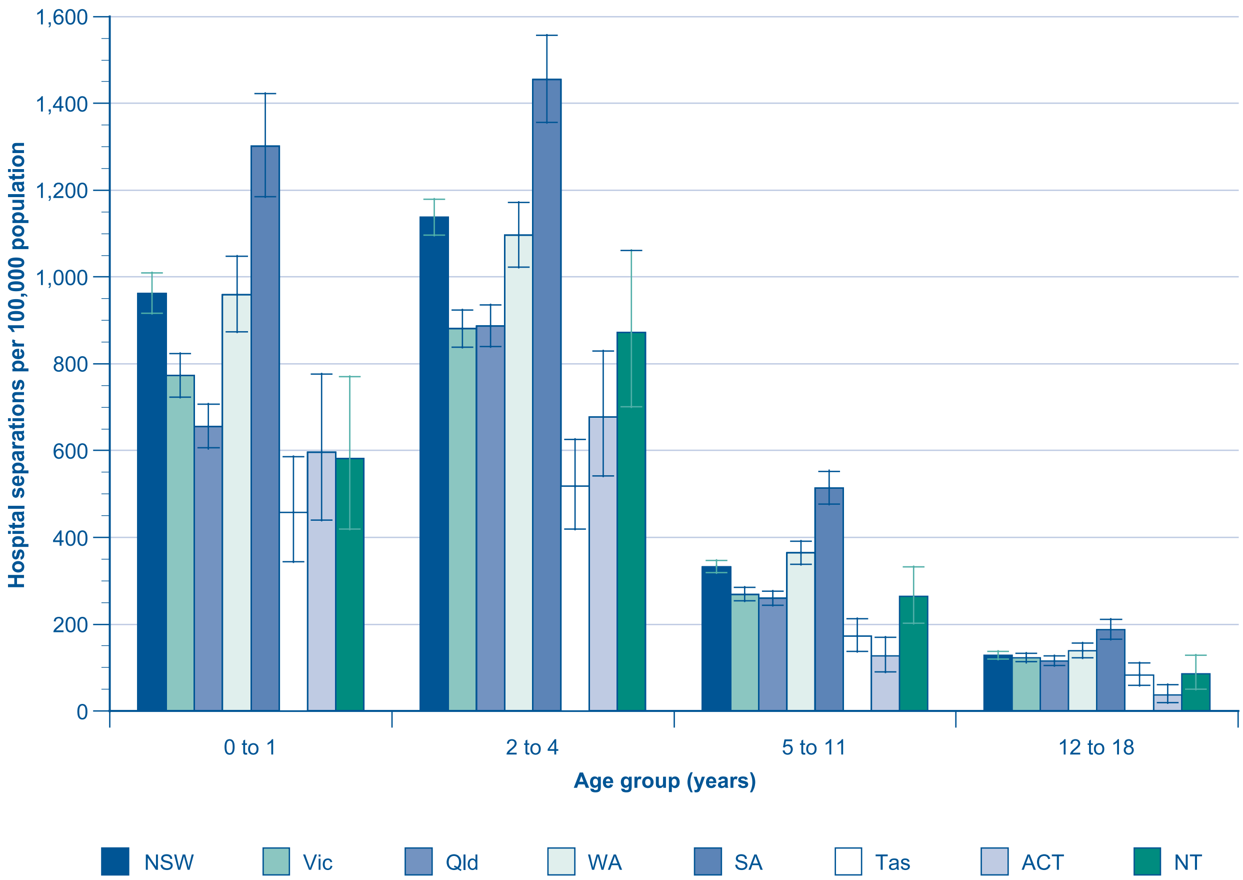
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

States and territories

Rates of hospital separation for asthma were higher in South Australia and lower in Tasmania than in the other states and territories in all age groups. Rates were also lower in the Australian Capital Territory in school-aged children (Figure 2.19; see also Appendix 2, Table A2.4).

Figure 2.19
Hospital separations for asthma per 100,000 population, by age group, state and territory, children aged 0 to 18 years, Australia, 2002–03



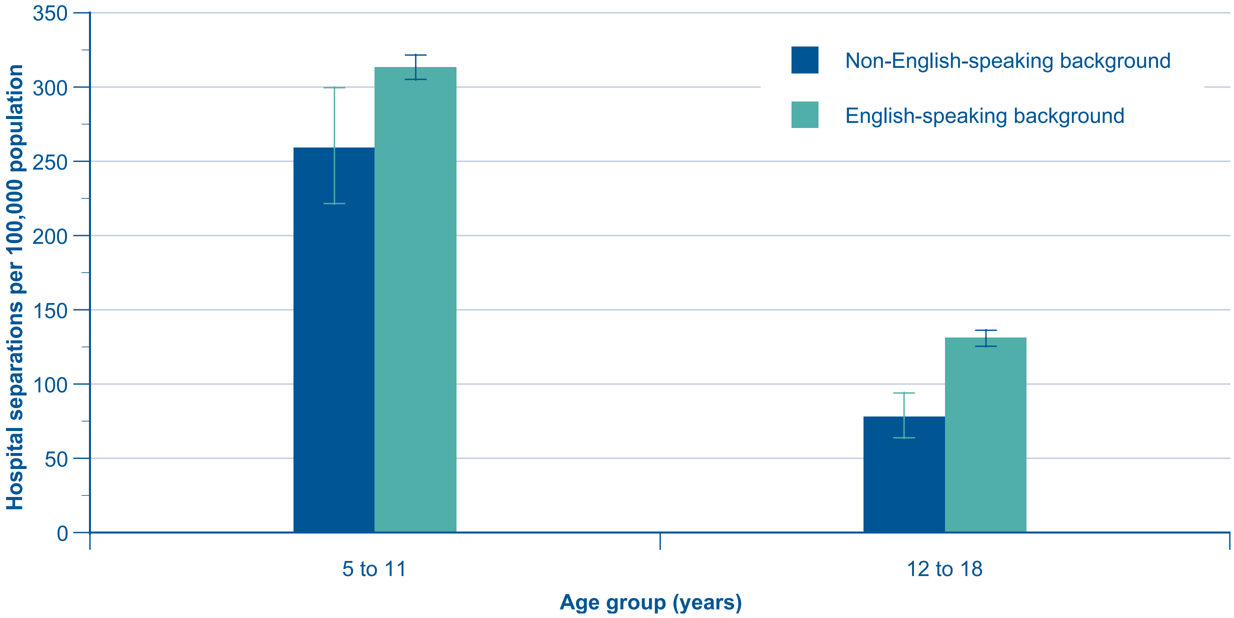
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Culturally and linguistically diverse background

Children from non-English-speaking backgrounds had slightly higher rates of hospitalisation than children from English-speaking backgrounds among those aged 2 to 4 years (p=0.06), and lower rates among those aged 5 years and over (p<0.05) (Figure 2.20).

Figure 2.20
Hospital separations for asthma per 100,000 population, by age group and English-speaking versus non-English-speaking background, children aged 5 to 18 years, Australia, 2002–03



Note: Asthma classified according to ICD-10-AM codes J45 & J46. For definition of non-English-speaking background and English-speaking background see Glossary.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

2.3 Management of asthma in children

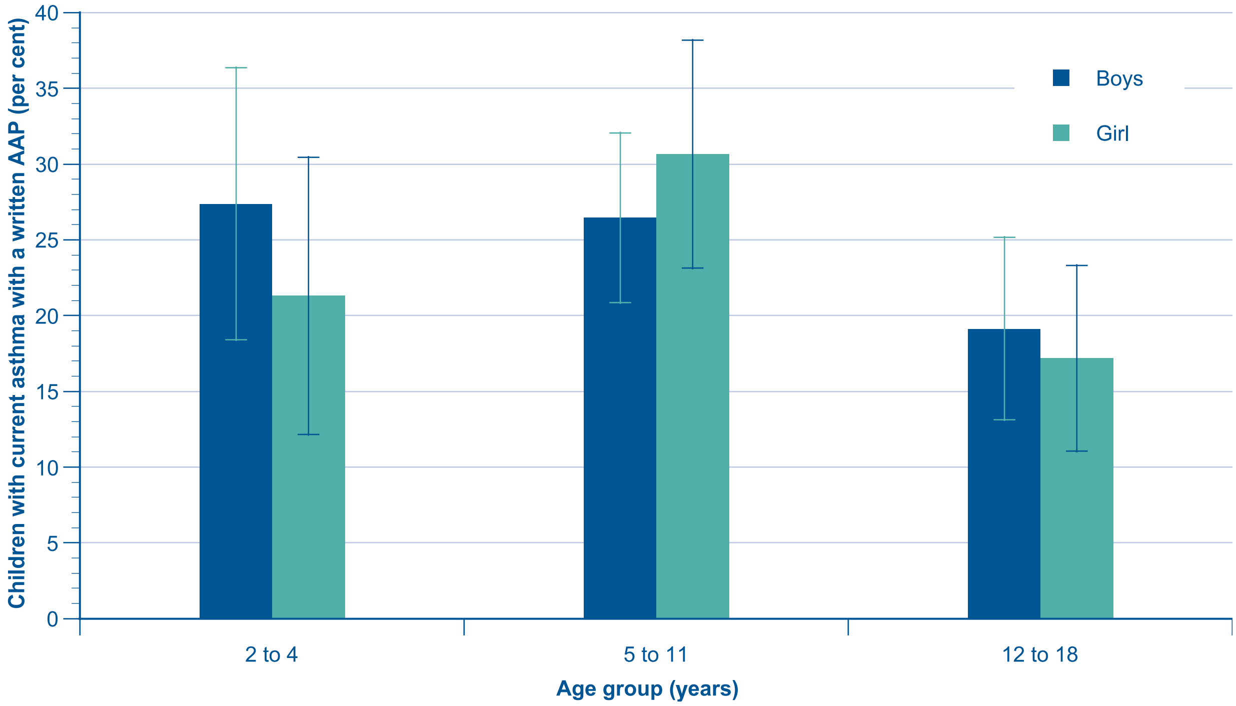
In this section, data from the Australian Bureau of Statistics 2001 National Health Survey have been analysed to investigate two aspects of the management of asthma in children: the possession of written asthma action plans and the use of asthma medications.

Written asthma action plans

Evidence from randomised controlled trials suggests that possession of written asthma action plans improves asthma outcomes, particularly if they have key components such as 2 to 4 action points and incorporate the use of inhaled and oral corticosteroid medication (Gibson & Powell 2004). A study conducted in Perth, Western Australia, found that the possession of a written asthma action plan was associated with a reduction in the number of ED visits or hospital admissions due to wheezing or asthma in schoolchildren aged 6 to 7 years (Palmer et al. 2004). Despite this, health survey data suggest that possession of written asthma action plans, while higher among children than adults, is quite low. According to data from the ABS 2001 National Health Survey, 23.6% (95% CI 20.8–26.4%) of children aged 0 to 18 years with current asthma possessed a written asthma action plan (National Health Survey 2001 (CURF)). In the Australian Capital Territory, 23.2% of new entrant primary school children aged 4 to 6 years with asthma reported that they had written asthma action plans (Glasgow et al. 2003). Rates from the New South Wales Health survey were higher, with 43.6% (95% CI 40.1–47.2%) of children aged 2 to 12 years with asthma reporting that they had written asthma action plans (Centre for Epidemiology and Research 2002).

Girls aged 5 to 11 years reported the highest rate of possession of written asthma action plans. However, this was only 30% of girls with asthma in that age group. Less than 1 in 5 of young people aged 12 to 18 years reported possession of a written asthma action plan (Figure 2.21).

Figure 2.21
Proportion with current asthma with a written asthma action plan (AAP), by age group and sex, children aged 2 to 18 years, Australia, 2001



Source: ABS National Health Survey 2001.

Medication use

In New South Wales, 59.4% of children aged 2 to 12 years with current asthma reported using a preventer medication (such as inhaled corticosteroids and cromones) in the last month. However, only 47.9% had used this medication every day or most days (Centre for Epidemiology and Research 2002). Among 6 to 7 year old children living in Melbourne in 2002, 14.1% of those with any recent wheeze and 40.9% of those with frequent wheeze were using inhaled corticosteroid as regular treatment (Robertson et al. 2004). These proportions had not changed significantly since a similar survey was conducted in 1993.

It is difficult to assess the importance of these findings without further information on the relation between treatment and the nature of asthma in individuals. Only a minority of children with asthma should be taking inhaled corticosteroids. Regular therapy with inhaled corticosteroids, leukotriene receptor antagonist or cromones is recommended for children with mild persistent asthma and children with frequent episodic asthma. Those with moderate or severe persistent asthma should be treated with inhaled corticosteroids.

Summary

Asthma is a common health complaint among Australian children. There is a substantial burden of health care utilisation attributable to asthma, especially in younger children. Fortunately, there is some evidence that this burden is decreasing slightly and, when hospital admission does occur, it is predominantly of pre-school-aged children and is almost always very brief. The marked week-to-week variation in rates of emergency department visits for asthma implies an important role for variable environmental triggers in causing disease exacerbations. High rates in winter and 2–4 weeks after return to school may be attributable to transmission of viral infections, which are the predominant cause of exacerbations of asthma in children. Potential strategies to prevent or control exacerbations, such as written asthma action plans and use of preventer medications, seem to be utilised by a minority of children with asthma. The potential benefit to be gained by optimising usage of these management strategies cannot be ascertained from the available data.

Prevalence

3

Key points

- Estimates of the prevalence of current asthma among adults, based on self-report, range from 10% to 12%.
- Estimates of the prevalence of current asthma in children range from 14% to 16%, based on self-report.
- The prevalence of asthma increased during the 1980s and early-to-mid 1990s. However, in recent years there is some evidence that this trend has plateaued and may even have reversed in children.
- The prevalence of asthma in Australia is high by international standards.
- Among children, boys have a higher rate of asthma than girls. However, after teenage years, asthma is more common in women than in men.
- The prevalence of asthma is higher among Aboriginal and Torres Strait Islander women than among other Australian women. The difference is particularly apparent among women aged 35 years and over.
- Those living in the most socioeconomically disadvantaged localities do not have a substantially different prevalence of asthma compared with those in the most advantaged areas.
- Overall, the prevalence of asthma does not differ substantially among the states or territories or between major cities, inner regional areas and outer regional and remote areas.
- People from non-English-speaking backgrounds have a lower prevalence of asthma than those from English-speaking backgrounds.

Introduction

Estimating the number of people in the community who have asthma is fundamentally important in assessing the impact of asthma at a population level. It is relevant to estimating resource needs and priorities both now and in the future. Examining differences among population subgroups in the prevalence of asthma provides insights into possible causative factors and also assists in targeting resources to areas of need. Finally, examination of changes over time in the number of people who have asthma contributes to the evaluation of population-based efforts to prevent the disease and, if a rising trend is observed, may stimulate the search for an environmental or lifestyle-related cause for that rise.

In this chapter we present data on the prevalence of asthma in Australia gathered from a wide range of sources. Data on time trends, differences among population groups, and international comparisons are reported.

In interpreting the information presented in this chapter, it is important to be aware of difficulties in measuring asthma and reporting its prevalence. There is no universally applied definition for asthma. The prevalence of asthma has been estimated using a wide range of subjective, or self-reported, and objective measures, alone or in combination, in both clinical and population-based settings. Self-reported measures include doctor diagnosis of asthma—self or parent-reported (Robertson et al. 1991; Ruffin et al. 2001); symptoms, such as wheeze (Grant et al. 1999; ISAAC 1995; Robertson et al. 1991), shortness of breath (particularly at night) (Burney et al. 1996; Woods et al. 2001), cough at night (Grant et al. 2000), and wheezing with exercise (Grant et al. 2000; Jones 1994; Ponsonby et al. 1996); and taking treatment for asthma (Burney et al. 1996).

Objective measures include measuring the twitchiness of the airways in response to inhaled stimuli (known as 'bronchial provocation challenge test') or measuring the extent to which airway narrowing can be reversed by inhaled medication (known as 'bronchodilator reversibility test') (Toelle et al. 2004); and measurement of day-to-day variability in airway narrowing ('peak flow variability') (Parameswaran et al. 1999).

This broad range of measures, all of which are relevant to asthma, has led to considerable controversy about exactly how best to identify this disease in population studies and, hence, how best to quantify the prevalence of the disease. As will be seen in this chapter, the observed variation in the prevalence of asthma owes more to the differences in definitions, than to real variation.

Over the last decade the prevalence of asthma in Australia has been measured in a range of population health surveys, including the Australian Bureau of Statistics' (ABS) National Health Survey and state and territory health surveillance programs. However, there are limited time series data available from these survey programs. Many surveys have been conducted only once, or, where there are repeated measures, the definition used to identify people with asthma has changed. There are some international studies involving Australia (Abramson et al. 1996; ISAAC 1998; Robertson et al. 1998), and there are results from studies of local populations (Haby et al. 2001; Peat et al. 1994; Toelle et al. 2004).

3.1 Prevalence of asthma

It has been estimated that 3,864,987 Australians have ever been diagnosed with asthma by a doctor (ABS 2002a). Of these, 2,199,411, or 11.6% of the population, stated that they still had asthma in 2001 (i.e. had current asthma). These estimates are based on data from the National Health Survey 2001, which is the only nationally representative, household survey in which the prevalence of asthma has been measured. In this survey 13.8% of children aged 0 to 17 years and 10.8% of adults aged 18 years and over reported current asthma.

In addition to the nationwide National Health Survey, a number of state, territory and locally-based surveys of the prevalence of asthma have been conducted (Tables 3.1, 3.2 and 3.3). There is some variation in the survey methods used, the age ranges surveyed, the sample sizes, and, most importantly, the way in which asthma was measured (see Appendix 1, Section A1.2, for a further description of asthma prevalence questions used in Australian health surveys). Hence, the data from these surveys cannot be used to compare prevalence rates among states or other population subgroups. Nevertheless, an examination of the range of values obtained in these surveys gives an idea of likely true prevalence of asthma in the population.

Among adults, the prevalence of reporting ever having been diagnosed with asthma ranges from 17% to 25%, with most estimates between 19% and 21% (Table 3.1; see also Appendix 2, Table A2.5). The prevalence of current asthma among adults has ranged from 9% to 15%, with most estimates falling between 10% and 12% (Table 3.2; see also Appendix 2, Table A2.6).

In four surveys conducted among children, estimates of the number who had ever been diagnosed with asthma ranged from 20% to 26%. Most estimates of the proportion of children with current asthma ranged between 14% and 16%, based on self-report (Table 3.3). Additional studies providing estimates of the prevalence of asthma among children have been included in Table 2.1 and Table 2.2 in Chapter 2.

Table 3.1
Prevalence of asthma ever being diagnosed by a doctor, adults, most recent health survey results, Australia, 1998–2004

Location	Survey	Year	Age range	Rates	95% CI
Australia	(1)	2001	18 years and over	19.0%	18.3–19.6%
NSW	(2)	2004	16 years and over	20.4%	19.1–21.6%
NT	(3)	2000	18 years and over	16.8%	15.4–18.4%
Qld	(4)	2004	18 years and over	24.5%	22.7–26.3%
SA	(5)	2003–04	16 years and over	20.1%	19.1–21.2%
SA	(3)	2000	18 years and over	18.1%	16.6–19.6%
Vic	(6)	2003	18 years and over	20.4%	19.5–21.3%
Melbourne, Vic	(7)	1998	20 to 44 years	18%	17–20%
WA	(8)	2004	16 years and over	18.1%	16.9–19.4%
WA	(3)	2000	18 years and over	17.6%	16.2–19.1%

Note: Only most recent estimates were included in this table from surveys periodically repeated in the same population using the same methods (e.g. repeat state CATI health surveys).

Sources: These estimates were obtained from the following surveys and studies: (1) ABS National Health Survey 2001 (CURF); (2) NSW Adult Health Survey 2004, Centre for Epidemiology and Research, NSW Department of Health (unpublished data) 2005; (3) WANTS Health and Well-Being Survey (D'Espaignet et al. 2002; Taylor et al. 2002); (4) 2004 Queensland Omnibus Survey, Health information Branch, Queensland Health (unpublished data) 2005; (5) South Australian Monitoring and Surveillance System, Population Research and Outcome Studies Unit, SA Department of Human Services (unpublished data), 2005; (6) Victorian Population Health Survey 2003, Victorian Department of Human Services, unpublished data, 2005; (7) ECRHS methodology (Woods et al. 2001); (8) Health and Wellbeing Surveillance System, Health Information Centre, WA Department of Health (unpublished data) 2005.

Table 3.2
Prevalence of current asthma in adults, most recent health survey results, Australia, 1998–2004

Location	Survey	Year	Age range	Rates	95% CI
Ever doctor-diagnosed asthma AND symptoms of asthma or taken treatment for asthma in last 12 months					
NSW	(2)	2004	16 years and over	10.4%	9.5–11.4%
Qld	(4)	2004	18 years and over	15.1%	13.6–16.5%
SA	(5)	2003–04	16 years and over	14.1%	13.2–15.0%
WA	(7)	2004	16 years and over	11.0%	9.9–12.0%
Ever doctor-diagnosed asthma AND symptoms in the last 12 months					
Vic	(6)	2003	18 years and over	11.7%	10.7–12.7%
Ever doctor-diagnosed asthma plus 'Yes' to 'Do you still have/get asthma'?					
Australia	(1)	2001	18 years and over	10.8%	10.3–11.4%
SA	(8)	2001	18 years and over	8.9%	7.9–10.0%
WA	(3)	2000	18 years and over	10.8%	9.6–12.0%
SA	(3)	2000	18 years and over	12.7%	11.4–14.0%
NT	(3)	2000	18 years and over	9.8%	8.7–11.1%
SA	(9)	2001	15 years and over	12.8%	11.6–14.1%
Ever doctor-diagnosed asthma and nocturnal dyspnoea or current asthma or use of asthma medication					
NW Adelaide, SA	(10)	2000	18 years and over	11.6%	10.4–12.9%
Ever doctor-diagnosed asthma AND 'Yes' to 'Have you had asthma in the last 12 months?'					
Tas	(11)	1998	18 to 74 years	9.6%	9.2–10.0%

Note: Only most recent estimates were included in this table from surveys periodically repeated in the same population using the same methods (e.g. repeat state CATI health surveys).

Sources: These estimates were obtained from the following surveys and studies: (1) ABS National Health Survey 2001 (CURF); (2) NSW Adult Health Survey 2004, Centre for Epidemiology and Research, NSW Department of Health (unpublished data) 2005; (3) WANTS Health and Well-Being Survey (D'Espaignet et al. 2002; Taylor et al. 2002); (4) 2004 Queensland Omnibus Survey, Health information Branch, Queensland Health (unpublished data) 2005; (5) South Australian Monitoring and Surveillance System, Population Research and Outcome Studies Unit, SA Department of Human Services (unpublished data), 2005; (6) Victorian Population Health Survey 2003, Victorian Department of Human Services, unpublished data 2005; (7) Health and Wellbeing Surveillance System, Health Information Centre, WA Department of Health (unpublished data) 2005. (8) Social, Environmental and Risk Context Information System (Gill et al. 2001); (9) South Australian Omnibus study (Wilson et al. 2003); (10) North West Adelaide Health Survey, SA Department of Human Services, 2002; (11) Healthy Communities Survey, Health and Wellbeing Outcomes Unit, Tasmanian Department of Health, 1999.

Table 3.3
Prevalence of asthma in children, most recent health survey results, Australia, 2001–2004

Location	Survey	Year	Age range	Rates	95% CI
Ever doctor-diagnosed asthma					
Australia	(1)	2001	0 to 17 years	24.8%	23.7–25.9%
NSW	(2)	2001	2 to 12 years	26.4%	25.4–27.4%
SA	(3)	2003–04	2 to 15 years	25.0%	22.6–27.4%
WA	(4)	2004	0 to 15 years	20.2%	17.2–20.8%
Ever doctor-diagnosed asthma AND symptoms of asthma or taken treatment for asthma in last 12 months					
NSW	(2)	2001	2 to 12 years	15.7%	14.7–16.8%
SA	(3)	2003–04	2 to 15 years	18.4%	16.3–20.7%
WA	(4)	2004	0 to 15 years	14.6%	12.1–17.2%
Ever doctor-diagnosed asthma AND 'Yes' to 'Do you still get asthma'?					
Australia	(1)	2001	0 to 17 years	13.8%	12.9–14.7%

Notes
1. Only most recent estimates were included in this table from surveys periodically repeated in the same population using the same methods (e.g. repeat state CATI health surveys)
2. Data from earlier surveys and other studies of asthma prevalence among children are provided in Chapter 2.

Sources: These estimates were obtained from the following surveys and studies: (1) ABS National Health Survey 2001 (CURF); (2) NSW Child Health Survey 2001, (Centre for Epidemiology and Research (NSW Department of Health) 2002); (3) South Australian Monitoring and Surveillance System, Population Research and Outcome Studies Unit, SA Department of Human Services (unpublished data) 2005; (4) Health and Wellbeing Surveillance System, Health Information Centre, WA Department of Health (unpublished data) 2005.

Time trends in the prevalence of current asthma

There are widespread reports that asthma has become more common in the last 20 years, particularly in Western nations (Burney 2002; Peat et al. 1994; Robertson et al. 1991). Some recent studies, however, suggest this trend may be levelling or decreasing (Anderson et al. 2004; Braun-Fahrlander et al. 2004; Devenny et al. 2004; Mommers et al. 2005; Robertson et al. 2004; Wong et al. 2004). However, the interpretation of these reports is complex since small differences in study methodology and definitions may confound comparisons between surveys. Furthermore, most surveys are based on self-reports of diagnosed asthma and these may be subject to changes in the tendency of doctors to apply the diagnostic label 'asthma'. Confident conclusions about time trends in the prevalence of asthma can only be made if the following criteria are met:

- Two or more studies of sufficient size have used the same survey methods and definitions for asthma, in the same survey populations separated by a period of several years.
- The observed trends are consistent across several different measures of asthma (preferably including an objective measure).
- The trends are consistent across a broad geographic region.

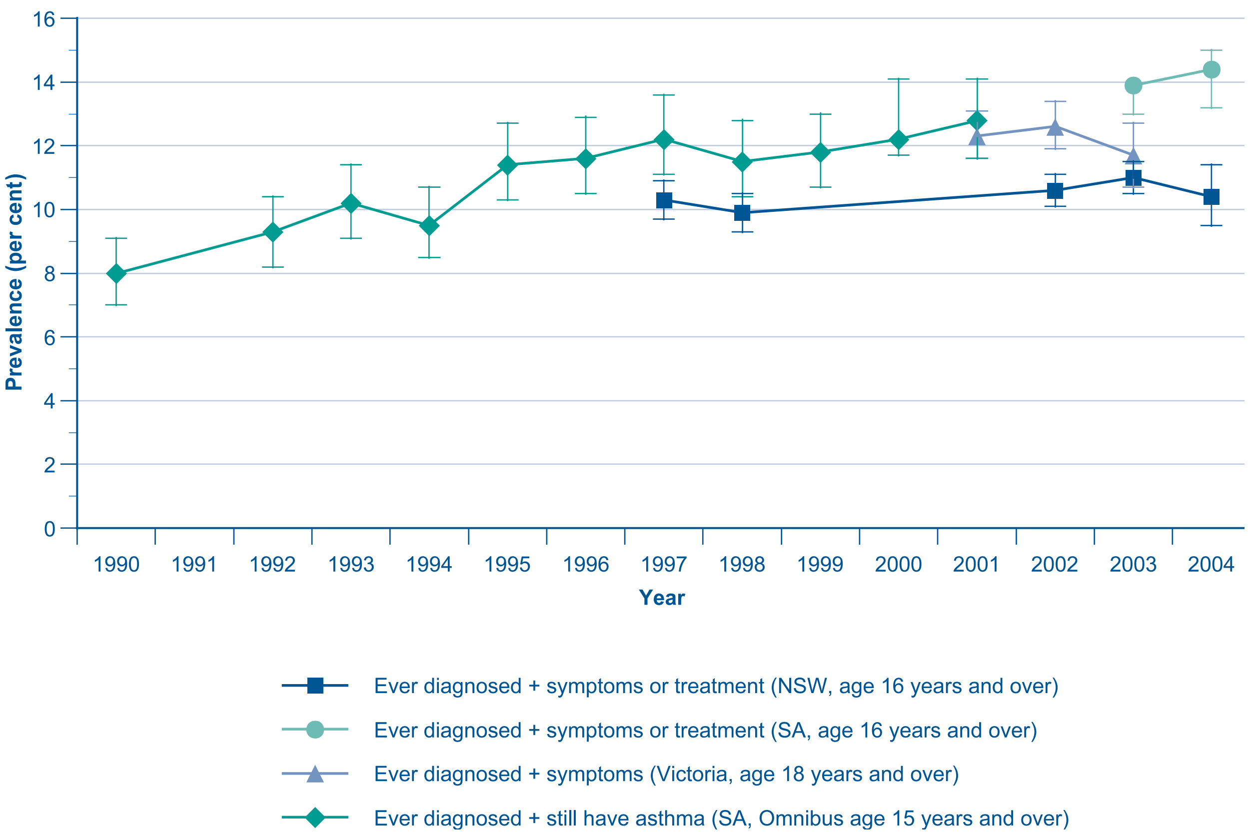
The finding of a consistent trend in one age group, for example children, does not necessarily imply that the same trend exists in other age groups.

There are some surveys that have been conducted using the same methodology in the same populations, although few have used a broad range measures of asthma and even fewer have used objective measures.

The available data on trends in the prevalence of asthma in Australia are shown in Figure 3.1 for adults and Figure 3.2 for children. In these figures, each line represents a series of surveys conducted in a single population using the same methodology, including the same measure of asthma. In some instances two measures of asthma from the same series of surveys are presented, each represented by a different line. It is important to point out that these lines should be interpreted as independent trends. The relation between the positions of these lines is difficult to interpret because it reflects methodological differences between the surveys, including the way in which asthma was measured.

There is evidence of a rising trend in the prevalence of asthma among adults since the early 1990s (Figure 3.1). This is most evident in the long series of surveys conducted in South Australia (Wilson et al. 2002). Over the more recent period, since the late 1990s, when several series are available, the prevalence of asthma appears to be stable in adults. There is also consistent evidence of a rise in the prevalence of asthma among children during the 1980s and into the early 1990s (Figure 3.2). More recent data suggest that this rising trend may have peaked.

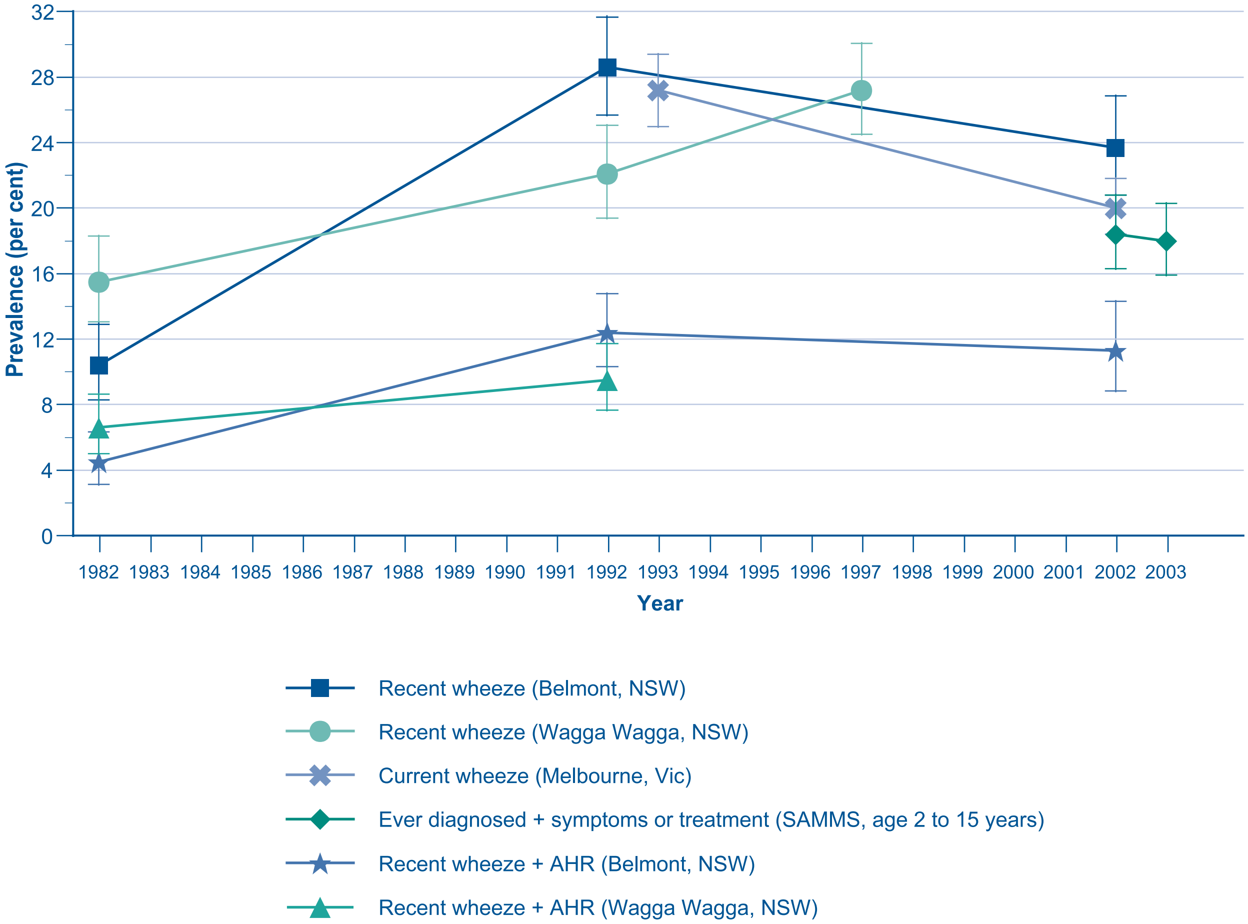
Figure 3.1
Prevalence of current asthma, adults, Australia, 1990–2004



Note: Different definitions of asthma are used. NSW: Asthma = Ever diagnosed with asthma by a doctor plus asthma symptoms or treatment in the last 12 months; SA: Asthma = Ever diagnosed with asthma by a doctor plus symptoms when didn't have a respiratory infection or treatment in the last 12 months; Victoria: Asthma = Ever diagnosed with asthma by a doctor plus asthma symptoms in the last 12 months; SA Omnibus: Asthma = ever diagnosed with asthma by a doctor plus 'Yes' to 'Do you still have asthma?'.

Sources: Victorian Department of Human Services, Population Research and Outcome Studies Unit; SA Department of Human Services; Centre for Epidemiology and Research, NSW Department of Health; Wilson et al. 2002, 2003.

Figure 3.2
Prevalence of current asthma, children aged 15 years and under, Australia, 1982–2003



Note: Different definitions are used. Recent wheeze = wheeze in the last 12 months. Recent wheeze + AHR = wheeze in the last 12 months plus airway hyperresponsiveness. Ever diagnosed + symptoms or treatment = Ever diagnosed with asthma by a doctor plus symptoms when didn't have a respiratory infection or treatment in the last 12 months.

Sources: Comino et al. 1996; Downs et al. 2001; Peat et al. 1994; Toelle et al. 2004; Population Research and Outcome Studies Unit, SA Department of Human Services.

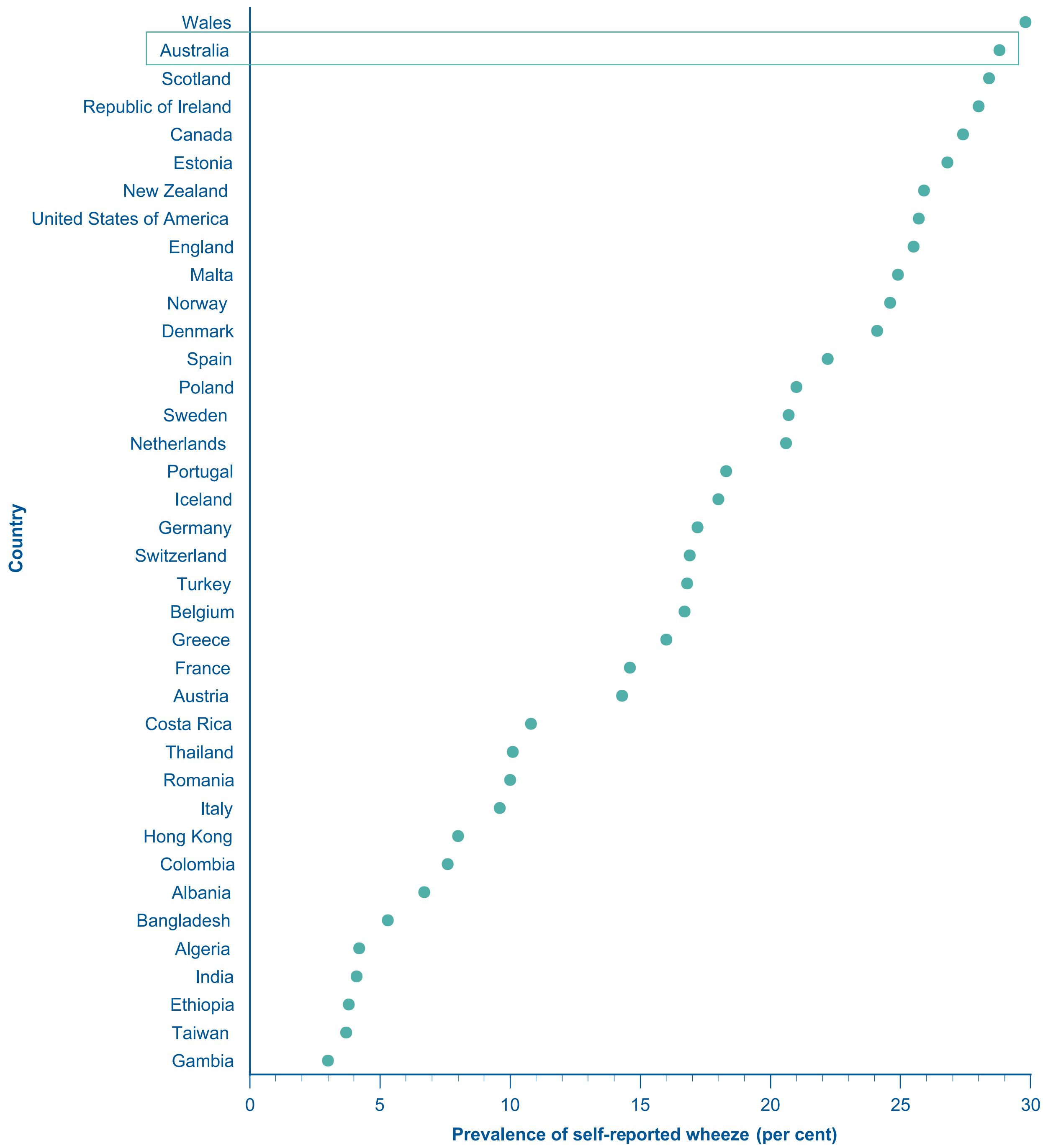
International comparisons

In assessing the burden of asthma in Australia it is useful to be able to place the prevalence of the disease in this country in an international context. The difficulties in comparing local data derived using various methods, definitions and settings are magnified substantially when attempting to make international comparisons of the prevalence of asthma. Fortunately, two large international studies, one conducted in adults (Burney 2002) and the other in children (ISAAC 1995), have applied standardised methods and definitions in an attempt to overcome these problems.

The European Community Respiratory Health Survey (ECRHS) was conducted among adults aged 20 to 44 years in 35 centres in 16 countries (Chinn et al. 1997). Melbourne was the Australian centre in this study (Abramson et al. 1996). Figure 3.3 shows the prevalence of self-reported wheeze among adults using data from the ECRHS and other comparable studies from countries not participating in ECRHS. The diagram shows that Australia had one of the highest prevalence rates of reported wheeze in the last 12 months among the 41 countries studied. The prevalence of self-reported wheeze among 13 to 14 year old children was also high in Australia compared with most other countries participating in ISAAC (see Figure 2.1).

Figure 3.3

World ranking for the percentage of adults with self-reported wheeze in previous 12 months, people aged 20 to 44 years



Source: GINA 2004. Copyright Global Initiative for Asthma (GINA). Reproduced with permission.

Differentials in the prevalence of current asthma

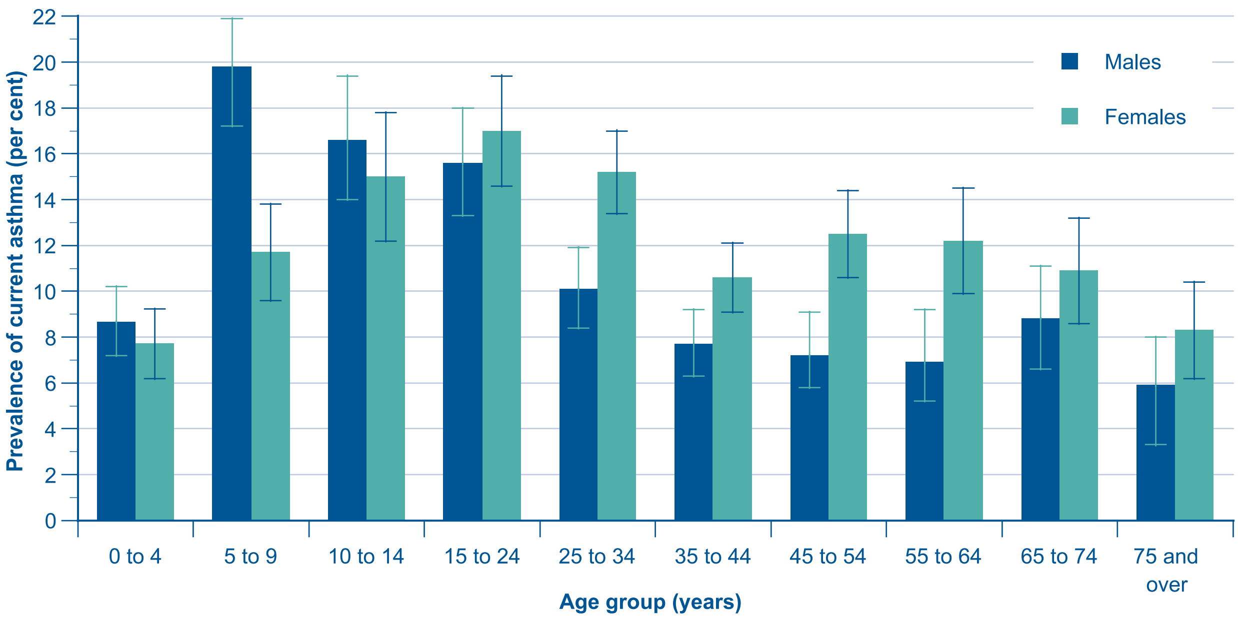
In this section we report on population differentials in the prevalence of asthma in Australia, using data from the ABS National Health Survey 2001. Subjects were classified as having current asthma if they reported ever being diagnosed with asthma by a doctor and still getting asthma.

Age and sex

The prevalence of current asthma in males was highest in the 5 to 9 years age group, whereas in females it was highest in 15 to 24 year olds (Figure 3.4). The prevalence of asthma was also high in both males and females aged 10 to 14 years and males 15 to 24 years.

The prevalence of asthma was higher in males than females among persons aged less than 15 years, especially in those aged 5 to 9 years. In contrast, the prevalence of asthma was higher in females than in males among persons aged 15 years and over, particularly among those aged 25 to 64 years.

Figure 3.4
Prevalence of current asthma, by age and sex, Australia, 2001

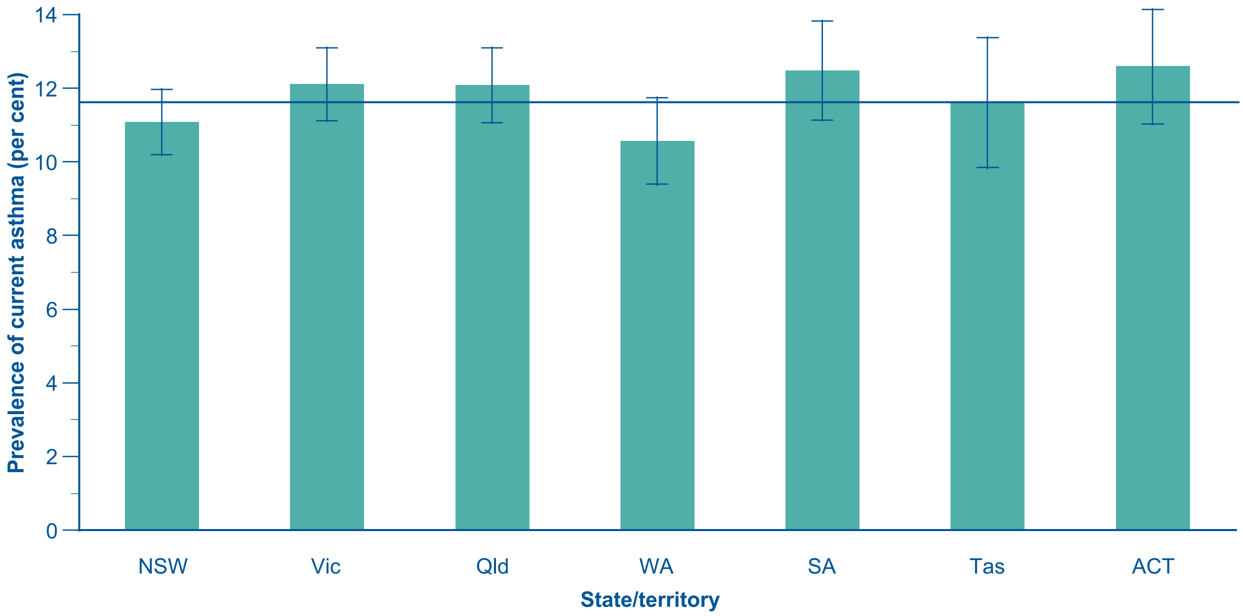


Source: ABS National Health Survey 2001.

States and territories

The prevalence of asthma did not differ significantly from the national average in any of the states or territories (Figure 3.5).

Figure 3.5
Prevalence of current asthma, by state and territory, all ages, Australia, 2001



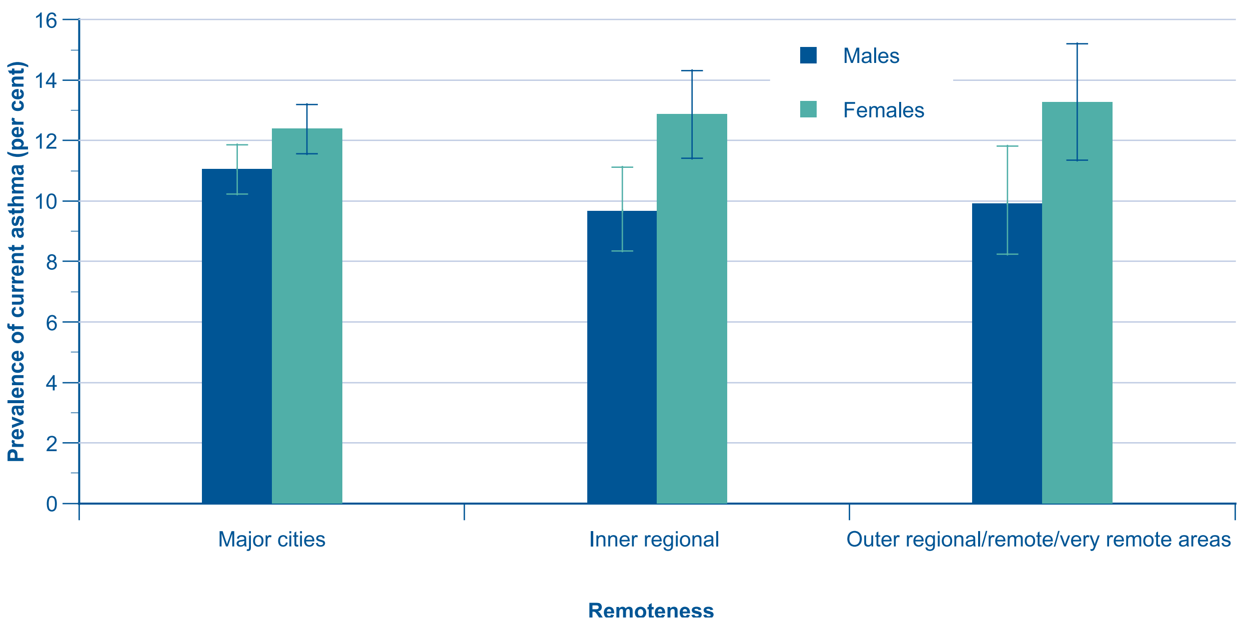
Note: Horizontal line represents prevalence of current asthma in Australia (11.6%). Northern Territory excluded as the numbers are too small to produce reliable estimates.

Source: ABS National Health Survey 2001.

Urban, rural and remote areas

Overall, the prevalence of asthma did not differ substantially between major cities, inner regional areas and outer regional and remote areas (Figure 3.6). The excess prevalence of asthma among females was greater in inner regional and outer regional and remote areas than in major cities.

Figure 3.6
Prevalence of current asthma, by sex and remoteness, all ages, Australia, 2001



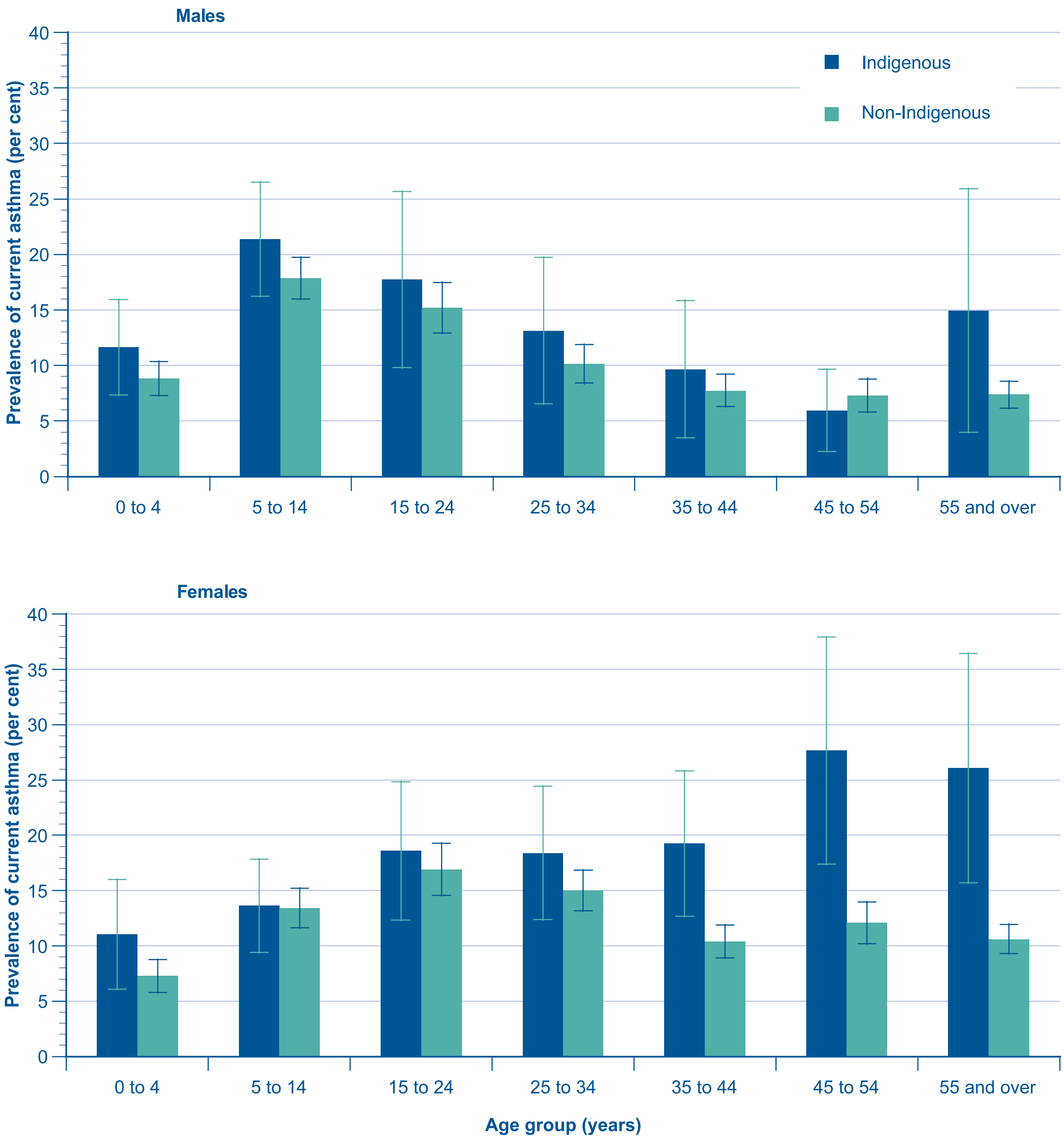
Note: Remoteness classified according to the Australian Standard Geographical Classification (ASGC) categories of remoteness.

Source: ABS National Health Survey 2001.

Aboriginal and Torres Strait Islander Australians

Data from the National Health Survey and the Indigenous National Health Survey 2001 (see Appendix 1, Section A1.6.2) show that the prevalence of current asthma was significantly higher among adult Aboriginal and Torres Strait Islander women than among other Australian women ($p<0.001$; Figure 3.7). However, the prevalence of asthma was similar among Aboriginal and Torres Strait Islander men and other Australian men also and among children of both groups. The prevalence of ever having doctor-diagnosed asthma and the prevalence of wheeze in the last 12 months were also higher in the Indigenous Australian population (data not shown). Among Aboriginal and Torres Strait Islander adults, the prevalence of asthma was much higher among females than males. In fact, among Aboriginal and Torres Strait Islander women, the prevalence was higher in older adults than in children, an age distribution of asthma that was quite unlike the age distribution in other Australian women.

Figure 3.7
Prevalence of current asthma, by age group, sex, and Indigenous status, Australia, 2001

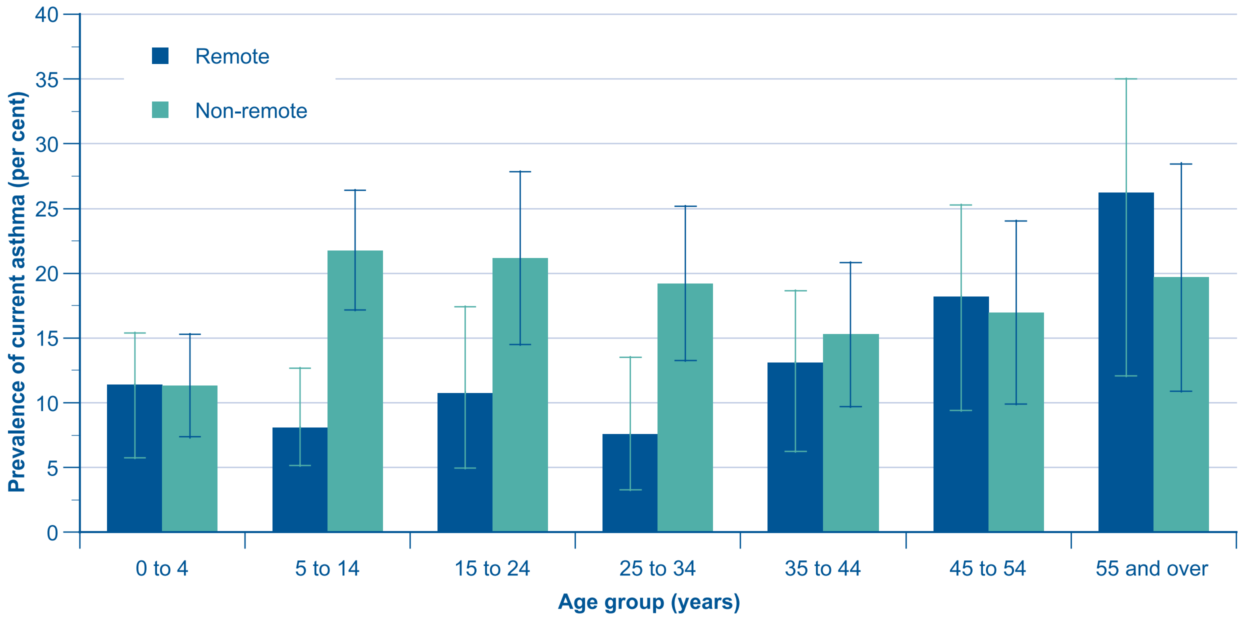


Source: ABS National Health Survey 2001.

Among children and young adults, the prevalence of asthma was higher in Aboriginal and Torres Strait Islander people living in non-remote areas than in those living in remote areas (Figure 3.8). This trend was reversed among older adults, with a higher prevalence among Aboriginal and Torres Strait Islander people living in remote areas. However, this estimate may have included a broader range of conditions. Due to linguistic differences, the questionnaire administered to Aboriginal and Torres Strait Islander people living in sparsely-populated remote areas did not distinguish between 'asthma' and 'breathing problems' (see Appendix 1, Section A1.6.2).

Figure 3.8

Prevalence of current asthma among Aboriginal and Torres Strait Islander people, by age group and remoteness, Australia, 2001



Note: Some people in 'Remote' were administered the 'Sparsely populated area' survey which used the term 'asthma or breathing problems' to define asthma status.

Source: ABS Indigenous Health Survey 2001.

There have also been several locally-based surveys that measured the prevalence of asthma among Aboriginal and Torres Strait Islander Australians (Table 3.4). There is substantial variation among the prevalence estimates. In part, this reflects the range of measures of asthma that have been used and also the means of identifying Indigenous status. However, some real variation in the prevalence of asthma within the Aboriginal and Torres Strait Islander population is likely, in particular relating to the remoteness or other characteristics of the setting. Additional studies reporting the prevalence of asthma among Indigenous Australian children have been included in Table 2.3 of this report.

Table 3.4
Prevalence of asthma among Aboriginal and Torres Strait Islander people, Australia, 1999–2001

Location	Source	Year	Age range	Rates	95% CI (number in survey)
Ever diagnosed with asthma by a doctor					
Tropical North, WA	(2)	2000	18 years and over	13.6%	6.5–18.8% (119)
Central Desert, WA	(2)	1999	18 years and over	21.8%	12.5–34.8% (59)
Ever diagnosed with asthma by a doctor and 'Yes' to 'Do you still get asthma?'					
Australia	(1)	2001	0 to 17 years	15.8%	13.4–18.2% (1,828)
			18 years and over	17.0%	14.5–19.5% (1,853)
Wheeze in last 12 months					
Tropical North, WA	(2)	2000	18 years and over	31.5%	23.5–40.8% (119)
Central Desert, WA	(2)	1999	18 years and over	41.5%	28.1–54.0% (59)

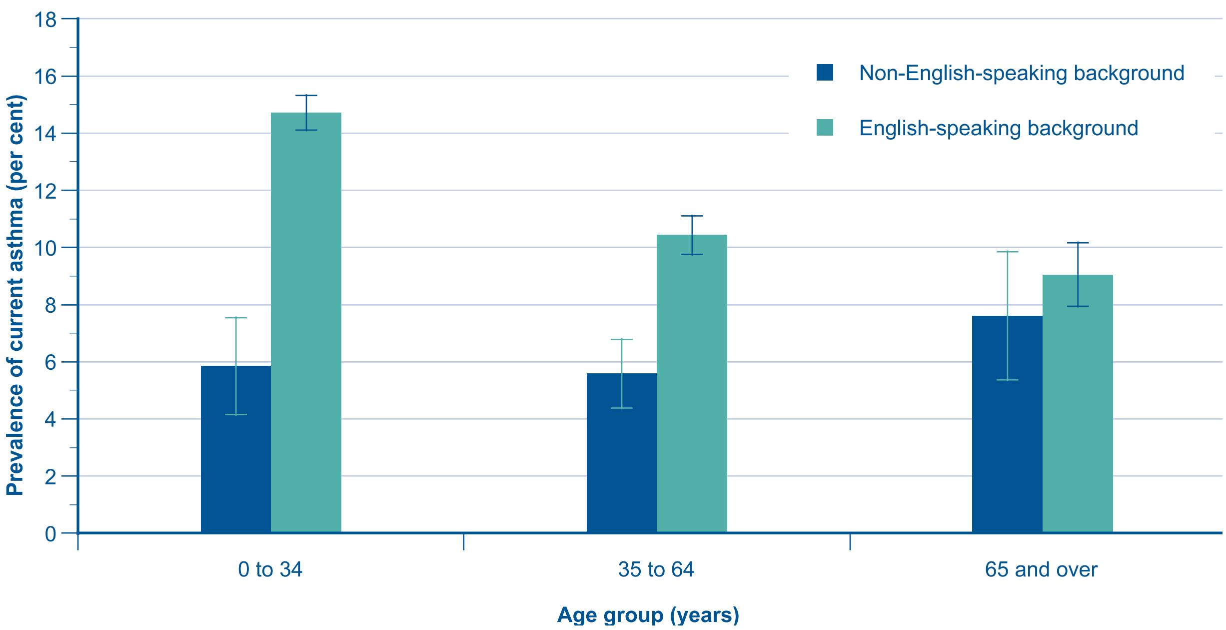
Sources: (1) ABS, National Health Survey 2001 (Indigenous CURF); (2) Verheijden et al. 2002.

Culturally and linguistically diverse background

Data from the National Health Survey 2001 demonstrated that the prevalence of current asthma was lower in people from non-English-speaking backgrounds (Figure 3.9). The prevalence of ever having asthma was also lower among people from non-English-speaking backgrounds (data not shown).

This is consistent with previous observations that the prevalence of asthma is higher in children and adults born in Australia than among those who were born overseas and subsequently migrated to Australia (Leung et al. 1994; Peat et al. 1992). The prevalence of asthma has been shown to increase among migrant populations with the duration of residence (Leung et al. 1994).

Figure 3.9
Prevalence of current asthma, by broad age group and English-speaking versus non-English-speaking background, Australia, 2001



Source: ABS National Health Survey 2001.

Socioeconomic disadvantage

People living in the most socioeconomically disadvantaged localities (classified using SEIFA; see Appendix 1, Section A1.12.3) did not have a substantially higher (or lower) prevalence of asthma compared with those in less disadvantaged areas (Figure 3.10). This finding contrasts with observations in some other countries. For example, in the USA there is a higher prevalence of asthma in children from lower income families (Miller 2000) and among families eligible for subsidised school lunches (Yawn et al. 2002).

Figure 3.10
Prevalence of current asthma, by sex and socioeconomic status, Australia, 2001

Note: Socioeconomic status is classified using the Socio-Economic Index for Areas (SEIFA), in which SEIFA 1 represents the most disadvantaged socioeconomic quintile, and SEIFA category 5 the most advantaged.

Source: ABS National Health Survey 2001.

Summary

Recent data suggest that 10 to 12% of adults and 14 to 16% of children report a diagnosis of asthma that remains a current problem. International comparative studies have shown a high prevalence of asthma in Australia, compared with many other countries. During the 1980s and early 1990s there is some evidence of a small increase in the prevalence of asthma among adults.

Asthma is more common in boys than girls before teenage years and, thereafter, it is more common among females than males. The highest reported prevalence is among 5 to 9 year old boys. In contrast to some overseas studies, there is no convincing evidence that people living in rural and remote areas and in socioeconomically disadvantaged areas in Australia have a higher risk of having asthma. Indigenous Australian women more commonly report asthma than other Australian women and this difference increases with increasing age. Persons of English-speaking backgrounds have a higher prevalence of asthma than other populations within the community.

Mortality

4

Key points

- There were 314 deaths attributed to asthma as the underlying cause in 2003. This represented 0.3% of all deaths in that year. In 2003, there was continuation of a declining trend in rates of death attributed to asthma since the most recent peak in 1989.
- Deaths due to asthma occur in all age groups. The risk of dying from asthma increases with age. However, although 62% of all deaths due to asthma occur in people aged 65 years and over, this is a smaller proportion than the proportion of all deaths that occur in this older age group (80%).
- The death rate due to asthma in Australia is moderately high, by international standards.
- People aged 35 to 64 years who live in outer regional and remote areas are more likely to die from asthma than people in cities and large towns.
- People living in more socioeconomically disadvantaged areas have a higher risk of dying from asthma than people who live in more advantaged areas.
- Older people with asthma have an increased risk of dying from asthma during winter.

Introduction

Death due to asthma is uncommon. The 314 deaths for which the underlying cause was asthma in 2003 represented only 0.3% of all deaths in that year. There is evidence that effective management of asthma can reduce the risk of death due to this disease (Suissa et al. 2000). Monitoring trends and differentials in rates of death due to asthma assists in the evaluation of existing measures to control the impact of asthma and, on occasions, has highlighted the need for investigation and management of rising death rates attributable to the disease (Beasley et al. 1990).

Interpreting trends and differences in rates of asthma mortality is complicated by a variable overlap with other diseases, particularly chronic obstructive pulmonary disease (COPD) (Guite & Burney 1996; Smythe et al. 1996). This is particularly a problem in older people in whom the attribution of death to asthma is less reliable than it is in younger people (Jones et al. 1999; Sears et al. 1986; Smythe et al. 1996). For the purposes of examining trends and differentials in asthma mortality, it is safest to limit comparisons to the 5 to 34 years age group, in whom the diagnosis of asthma as a cause of death is most reliable (Sears et al. 1986). However, as most deaths due to asthma occur in the elderly, it is also important to monitor older age groups.

Data specifying the underlying cause of death from the National Mortality Database held at the Australian Institute of Health and Welfare have been used to prepare this chapter. For a description of this dataset, refer to Appendix 1, Section A1.10.

4.1 Deaths due to asthma

Asthma as an underlying or associated cause of death

Asthma was the underlying cause of 314 deaths during 2003 (Table 4.1). The underlying cause is the disease considered to be most directly responsible for the death (AIHW 2004). However, there were an additional 934 deaths in which asthma was an associated cause of death, that is, asthma was listed on the death certificate but was not identified as the underlying cause of death.

There were only 45 deaths among persons aged 5 to 34 years in which asthma was regarded as an underlying or associated cause of death. In the majority of these instances (31), asthma was regarded as the underlying cause of death.

In the remainder of this chapter, analyses are limited to deaths in which asthma was listed as the underlying cause of death.

Table 4.1
Deaths where asthma was the underlying or an associated cause, Australia, 2003

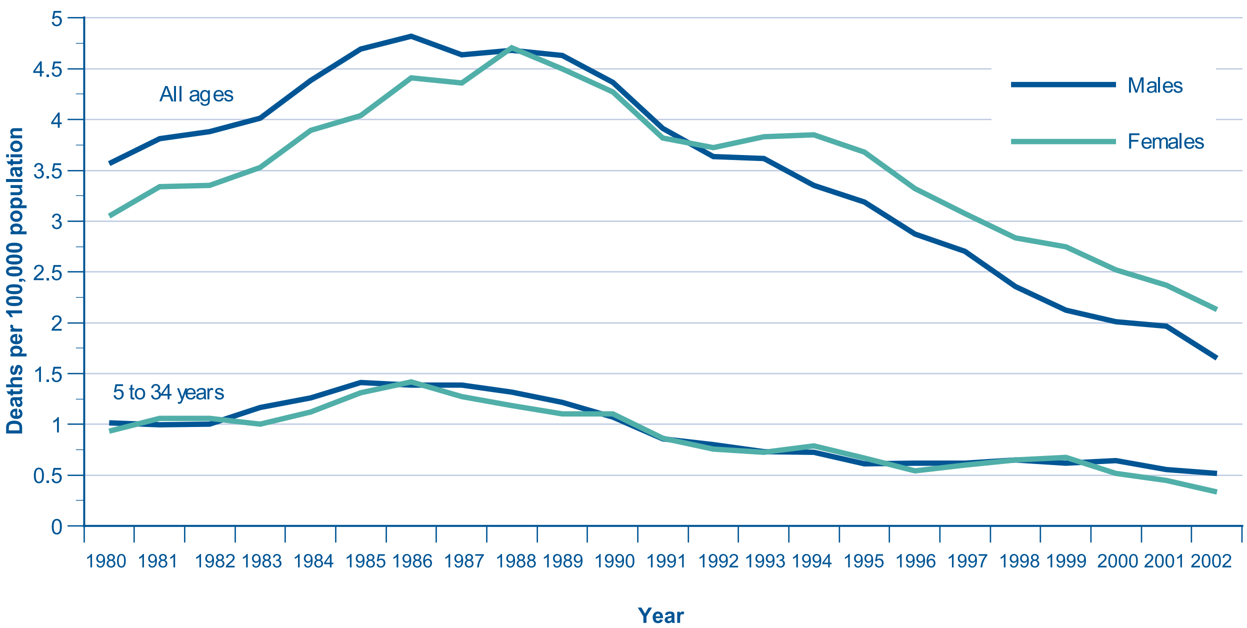
	Males		Females		Persons	
	Underlying cause	Underlying or associated cause	Underlying cause	Underlying or associated cause	Underlying cause	Underlying or associated cause
All persons						
Number of deaths	108	451	206	797	314	1,248
Deaths per 100,000 population (95% CI)	1.09 (0.91–1.33)	4.57 (4.16–5.01)	2.06 (1.79–2.37)	7.97 (7.43–8.55)	1.58 (1.41–1.77)	6.28 (5.94–6.64)
Age 5 to 34 years						
Number of deaths	19	26	12	19	31	45
Deaths per 100,000 population (95% CI)	0.45 (0.28–0.72)	0.62 (0.41–0.92)	0.29 (0.16–0.53)	0.46 (0.29–0.74)	0.37 (0.26–0.51)	0.54 (0.40–0.73)

Source: AIHW National Mortality Database.

Time trends in asthma deaths

There was a rise in deaths attributed to asthma during the early to mid-1980s, reaching a peak in 1989 with 736 deaths (4.4 per 100,000 population, 95% CI: 4.1–4.7), with a subsequent steady decline to 314 deaths (1.6 per 100,000 population, 95% CI: 1.4 to 1.8) in 2003 (Figure 4.1). This trend is confirmed, although less marked, among deaths that occurred in 5 to 34 year olds, in whom the attribution to asthma is more certain. In this latter group, the peak occurred slightly earlier, in 1986, with 117 deaths (1.5 per 100,000 population, 95% CI: 1.2–1.8).
In 2003 there were 31 deaths due to asthma in people aged 5 to 34 years (0.37 per 100,000 population, 95% CI: 0.26–0.51). After 1992, mortality rates were higher in females than males in the population as a whole. However, this gender difference was not observed in the 5 to 34 year old subgroup. See also Appendix 2, Table A2.11.

Figure 4.1
Deaths due to asthma per 100,000 population, three year moving average, by sex, all ages and people aged 5 to 34 years, Australia, 1980–2002



Note: Age standardised to the Australian population as at 30 June 2001. Asthma classified according to ICD-9 code 493 and ICD-10 codes J45 & J46. Deaths coded to ICD-9 (1979–1997) were converted to ICD-10 using conversion factors See Appendix 1, Section A1.10 for details.

Sources: AIHW National Mortality Database; Australian Bureau of Statistics.

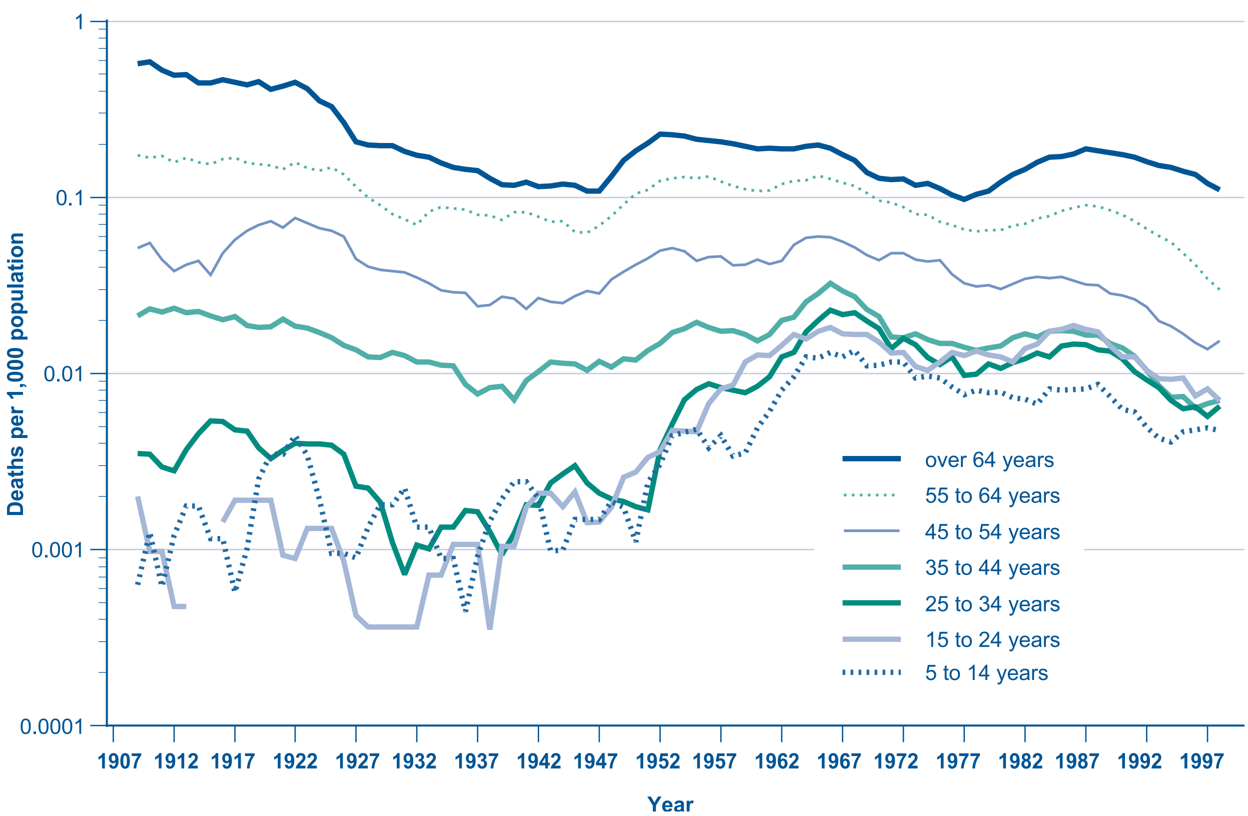
We cannot definitely attribute this reduction in death rates due to asthma to any specific cause. It is unlikely that the observed changes in death rates are explained solely by changes in diagnostic fashion, coding misclassification or other artefactual changes (see Appendix 1, Section A1.10). A fall in the prevalence of asthma, either due to reduced incidence or increased remissions, would be expected to cause a reduction in death rates. However, evidence about recent trends in the prevalence of asthma, while limited (see Chapter 3), provides little to support the view that this has declined substantially, particularly in adults. Hence, it is unlikely that the reduction in deaths due to asthma is caused by a reduction in the number of people who have asthma.

It seems most likely that at least part, if not all, of the reduction in deaths due to asthma is attributable to a reduction in the risk of dying among people who have asthma. Nationwide programs to improve asthma management, including the introduction of management guidelines, may have contributed to this successful outcome. However, other changes in treatment practices or environmental changes affecting the severity of asthma and the severity of exacerbations of asthma may also have played a role.

These relatively recent trends may be viewed in the context of long-term trends (Dobbin et al. 2004; Taylor et al. 1997). In the population as a whole there was an overall decline, over the 20th century, in the death rate attributed to asthma. Figure 4.2 and Figure 4.3 provide an overview of trends in recorded death rates for males and females by age for most of the 20th century. Asthma death rates for the 5 to 34 year age group were low in the early 20th century, and showed substantial fluctuations over time, most notably a marked increase from the mid-1940s to the mid-1960s, reaching a peak in approximately 1966. This was followed by a decreasing trend to a low in the late 1970s, then a more recent increase was recorded between 1979 and the late 1980s among those aged over 15 years, which then declined until the present.

Figure 4.2

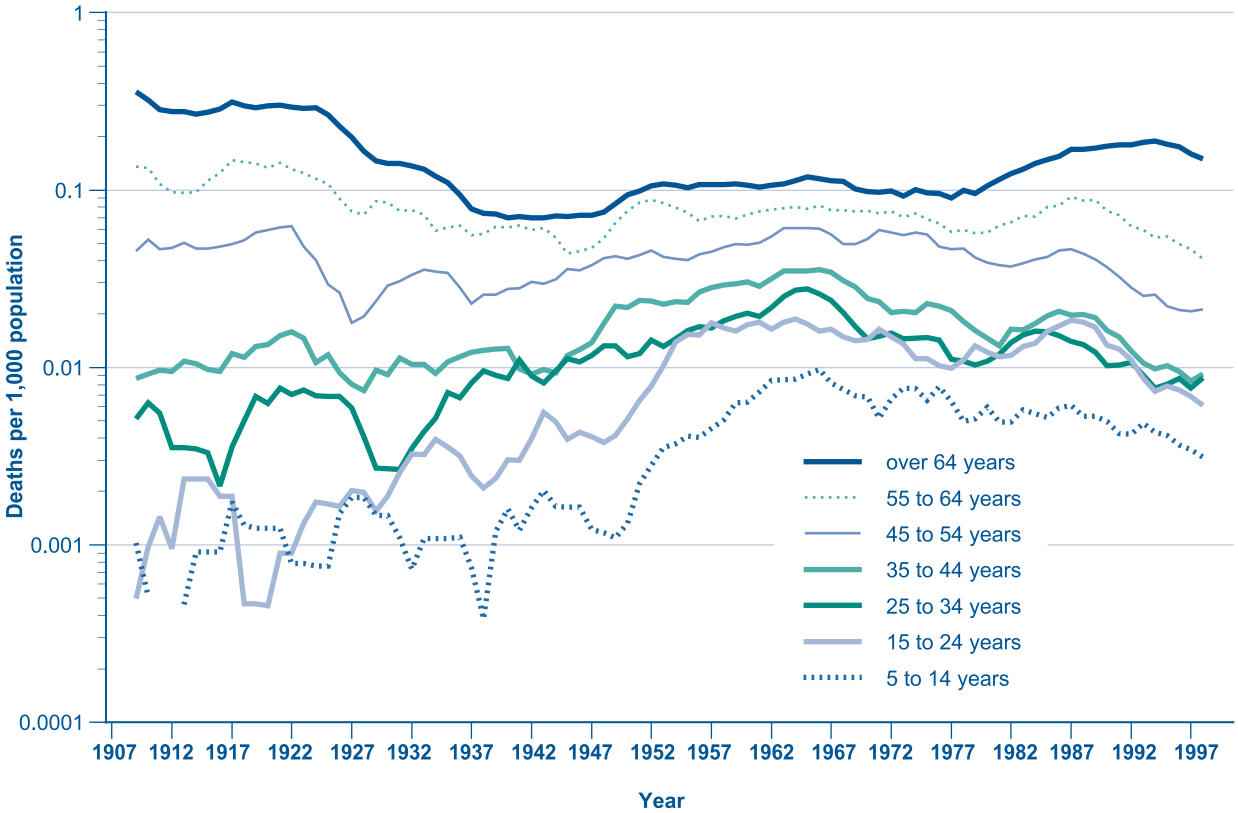
Deaths due to asthma per 1,000 population, five year moving average, by year of death and age group, males aged 5 years and over, Australia, 1909–1998



Note: y axis is on a logarithmic scale.

Source: Adapted from Dobbin et al. 2004. Reproduced with permission.

Figure 4.3
Deaths due to asthma per 1,000 population, five year moving average, by year of death and age group, females aged 5 years and over, Australia, 1909–1998



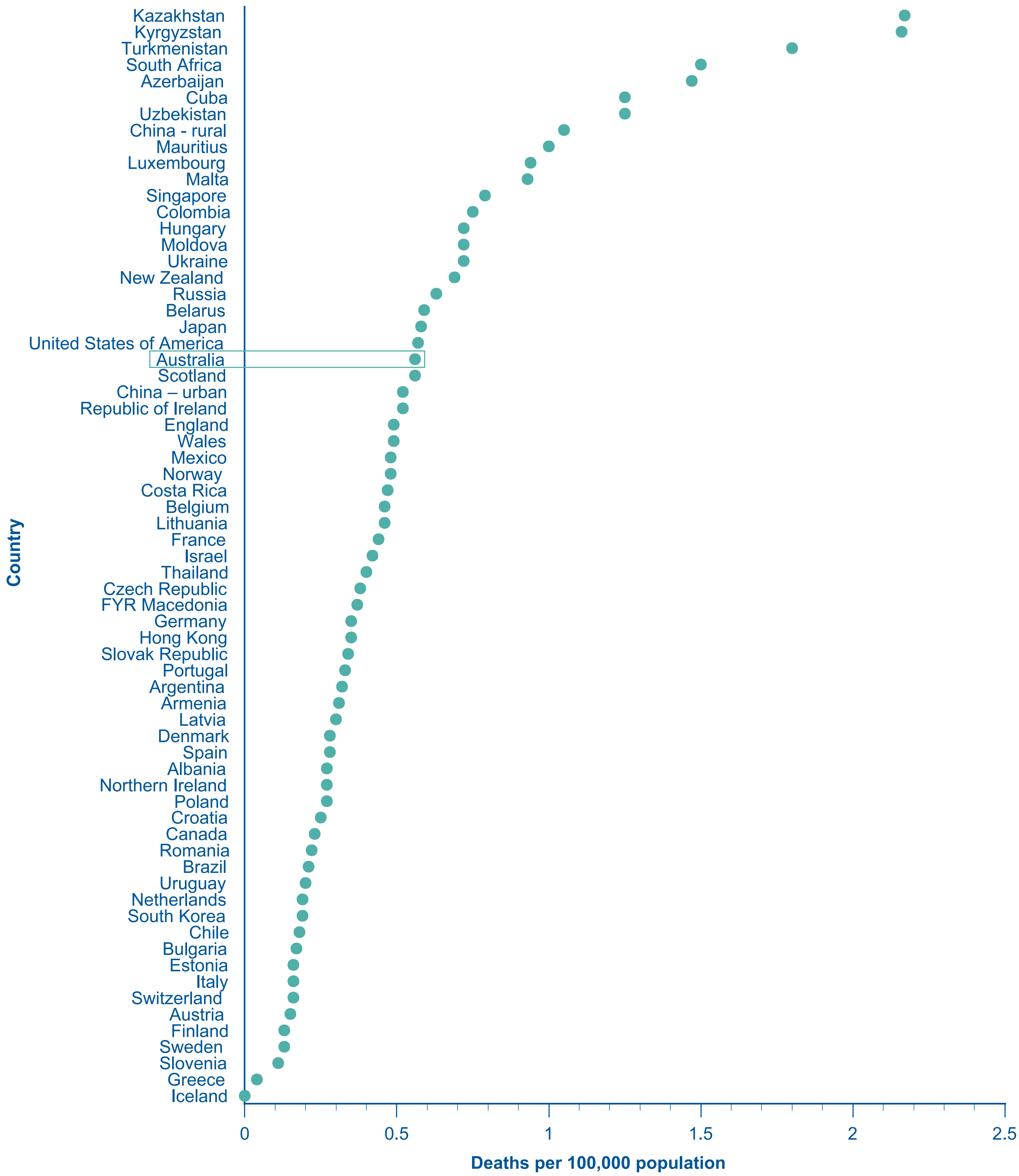
Note: y axis is on a logarithmic scale.

Source: Adapted from Dobbin et al. 2004. Reproduced with permission.

International comparisons

Figure 4.4 shows mortality rates for obstructive lung disease in people aged 5 to 34 years (GINA 2004). In this age group, most deaths classified in this way were due to asthma. The figure shows that the mortality rate due to asthma in Australia was moderately high, by international standards.

Figure 4.4
World ranking of asthma mortality per 100,000 population, people aged 5 to 34 years



Note: WHO country-specific mortality data for ICD codes 490 to 493 have been used. These codes incorporate asthma, emphysema, chronic bronchitis, and bronchitis not specified as acute or chronic. However in the 5 to 34 year age group, these mortality figures have been shown to be similar to the asthma mortality rates. For each country, the mean mortality rate from the two most recent years available was presented (mean 1996 to 1997); mortality data not reported if prior to 1992.

Source: GINA 2004. Copyright Global Initiative for Asthma (GINA). Reproduced with permission.

Differentials in asthma mortality

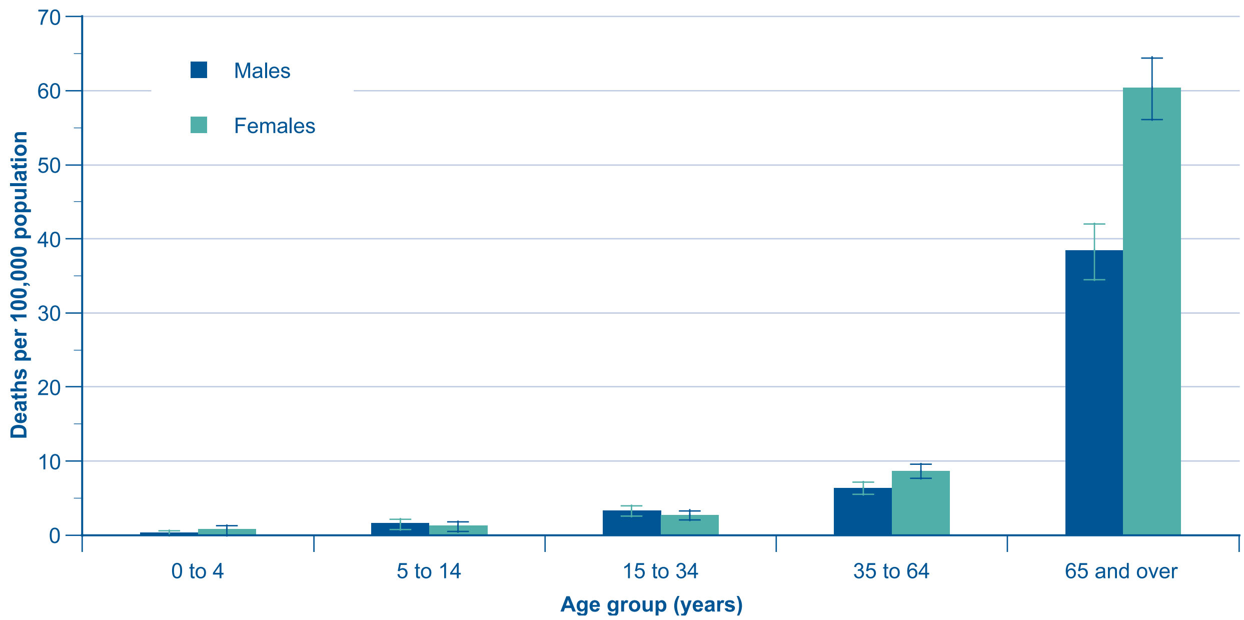
Factors affecting asthma mortality fall into four categories—underlying disease severity (Jalaludin et al. 1999), management and care (Abramson et al. 2001), health behaviours and compliance (Sturdy et al. 2002), and psychological and socioeconomic factors (Castro et al. 2001; Sturdy et al. 2002). Data for many of these characteristics are not available from routine surveys and require specific studies to investigate their contribution to asthma-related mortality. However, data are available on age and sex, geographical area, socioeconomic disadvantage and country of birth, which can be analysed to examine differences across these groups to assist in identifying opportunities for prevention.

Age and sex

Asthma mortality increased substantially with age in both males and females (Figure 4.5). This reflects a similar age trend in all-cause deaths (Dunn et al. 2002). Sixty-one per cent of all deaths attributed to asthma between 1999 and 2003 occurred in people aged 65 years and over. Among people aged 35 years and over, the risk of death due to asthma was significantly higher in females than males, especially for those aged 65 years and over. This is consistent with the higher prevalence of asthma reported in women than men (see Figure 3.4). However, this gender differential occurred predominantly in the age group in which misclassification between COPD and asthma is most problematic. Hence, the extent to which the higher death rate due to asthma among older women compared with older men was due to gender differences in diagnosis and labelling, as opposed to actual gender differences in prevalence and case-fatality rates, remains unknown.

Figure 4.5

Deaths due to asthma per 100,000 population, by age group and sex, Australia, 1999–2003

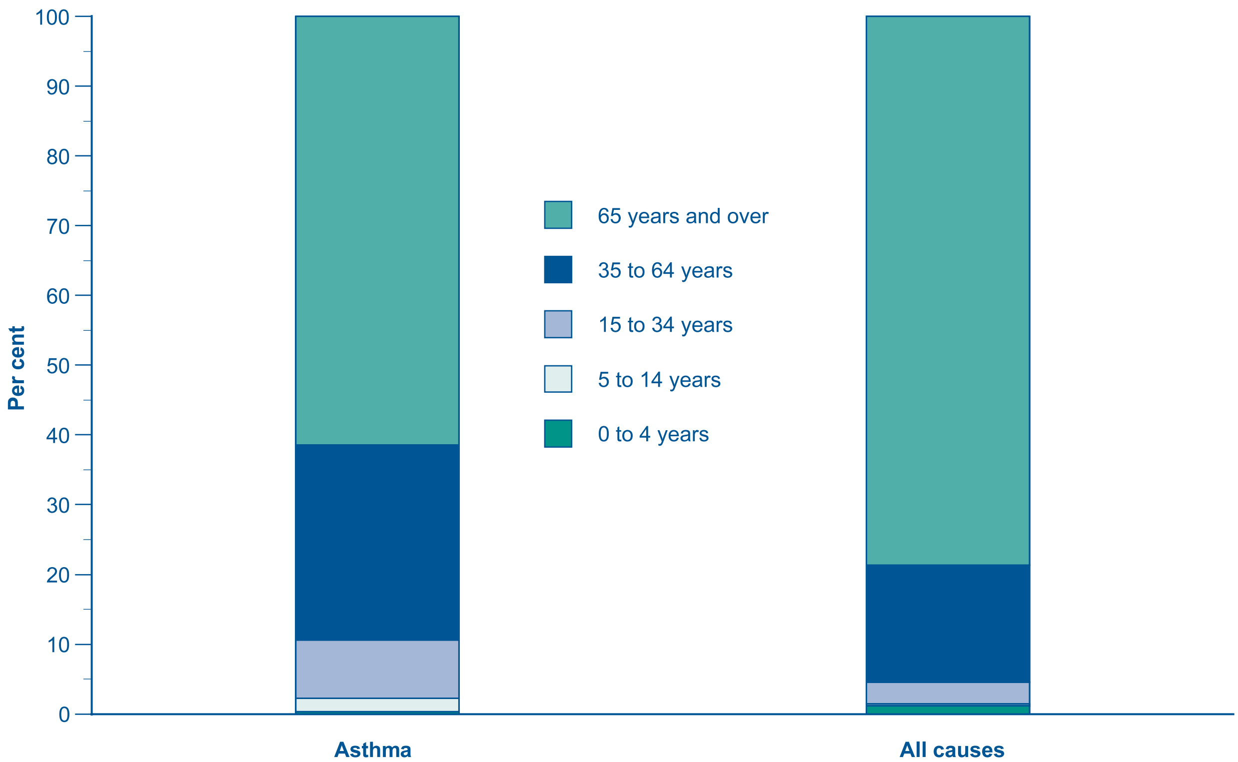


Note: Age-specific death rates for aggregated data from 1999 to 2003. Asthma classified according to ICD-10 codes J45 & J46.

Sources: AIHW National Mortality Database; Australian Bureau of Statistics.

During the period 1999–2003, most deaths due to asthma occurred in persons aged 65 years and over. However, the proportion of asthma-related deaths that occurred at this age was smaller than the proportion of deaths due to all causes in this age group (Figure 4.6). In contrast, deaths among people aged 5 to 64 years represented a larger proportion of asthma deaths than all-causes deaths (38% and 20%, respectively).

Figure 4.6
Age distribution for asthma and all cause mortality, Australia, 1999–2003



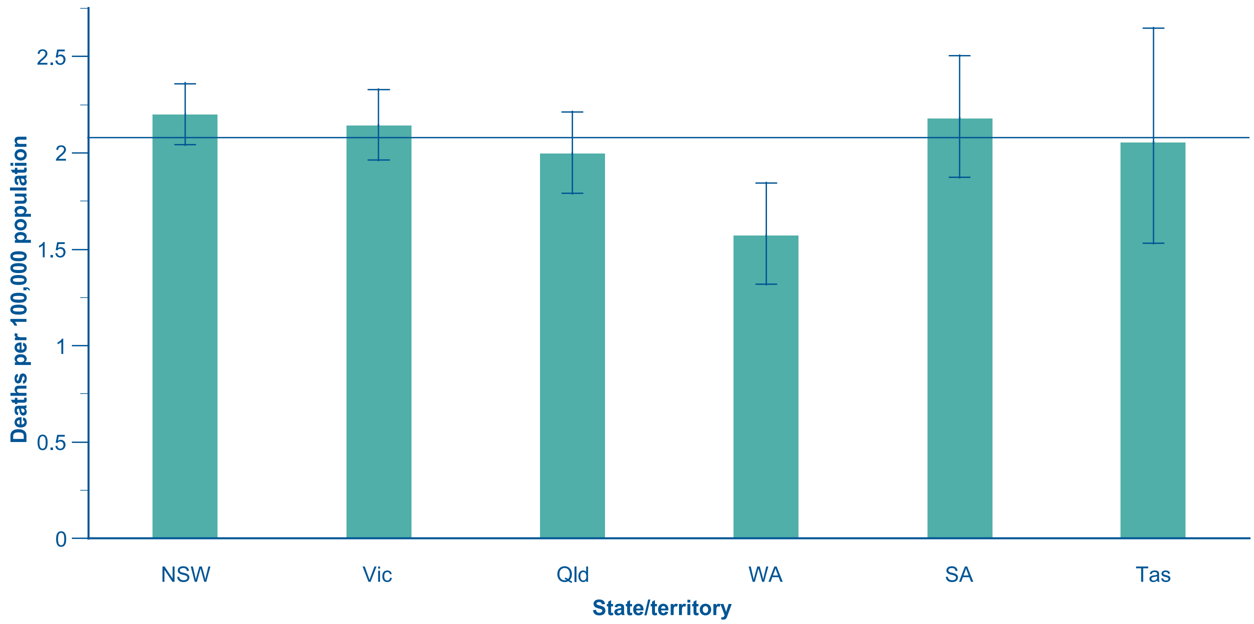
Note: Age-specific death rates calculated for aggregated data from 1999 to 2003. Asthma classified according to ICD-10 codes J45 & J46.

Sources: AIHW National Mortality Database; Australian Bureau of Statistics.

States and territories

Death rates due to asthma were slightly lower than average in Western Australia (Figure 4.7). However, the small numbers of deaths in the states and territories with smaller populations mean that the differences have to be interpreted with caution.

Figure 4.7
Deaths due to asthma per 100,000 population, by state and territory, Australia, 1999–2003



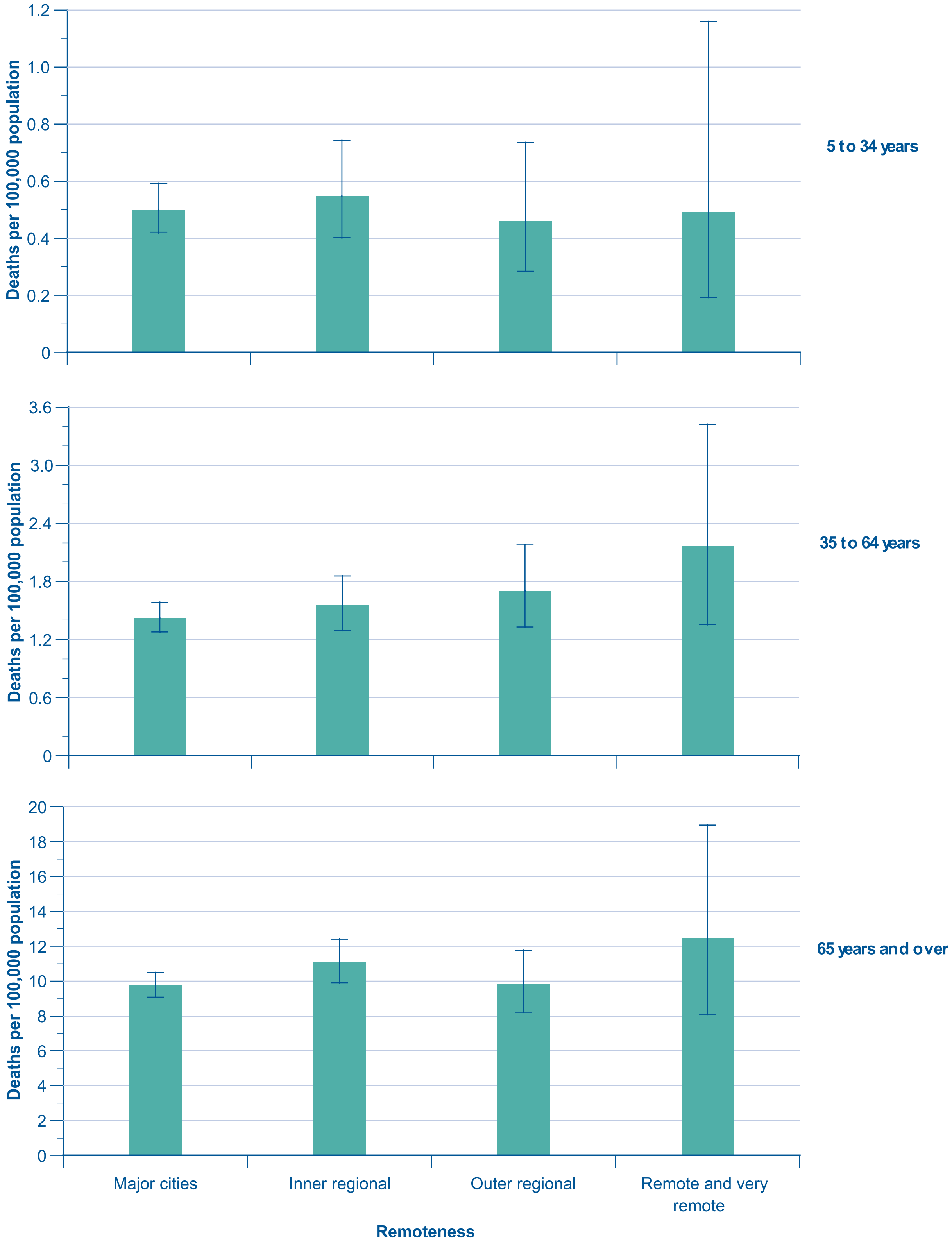
Sources: AIHW National Mortality Database; Australian Bureau of Statistics.

Urban, rural and remote areas

Death rates for asthma were slightly higher in outer regional and remote areas than in major cities among persons aged 35 to 64 years (p=0.02; Figure 4.8). In this age group, the death rate due to asthma among persons living in remote and very remote areas was 1.58 times higher than the rate among persons living in major cities (95% CI 1.00 to 2.48 times). This trend was independent of related variation in socioeconomic status. There was no significant relation between death rates due to asthma and level of remoteness among persons aged less than 35 years or 65 years and over (see Appendix 1, Section A1.3 for method of analysis). The finding of a higher death rate due to asthma in outer regional and remote areas among adults aged 35 to 64 years is consistent with observations on regional variation in all-cause mortality rates and with previous studies showing increased asthma mortality in rural areas (Castro et al. 2001; Dunn et al. 2002; Jones & Bentham 1997; Tong & Drake 1999).

It is possible that part of this increased risk in remote areas can be attributed to the distance people are located in relation to acute medical facilities and, hence, their access to prompt treatment for severe attacks. Other plausible explanations include differences in exposures influencing disease severity and exacerbation risk, and differences in access to effective long-term asthma management.

Figure 4.8
Deaths due to asthma per 100,000 population, by remoteness, people aged 5 years and over, Australia, 1999–2003



Notes

1. Death rates for aggregated data from 1999 to 2003.
2. Asthma classified according to ICD-10 codes J45 and J46.
3. Remoteness classified according to the Australian Standard Geographic Classification (ASGC) categories of remoteness.
4. Y axis has different scale for each age group.

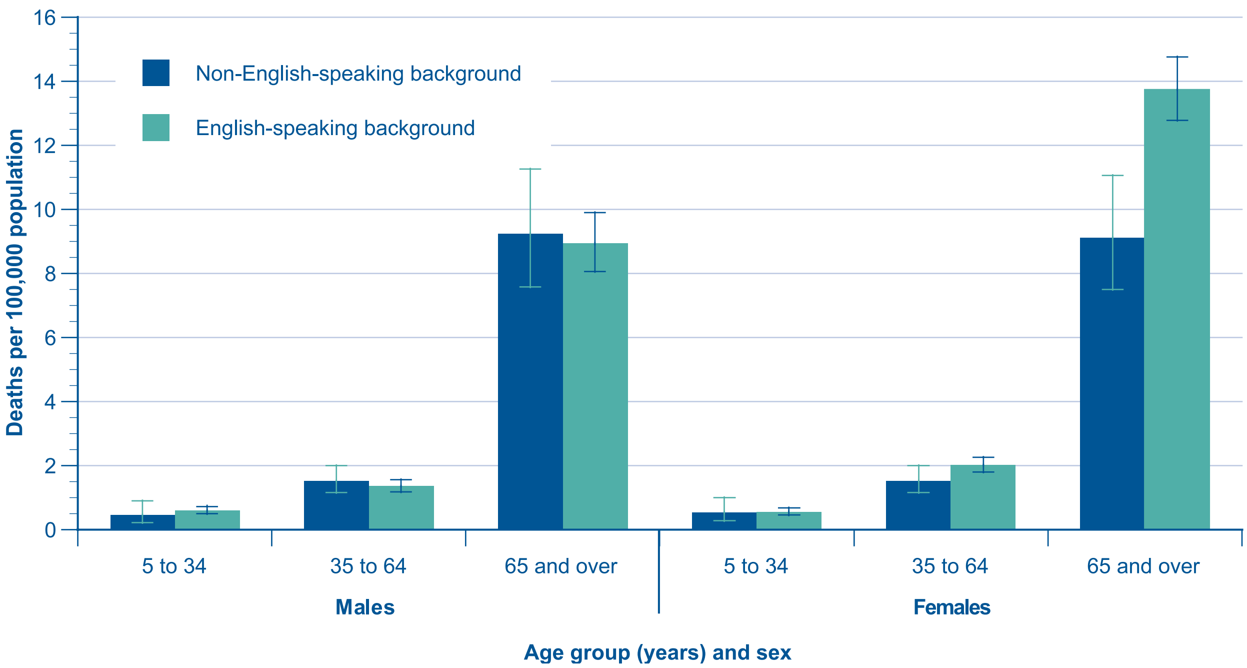
Sources: AIHW National Mortality Database; Australian Bureau of Statistics.

Culturally and linguistically diverse background

Older women from non-English-speaking backgrounds had lower death rates due to asthma than older women from English-speaking backgrounds (Figure 4.9). This difference in death rates is attributable to the lower prevalence of asthma among older, non-English-speaking women (see Figure 3.9). The case-fatality rate due to asthma, in all age groups, is similar in people of English-speaking and non-English-speaking backgrounds (Figure 4.10).

Figure 4.9

Deaths due to asthma per 100,000 population, by sex and English-speaking versus non-English-speaking background, people aged 5 years and over, Australia, 1999–2003

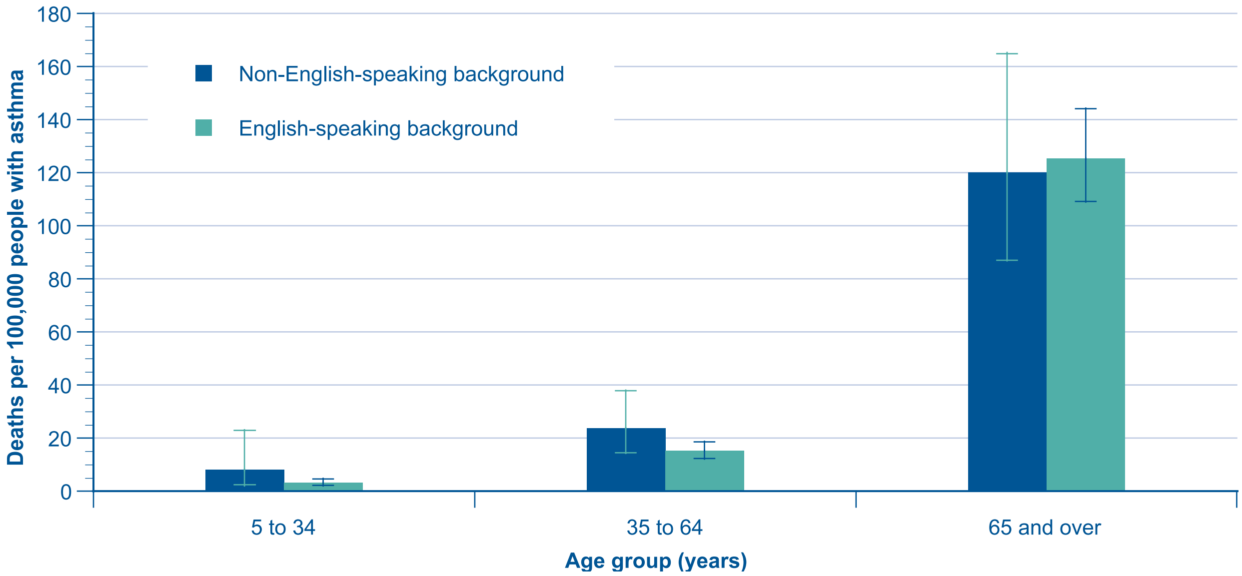


Notes: Death rates for aggregated data from 1999 to 2003. Asthma classified according to ICD-10 codes J45 & J46. For definition of non-English-speaking background and English-speaking background see Glossary.

Sources: AIHW National Mortality Database; Australian Bureau of Statistics.

Figure 4.10

Deaths due to asthma per 100,000 people with asthma, by English-speaking versus non-English-speaking background, people aged 5 years and over, Australia, 1999–2003



Notes: Death rates for aggregated data from 1999 to 2003. Asthma classified according to ICD-10 codes J45 & J46. For definition of non-English-speaking background and English-speaking background see Glossary.

Sources: AIHW National Mortality Database; National Health Survey, Australian Bureau of Statistics.

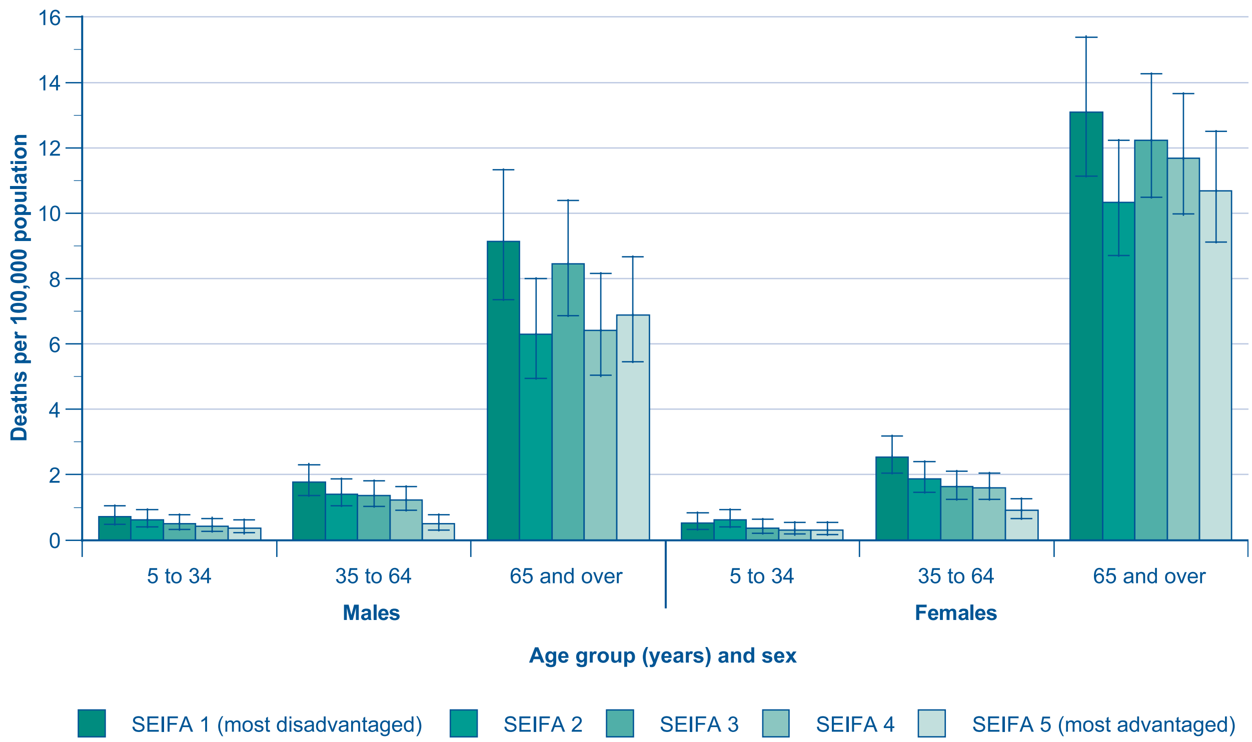
Socioeconomic disadvantage

Socioeconomic status reflects a complex interplay of factors such as ethnicity, education, income, occupation and geographic location. Overseas studies have found an increased risk of death from asthma related to race (Castro et al. 2001; Grant et al. 2000), lower socioeconomic status (Castro et al. 2001; Grant et al. 2000), and lower income and education (Grant et al. 2000). In Australia, all-cause mortality is correlated with the degree of socioeconomic disadvantage, particularly among men (Dunn et al. 2002).

The relation between levels of relative socioeconomic disadvantage and mortality risk were assessed using a locality-based index (SEIFA, see Appendix 1, Section A1.12). There was a significant relation between increasing levels of socioeconomic disadvantage and higher death rates for asthma in those localities among persons aged 5 to 64 years. This trend was not significant among persons aged 65 years and over (Figure 4.11). This trend was strongest in the 35 to 64 year age group, in which the death rate due to asthma in the two most disadvantaged quintiles was 3.2 times higher in males and 2.4 times higher in females than the death rate in the most advantaged quintile (95% CI 1.98 to 5.14 times in males, 1.67 to 3.40 times in females). This association was independent of related variation in the degree of remoteness.

Figure 4.11

Deaths due to asthma per 100,000 population, by age group, sex and socioeconomic status, people aged 5 years and over, Australia, 1999–2003



Note: Death rates for aggregated data from 1999 to 2003. Asthma classified according to ICD-10 codes J45 & J46.

Source: AIHW National Mortality Database; Australian Bureau of Statistics.

Seasonal variation in mortality risk

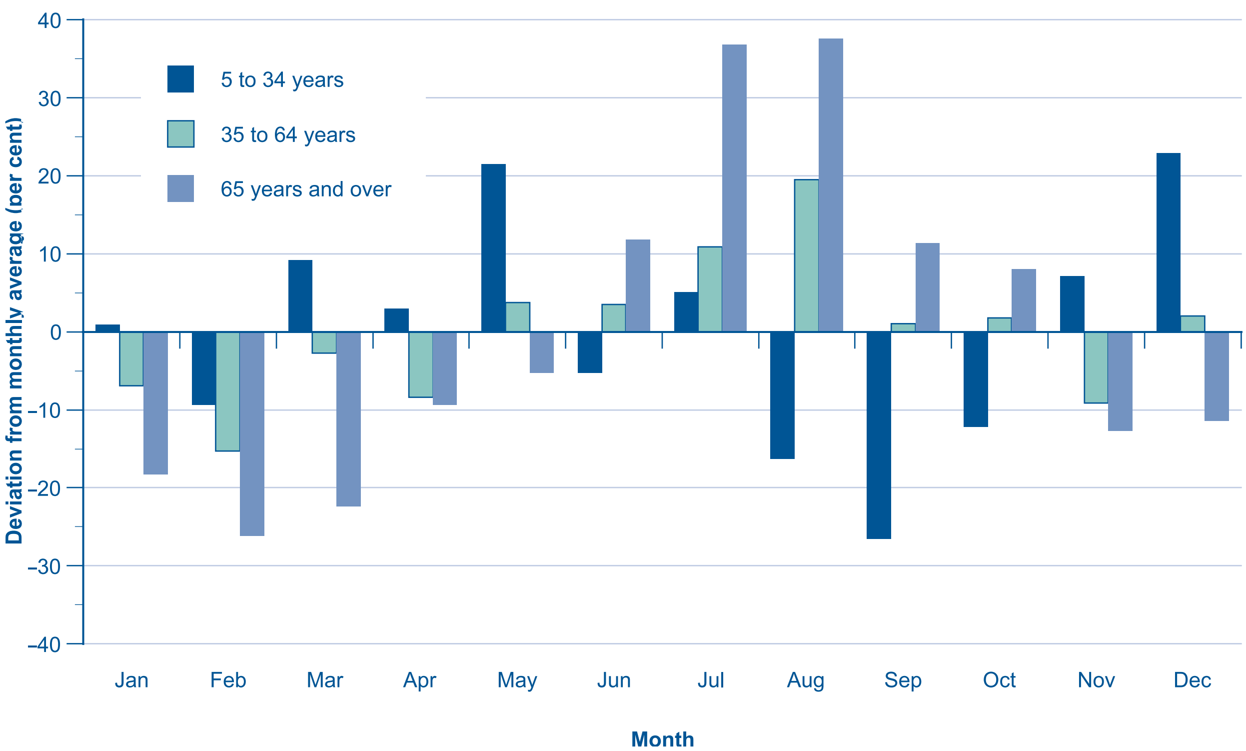
Previous studies have shown that seasonal variation in risk of death due to asthma varies between age groups (Marks & Burney 1997; Weiss 1990). These studies from the USA and England & Wales have shown higher rates during winter months in the older age groups. Data for Australia (Figure 4.12) reflected a similar pattern in people aged 65 years and over. This seasonal pattern presumably reflects the impact of the winter rise in influenza and pneumonia. A similar winter predominance is observed for all-cause mortality in this age group (AIHW: De Looper 2002).

Overall, there was no winter predominance in the pattern of asthma mortality among those aged 5 to 34 years and 35 to 64 years. There was no clear seasonal trend in these age groups. This is in contrast to the USA (Weiss 1990) and England & Wales (Marks & Burney 1997) where asthma mortality in 5 to 34 year olds peaked in late summer.

In Australia, all-cause deaths are more common in spring in younger people (AIHW: De Looper 2002), although the degree of seasonal predominance in this age group is less than in older age groups.

Figure 4.12

Average monthly deviation from average number of deaths due to asthma, by broad age group, Australia, 1979–2003



Note: Asthma classified according to ICD-9 code 493, 1979 to 1996 and ICD-10 codes J45 and J46, 1997 to 2003. For each month, the deviation from that year's monthly average number of deaths for the relevant age group was calculated. The mean monthly deviation was then calculated over the observed 24 years.

Source: AIHW National Mortality Database.

Summary

We have shown that Australian mortality rates due to asthma have been steadily falling for more than a decade and that this has continued an overall decline that occurred throughout the 20th century. However, the risk remains high compared with other nations.

Mortality rates for asthma increased markedly with age and, generally speaking, people living in remote areas and those living in socioeconomically disadvantaged areas had higher mortality rates. These trends mirror similar trends observed for all-cause mortality; however, a greater proportion of deaths due to asthma were among people aged 5 to 64 years than of deaths due to all causes. Among people aged 65 years and over, mortality was more commonly attributed to asthma in females than in males. How far this represents diagnostic or labelling preferences, as opposed to real differences in risk, is not known. There was an increased risk of death due to asthma during winter in older people but there was no such pattern among children and young adults.

Use of health services

5

Key points

- Urgent health service use for asthma reflects, in part, the impact of exacerbations of asthma in the population.

General practice encounters

- During the period 1998–99 to 2003–04, the average number of general practice encounters at which asthma was managed was 14.5 encounters per 100 population per year. This represents 3.7% of all general practice encounters over that period.
- Boys aged 0 to 4 years have the highest rate of asthma-related general practice encounters.
- Overall, the rate of general practice encounters for asthma has declined over the last 6 years, particularly in children aged 0 to 4 years.
- The Asthma 3+ Visit Plan is an incentive scheme designed to promote structured asthma care in general practice. Since its introduction in 2001, it is estimated that 3.9% of people with current asthma or 12.9% of people with moderate or severe asthma have utilised this service.
- Children and older adults with asthma are the most likely to access the Asthma 3+ Visit Plan, and young adults aged 15 to 34 years are the least likely.

Hospital emergency department visits

- Children aged 0 to 4 years have the highest rate of emergency department visits for asthma.
- People aged over 65 years and children aged 0 to 4 years are most likely to be admitted to hospital after going to an emergency department for asthma.

Hospitalisations

- Children, particularly those aged less than 5 years, have higher rates of hospitalisation for asthma than adults.
- There was a 46% reduction in the rate of hospital admissions for asthma among children and a 39% reduction among adults between 1993–94 and 2002–03.
- The average length of stay for people hospitalised for asthma fell from 2.9 days to 2.3 days between 1993–94 and 2002–03.
- The total hospital bed-days occupied by people with asthma decreased by 48% between 1993–94 and 2003–04.
- Among people aged 65 years and over, rates of hospitalisation for asthma are highest in the winter months, whereas, among children, the peaks occur in February and May.
- Among children, boys have higher rates of hospitalisation for asthma than girls, in keeping with the higher prevalence of asthma in boys. However, this trend is reversed after the age of 15 years when more females than males are admitted to hospital for asthma.

- Among people aged 35 years and over, rates of hospitalisation for asthma are higher in people living in more remote areas.
- Indigenous Australians have higher rates of hospitalisation for asthma than other Australians in all age groups.
- Rates of hospitalisation for asthma are higher among people living in more socioeconomically disadvantaged areas.

Asthma requiring mechanical ventilation

- In 2001–02, 15.3 out of every 1,000 hospitalisations for asthma among adults included a period of mechanical ventilation.
- The proportion of hospitalisations for asthma in which mechanical ventilation was instituted increased between 1998–99 and 2000–01.
- The highest proportion of hospitalisations for asthma requiring mechanical ventilation is among 35 to 64 year old adults.
- Persons of non-English-speaking background are more likely to require mechanical ventilation during a hospitalisation than English-speaking persons.

Re-attendances for asthma

- Approximately 8% of people who visit an emergency department for asthma or are admitted to hospital re-attend these services within 28 days.
- The highest rate of re-admissions is among people aged 15 to 64 years. Re-admission rates are higher in females than males.
- Following a hospitalisation for asthma, 5% of people are re-admitted to hospital for asthma within 28 days and a further 2% visit an emergency department.
- Approximately 5% of people who initially visit an emergency department for asthma re-visit the emergency department for asthma and a further 3% are admitted to hospital within 28 days.

Introduction

People with asthma seek health care for non-urgent reasons, such as routine review and prescription of usual asthma therapy, or for urgent management of disease exacerbations or 'attacks'. This chapter presents analyses of data on the use of health care services by people with asthma. In particular, there is a focus on the application of these data to investigate the nature of exacerbations of asthma at a population level. In addition, data on re-attendance for asthma care at emergency departments (EDs) and hospitals are described. These data may be used as an indicator of the quality of health care in the acute and post-acute setting in terms of its impact on the subsequent course of the disease.

Clinicians monitor markers of control of asthma to guide management and changes in medication. Well-controlled asthma indicates that the disease is mild and/or well managed and poor asthma control may indicate poor management. Hence, knowledge of the overall level of asthma control in the population provides some information on the effectiveness of the management of asthma in the community and the need for further efforts in improving asthma management. Most markers of disease control require clinical measures that are not readily available at a population level. However, exacerbations are one marker of poor asthma control that can be measured using urgent health care utilisation data as a proxy for the occurrence of exacerbations. Therefore, these data can be used to monitor levels of asthma control in the population.

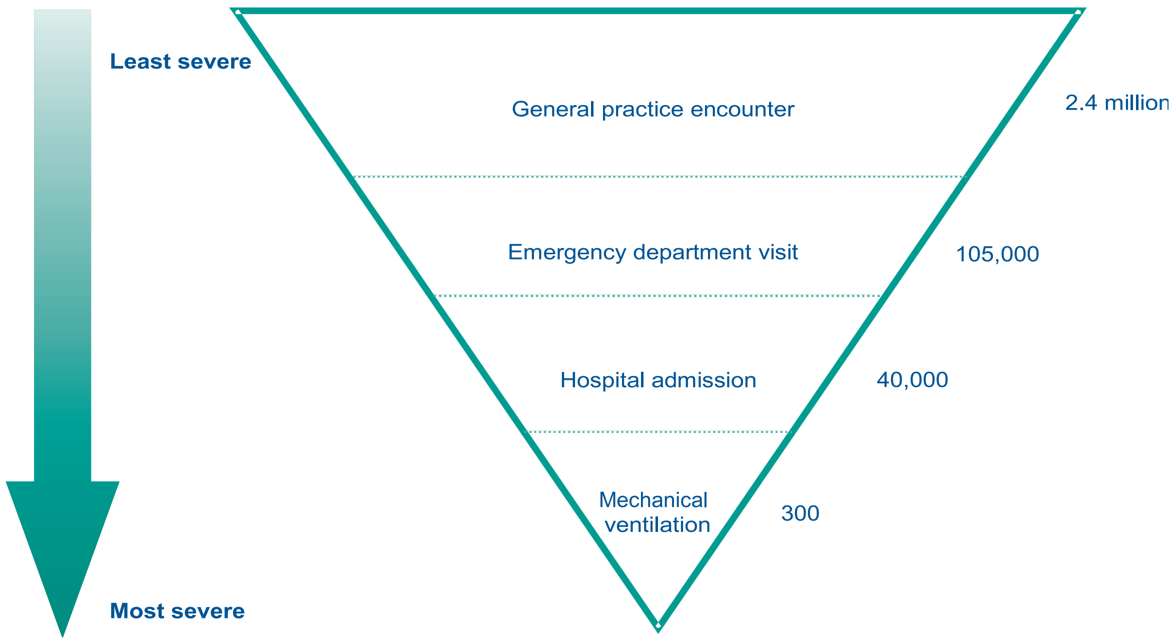
There is empirical support for the interpretation of health care utilisation as a population-based indicator of the level of control of asthma (Cowie et al. 2001; de Marco et al. 2003; Herjavecz et al. 2003; Vollmer et al. 2002). Additionally, there is evidence that factors that could predispose an individual to poorly controlled asthma have also been associated with greater health care utilisation. These include poor knowledge about asthma (Goeman et al. 2004; Radeos et al. 2001), absence of an asthma management plan (Adams et al. 2000; Fernandes et al. 2003; Radeos et al. 2001), poor self-management skills (Kennedy et al. 2003; Soriano et al. 2003) and limited access to primary care (Christakis et al. 2001). Furthermore, interventions that target improving asthma control through self-management plans and education have been shown to reduce urgent health care utilisation (Castro et al. 2003; Cote et al. 2001). However, the occurrence of exacerbations does not always indicate the presence of severe or poorly controlled asthma. Viral respiratory tract infections cause disease exacerbations, even in people with otherwise well-controlled asthma (Reddel et al. 1998).

People with asthma who experience exacerbations of their disease may self-manage the episode or seek urgent medical care from their general practitioner. In more severe cases, they may seek care from a hospital emergency department. There is a relationship between severity of the exacerbation and type of health care used (Figure 5.1), which allows data on health care utilisation to be interpreted, indirectly, as evidence about the incidence and severity of disease exacerbations.

General practitioners provide the largest volume of care. However, this includes maintenance and review care for asthma as well as management of asthma exacerbations (represented by the wide area at the top of Figure 5.1). Emergency departments and hospitals are generally only used for the management of exacerbations of asthma. Figure 5.1 illustrates that, while exacerbations of greater severity make up a small proportion of asthma exacerbations, they require greater levels of intervention and this is reflected in the type of health care used (indicated by the arrow in Figure 5.1). The small area at the bottom of Figure 5.1 represents a subset of the most severe exacerbations that are life threatening. Some of these patients require assisted (mechanical) ventilation in the intensive care unit. The categories presented in Figure 5.1 are not mutually exclusive. A proportion of those cases managed by general practitioners subsequently visit an ED, which, for some patients, results in admission to hospital.

In summary, health care use attributable to exacerbations of asthma is an indicator, albeit imperfect, of the level of control of asthma in the community. The nature and intensity of health service use gives a further indication of disease control by reflecting the severity of the exacerbations of asthma.

Figure 5.1
Types of health service use, with approximate number of episodes of care for asthma in one year and severity of asthma exacerbations



5.1 General practice encounters

General practitioners (GPs) play a central role in the management of asthma in the community. This role includes assessment, prescription of regular therapy, education and review, and managing acute exacerbations of disease for most people with asthma. It is important to monitor data on general practice encounters for asthma to provide information on trends and differentials in the use of health care resources for asthma and in accessibility to general practice care for patients with asthma. Variations in resource utilisation and accessibility provide important information for policy and planning purposes, including the development and evaluation of community interventions.

Asthma-related visits to general practitioners may occur for a variety of reasons, including: the acute or reactive management of asthma symptoms; a review during or following an acute episode; or a visit for maintenance activities such as monitoring and prescription of regular medications. The GP may initiate an opportunistic review when the patient visits for another condition or the patient or the GP may schedule a structured asthma review visit.

With the introduction of a number of strategies to improve the management of asthma in general practice, there was an expectation that the number of planned review encounters would increase (at least initially), while visits for acute episodes or exacerbations of asthma would decrease. Although there is information on the number of review visits for which specific re-imbursement is claimed under the Practice Incentive Program (PIP) (see the section on 'Asthma 3+ Visit Plan PIP claims'), there is no data source that can provide information, separately, on the rate of acute and review asthma-related general practice encounters.

This section presents information on all asthma-related general practice encounters. These estimates are based on data from the Bettering the Evaluation and Care of Health (BEACH) survey (AIHW GPSCU 2002), which are derived from a set of encounters reported by a rolling random sample of general practitioners. Rates are expressed as population-based rates and as proportions of all general practice encounters. For more details about BEACH data and methods see Appendix 1, Section A1.3. A summary of these data is provided in Appendix 2, Table A2.10. This section also reports data on PIP claims for reimbursement for structured general practice review visits for asthma (the Asthma 3+ Visit Plan).

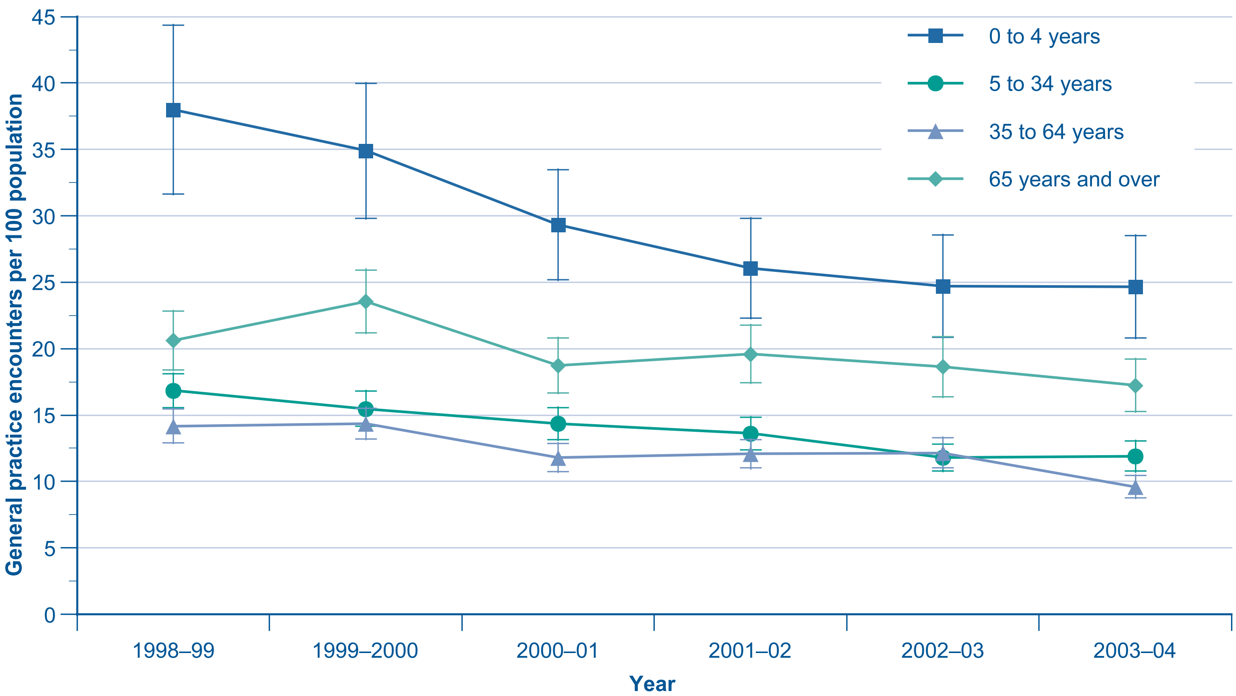
Time trends in general practice encounters for asthma

During the period 1998–99 to 2003–04, the rate of general practice encounters for asthma decreased both in absolute terms, from 17 per 100 population per year in 1998–99 to 12 per 100 population per year in 2003–04 (Figure 5.2) and in relative terms, from 3.1% of all general practice encounters in 1998–99 to 2.5% of all general practice encounters in 2003–04 (Figure 5.3). The largest decrease was in the 0 to 4 year age group. The rate of GP encounters for asthma in this age group was higher than in other age groups but it fell by over 30% between 1998–99 and 2003–04 (Figure 5.2).

The interpretation of this reduction in GP visits for asthma may reflect improvements in asthma, including decreased prevalence, decreased severity, improved asthma control and/or improved self-management of asthma exacerbations. As well as these, there are other plausible explanations. It is also possible that the diagnosis of asthma may have changed over time so that some individuals previously labelled with asthma are now diagnosed with a different disease. Finally, the decrease in general practice encounters could possibly be interpreted as reflecting a reduction in accessibility of general practice encounters for people with asthma. The last of these seems less likely since there is a relative reduction in asthma encounters, as well as an absolute reduction. Furthermore, the reduction in GP encounters for asthma is paralleled by reductions in emergency department visits and hospital admissions for asthma, as described in the next section.

Figure 5.2

General practice encounters for asthma per 100 population, by age group, Australia, 1998–2004

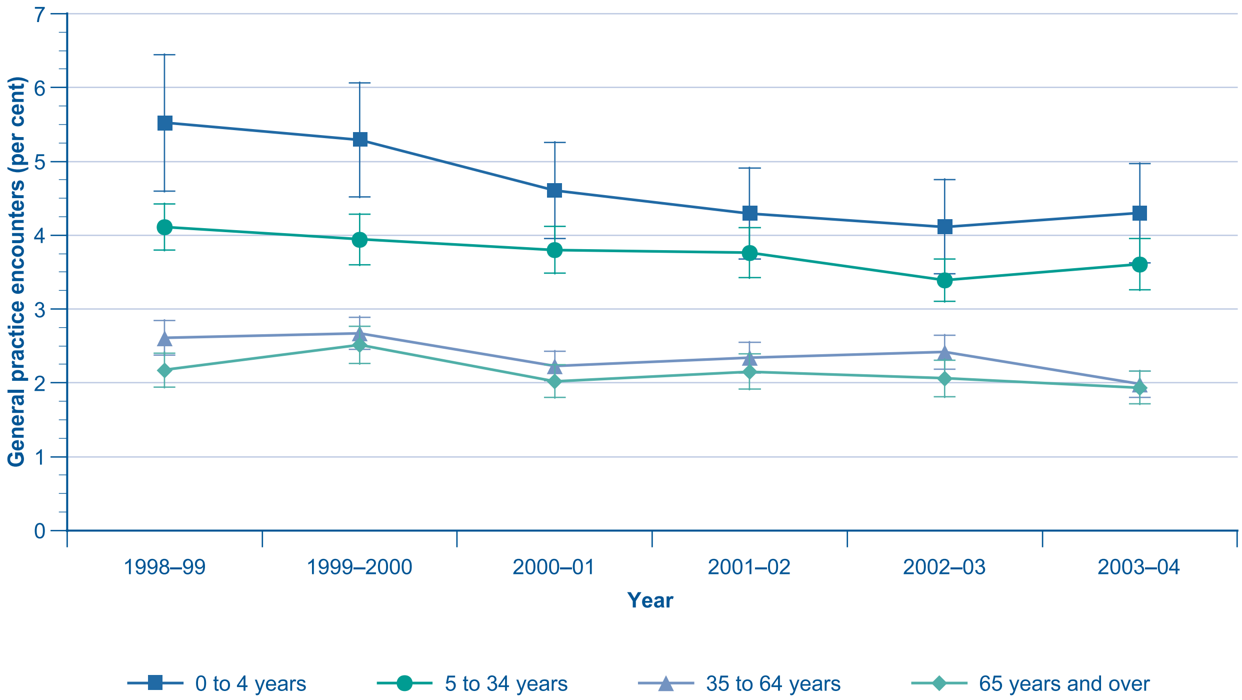


Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March.

Source: BEACH Survey of General Practice.

Figure 5.3

Proportion of general practice encounters for asthma, by age group, Australia, 1998–2004



Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March.

Source: BEACH Survey of General Practice.

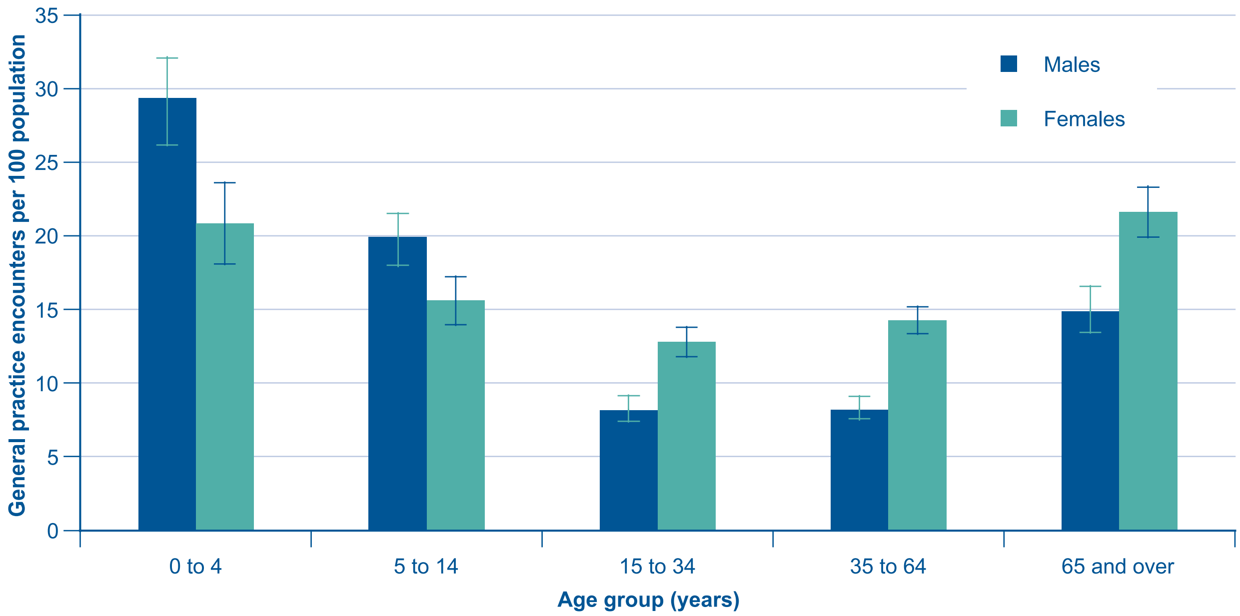
Longer-term time trend data are not available for Australia. Data from the USA show that the rate of visits to office-based physicians (which includes primary care physicians and allergy, pulmonary and internal medicine specialists) for asthma increased from 4 per 100 population in 1980, to 7 per 100 population in 1990 and has since stabilised at 6 per 100 (Stafford et al. 2003).

Differentials in general practice encounters for asthma

Age and sex

Among children, boys were more likely than girls to have an asthma-related general practice encounter. This trend was reversed after the age of 15 years, with females having more asthma-related general practice encounters (Figure 5.4), reflecting the change in asthma prevalence at this age. During 2001–04, males aged 0 to 4 years had the highest rate of asthma-related general practice encounters (29.3 per 100 population), followed by females aged 65 years and over (21.6 per 100 population) and 0 to 4 years (20.8 per 100 population), while males aged 15 to 34 years and 35 to 64 years had the lowest rates.

Figure 5.4
General practice encounters for asthma per 100 population, by age group and sex, Australia, April 2001 to March 2004

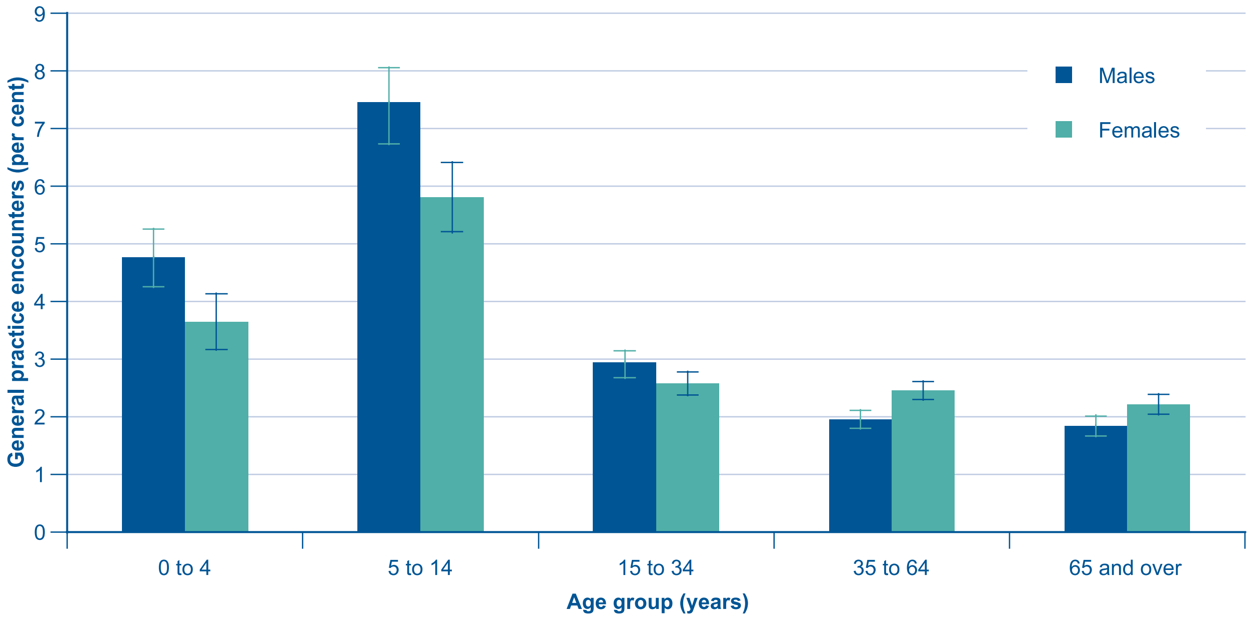


Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008.

Source: BEACH Survey of General Practice.

Asthma represented the largest proportion of general practice encounters among children aged 5 to 14 years (6.6%) and the smallest proportion among adults aged 65 years and over (2.1%) (Figure 5.5). Although the absolute rates of attendance for asthma were higher in children aged 0 to 4 years and adults aged 65 years and over, people in these age groups visited general practices relatively more commonly for reasons other than asthma.

Figure 5.5
Proportion of general practice encounters for asthma, by age group and sex, Australia, April 2001 to March 2004



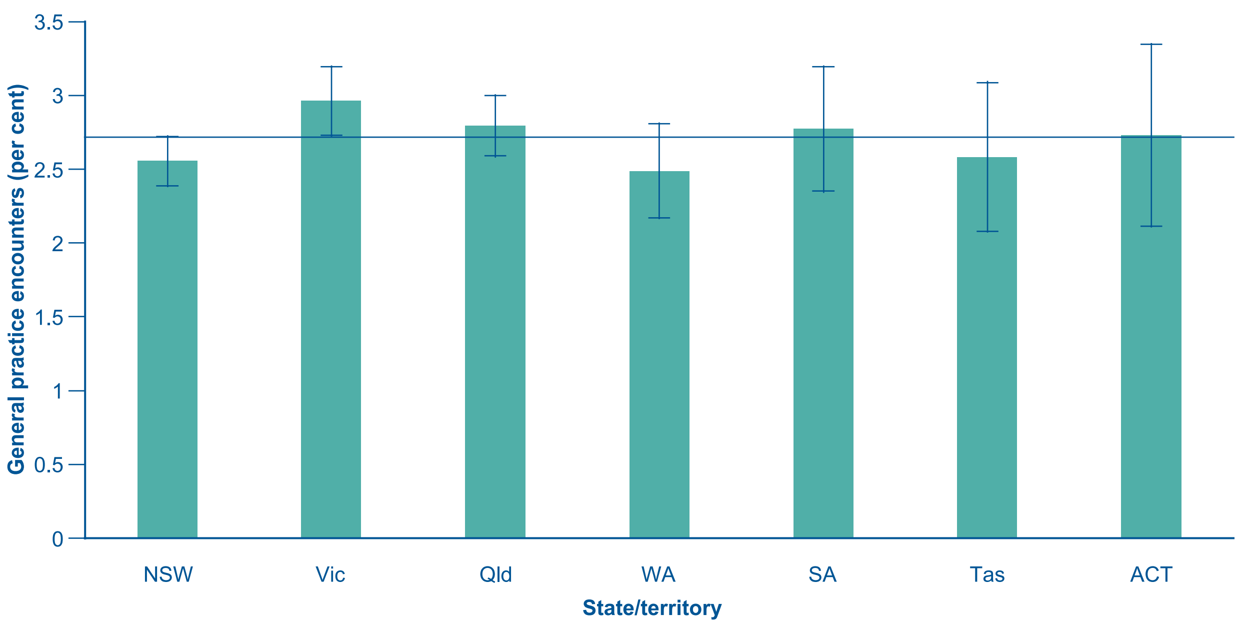
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008.

Source: BEACH Survey of General Practice.

States and territories

There was little variation among the states and territories in the proportion of general practice encounters for asthma (Figure 5.6).

Figure 5.6
Proportion of general practice encounters for asthma, by state and territory, Australia, April 2001 to March 2004



Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. Horizontal line represents the national average annual proportion of general practice encounters for asthma (2.7 per 100 general practice encounters). Data for Northern Territory excluded as the numbers are too small to produce reliable estimates.

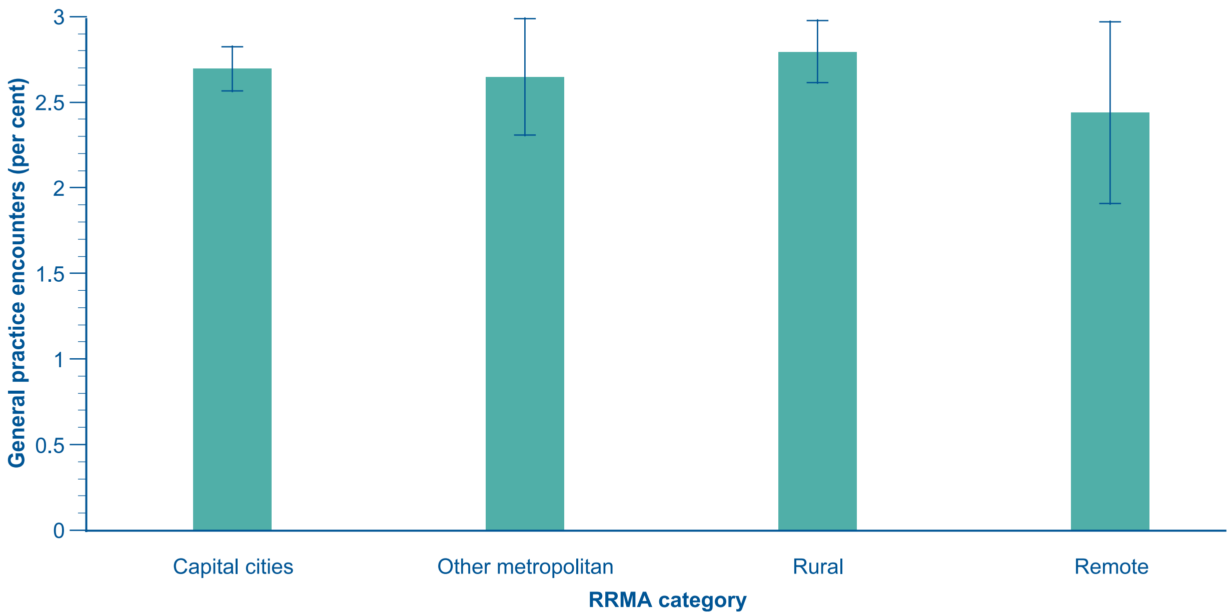
Source: BEACH Survey of General Practice.

Urban, rural and remote areas

The rates for asthma-related general practice encounters did not differ across metropolitan, rural and remote regions in Australia for the period April 2001 to March 2004 (Figure 5.7).

Figure 5.7

Proportion of general practice encounters for asthma, by remoteness, Australia, April 2001 to March 2004



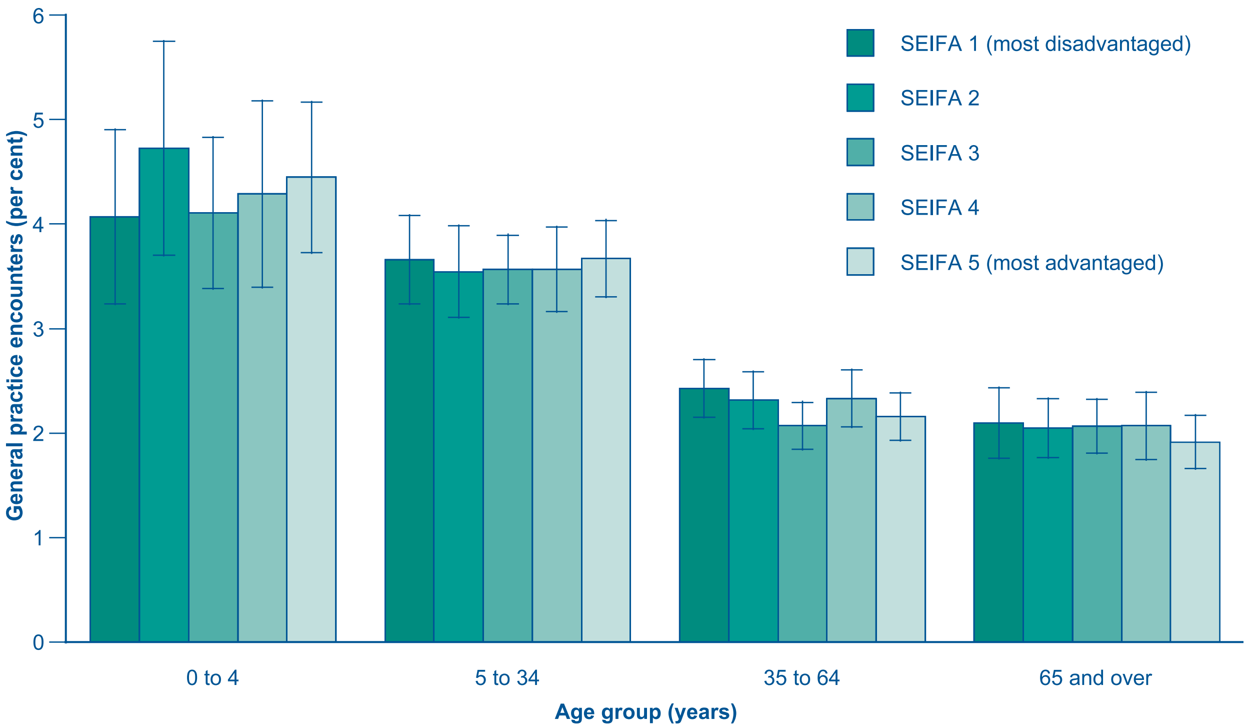
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. Remoteness is classified according to the rural, remote and metropolitan areas (RRMA) classification (see Appendix 1, Section A1.2).

Source: BEACH Survey of General Practice.

Socioeconomic disadvantage

The proportion of all general practice encounters that were for asthma, in all age groups, was unrelated to levels of socioeconomic disadvantage in individuals' locality of residence during the period 2001–04 (Figure 5.8).

Figure 5.8
Proportion of general practice encounters for asthma, by age group and socioeconomic status, Australia, April 2001 to March 2004



Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. Socioeconomic status is classified using the Socio-Economic Index For Areas (SEIFA), in which SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Source: BEACH Survey of General Practice.

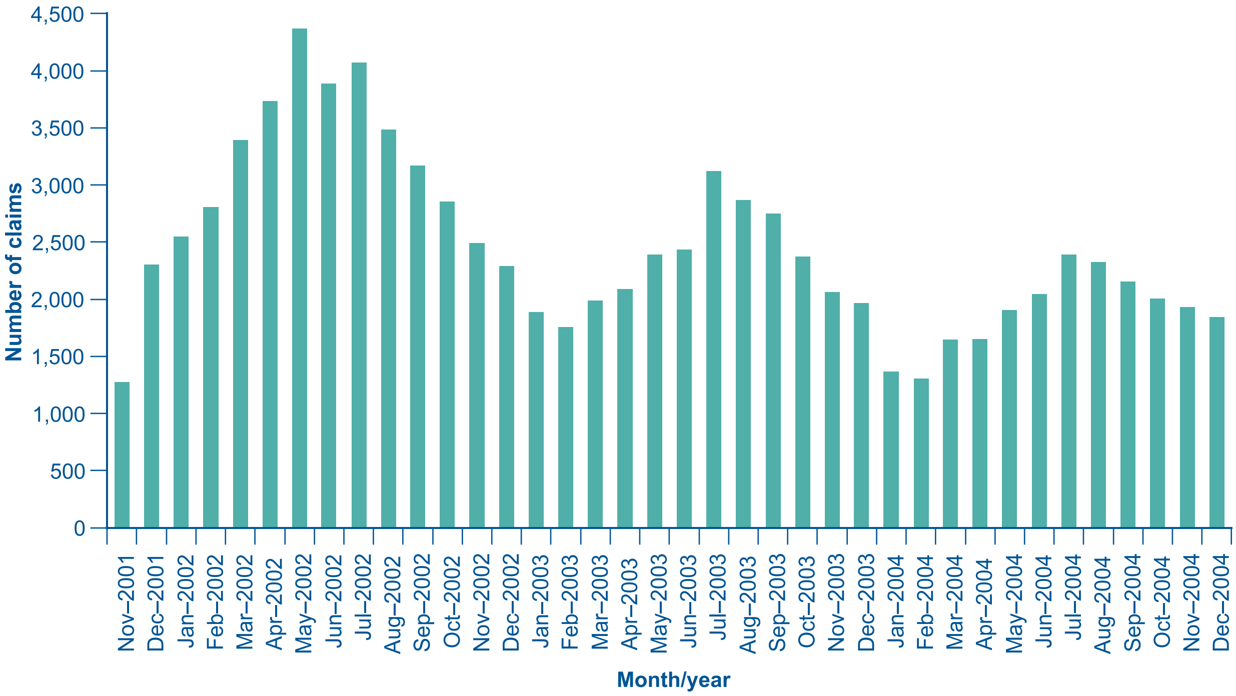
Asthma 3+ Visit Plan Practice Incentive Program claims

The Asthma 3+ Visit Plan Practice Incentive Program (PIP) is funded by the Australian Government. It is aimed at patients with moderate or severe asthma and entails the development and ongoing review of an asthma management plan over at least three general practice visits (DoHA 2002).

The program began in late 2001 and by the end of March 2005 96,903 Asthma 3+ Visit Plan claims had been lodged for 84,914 individuals. Overall, the number of people for whom at least one claim for an Asthma 3+ Visit Plan PIP payment had been made since November 2001 represents 3.9% of the estimated number of people with current asthma in Australia. Assuming that 32% of adults with current asthma have moderate or severe disease and 23% of children with asthma have frequent episodic or persistent disease (see Chapter 8, Table 8.6), it is estimated that 12.9% of people with asthma who are eligible for the scheme have had a least one claim for it. The number of claims for Asthma 3+ Visit Plan payments has steadily declined since 2002.

The rate of claims for payments under the scheme peaked in May and July 2002 (Figure 5.9). Seasonal fluctuations are observed in the number of claims made for Asthma 3+ Visit Plan payments, with higher rates in the winter months and lower rates in January and February. This is consistent with the overall rate of general practice consultations for asthma during these times.

Figure 5.9
Number of Asthma 3+ Visit Plan PIP claims, all ages, Australia, November 2001 to December 2004



Note: Claims are for asthma review visit classified codes 2546, 2547, 2552, 2553, 2558, 2559, 2664, 2666, 2668, 2673, 2675 & 2677.

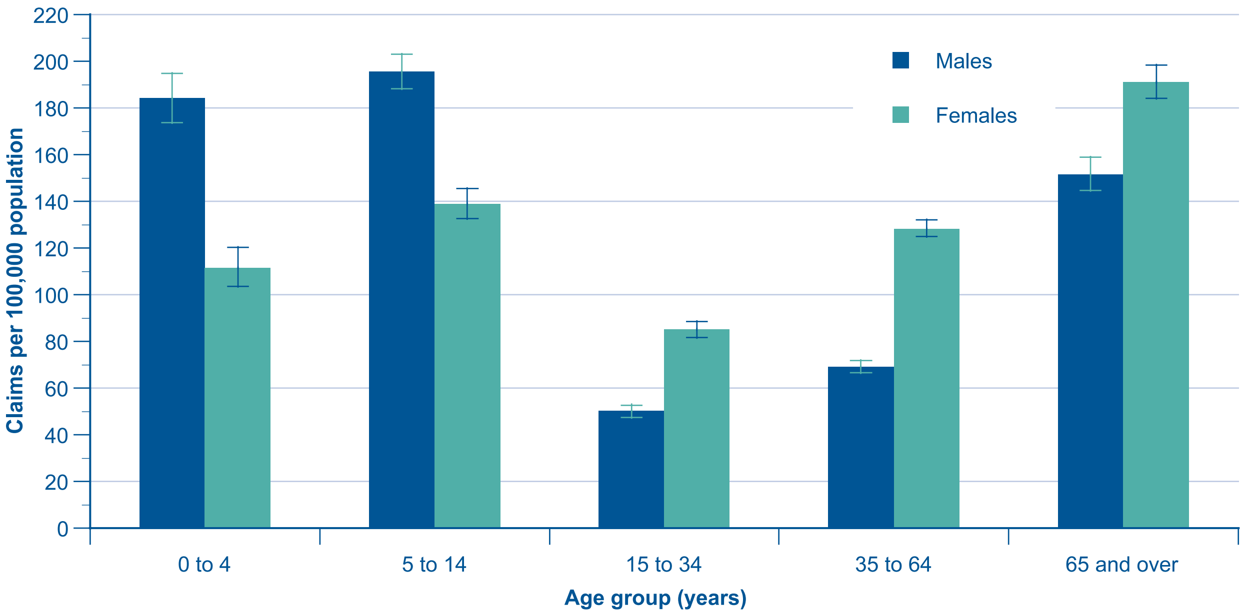
Source: MBS statistics.

Differentials in Asthma 3+ Visit Plan Practice Incentive Program claims

Age and sex

Among children aged less than 15 years, Asthma 3+ Visit Plan PIP claims were higher for males than females in 2004 (Figure 5.10), consistent with the higher prevalence of asthma in males in this age group. The reverse differential was evident among persons aged 15 years and over. The rate of claims was highest in females aged 65 years and over and males aged 5 to 14 years. This age and gender pattern is similar to that observed for general practice consultations for asthma (Figure 5.4), except that the rate of Asthma 3+ Visit Plan claims among persons aged 65 years and over is relatively higher and the rate of claims for persons aged less than 5 years is relatively lower. Among people with asthma, young adults were least likely to have utilised the Asthma 3+Visit Plan (Figure 5.11).

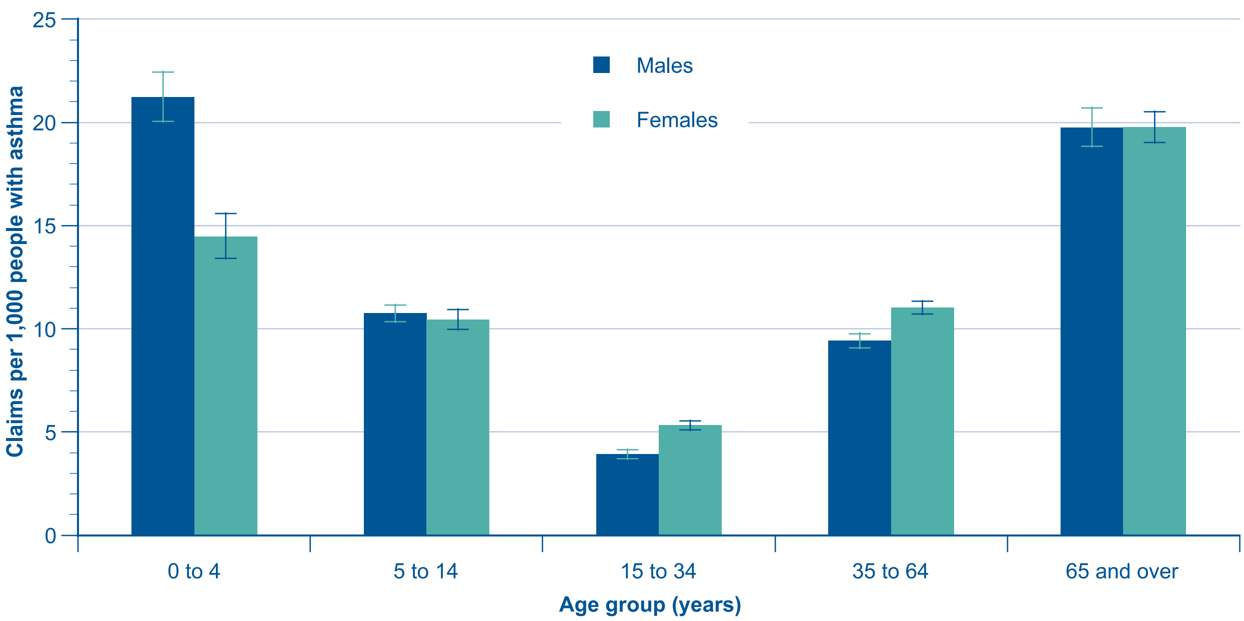
Figure 5.10
Asthma 3+ Visit Plan PIP claims per 100,000 population, by age group and sex, Australia, 2004



Note: Claims are for asthma review visit classified codes 2546, 2547, 2552, 2553, 2558, 2559, 2664, 2666, 2668, 2673, 2675 & 2677.

Sources: MBS statistics; Australian Bureau of Statistics.

Figure 5.11
Asthma 3+ Visit Plan PIP claims per 1,000 people with asthma, Australia, 2004



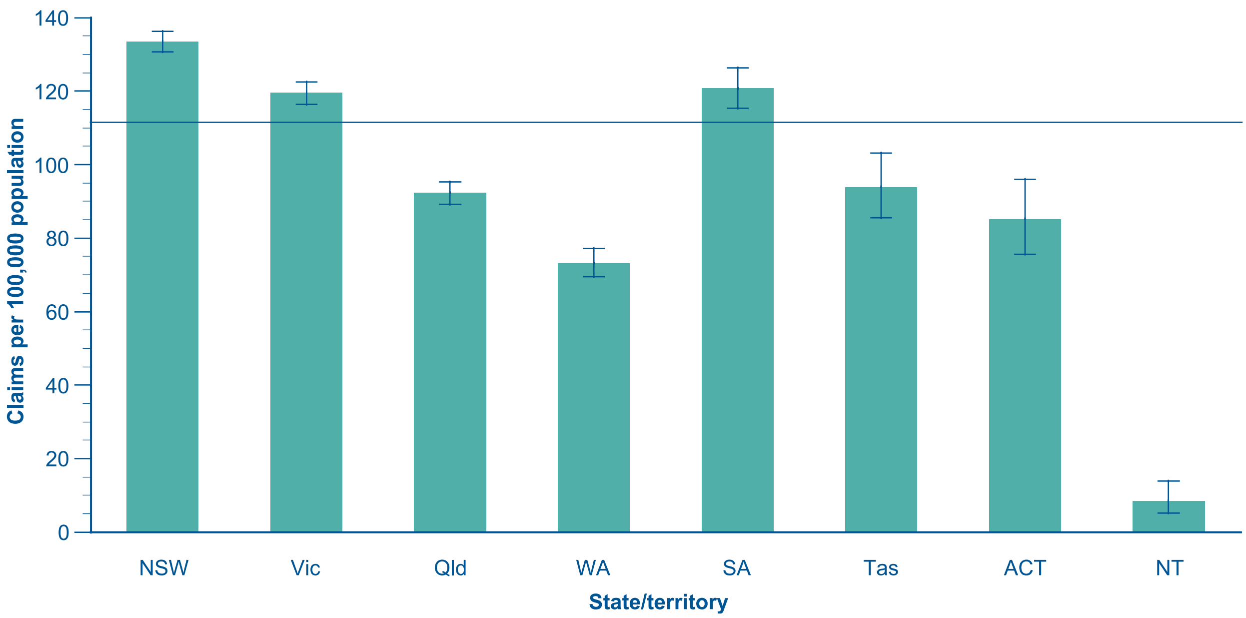
Note: Claims are for asthma review visit classified codes 2546, 2547, 2552, 2553, 2558, 2559, 2664, 2666, 2668, 2673, 2675 & 2677. Current asthma prevalence rates for each age group were estimated using the 2001 National Health Survey prevalence estimates and 2004 population estimates from the Australian Bureau of Statistics.

Sources: MBS statistics; ABS National Health Survey 2001; Australian Bureau of Statistics.

States and territories

During 2004, the rate of claims for Asthma 3+ Visit Plan payments was highest in New South Wales and South Australia. In Queensland, Western Australia, Tasmania, the Australian Capital Territory and the Northern Territory, the rate was significantly lower than the national average (Figure 5.12). This variation in utilisation of the Asthma 3+ Visit Plan contrasts with the lack of variation among the states and territories in the overall rates of GP consultations for asthma (Figure 5.6).

Figure 5.12
Asthma 3+ Visit Plan PIP claims per 100,000 population, by state and territory, Australia, 2004



Note: Claims are for asthma review visits classified codes 2546, 2547, 2552, 2553, 2558, 2559, 2664, 2666, 2668, 2673, 2675 and 2677. Horizontal line represents the Australian rate of Asthma 3+ Visit Plan PIP claims (112 per 100,000 population).

Sources: MBS statistics; Australian Bureau of Statistics.

Summary

The highest rate of asthma-related general practice encounters was seen in boys aged 0 to 4 years and the lowest rate was among males aged 15 to 64 years. Over the last 6 years, the rate of general practice encounters for asthma decreased from 17 per 100 population per year to 12 encounters per 100 population per year. This decline was most noticeable in the 0 to 4 year age group. There was no evidence of variation in the rate of general practice encounters for asthma according to remoteness or level of socioeconomic disadvantage. The age and gender distribution of claims for the Asthma 3+ Visit Plan followed a similar pattern, except that there were relatively more claims for people aged 65 years and over. Rates of Asthma 3+ Visit Plans claims have decreased since 2002 and have occurred in 3.9% of the estimated number of people with asthma since the introduction of the scheme.

5.2 Hospital emergency department visits

People with asthma may visit an emergency department (ED) when they experience an exacerbation or worsening of their disease. Since exacerbations may be a feature of severe or poorly controlled asthma, rates of ED visits for asthma are often considered to reflect the prevalence of severe or poorly controlled asthma in the community (Farber et al. 1998; Vollmer et al. 2002; Wakefield et al. 1997). The rate of ED visits for asthma may also be a useful indicator of the effects of interventions implemented to reduce the frequency and severity of exacerbations of asthma (Harish et al. 2001; Sin & Man 2002).

However, going to an ED is only one of a range of alternatives available for managing less severe flare-ups of asthma. Hence, variation in ED visits may, in part, be attributable to variation in access to general practitioner care (including after hours and home visit accessibility) and in the use of self-management plans for exacerbations. Also, the accessibility of the ED care itself may influence the likelihood that people with worsening of asthma will seek out this care.

Finally, it should be noted that not all ED visits for asthma are attributable to exacerbations of asthma. There is some evidence to show that people may use EDs as a source of routine primary care (Ford et al. 2001; Halfon et al. 1996; Hanania et al. 1997).

Currently, only New South Wales, Victoria and, more recently, Western Australia collect data on ED visits with diagnoses attached to each record. In this section we present combined data obtained from the New South Wales Emergency Department Data Collection and the Victorian Emergency Minimum Dataset.

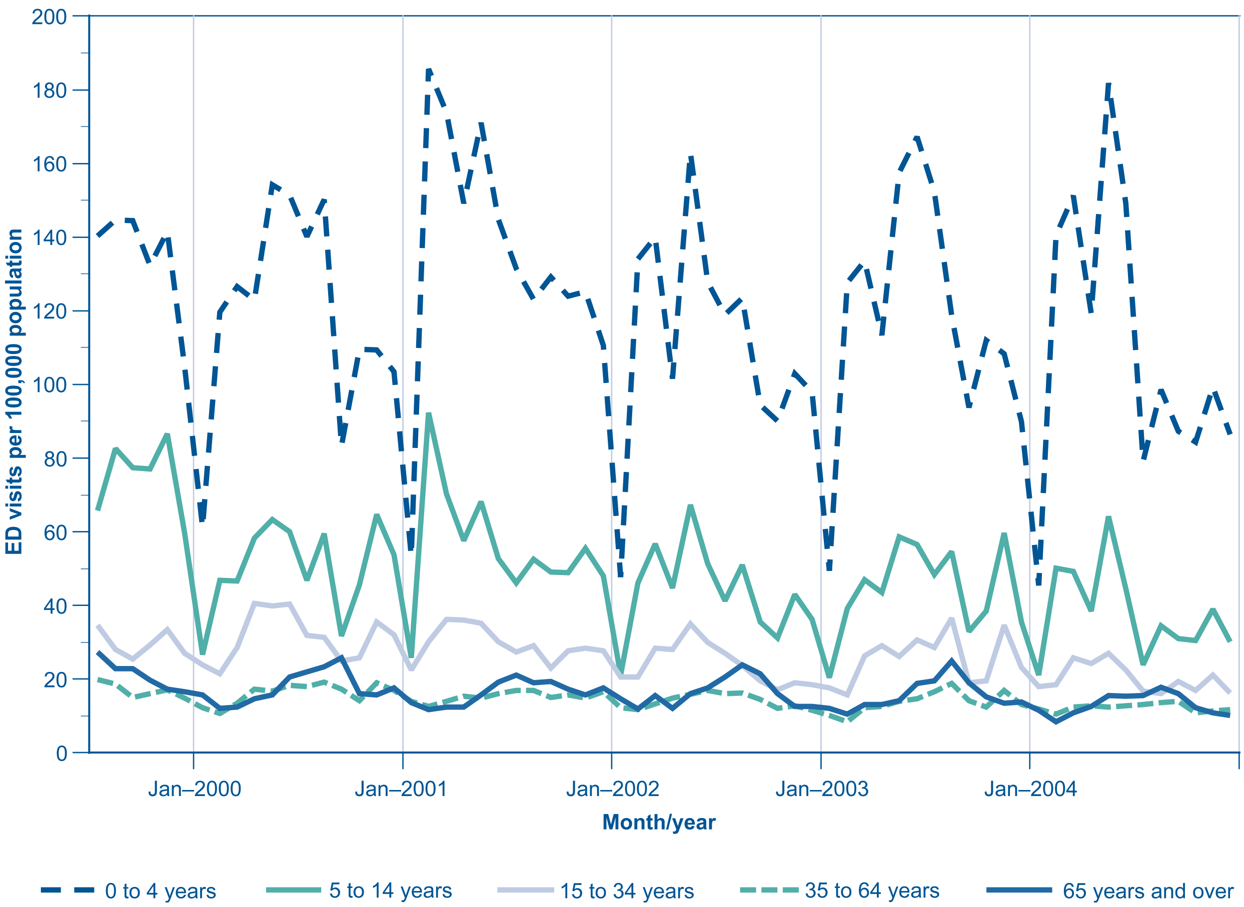
There are some limitations to the available data. Coverage of EDs is not complete and the estimated population-based attendance rates are an underestimate of the true rates. Furthermore, coverage is generally higher in metropolitan than rural areas, which results in some bias in the available data. Finally, in contrast to the hospital in-patient data (National Hospital Morbidity Database), the diagnoses used in the ED dataset are provisional and are not coded by a professional coder. Inconsistencies in coding may limit the ability to identify all presentations for asthma. However, it has been shown elsewhere that this form of ED data is reasonably accurate for the purpose of identifying people presenting with asthma (Premaratne et al. 1997). For a further description of this data source, refer to Appendix 1, Section A1.4.

Time trends in ED visits for asthma

There was marked month-to-month variability in the rate of ED visits for asthma, particularly among children. Of note, the lowest rate of ED visits for asthma, expressed as a rate per 100,000 population, consistently occurred in January when there was also the least difference between age groups. At other times of the year, the rate of visits to an ED for asthma was much higher among children aged 0 to 14 years than in all other age groups. Both the timing and the size of peaks in rates of ED visits varied with age (Figure 5.13). Among children under the age of 15 years, several very large peaks in ED visits occurred, most notably in February 2001, May 2002 and May 2004. Among persons aged 65 years and over, and to a lesser extent those aged 35 to 64 years, the fluctuations in ED visit rates were less marked.

Figure 5.13

Emergency department visits for asthma per 100,000 population, by age group and month, New South Wales and Victoria, July 1999 to December 2004



Note: As the coverage of the ED data is less than 100%, this rate will be an underestimate of the true ED visit rate among people with asthma. Data for the period July to December 2004 are for New South Wales only.

Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

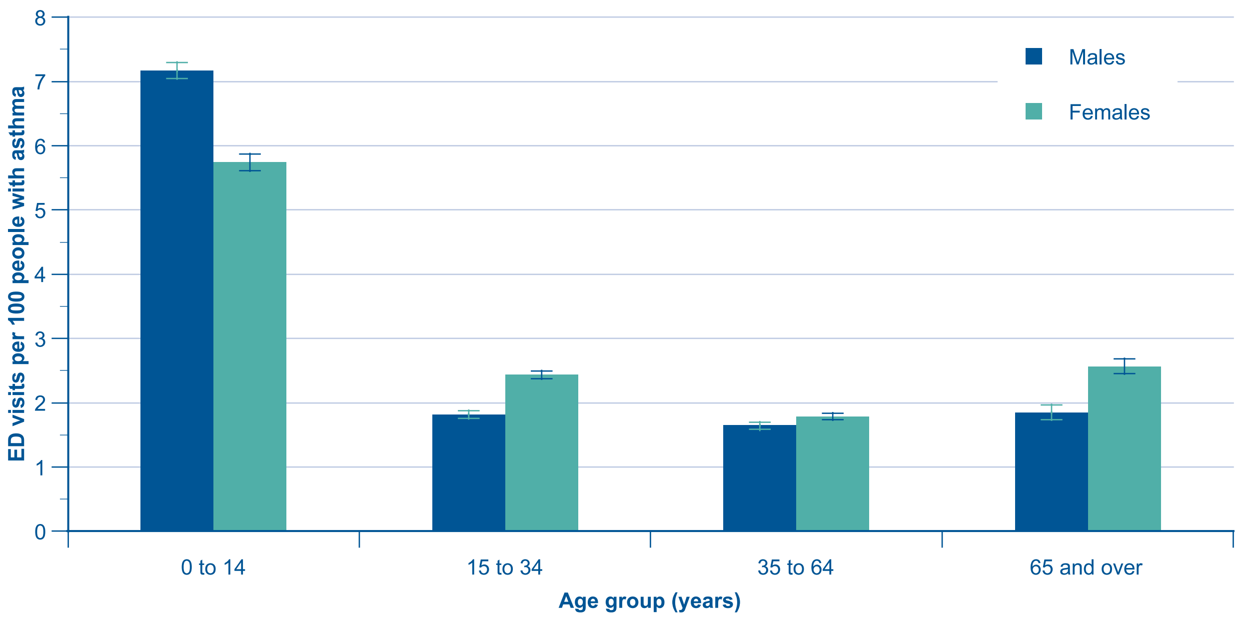
Differentials in ED visits for asthma

Age and sex

Overall, 1.7% of all ED visits were for asthma during the period 1999–2004. The proportion was highest among children aged 0 to 14 years (3.4%) and decreased with age.

The rate of visits to an ED for asthma, expressed as the rate per 100 people with asthma, was much higher among children aged 0 to 14 years than in all other age groups (Figure 5.14). Males with asthma had a higher ED visit rate than females during childhood and the gender difference was reversed in adult life. However, the differences between males and females were small except for the moderate excess of males in the youngest age group.

Figure 5.14
Emergency department visits for asthma per 100 people with asthma, by age group and sex, New South Wales and Victoria, July 1999 to June 2004



Note: The total number of people with asthma in New South Wales and Victoria was estimated by age group and sex based on the 2001 National Health Survey. As the coverage of the ED data are less than 100%, this rate will be an under-estimate of the true ED visit rate among people with asthma.

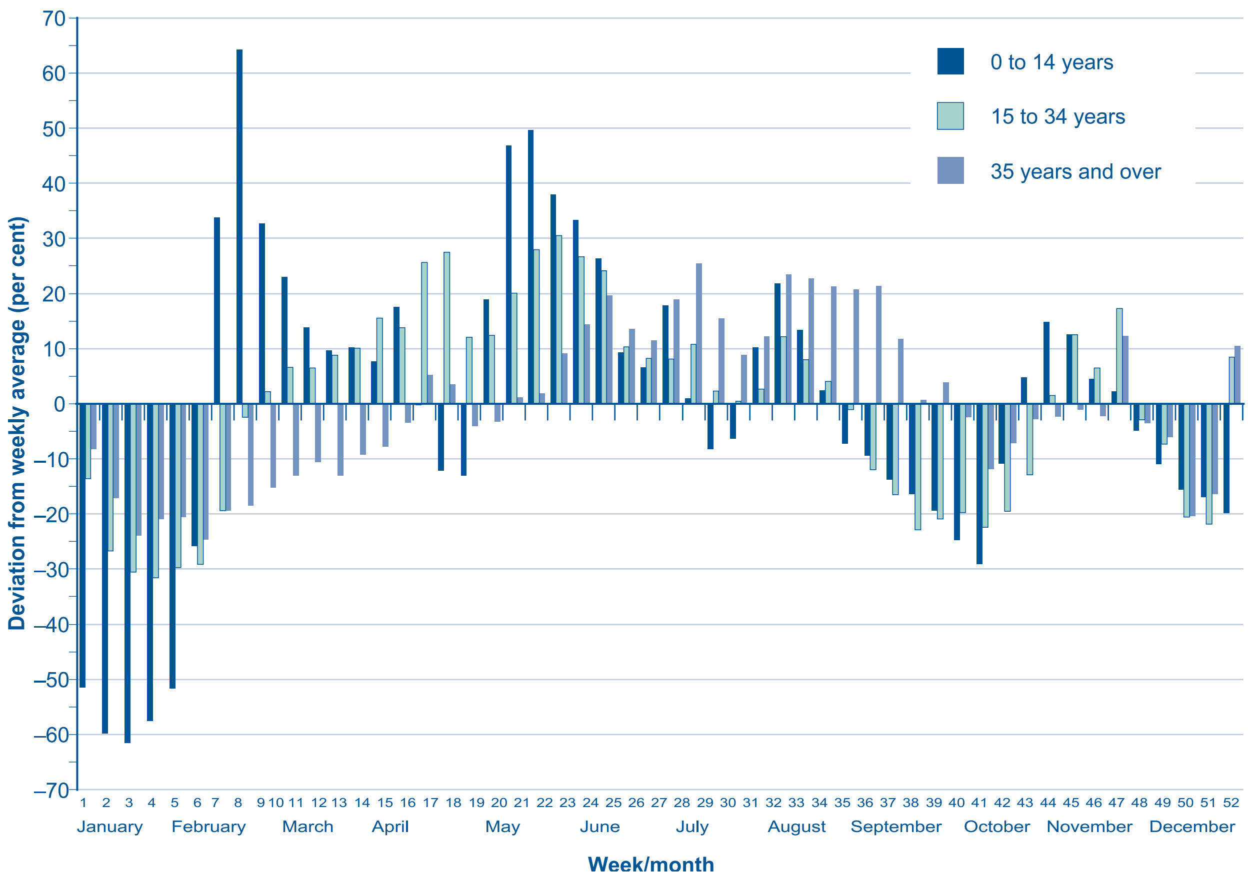
Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services; ABS National Health Survey 2001.

Seasonal variation

Figure 5.15 shows the weekly variation in the number of ED visits for asthma during 1999–2004 in Victoria and New South Wales. The rate of ED visits for asthma was lower than average in all age groups during December and January. However, the rate peaked among children aged 0 to 14 years in mid-February to early March. There was a second, slightly lower, peak in May. In contrast, adults aged 35 years and over recorded lower than average visits at that time and had higher than average visits in late winter months (July and August). Young adults (aged 15 to 34 years), on the other hand, recorded a peak in visits in the April to June period. This age-related variability in ED visit rates for asthma highlights the importance of different environmental factors in triggering exacerbations of asthma at different ages.

Figure 5.15

Seasonal variation in emergency department visits for asthma, New South Wales and Victoria, July 1999 to June 2004

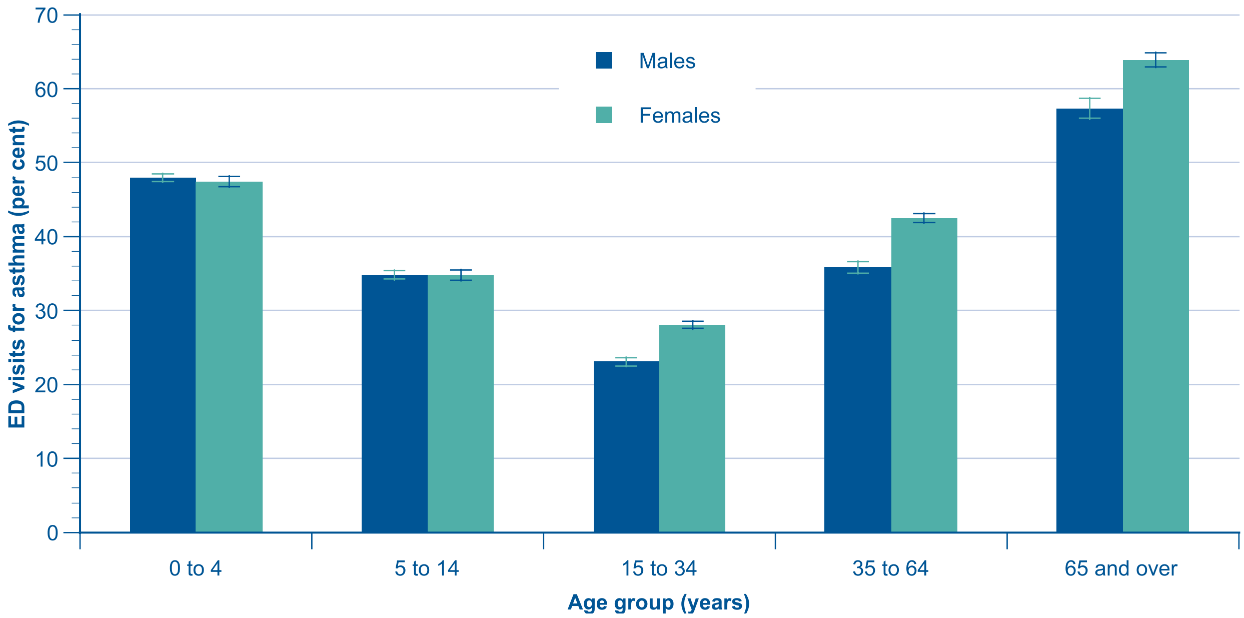


Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

Outcome of ED visits for asthma

Among those visiting the ED for asthma during the period June 1999 to July 2004, 38.9% were admitted to hospital, rather than discharged home. The highest proportion of ED visits resulting in admission to hospital for asthma occurred in the elderly, followed by the youngest age group (0 to 4 years) (Figure 5.16). The lowest proportion of ED visits resulting in admission to hospital occurred in persons aged 15 to 34 years. There was no significant difference between boys and girls in the likelihood of being admitted to hospital from the ED, but among people aged 15 years and over, females were more likely to be admitted after visiting ED for asthma than males ($p<0.001$).

Figure 5.16
Proportion of emergency department visits for asthma resulting in admission to hospital, by age group and sex, New South Wales and Victoria, July 1999 to June 2004



Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset, Victorian Department of Human Services.

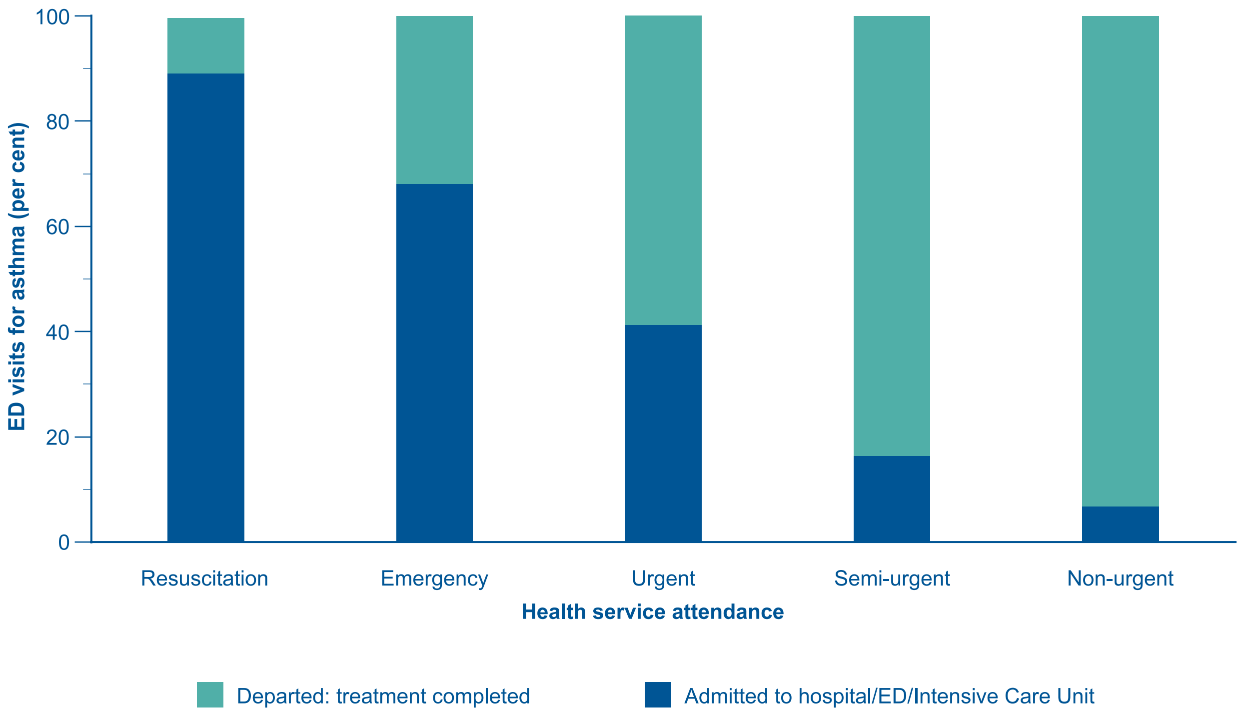
When people present to an ED they are assessed and assigned a triage category, based on their condition, that designates the maximum permissible waiting time. There are five levels of triage category and waiting times:

1 Resuscitation (within 1 minute)
2 Emergency (within 10 minutes)
3 Urgent (within 30 minutes)
4 Semi-urgent (within 60 minutes)
5 Non-urgent (within 120 minutes).

Among people visiting an ED for asthma, 88% of those who were assigned the triage category 'resuscitation' were subsequently admitted to hospital (including critical care, ED admission and transfer to another hospital), while 92% of those assigned to the 'non-urgent' triage category departed the ED after treatment (Figure 5.17). This indicates that triage categories generally reflect the level of severity of asthma exacerbations managed in EDs.

There were 16.4% and 6.8% of ED visits for asthma that were triaged as semi-urgent and non-urgent, respectively, where the person was subsequently admitted to hospital. This suggests that these individuals may have been triaged incorrectly and experienced a delay in receiving medical attention despite having severe enough asthma to result in hospital admission. However, it is important to recognise that the purpose of the triage system is only to decide on the urgency with which patients require medical attention in the ED. The decision to admit to hospital is not solely related to the acuity of the initial presentation. The response to initial treatment, the availability of care at home, self-management confidence and competence of the patient or carer, and remoteness from urgent medical care facilities all influence the decision on admission to hospital. These factors are unlikely to influence the triage category. More reassuring is the observation that only 0.3% of people with asthma triaged as semi-urgent or non-urgent were admitted to the Intensive Care Unit, compared with 8.6% in the more urgent triage categories of resuscitation or emergency.

Figure 5.17
Outcome status by triage category among people visiting emergency departments for asthma, New South Wales and Victoria, July 1999 to June 2004



Note: Data are aggregated from July 1999 to June 2004. Those that were dead on arrival were excluded. 'Admitted' includes admissions to hospital, ED and intensive care units and also transfers to another hospital. 'Departed: treatment completed' excludes people who did not wait for treatment.

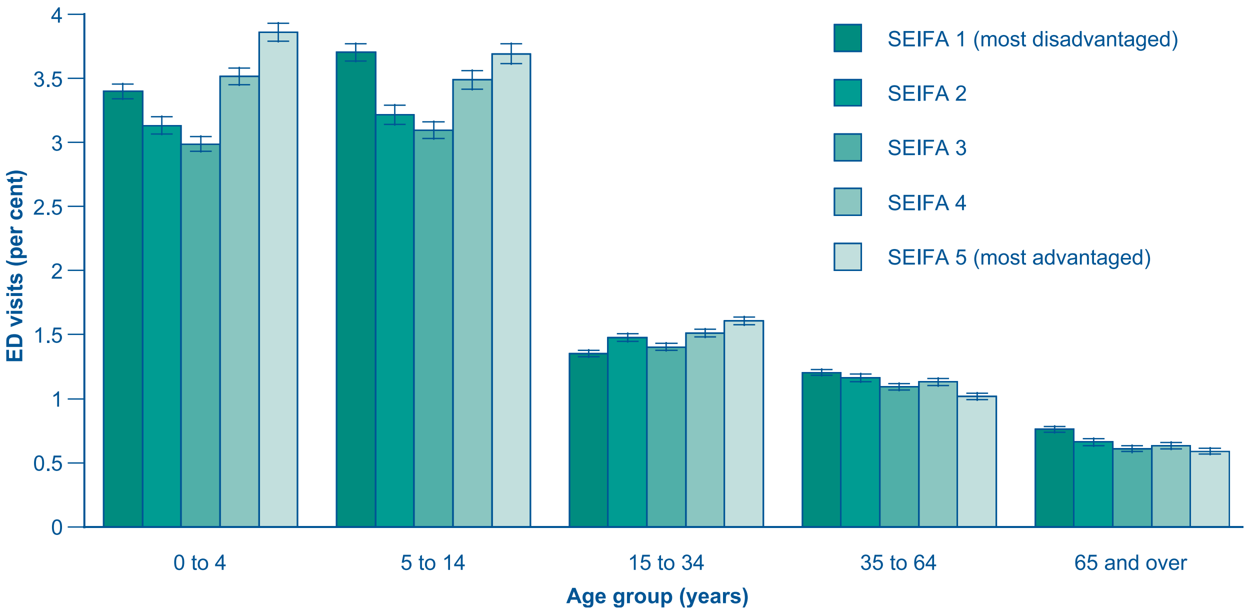
Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

Socioeconomic disadvantage

Among children aged 0 to 14 years, the proportion of all ED visits that were for asthma was highest among children living in both the two most socioeconomically advantaged quintiles and the most disadvantaged quintile. It is likely that more than one factor, such as accessibility, availability of alternative forms of care, and efficacy of self-management, is responsible for this complex trend. Among adults aged 35 years and over, the proportion of all ED visits that were for asthma tended to be greater in people from more disadvantaged localities (Figure 5.18).

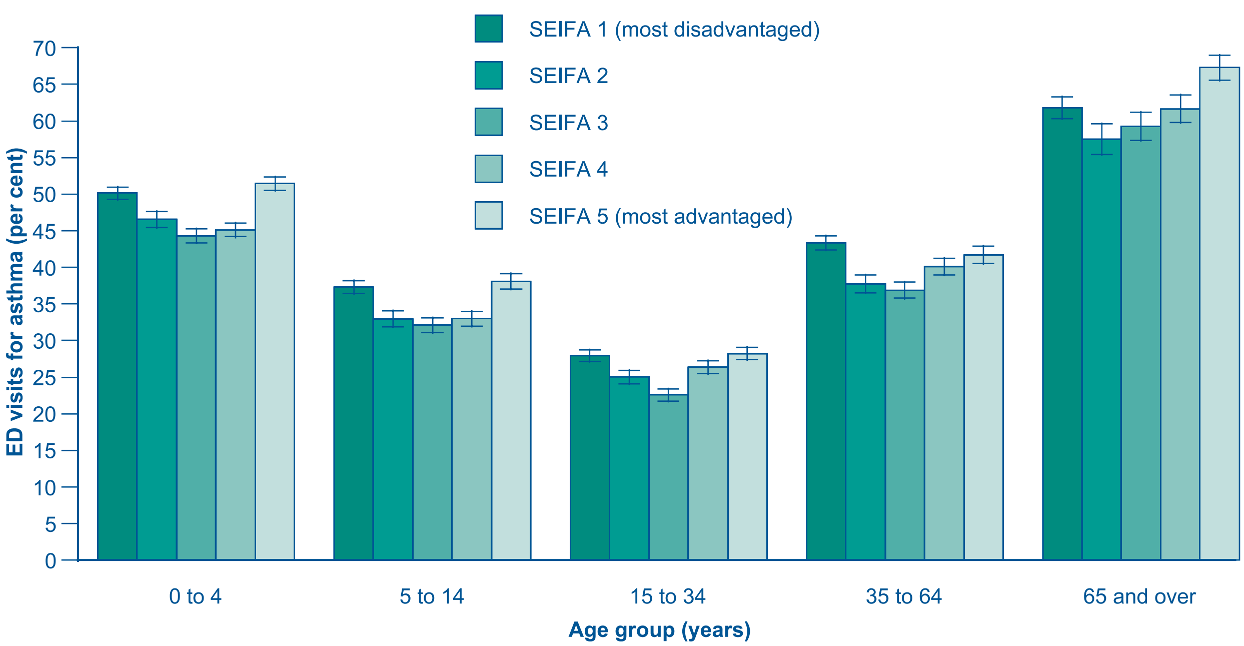
Among people attending the ED with a diagnosis of asthma, those who lived in both the most advantaged and most disadvantaged localities had higher rates of admission to hospital resulting from the ED visit than people who lived in localities with intermediate socioeconomic status (Figure 5.19).

Figure 5.18
Proportion of all emergency department visits that are for asthma, by age group and socioeconomic status, New South Wales and Victoria, July 1999 to June 2004



Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset, Victorian Department of Human Services.

Figure 5.19
Proportion of emergency department visits for asthma that resulted in admission to hospital, by age group and socioeconomic status, New South Wales and Victoria, July 1999 to June 2004



Sources: NSW Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health; Victorian Emergency Minimum Dataset, Victorian Department of Human Services.

Summary

There were marked month-to-month fluctuations in rates of visits to EDs for asthma, most notably in children under the age of 15 years. The peak visit rate in children was in late summer, whereas for adults it was late autumn and winter. Among children with asthma, boys visited EDs more often than girls. However, among people aged over 15 years, females visited slightly more often than males. There was a U-shaped relation with socioeconomic status among children. Children living in the most advantaged and the most disadvantaged localities had the highest rates of ED visits for asthma.

Finally, the elderly and the very young were more likely to be admitted to hospital after visiting an ED for asthma. This may reflect a range of clinical, social and geographical factors.

5.3 Hospitalisations

Hospitalisation for asthma occurs as a consequence of disease exacerbations. Hospitalisation is required when the exacerbation is severely disabling or life-threatening or when other circumstances make home-based management inadvisable or not feasible.

Changes in the number of hospitalisations for asthma may be due to changes in the severity and prevalence of the disease in the community and the effectiveness of disease management (Adams et al. 2000; Christakis et al. 2001; Griffiths et al. 1997; Homer et al. 1996; Jalaludin et al. 1998; Rasmussen et al. 2002). The use of hospital care for the management of exacerbations may also be influenced by the relative accessibility of hospital services and of alternative services such as general practitioners, especially after hours (Phelan et al. 1993, 2002). Changes in admission criteria and administrative policies will also affect hospital usage data.

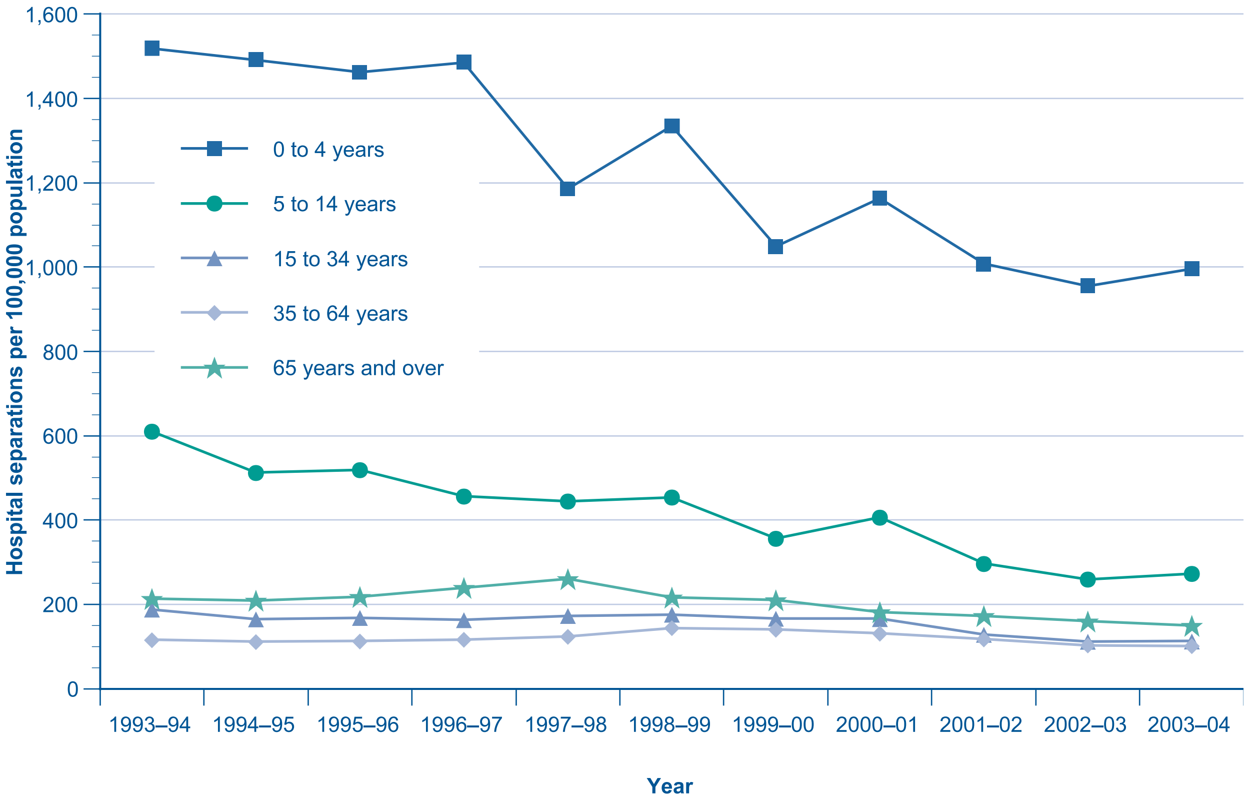
The data for this section are derived from the National Hospital Morbidity Database (NHMD) (AIHW) for the period 1993–94 to 2002–03. In these data, the term 'hospital separation' refers to the formal process by which a hospital records the completion of treatment and/or care for an admitted patient. This includes completion due to discharge, death, transfer to another hospital or change in the type of care. For more information on this database, see Appendix 1, Section A1.9. A summary of these data is provided in Appendix 2, Tables A2.7, A2.8 and A2.9.

In 2003–04, hospital separations with a principal diagnosis of asthma accounted for 37,989 or 0.6% of all separations (AIHW 2005).

Time trends in hospital use for asthma

There has been an overall reduction in the rate of hospital separations for asthma among children, especially those aged 0 to 4 years and 5 to 14 years, since 1993. Much of the decline in the 0 to 4 years age group occurred since 1996. The hospitalisation rate in people aged over 15 years was much lower but also decreased overall during this time (Figure 5.20). Between 1993–94 and 2003–04, hospital separations decreased by 43% among children aged 0 to 14 years and by 17% among those aged 15 years and over. Among adults, most of this decline has occurred since 1998–99. The trends in hospital separation rates are unchanged by the exclusion of same day separations (i.e. people who were discharged on the same day as they were admitted (data not shown)).

Figure 5.20
Hospital separations for asthma per 100,000 population, by age group, Australia, 1993–2004

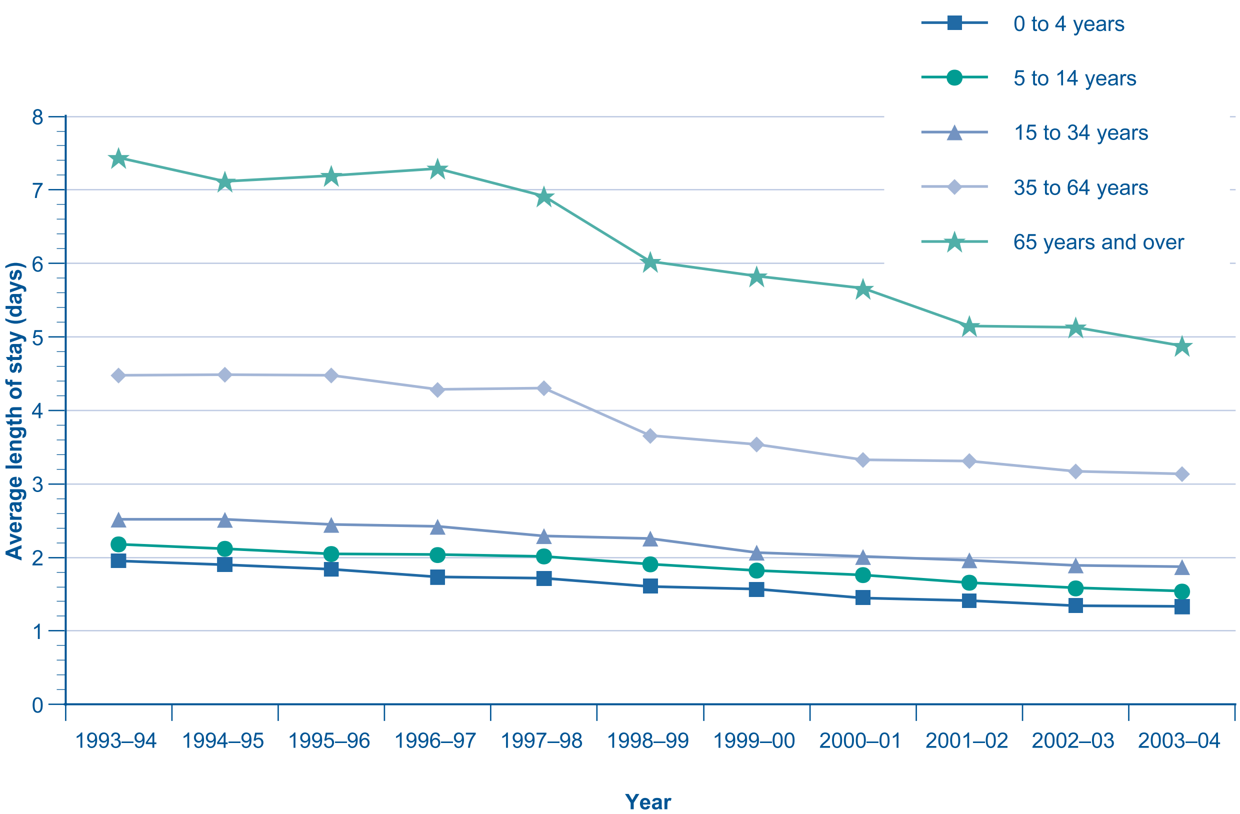


Note: Age standardised to the Australian population as at 30 June 2001. Asthma classified according to ICD-9-CM code 493 and ICD-10-AM codes J45 & J46. Hospital separations coded to ICD-9-CM (1993–97) were converted to ICD-10-AM using the following conversion: ages 5 to 34 years, no conversion; 35 to 64 years, converted by a factor of 0.64; 65 years and over, converted by a factor of 0.53. See Appendix 1 for details about age standardisation (Section A1.1) and conversion/comparability factors (Section A1.9).

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

The average length of stay in hospital among people admitted with asthma decreased from 2.9 days in 1993–94 to 2.2 days in 2003–04. This trend toward shorter stays has been observed in all age groups (Figure 5.21).

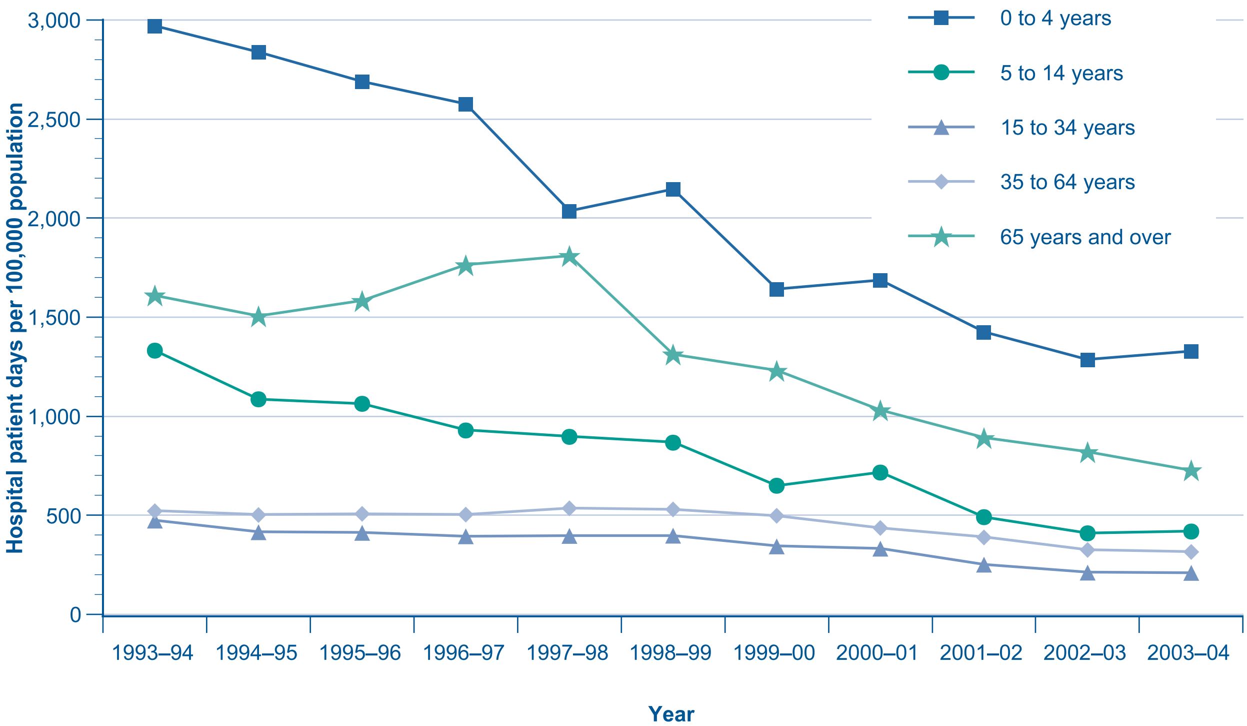
Figure 5.21
Average length of stay for asthma, by age group, Australia, 1993–2004



Source: AIHW National Hospital Morbidity Database.

The trend towards a reduction in the number of hospital separations for asthma, together with a reduction in the length of stay associated with those separations, has resulted in an even larger reduction in the total number of patient days in hospital attributable to asthma (Figure 5.22). The overall number of hospital bed-days occupied by patients with asthma has declined by 49% between 1993–94 and 2003–04.

Figure 5.22
Hospital patient days for asthma per 100,000 population, by age group, Australia, 1993–2004



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1 (Section A1.1) for details. Asthma classified according to ICD-9-CM code 493 and ICD-10-AM codes J45 & J46. Hospital patient days coded to ICD-9-CM (1993–97) were converted to ICD-10-AM using the following conversion: ages 5 to 34 years, no conversion; 35 to 64 years, converted by a factor of 0.64; 65 years and over, converted by a factor of 0.53. Hospital separations of more than 120 days duration were excluded from this analysis. This accounted for 0.017% of all patient days.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

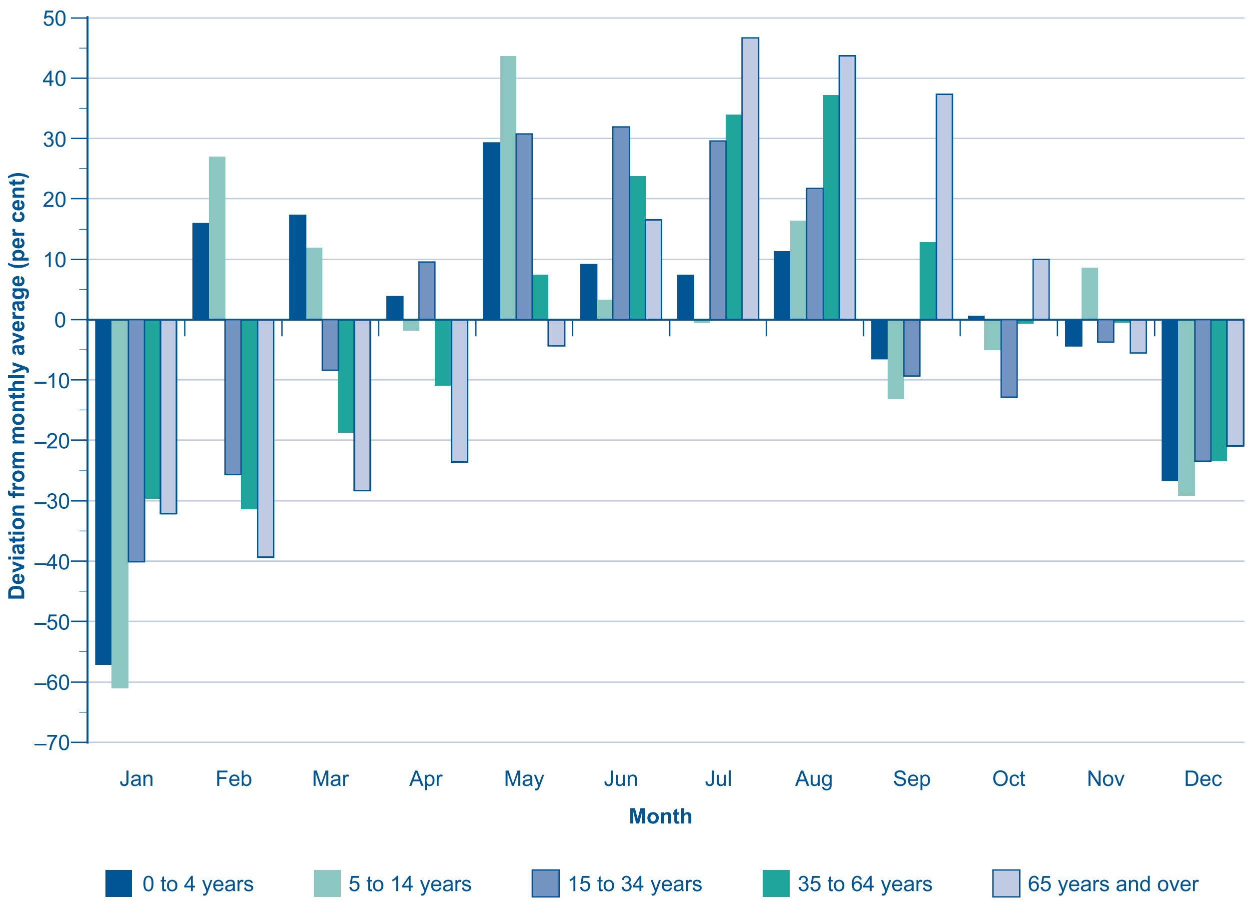
Seasonal variation in hospital use for asthma

Several studies conducted overseas have shown that hospitalisation rates for asthma are higher during winter months in the older age groups, and higher in late summer and autumn among children and young adults (Fleming et al. 2000; Gergen et al. 2002; Harju et al. 1998; Kimbell-Dunn et al. 2000).

Data for Australia (Figure 5.23) reflect a similar pattern, with highest separation rates over winter in adults, most notably in people aged 35 years and over. This seasonal pattern is likely to reflect the impact of the winter rise in respiratory tract infections.

Figure 5.23

Seasonal variation in hospital separation rates for asthma, by age group, Australia, 1993–2003



Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Source: AIHW National Hospital Morbidity Database.

Differentials in hospital use for asthma

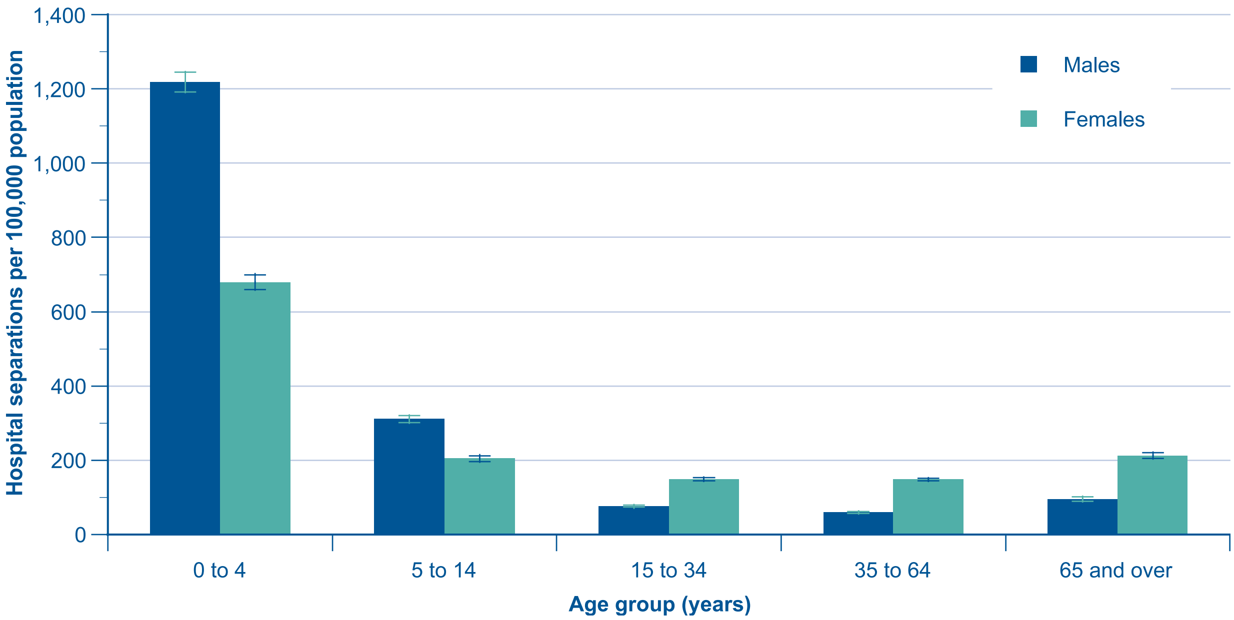
Age and sex

Children aged 0 to 4 years had the highest rate of hospital separations for asthma in 2002–03 and the rate among boys in this age group was almost twice that of girls (Figure 5.24). Boys aged 5 to 14 years also had a higher rate of hospital separations for asthma than girls. This pattern was reversed in people aged 15 years and over, with females having a higher rate than males.

The age and gender pattern observed for asthma hospitalisations differs from the general pattern observed for all causes of hospitalisation. For example, all-cause hospitalisation rates are highest in the oldest age groups and lowest in children aged 1 to 14 years (AIHW 2005). Overall, more boys than girls are admitted to hospital but the difference for all-cause hospitalisations is less than the difference observed for asthma in those aged 1 to 14 years.

Figure 5.24

Hospital separations for asthma per 100,000 population, by age group and sex, Australia, 2002–03



Note: Asthma classified according to ICD-10-AM codes J45 & J46.

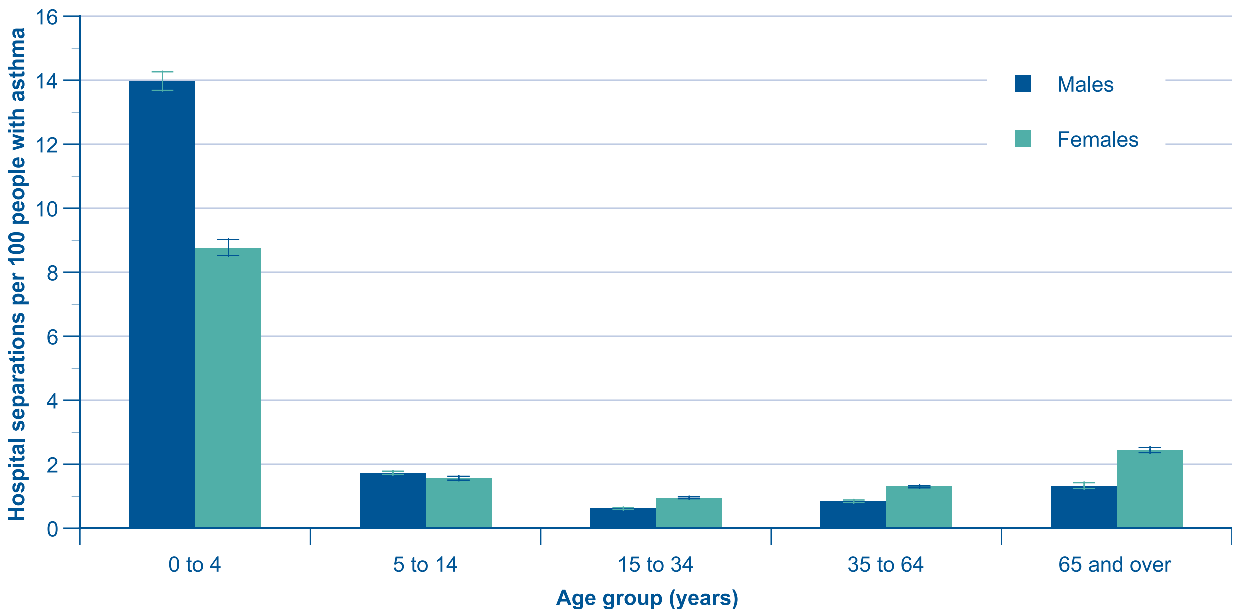
Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

The gender differences in hospitalisation rates are partially explained by differences in disease prevalence. In Figure 5.25, hospitalisations for asthma have been expressed as a rate per 100 people with current asthma, as estimated by the National Health Survey 2001, for each age and gender group. Boys aged 0 to 4 years with asthma were more likely to be hospitalised than girls of the same age with asthma but the difference between boys and girls aged 5 to 14 years with asthma was minimal. Gender differences in hospitalisation rates in other age groups were relatively minor, except among the elderly where females with asthma were more likely to be hospitalised than males.

However, the age differential in hospital separation rates is not explained by differences in prevalence. The case-based hospitalisation rates were much higher for children, especially those aged 0 to 4 years, than for adults.

Figure 5.25

Hospital separations for asthma per 100 people with asthma, by broad age group and sex, Australia, 2002–03

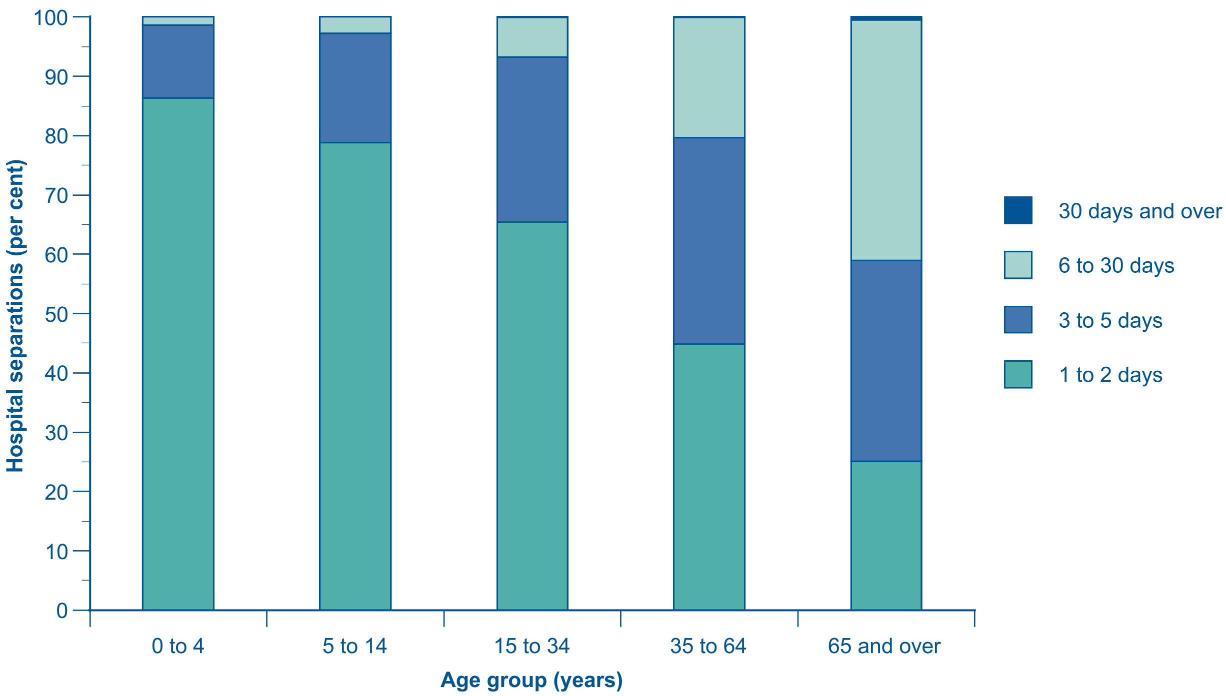


Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; ABS National Health Survey 2001.

Average length of stay for people hospitalised with asthma increased with age (Figure 5.26). The median length of stay (length of hospital stay for 50% of people) for asthma separations during 2002–03 was 1–2 days among 0 to 14 year olds compared to 3–5 days for people aged 65 years and over. Among persons aged 5 years and over, females had a slightly longer length of stay than males (data not shown).

Figure 5.26
Relative frequency of length of stay for asthma, by broad age group, Australia, 2002–03



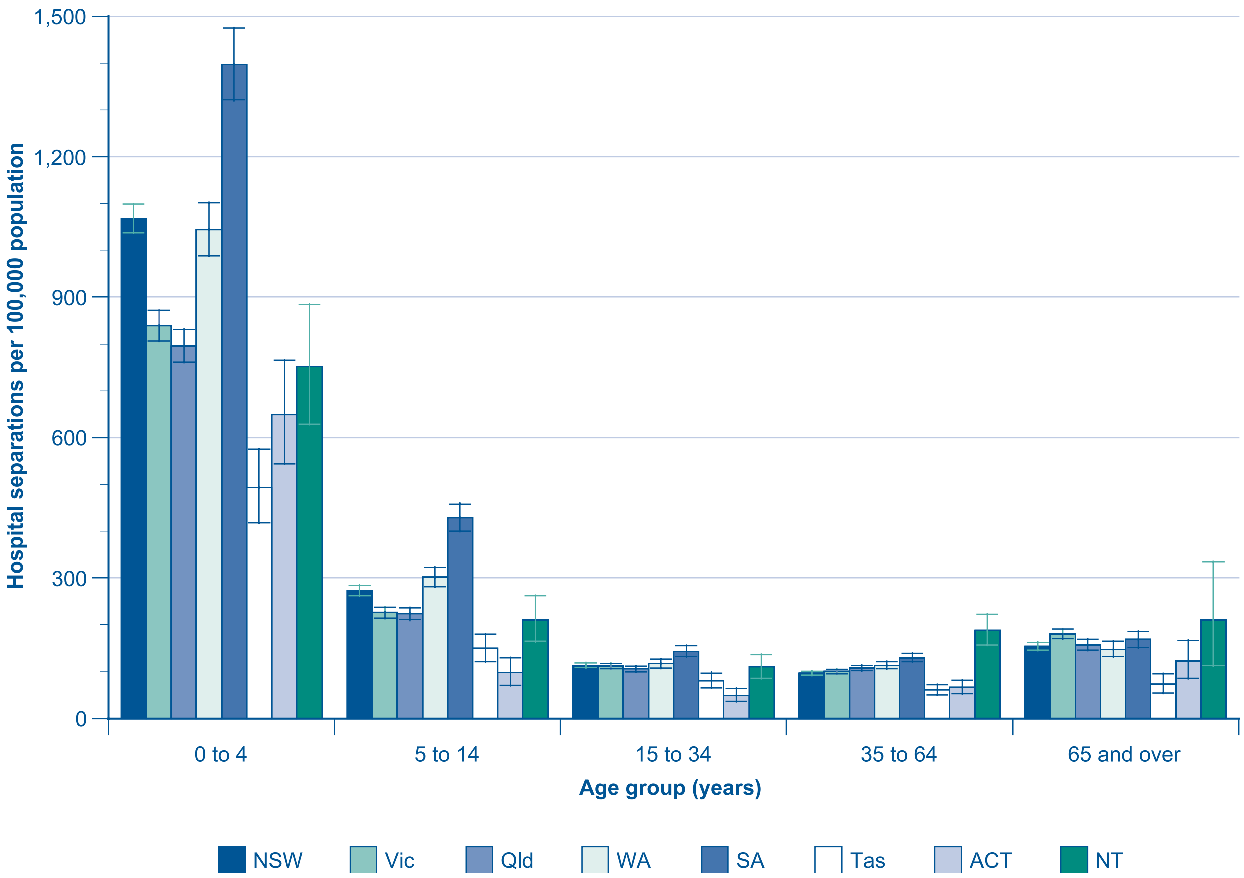
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Source: AIHW National Hospital Morbidity Database.

States and territories

Hospital separation rates for asthma in 2002–03 were lower than the national average in Victoria, Tasmania and the Australian Capital Territory and were higher than average in Western Australia and South Australia. These differences between jurisdictions are mainly attributable to differences in hospital separation rates for children, particularly those aged 0 to 4 years, but also to a lesser extent those aged 5 to 14 years (Figure 5.27).

Figure 5.27
Hospital separations for asthma per 100,000 population, by age group, state and territory, Australia, 2002–03



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1, Section A1.1 for details. Asthma classified according to ICD-10-AM codes J45 & J46.

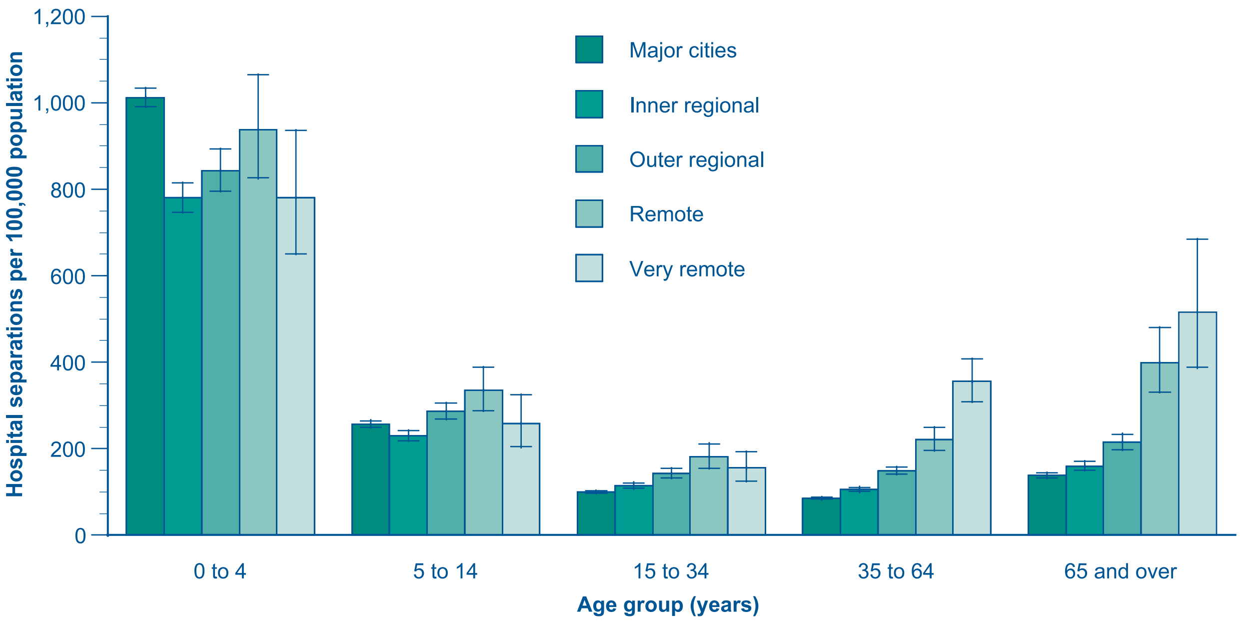
Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Urban, rural and remote areas

Hospital separation rates for asthma generally increased, particularly for adults, with increasing remoteness from major cities ($p<0.001$; Figure 5.28). This trend was independent of related variation in socioeconomic disadvantage (SEIFA) and was steeper with increasing age. The difference in hospital separation rates for asthma between people living in major cites and those living in remote and very remote areas was 32%, 70%, 160% and 220%, in the age groups 5 to 14, 15 to 34, 35 to 64 and 65 years and over, respectively. However, among children aged 0 to 4 years, those living in major cities had the highest separation rate. This pattern was in contrast to other age groups.

These findings are broadly consistent with observations on regional variation in hospitalisation rates for all diagnoses, and with previous studies showing increased hospitalisation for asthma in rural areas (AIHW 2002a; Jones et al. 1998; Tong & Drake 1999).

Figure 5.28
Hospital separations for asthma per 100,000 population, by age group and remoteness, Australia, 2002–03

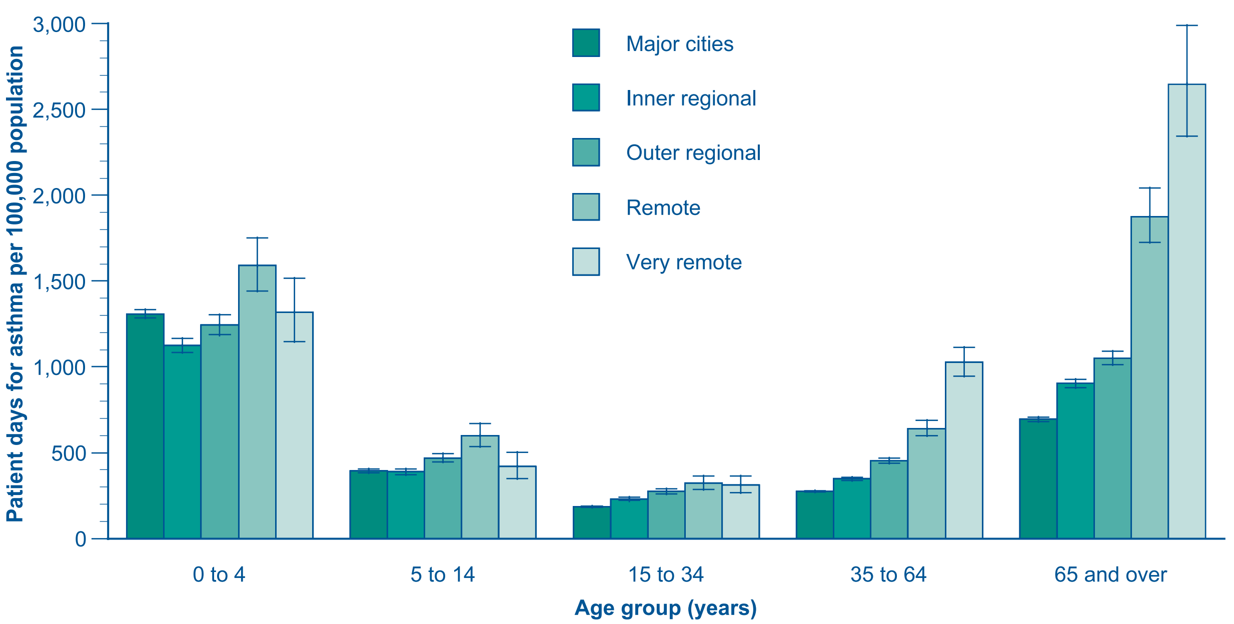


Note: Remoteness classified according to the Australian Standard Geographic Classification (ASGC) categories of remoteness.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Similar age trends were observed when examining total patient days for asthma. However, the magnitude of the difference between major cities and very remote areas among people aged 65 years and over was greater than observed for hospital separations for asthma, reflecting a longer average length of stay among elderly people in remote areas (Figure 5.29).

Figure 5.29
Hospital patient days for asthma per 100,000 population, by age group and remoteness, Australia, 2002–03



Note: Remoteness classified according to the Australian Standard Geographic Classification (ASGC) categories of remoteness.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

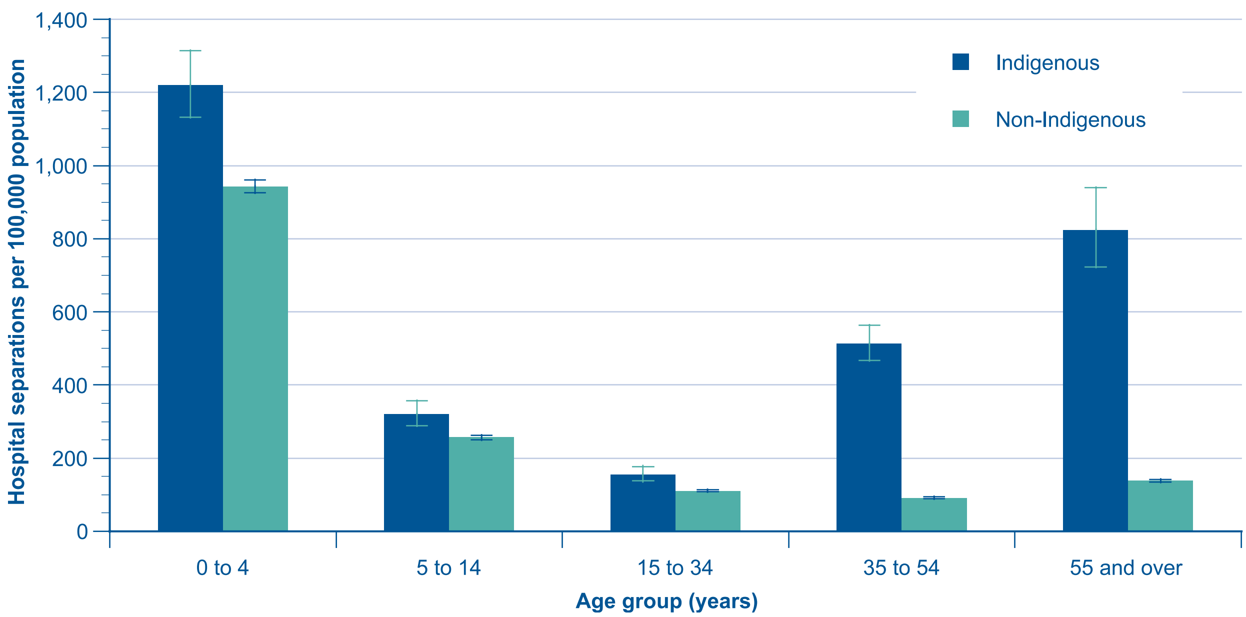
Aboriginal and Torres Strait Islander Australians

Hospital separation rates for asthma were higher among Indigenous Australians than among other Australians across all age groups, but particularly among persons aged 35 years and over (Figure 5.30). Data for patient days reflected a similar pattern (Figure 5.31).

Among Indigenous Australians during childhood (0 to 14 years), hospital separations for asthma were consistently higher in males; however, after the age of 15 years this was reversed and females demonstrated higher hospital separation rates across all ages (data not shown). This gender differential, which changes with age, is consistent with observed gender differentials in hospital separation rates for asthma in the general population.

The relatively high rate of hospital separations for asthma among Indigenous Australians is consistent with the overall high rates of hospitalisation in this community in every age group and for both sexes (AIHW 2004a). In addition to this, hospitalisation rates for Aboriginal and Torres Strait Islander people are likely to be an underestimate of the true hospitalisation rates due to under enumeration of Indigenous Australians in most states and territories. Only three jurisdictions are considered reliable; Northern Territory, Western Australia and South Australia.

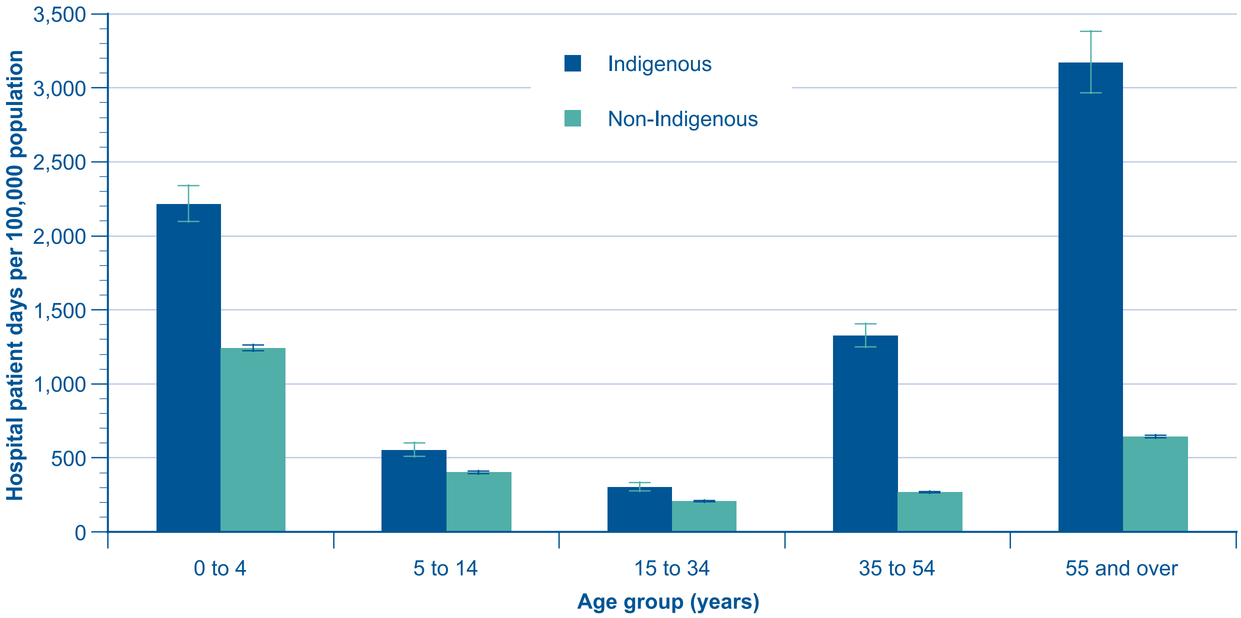
Figure 5.30
Hospital separations for asthma per 100,000 population, by age group and Indigenous status, Australia, 2002–03



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1, Section A1.1 for details. Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: National Hospital Morbidity Database; Australian Bureau of Statistics.

Figure 5.31
Hospital patient days for asthma per 100,000 population, by age group and Indigenous status, Australia, 2002–03



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1, Section A1.1 for details. Asthma classified according to ICD-10-AM codes J45 & J46.

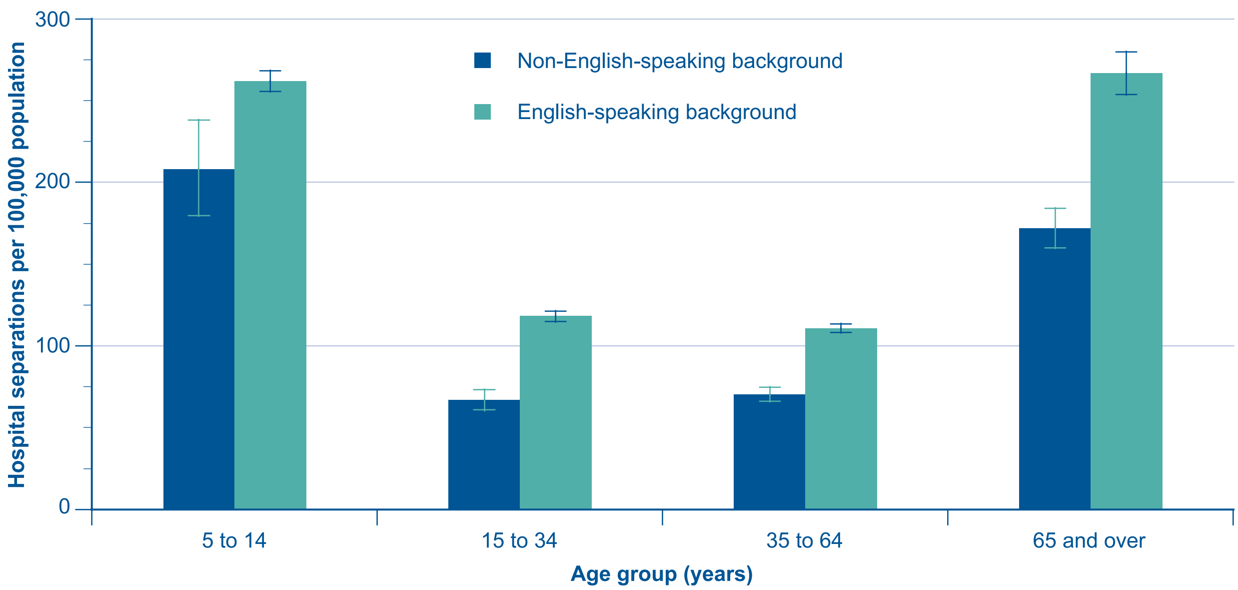
Sources: National Hospital Morbidity Database; Australian Bureau of Statistics.

Culturally and linguistically diverse background

Among persons aged 5 years and over, the rates of hospitalisation for asthma were higher in people from English-speaking backgrounds than in people from non-English-speaking backgrounds, consistent with the differences in prevalence (Figure 5.32 and Figure 5.33).

Figure 5.32

Hospital separations for asthma per 100,000 population, by broad age group and English-speaking versus non-English-speaking background, people aged 5 years and over, Australia, 2002–03

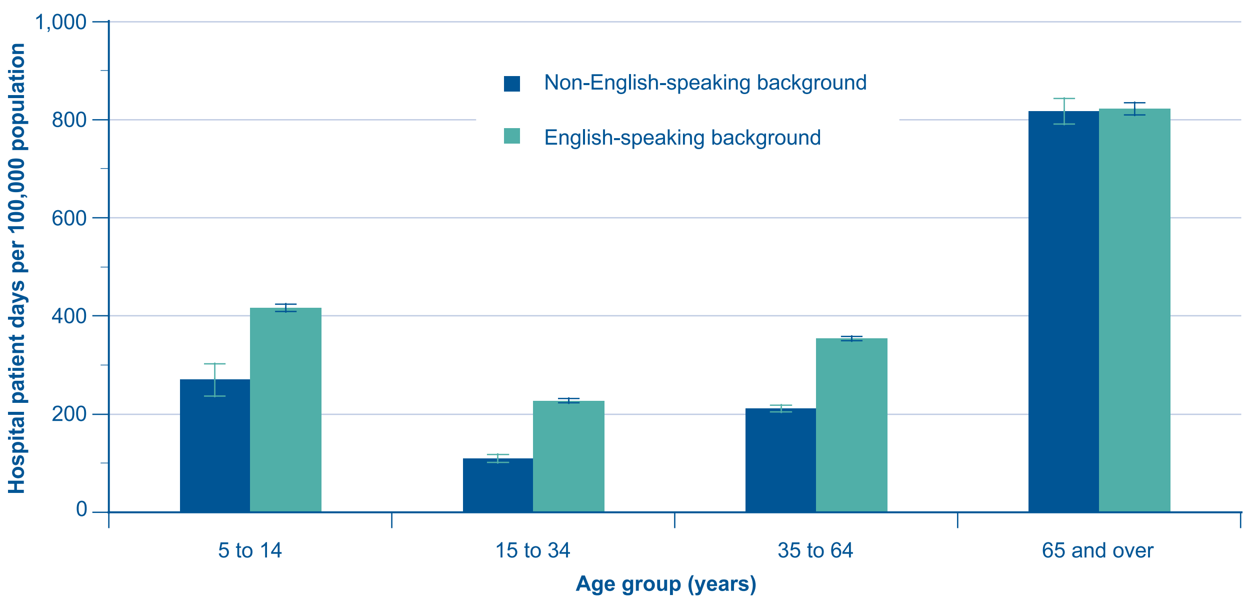


Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1, Section A1.1 for details. Asthma classified according to ICD-10-AM codes J45 & J46. For definition of non-English-speaking background and English-speaking background see Glossary.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Figure 5.33

Hospital patient days for asthma per 100,000 population, by broad age group and English-speaking versus non-English-speaking background, people aged 5 years and over, Australia, 2002–03



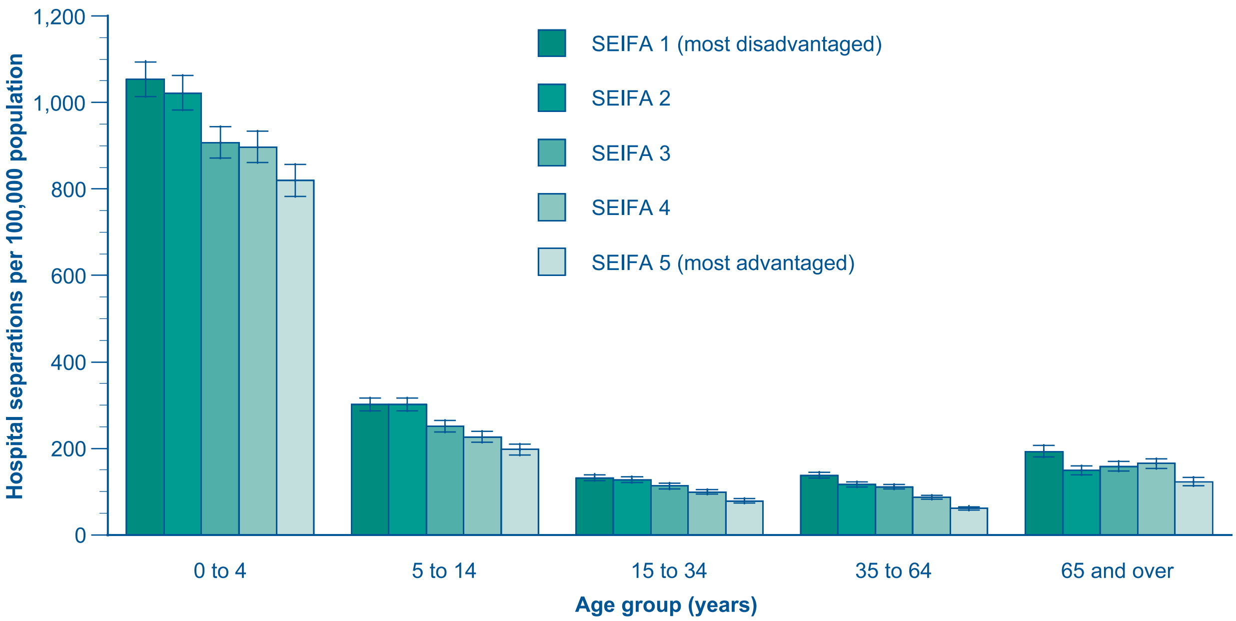
Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1, Section A1.1 for details. Asthma classified according to ICD-10-AM codes J45 & J46. Hospital separations of more than 120 days duration were excluded from this analysis. This accounted for 0.017% of all patient days. For definition of non-English-speaking background and English-speaking background see Glossary.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Socioeconomic disadvantage

Rates of hospitalisation for asthma were higher among people who lived in more socioeconomically disadvantaged localities than for those living in more advantaged localities ($p<0.001$; Figure 5.34). This trend was independent of related variation in remoteness from services (ASGC). Apart from persons aged 65 years and over, the trend did not vary substantially with age. The difference in hospital separation rates between persons who lived in locations in the most socioeconomically advantaged quintile and those who lived in locations in the two most disadvantaged quintiles was 41%, 49%, 45%, 64% and 15%, in the age groups 0 to 4 years, 5 to 14 years, 15 to 34 years, 35 to 64 years and 65 years and over, respectively. Data for patient days reflected a similar pattern (Figure 5.35).

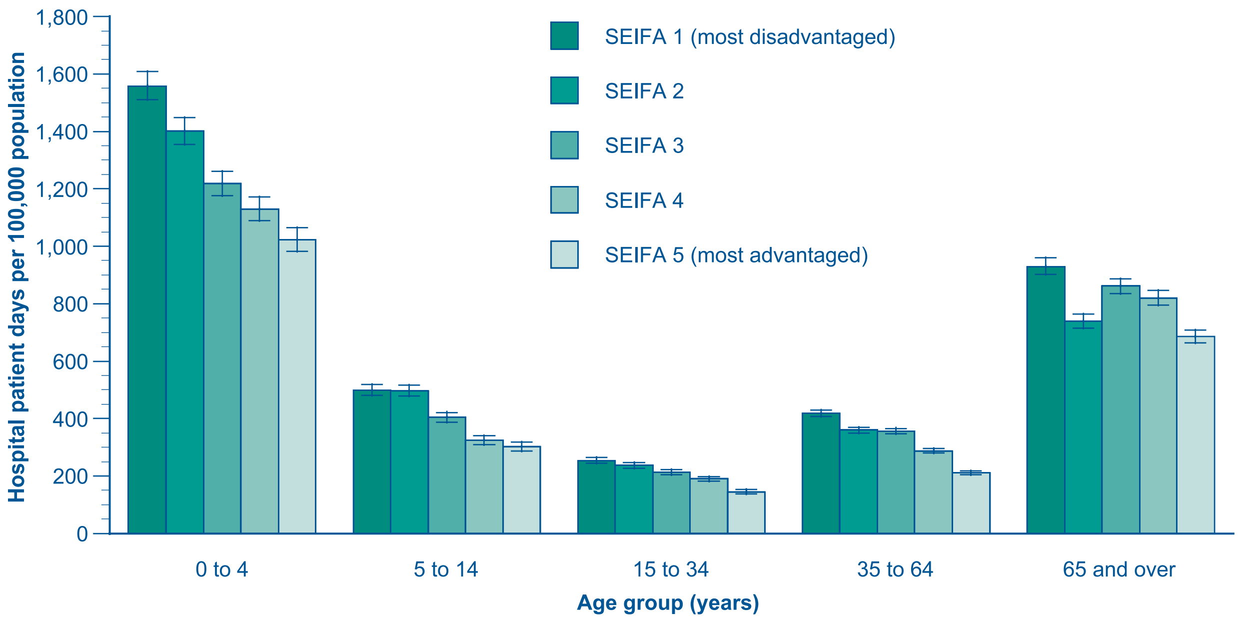
Figure 5.34
Hospital separations for asthma per 100,000 population, by broad age group and socioeconomic status, Australia, 2002–03



Note: Socioeconomic status is classified using the Socio-Economic Index For Areas (SEIFA) in which SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Figure 5.35
Hospital patient days for asthma per 100,000 population, by broad age group and socioeconomic status, Australia, 2002–03



Note: Socioeconomic status is classified using the Socio-Economic Index For Areas (SEIFA) in which SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Sources: AIHW National Hospital Morbidity Database; Australian Bureau of Statistics.

Summary

Since 1993, rates of hospital bed utilisation for asthma have declined substantially. However, children still have high rates of hospitalisation for asthma compared with adults.

Indigenous Australians, people living in remote areas and those living in socioeconomically disadvantaged areas have higher separation rates for asthma. These trends reflect similar trends observed for hospital separations for all causes.

Among children, boys have higher rates of hospitalisation for asthma than girls, in keeping with the higher prevalence of asthma in boys. However, among persons aged 15 years and over, hospitalisation for asthma is more common in females than males.

There is a marked seasonal variation in rates of hospitalisation for asthma. The seasonal patterns differ between age groups. There is an increased risk of hospitalisation for asthma during winter in adults, particularly those aged over 35 years. However, among children and young adults, seasonal peaks are seen in February and May. This is consistent with patterns that have been observed in studies both locally and overseas.

5.4 Invasive mechanical ventilation

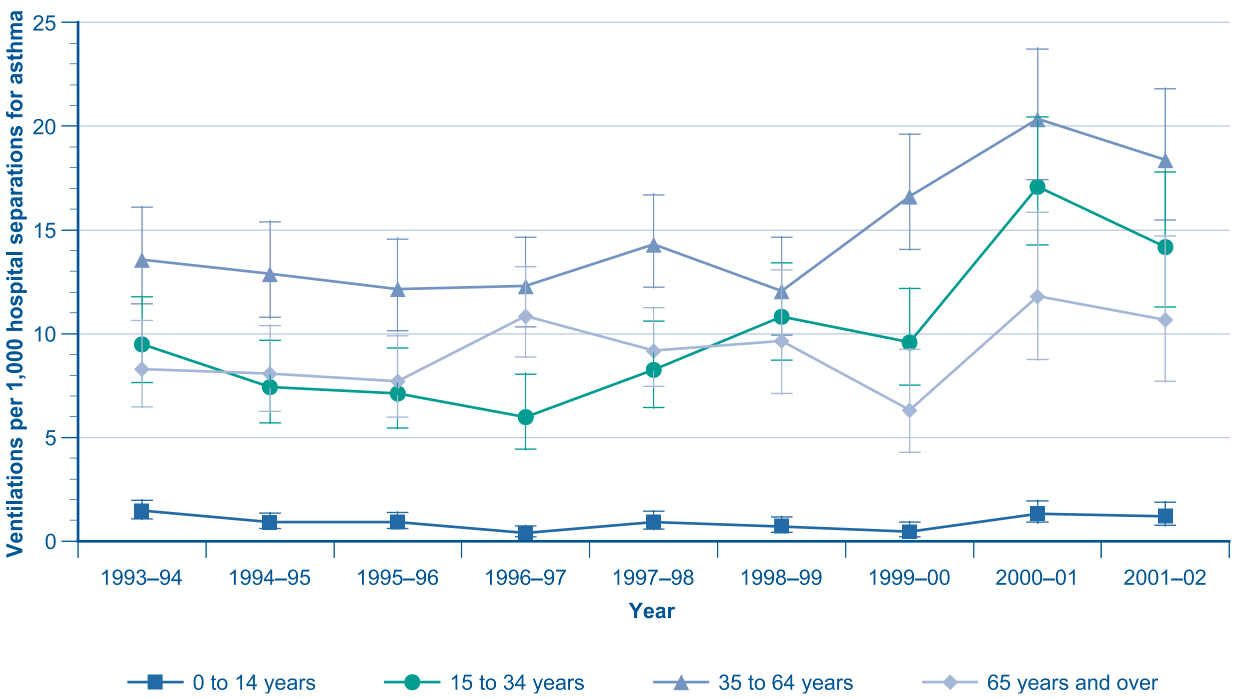
A small proportion of people with severe exacerbations of asthma either stop breathing altogether or decrease their breathing to such an extent that they are at risk of stopping breathing. This represents a severe, imminently life-threatening event and can only be averted by the introduction of artificial mechanical ventilation, via an endotracheal tube attached to a positive pressure ventilator ('life support machine'). This procedure is sometimes referred to as invasive mechanical ventilation to distinguish it from a non-invasive form of ventilation that is used in less severe circumstances. Monitoring trends and differentials in the occurrence of this event, which is routinely recorded in hospital statistics, provides insights into the epidemiology of severe, life-threatening asthma and, possibly, asthma deaths (Kolbe et al. 2000). However, in interpreting these trends it is important to recognise that criteria for intubation and the use of invasive ventilation may vary over time and between institutions. In particular, policies in relation to the use of non-invasive ventilation as a means of averting the need for intubation will have influenced rates of invasive mechanical ventilation.

Within the National Hospital Morbidity Database, information is included about procedures during hospital care. This section presents data relating to the use of invasive mechanical ventilation that have been derived from this database.

Time trends in invasive mechanical ventilation for asthma

During the period 1993–94 to 2001–02, the number of people aged 15 years and over who required invasive mechanical ventilation decreased from 284 to 250. However, as the overall hospitalisation rate for asthma decreased substantially during this period, the proportion of adults admitted with asthma who required invasive mechanical ventilation increased from 12.0 to 18.4 per 1,000 during this period (Figure 5.36). This increased rate of invasive mechanical ventilation among admitted patients may reflect an increase in the average level of severity in patients who are admitted. Alternatively, or additionally, it may also reflect a greater propensity to offer invasive ventilation to patients with asthma with severe ventilatory failure.

Figure 5.36
Proportion of hospital separations for asthma with invasive mechanical ventilation, by age group, Australia, 1993–2002



Note: Same day separations excluded. Asthma classified according to ICD-10-AM codes J45 & J46.

Source: AIHW National Hospital Morbidity Database.

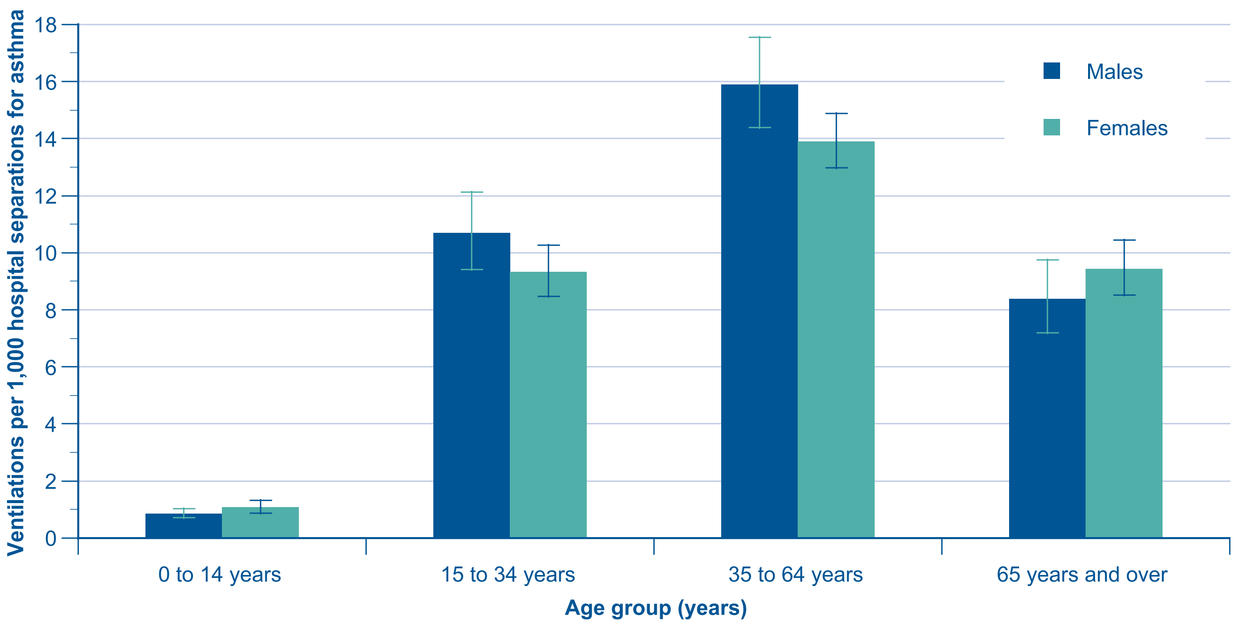
Differentials in invasive mechanical ventilation for asthma

Age and sex

The highest proportion of hospital separations for asthma that were associated with a period of invasive mechanical ventilation was among 35 to 64 year old adults (Figure 5.37). The slightly lower rate of invasive ventilation among older persons may reflect a lower average level of severity among separations in this age group. However, an active decision on the part of patients, families and clinicians not to instigate invasive mechanical ventilation in certain patients approaching the end of life may also have contributed to this trend. There were no major differences between males and females in the propensity to use invasive mechanical ventilation.

Figure 5.37

Rate of hospital separations for asthma with invasive mechanical ventilation, by age group and sex, Australia, 1993–2002



Note: Same day separations excluded. Asthma classified according to ICD-10-AM codes J45 & J46.

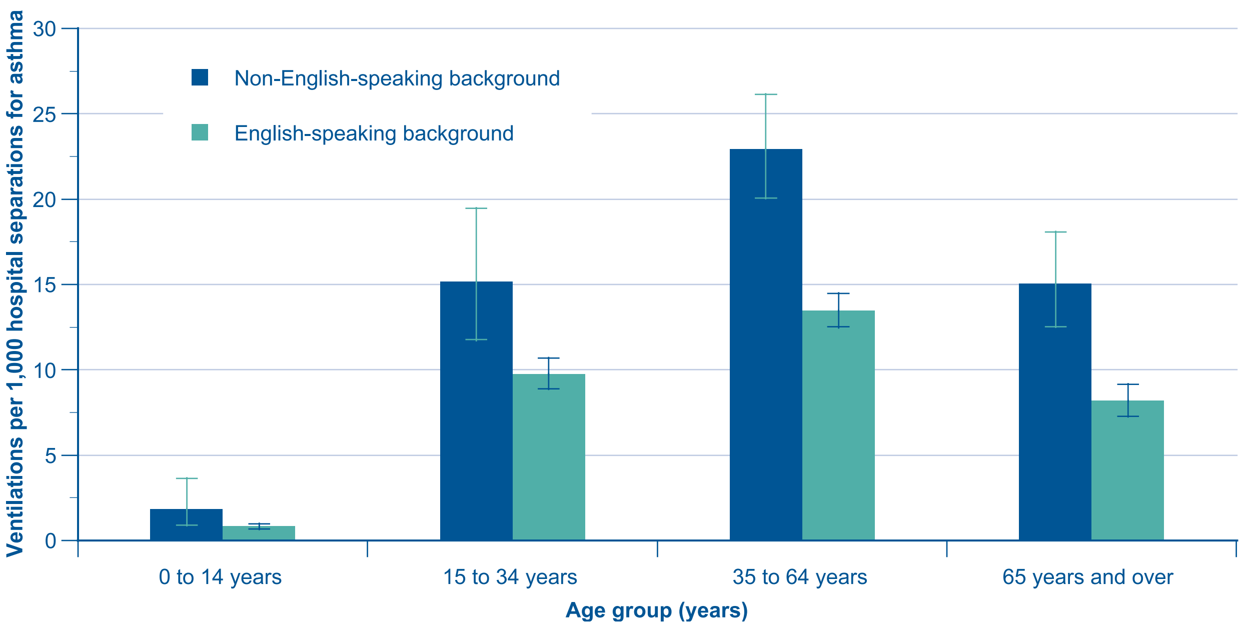
Source: AIHW National Hospital Morbidity Database.

Culturally and linguistically diverse background

Persons of non-English-speaking background were more likely to require invasive mechanical ventilation during a hospital separation for asthma than English-speaking persons (Figure 5.38). This higher rate of ventilation for asthma is consistent with the higher case-fatality rate among persons of non-English-speaking background. Both these adverse outcomes may reflect more severe disease and, possibly, delayed institution of effective treatment for exacerbations in persons of non-English-speaking background.

Figure 5.38

Rate of hospital separations for asthma with invasive mechanical ventilation, by age group and English-speaking versus non-English-speaking background, Australia, 1995–2002



Note: Same day separations excluded. Asthma classified according to ICD-10-AM codes J45 & J46. For definition of non-English-speaking background and English-speaking background see Glossary.

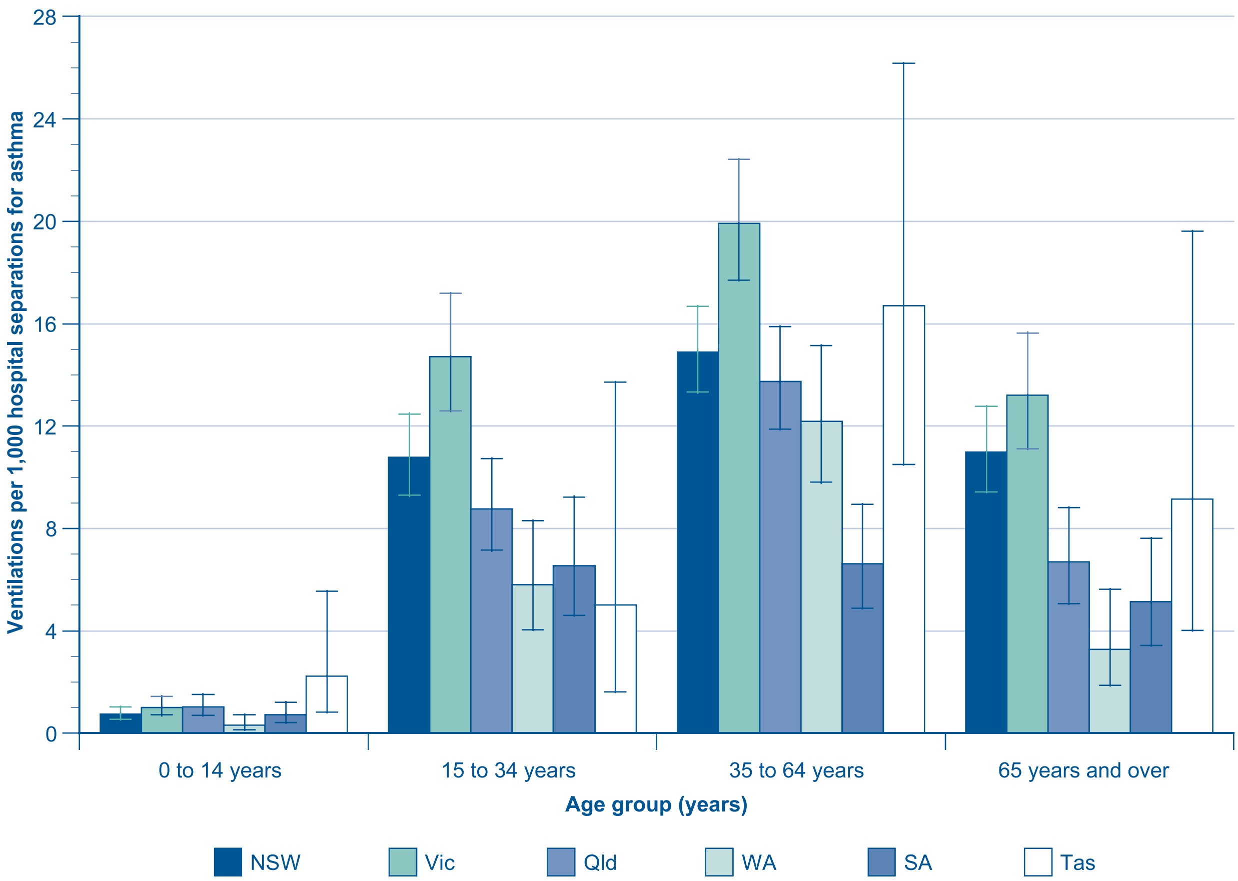
Source: AIHW National Hospital Morbidity Database.

States and territories

There were some differences between states and territories in the proportion of persons admitted with asthma who received a period of invasive mechanical ventilation (Figure 5.39). The proportion was highest in Victoria and lowest in South Australia.

Figure 5.39

Rate of hospital separations for asthma with invasive mechanical ventilation, by age group and state and territory, Australia, 1995–2002



Note: Same day separations excluded. Asthma classified according to ICD-10-AM codes J45 & J46. Northern Territory and Australian Capital Territory not shown because numbers too small to produce reliable estimates.

Source: AIHW National Hospital Morbidity Database.

Summary

The use of invasive mechanical ventilation signifies active management of a severe, life-threatening exacerbation of asthma. It is a rare event among people admitted with asthma; only 250 people required invasive mechanical ventilation for asthma during 2002–03. People from non-English-speaking backgrounds who are admitted with asthma are more likely to require invasive mechanical ventilation than people from English-speaking backgrounds.

5.5 Re-attendances for asthma

There is evidence that early re-admission to hospital is related to the quality of in-patient care (Ashton et al. 1997). Between 9 and 48% of re-admissions were associated with evidence of substandard care during hospitalisation in one review (Benbassat & Taragin 2000). In relation to asthma, it is known that programs to improve patient care in the hospital or emergency department (ED) can result in reduced hospital re-admissions (Blais et al. 1998; Madge et al. 1997; Mayo et al. 1990; Sin & Tu 2001; Wesseldine et al. 1999). However, the likelihood of re-admission to hospital for asthma is related not only to the quality of care in hospital (Slack & Bucknall 1997) but also to the quality of care in the community (Sin et al. 2002), in particular from the patient's general practitioner or specialist (Homer et al. 1996). The absence of an asthma action plan (Adams et al. 2002; Farber 1998), not using inhaled steroids (Farber et al. 1998; Pollack et al. 2002), and discontinuity of care (Wakefield et al. 1997) are associated with increased hospital admissions and re-admissions. Hence, re-admission rates are a useful indicator of the quality of care for asthma. However, as it is difficult to partition the responsibility for re-admissions between sectors, the re-admission rate should be considered as an indicator of the quality of care for patients with asthma across the whole health care system.

Most research in this field has focussed on re-admissions to hospital. However, the ED is an important site of urgent medical care for many patients with asthma. Hence, in relation to asthma, it would be more appropriate to base the study of repeat attendance at health care facilities on both hospital admissions and ED visits.

In this report, 're-attendance' is the term used to describe repeat admissions to hospitals, visits to EDs or both. In order to monitor re-attendances for asthma, it is necessary to link data to identify multiple hospital admissions or ED visits for asthma by the same individual. This can be achieved through matching personally identifying variables such as name, date of birth and postcode, within the combined hospital and ED data to identify attendances by the same individual.

This section utilises linked hospital/ED data from two states, Victoria and New South Wales, for the period July 2000 to June 2003. In Victoria, the source datasets used in the linkage were the Victorian Admitted Episodes Dataset and the Victorian Emergency Minimum Dataset, and in New South Wales, these were the NSW Inpatient Statistics Collection and the NSW Emergency Department Data Collection. For a detailed description of the datasets and methods used in this section, refer to Appendix 1 (Section A1.9).

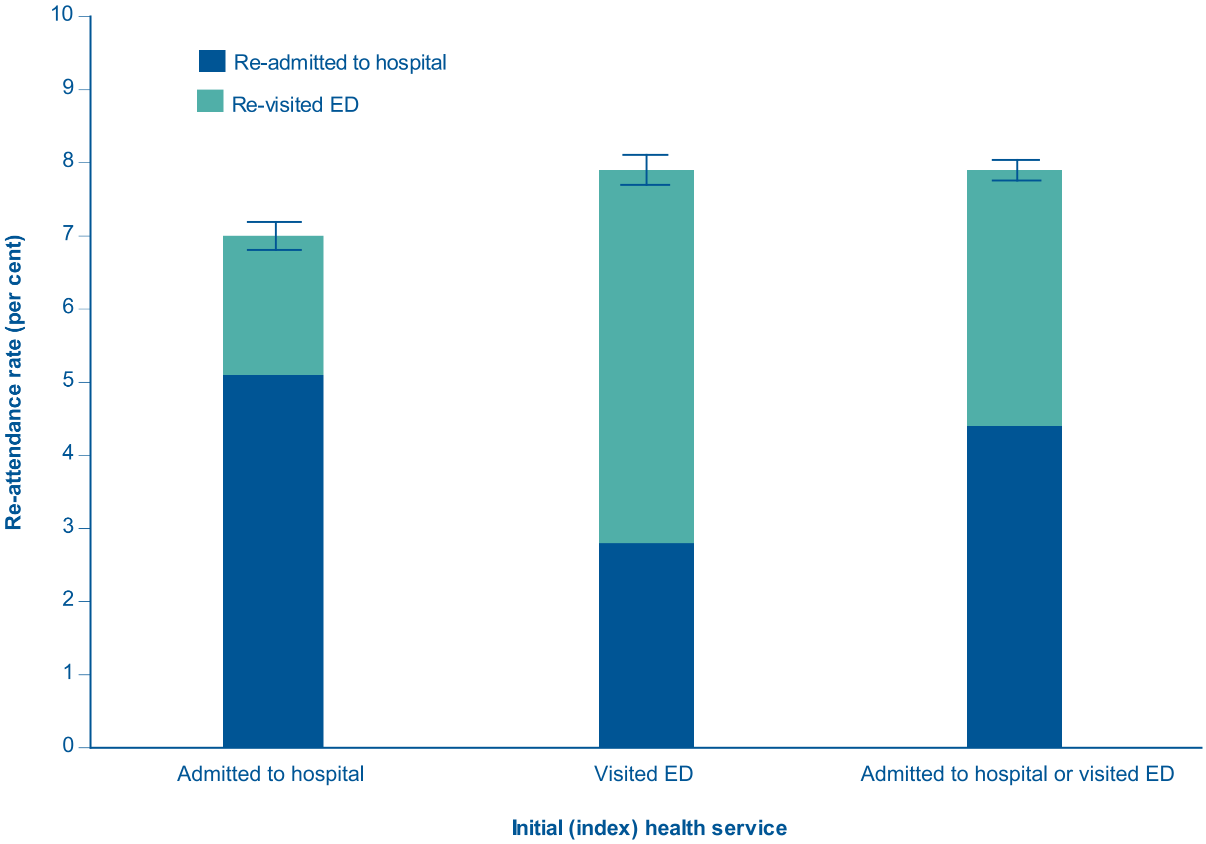
Only hospital admissions and ED visits with a principal diagnosis of asthma were included in these analyses, and multiple visits by the same individual within the re-attendance period (28 days or 3 months) were only counted once. People who were admitted to hospital as a result of a visit to an ED were counted as hospital admissions only.

Figure 5.40 provides a comparison of re-attendance rates for asthma within 28 days for hospital admissions and ED visits, separately and combined. People who re-attended after either visiting an ED or being admitted to hospital for asthma are represented in the third column. Approximately 8% re-attended, including subsequent hospital admission (5%) or ED visit (3%) for asthma within 28 days.

Among people who had been admitted to hospital for asthma, approximately 5% were re-admitted to hospital for asthma and a further 2% visited an ED for asthma within 28 days. Among people who had initially only visited an ED for asthma, approximately 5% re-visited the ED without a hospital admission, and nearly 3% were subsequently admitted to hospital for asthma within 28 days.

Figure 5.40

Re-attendance rate for asthma within 28 days, all ages, New South Wales and Victoria, 2000–03



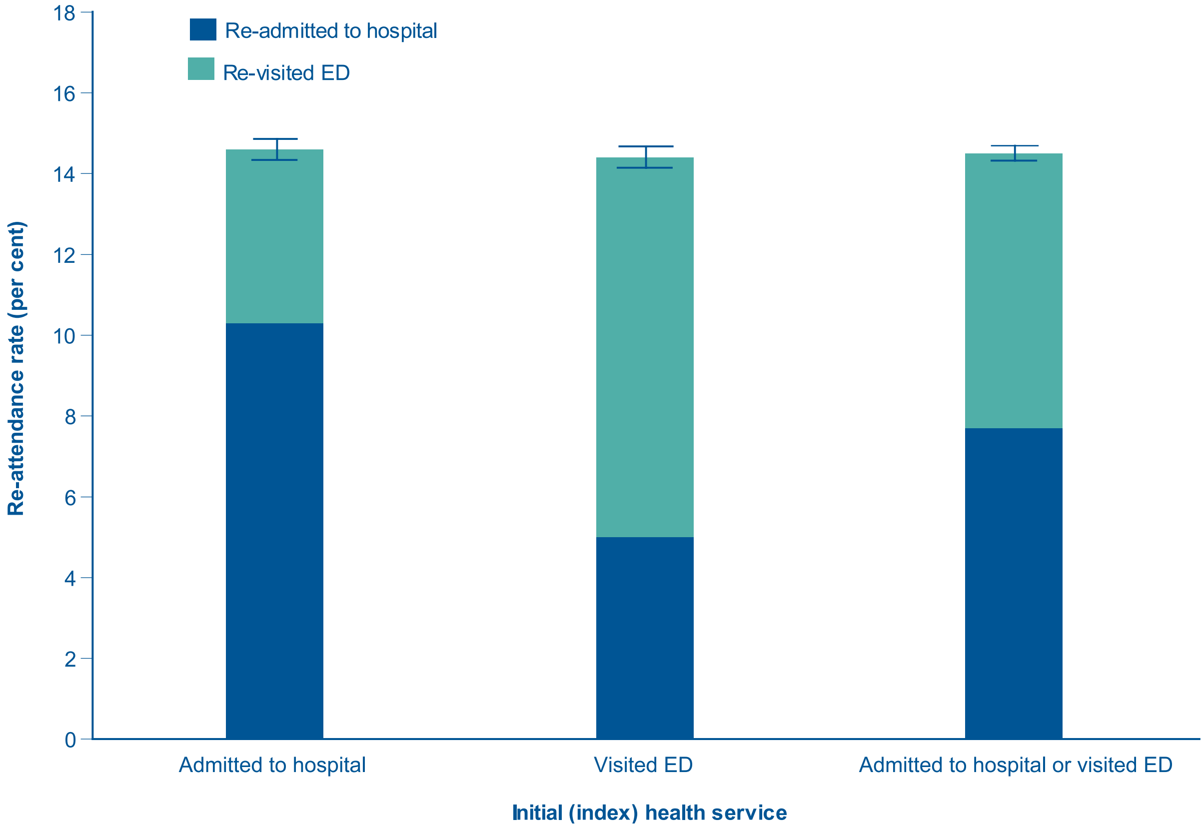
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: NSW Inpatients Statistical Collection and NSW Emergency Department Data Collection, Centre for Epidemiology and Research, NSW Department of Health; Victorian Admitted Episodes Dataset (VAED) and Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

A similar pattern is observed when considering the re-attendance rate within 3 months (Figure 5.41). Approximately 14% of people who were either admitted to hospital or visited an ED for asthma subsequently re-attended for asthma within 3 months. Approximately 10% of people who had been admitted to hospital for asthma were re-admitted, and a similar proportion who visited an ED subsequently returned to the ED within 3 months for asthma.

Figure 5.41

Re-attendance rate for asthma within 3 months, all ages, New South Wales and Victoria, 2000–03



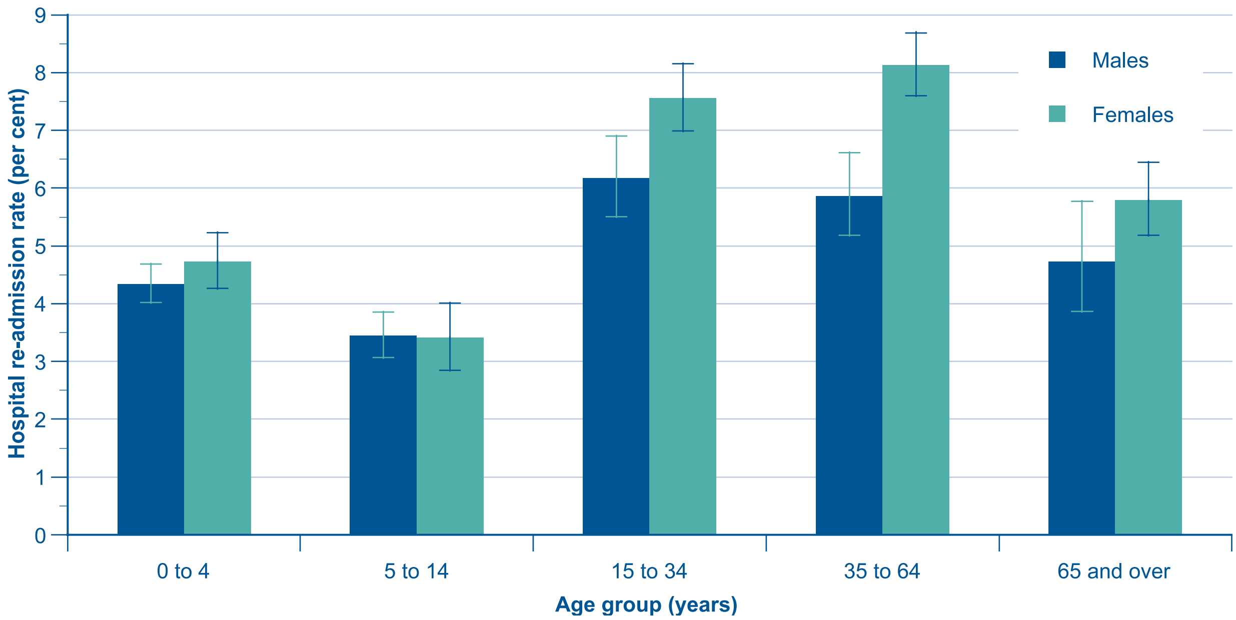
Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: NSW Inpatients Statistical Collection and NSW Emergency Department Data Collection, Centre for Epidemiology and Research, NSW Department of Health; Victorian Admitted Episodes Dataset (VAED) and Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

The highest overall rate of re-admissions occurred among people aged 15 to 64 years for both males and females. Generally, more females were re-admitted to hospital for asthma within 28 days than males. This was apparent in all age groups except those aged 5 to 14 years where the rates were very similar. The gender difference was most pronounced among people aged 35 to 64 years (Figure 5.42).

Figure 5.42

Hospital re-admission rate for asthma within 28 days, by age group and sex, New South Wales and Victoria, 2000–03

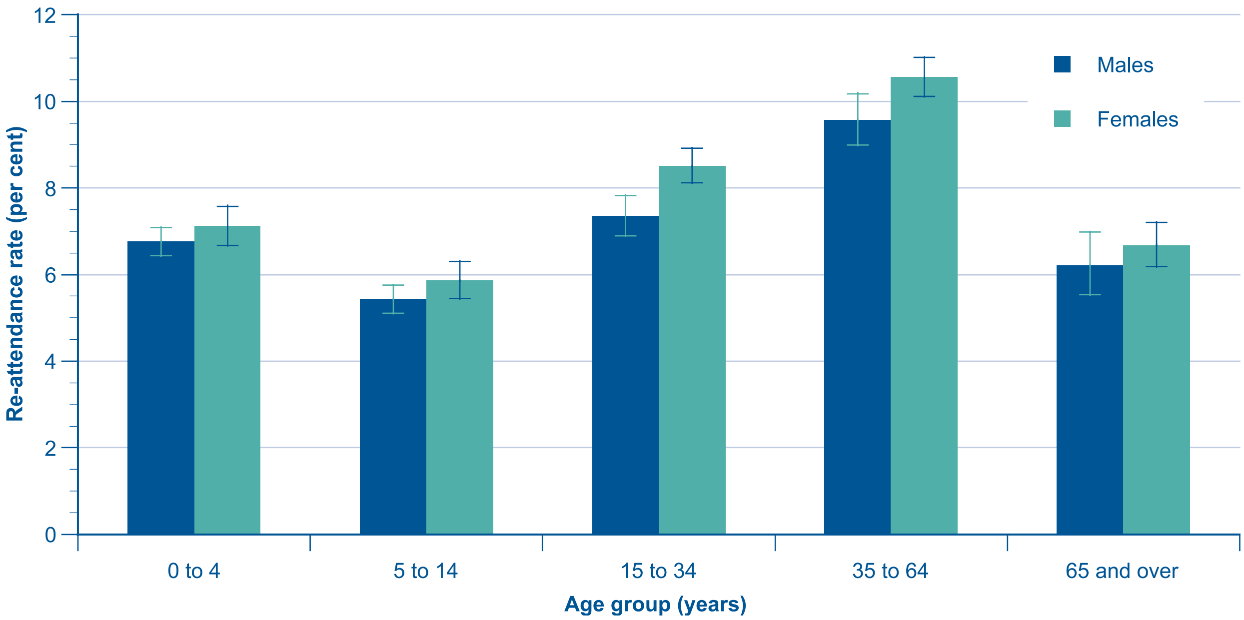


Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: Inpatients Statistical Collection, Centre for Epidemiology and Research, NSW Department of Health; Victorian Admitted Episodes Dataset (VAED), Victorian Department of Human Services.

A similar pattern was observed in re-attendances to hospitals or EDs within 28 days. As for hospital re-admissions, the highest rates of re-attendances occurred among people aged 15 to 64 years. However, the difference between genders was diminished (Figure 5.43).

Figure 5.43
Re-attendance rate for asthma within 28 days, by age group and sex, New South Wales and Victoria, 2000–03



Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: NSW Inpatients Statistical Collection and NSW Emergency Department Data Collection, Centre for Epidemiology and Research, NSW Department of Health; Victorian Admitted Episodes Dataset and Victorian Emergency Minimum Dataset (VEMD), Victorian Department of Human Services.

Summary

Approximately 8% of people who either visited an ED or were admitted to hospital for asthma re-attended these services within 28 days in New South Wales and Victoria. Re-attendances were more common among females than males, particularly among those aged 15 to 64 years.

Management

6

Key points

Written asthma action plans

- Asthma action plans are written instructions on how to recognise when asthma is getting worse, and what action to take when it does. They help many people control their asthma and stay out of hospital.
- Most people with current asthma do not have a written asthma action plan. Young adults, adult men, and persons living in less well-off areas are least likely to have a written asthma action plan.
- There was an increase in the number of people who had these plans in the early 1990s. However, the number of people with asthma who have written asthma action plans decreased during the period since 1995.
- People with current symptoms of asthma or more severe asthma are more likely to have a written asthma action plan.

Medications

- The most common type of respiratory medication used in all age groups is bronchodilators (mainly short-acting beta agonists), which are used by people with asthma and COPD for relief of symptoms.
- The use of nebulised administration of bronchodilators has declined since 2000.
- There is evidence that many people with asthma who would benefit from use of inhaled corticosteroids are not using them regularly.
- The majority of inhaled corticosteroids are taken in the highest dose. It is likely that for many people their asthma could be well controlled with a lower dose of inhaled corticosteroid.
- In 2004, two-thirds of inhaled corticosteroids used were in a combined formulation with long-acting beta agonists. Use of this combined medication should allow the use of lower doses of inhaled corticosteroids, with equivalent efficacy.

Spirometry

- Spirometry is a breathing test used to help diagnose and monitor asthma and other lung diseases.
- Between 1994 and 2004, there was little apparent change in the use of spirometry among all age groups. There was a steady decline in spirometry claims from 1998 to 2004 in those aged 5 to 34 years.
- There is a lot of variation between the states and territories in the number of claims for performing spirometry. The reason for this variation is not known.

Introduction

Over the last 20 years a consensus has emerged, based on available evidence, that written asthma action plans and regular use of medications that control the disease and prevent exacerbations are key elements in the effective management of asthma. Additionally, the important role of spirometry in the diagnosis, assessment and follow-up of patients with asthma has been recognised for many years.

This chapter will review the data relating to the use of these management strategies and their implementation in the Australian population.

6.1 Written asthma action plans

A written asthma action plan (AAP) enables people with asthma to recognise a deterioration in their condition promptly and respond appropriately, by integrating changes in symptoms or peak expiratory flow measurements with written instructions to introduce or alter their medication. The aim of an AAP is to assist the process of early intervention and to prevent or reduce the severity of acute asthma episodes. There is evidence that, in patients with asthma, the use of a written AAP in conjunction with training in self-management and regular medical review improves outcomes. This includes less need for hospitalisation, urgent GP visits, and additional medication, as well as better lung function (Gibson et al. 2002). It has also been shown that written AAPs reduced the risk of death from asthma by 70% (Abramson et al. 2001). Written asthma action plans have formed part of national guidelines for the management of asthma since 1989 (Woolcock et al. 1989) and have been promoted in public education campaigns by the NAC (NAC 2002).

AAPs may be provided in various formats. The following features, which are common to most of the AAPs that have been shown to be beneficial, are considered to be the four essential components:

1. The AAP should be in a written format.
2. It should be individually prescribed, rather than a generic example.
3. It should contain information that allows the user to recognise the onset of an exacerbation.
4. It should contain information on what action to take in response to that exacerbation (usually increase or commence steroids and/or seek urgent medical care).

While most existing surveys on the use of AAPs have asked about the possession of a written AAP, most have not specifically established whether it contains the other essential components.

Possession of written asthma action plans

In recent surveys the proportion of adults with current asthma who possess an asthma action plan ranged from 15% to 22% (Table 6.1).

People with recent asthma symptoms or with more severe asthma were more likely to report that they possessed a written AAP. In New South Wales in 1997, 43% of adults with severe asthma possessed a written AAP (Marks et al. 2000). In the same state, in 2003, 41.2% of people who had taken treatment for asthma or had symptoms of asthma in the last 4 weeks reported having a written AAP (Centre for Epidemiology and Research 2004). At the same time, in Victoria, 51% of people who had experienced asthma symptoms in the last 12 months had an AAP (Department of Human Services, unpublished data 2004).

Table 6.1
Possession of asthma action plans: people with current asthma, Australia, 1998–2001

Place	Age (people with current asthma)	Year	Rates	95% CI
Possession of a written asthma action plan				
Australia (1)	All ages (n=3,157)	2001	17.0%	15.6–18.5%
	15 years and over (n=2,170)	2001	14.6%	12.9–16.4%
ACT (2)	4 to 6 years	1999–2001	23.2%	21.3–25.1%
Possession of an asthma action plan (written instructions on what to do if asthma is out of control)				
SA (3)	15 years and over (n=388)	2001	22.2%	18.1–26.3%
	15 years and over (n=346)	1998	29.2%	24.3–34.6%
Possession of a written asthma management plan from a doctor on how to treat asthma				
Qld (4)	18 years and over (n=795)	2000	21.1%	18.3–23.9%
NSW (5)	16 years and over (n=1,897)	1998	34.4%	31.4–37.3%
NSW (6)	2 to 12 years (n=1,296)	2001	43.6%	40.1–47.2%

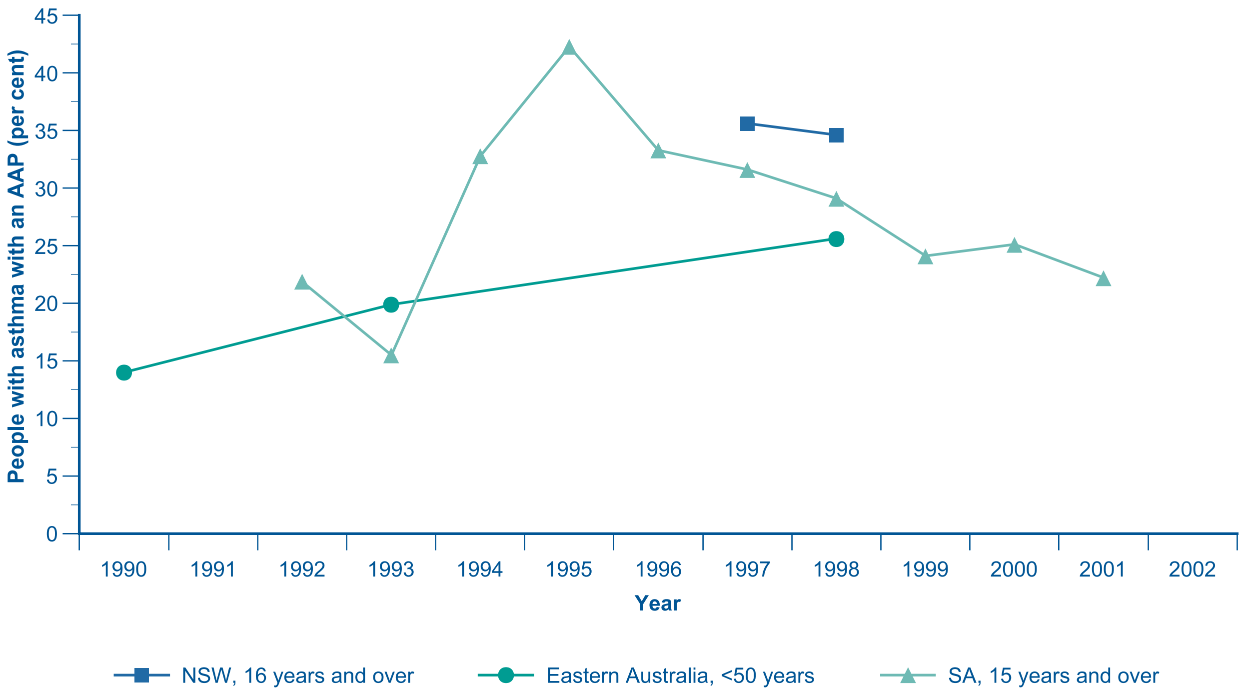
Notes: Only people with current asthma (n) were asked about the possession of AAPs. The definitions for current asthma were: NSW Survey and Queensland Chronic Disease Survey: Doctor diagnosis of asthma plus treatment or symptoms of asthma in the last 12 months; National Health Survey and SA Omnibus: 'Yes' to the question 'Have you ever been diagnosed by a doctor with asthma?' and 'Yes' to 'Do you still have/get asthma?' While the currently accepted term for written instructions on how to manage one's asthma is an 'asthma action plan', it was previously known as an 'asthma management plan'. As a result, the questions used in some surveys reported in the table refer to an 'asthma management plan' while others refer to an 'asthma action plan'.

Sources: (1) ABS National Health Survey 2001 (CURF); (2) ACT assessment of new primary school entrants (Glasgow et al. 2003); (3) South Australian Health Omnibus Survey (Wilson et al. 2003); (4) Queensland Chronic Disease Survey (Epidemiology Services Unit 2002); (5) NSW Health Survey 1998 (Public Health Division 2001); (6) NSW Child Health Survey (Centre for Epidemiology and Research 2002).

Time trends in the possession of written asthma action plans

The data from the series of South Australian Health Omnibus surveys show that, between 1992 and 1995, there was a rise in the proportion of adults with asthma who reported that they had AAPs (Figure 6.1). This trend is confirmed by the NAC studies in eastern Australia in 1990 and 1993. However, the rate of AAP ownership has declined since 1995 in the South Australian series. No other time series is available for the recent period, but the single studies performed in recent years in other states and nationally show rates of possession of AAPs equivalent to the most recent, lower, rates found in the South Australian series (Table 6.1).

Figure 6.1
Possession of asthma action plans: adults with current asthma, Australia, 1990–2001



Notes: Only people with current asthma were asked about the possession of AAPs. Definitions used to identify AAP possession are SA: Current asthma = 'Yes' to the question 'Have you ever been diagnosed by a doctor with asthma?' and 'Yes' to 'Do you still have asthma?' then asked 'Do you have an asthma action plan (written instructions of what to do if your asthma is out of control)?'; NSW: Current asthma = doctor diagnosis of asthma plus treatment or symptoms of asthma in the last 12 months, 'Do you have a written asthma action plan?'; Eastern Australia: Current asthma = self-reported diagnosis of asthma, 'Do you have a written action plan?'

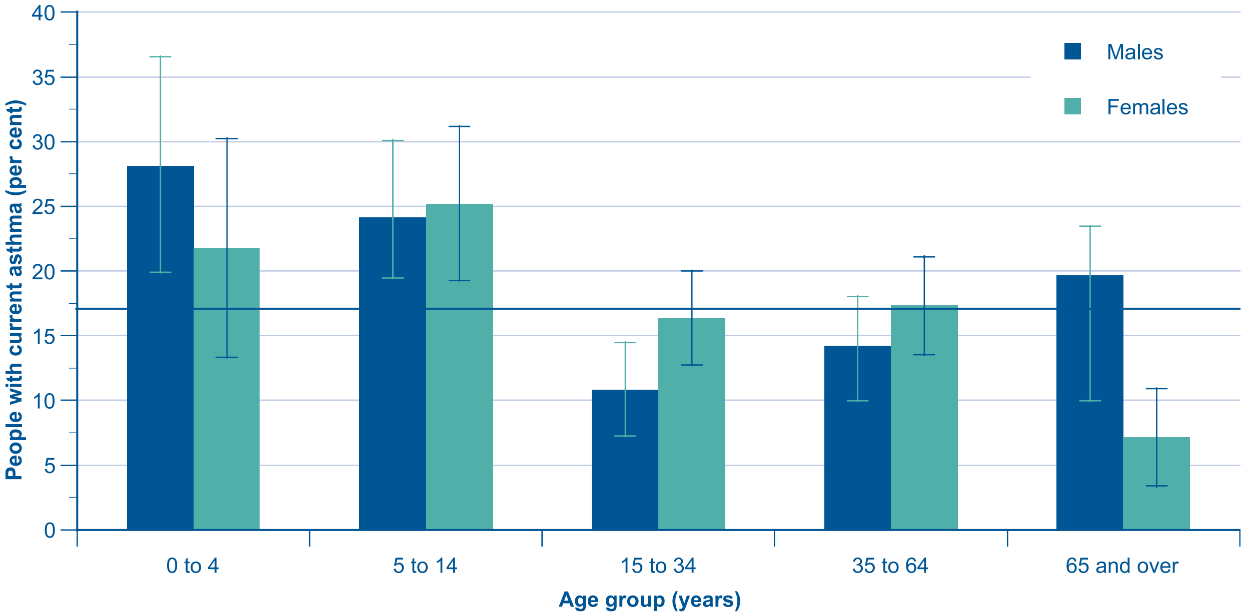
Sources: Comino et al. 1996; Gibson et al. 2000; Public Health Division 2001; Wilson et al. 2002, 2003.

Differentials in the possession of written asthma action plans

Age and sex

Among people with asthma, the highest rate of possession of written AAPs was among children and the lowest rate was among young adults (Figure 6.2). In the adult age range, females were more likely than males to report having a written AAP, except in the elderly. Males aged 15 to 34 years and females aged 65 years and over had a very low rate of possession of written AAPs (10.8% and 7.1%, respectively).

Figure 6.2
Possession of a written asthma action plan in people with current asthma, by broad age group and sex, Australia, 2001



Note: Horizontal line represents the proportion of people of all ages with a written AAP (17.0%).

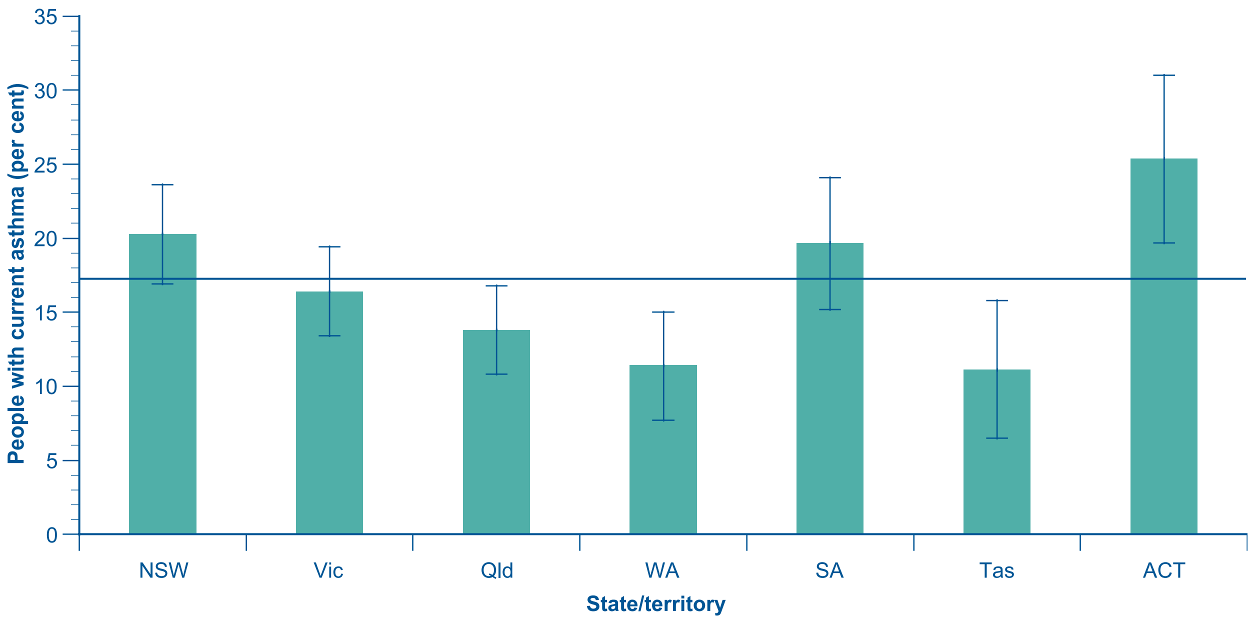
Source: ABS National Health Survey 2001.

States and territories

The proportion of people with current asthma who reported having a written AAP was relatively high in the Australian Capital Territory and New South Wales and relatively low in Western Australia, Tasmania and Queensland (Figure 6.3).

Figure 6.3

Possession of a written asthma action plan in people with current asthma, by state and territory, all ages, Australia, 2001



Note: Horizontal line represents the proportion of people of all ages with a written AAP (17.0%). Northern Territory excluded because numbers too small to produce reliable estimates.

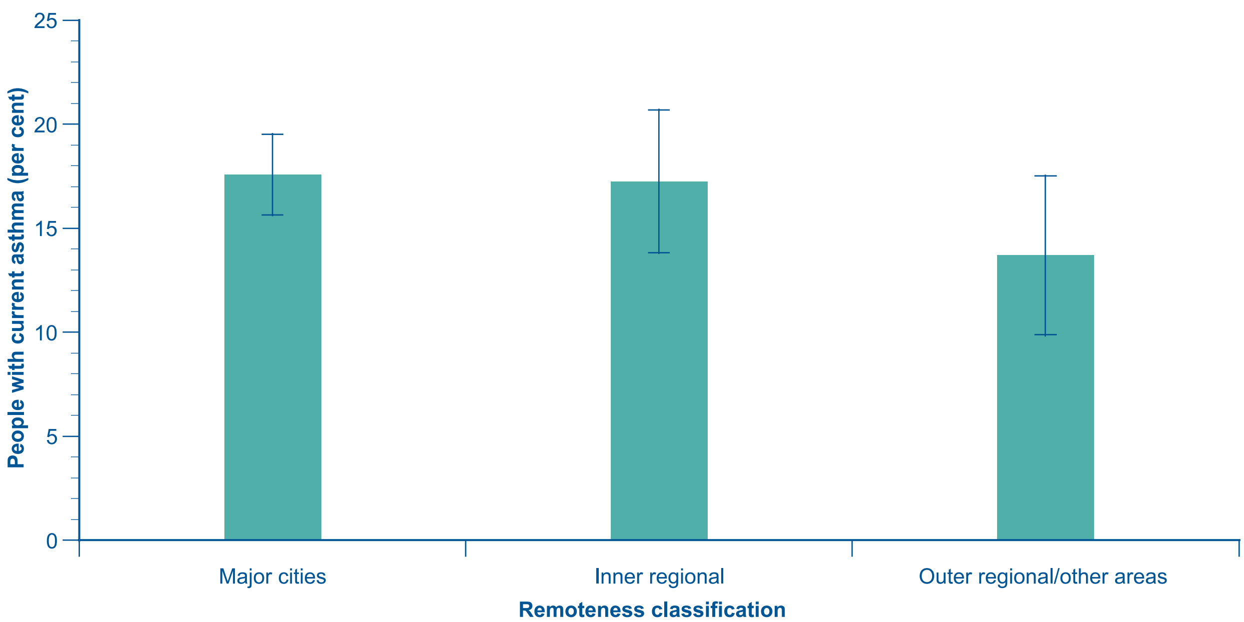
Source: ABS National Health Survey 2001.

Urban, rural and remote areas

There was no significant difference in the rate of ownership of a written AAP among people with current asthma living in major cities, or in regional and remote areas (p trend=0.1) (Figure 6.4).

Figure 6.4

Possession of a written asthma action plan in people with current asthma, by remoteness, all ages, Australia, 2001



Note: Remoteness is classified according to the Australian Standard Geographical Classification (ASGC) of remoteness.

Source: ABS National Health Survey 2001.

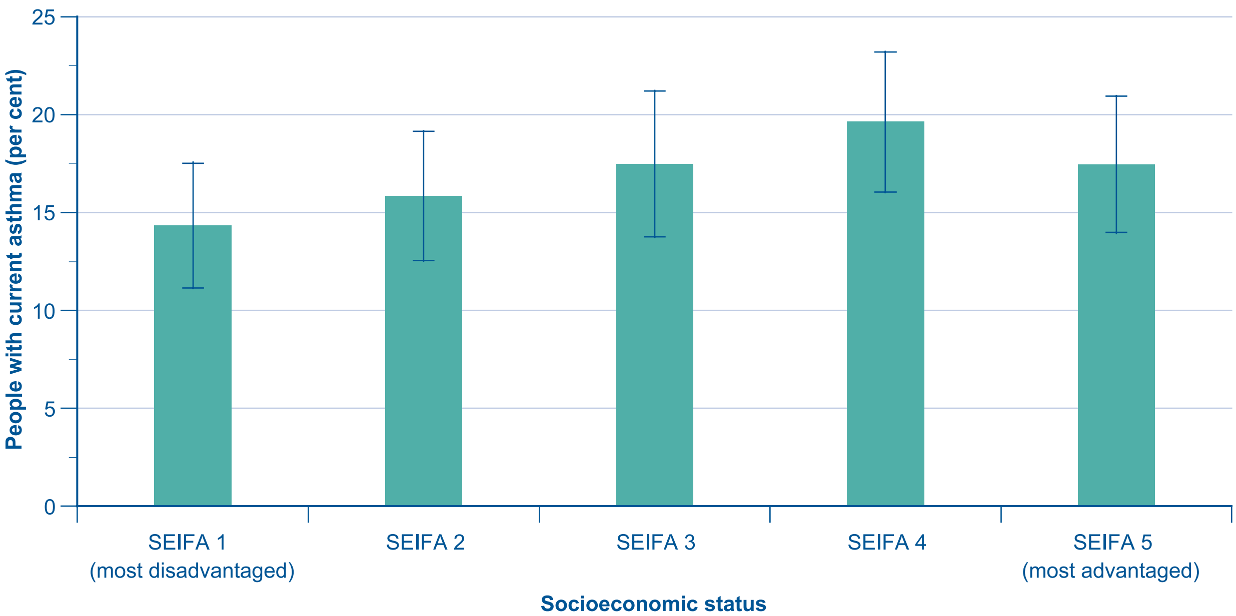
Culturally and linguistically diverse background

In the 2001 National Health Survey (ABS 2002a), approximately 17% of people from English-speaking backgrounds reported possession of written asthma action plans, compared to 13% from non-English-speaking backgrounds (ACAM 2003). This difference was not statistically significant.

Socioeconomic disadvantage

There was a lower rate of possession of written AAPs among people with asthma living in localities with greater levels of socioeconomic disadvantage (p trend=0.04), (Figure 6.5).

Figure 6.5
Possession of a written asthma action plan in people with current asthma, by socioeconomic status, all ages, Australia, 2001



Note: SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Source: ABS National Health Survey 2001.

Summary

The majority of people with asthma do not have a written asthma action plan. Although there was apparently an increase in the use of AAPs during the early part of the 1990s, coinciding with the public awareness campaigns of the National Asthma Council (Comino et al. 1996), this trend has not been sustained. Young adults, adult men, and persons living in outer regional and remote areas and in socioeconomically disadvantaged areas were least likely to have a written AAP. People with more severe asthma or those experiencing symptoms were also more likely to have AAPs. There was some variation among the states and territories in the proportion of people with asthma who reported possessing a written AAP.

There are no data on the extent to which the AAPs that are in use incorporate those elements that are required for their effectiveness.

6.2 Medication use

Drug therapy is the mainstay of asthma management. Broadly speaking, there are three ways in which medications are used in the treatment of asthma:

1. to relieve symptoms when they occur;
2. to control the disease and attempt to prevent symptoms and exacerbations; and
3. to treat exacerbations of the disease.

The most commonly used class of medications for relief of symptoms are short-acting beta agonists. However, short-acting anti-cholinergic drugs can also be used for this purpose.

There is evidence from systematic reviews that inhaled corticosteroids are highly effective for the second purpose, to minimise symptoms and prevent exacerbations (Adams et al. 2003, 2004a, 2005). Recent analyses of data from clinical trials has demonstrated that most people with asthma can be well controlled with relatively low doses of inhaled corticosteroids, resulting in a low risk of adverse effects (Powell & Gibson 2003). The addition of long-acting beta agonists to inhaled corticosteroids, now available in a combined formulation, allows equivalent or greater effectiveness in disease control with lower doses of inhaled corticosteroids (Greening et al. 1994). Leukotriene antagonists are also used for disease control, though they are less effective than inhaled corticosteroids (Ng et al. 2004). Cromoglycate (a cromone) has been traditionally used for the prevention of asthma exacerbations in children but evidence for its effectiveness for this purpose is generally lacking.

Oral corticosteroids have long been the mainstay of treatment for exacerbations of asthma. The role of intermittent use of inhaled corticosteroids or short-term increases in the maintenance or usual dose of inhaled corticosteroids remains uncertain.

In this chapter we review data on use of medications for the treatment of asthma in Australia, focussing in particular on medications used to control the disease, principally inhaled corticosteroids. Various sources of data have been used for this purpose. Information on the wholesale supply of medications in the community and on reimbursements for the purchase of prescription medications is available from IMS Health and the Pharmaceutical Benefits Scheme, respectively. In 2002, data from the Pharmaceutical Benefits Scheme (PBS) and the Repatriation Pharmaceutical Benefits Scheme (RPBS) provided information about 80% of prescribed medications purchased in Australia. IMS Health collects data from all pharmaceutical wholesalers about the sale of both prescription and non-prescription medications to the hospital and community sectors (see Appendix 1, Section A1.8, for more details about these data sources). However, data from these sources cannot be linked to the reason for medication use or to the characteristics of the purchaser. Since many of the medications used to treat asthma are also used by people with COPD, wheezy bronchitis and other related illnesses, this reduces the specificity of conclusions drawn from analyses of these data. Health surveys, including the ABS National Health Survey, are the best source of information about actual use of medication by people with asthma.

The data on medication use from all sources is expressed in units of defined daily doses (DDDs) per 1,000 population per day. This unit of measurement represents the number of standard daily doses of each medication or class of medications that have been supplied, prescribed or used within a population. See Appendix 1, Section A1.8.3, for more details of these calculations.

Time trends in medication supply for respiratory conditions

Classes of medications

Short-acting beta agonists, mainly salbutamol and terbutaline, remain the most commonly supplied class of medications among those used to treat respiratory disorders in Australia (Figure 6.6). The number of DDDs of this class of medications that were supplied wholesale was greater than the number of DDDs for which prescriptions were reimbursed. This is because this class of medication is commonly dispensed over the counter, that is, without a prescription. Short-acting beta agonists and anti-cholinergics are also commonly used in patients hospitalised with respiratory illness, for which it is dispensed by hospital pharmacies. In both these circumstances, usage would be recorded in the wholesale supply data but not in the reimbursed prescription data. Apart from this difference, the data on wholesale supply and reimbursed prescriptions agree very closely (Figure 6.6).

Supply of short-acting beta agonists has been decreasing since 1999 and, more recently, use of the short-acting anti-cholinergic ipratropium bromide has also been declining. The latter trend may have been accelerated by the introduction of tiotropium, a long-acting anti-cholinergic medication that is mainly recommended for use by patients with COPD.

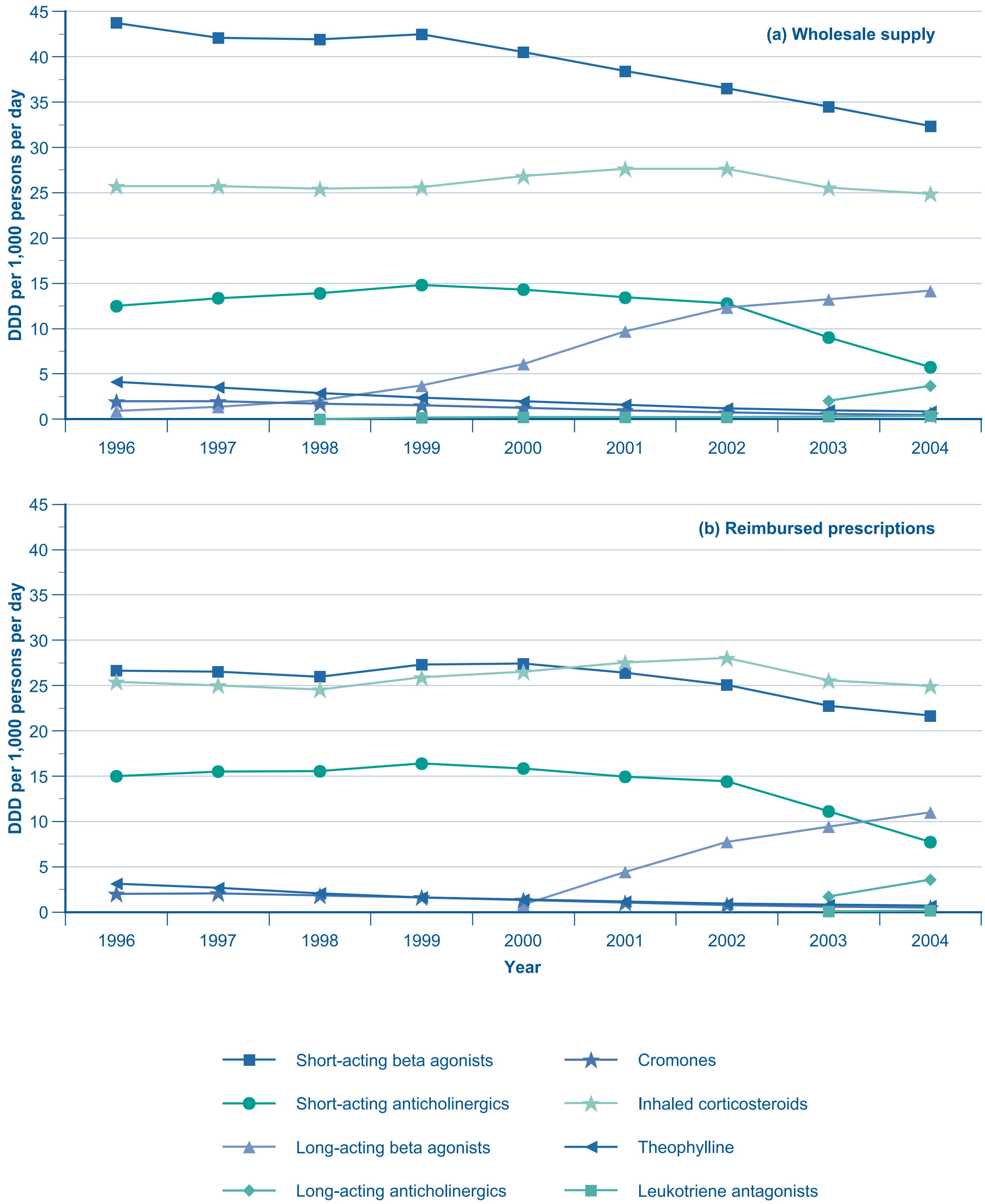
The number of DDDs of inhaled corticosteroids distributed per year has been remarkably stable since 1996. There was a small increase between 1999 and 2002 and a small decrease back to pre-1999 levels since then.

Long-acting beta agonists first became eligible for reimbursement under the PBS in 2000. Since that year, there has been a rapid increase in the use of this class of medications.

The use of other medications for asthma and other respiratory disorders, cromones (cromoglycate and nedocromil) and theophylline, was low and decreased during this period. Reimbursement for prescriptions for leukotriene antagonists has only recently been introduced. The overall usage of this class of medications remains low, relative to other respiratory medications.

Figure 6.6

Respiratory medications (a) supplied by wholesalers and manufacturers and (b) reimbursed prescriptions, by defined daily dose (DDD) per 1,000 persons per day, Australia, 1996–2004



Note: Respiratory medications classified according to ATC. Short-acting anticholinergics include ipratropium. Long-acting anticholinergics include tiotropium.

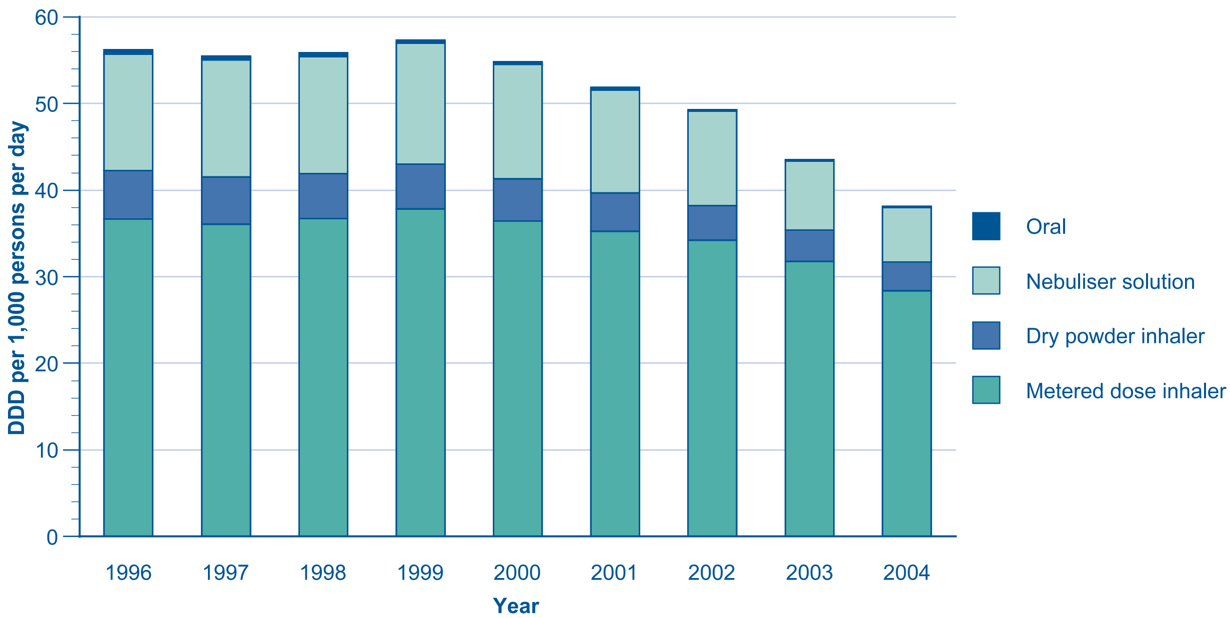
Sources: (a) IMS Health; (b) Pharmaceutical Benefits Scheme (PBS) and Repatriation Pharmaceutical Benefits Scheme (RPBS); Australian Bureau of Statistics.

Route of administration of bronchodilators

Nearly all short-acting beta agonist and anti-cholinergic bronchodilator medication was administered by inhalation (as opposed to oral tablets or syrups) (Figure 6.7). Metered dose inhalers (puffers) were the most popular devices supplied for this purpose. Approximately one-quarter of the supply of this class of medication was in the form used for nebulised delivery. This proportion declined by 50% between in 2000 and 2004, in accordance with current evidence and recommendations (Cates 1999).

Figure 6.7

Delivery devices supplied by wholesalers for the administration of short-acting beta agonist and anticholinergic medication, by defined daily dose (DDD) per 1,000 persons per day, Australia, 1996–2004

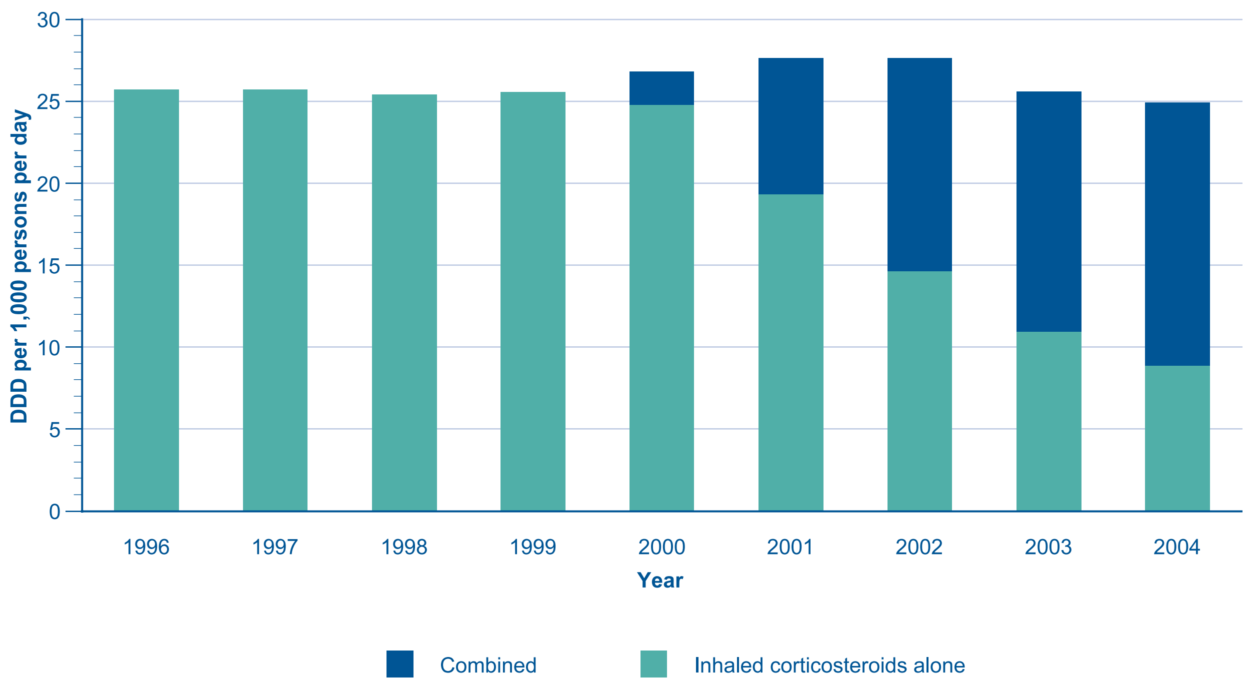


Sources: IMS Health; Australian Bureau of Statistics.

Combined medications

Inhalation devices that combined long-acting beta agonists and corticosteroids in the same unit were introduced onto the Australian market in 2000. In subsequent years, the proportion of all inhaled corticosteroids that were supplied by wholesalers in combination with long-acting beta agonists steadily increased. By 2004, combined therapy represented 64% of all DDDs of inhaled corticosteroid therapy supplied by wholesalers (Figure 6.8).

Figure 6.8
Inhaled corticosteroids supplied by wholesalers separately or as part of combined therapy, by defined daily dose (DDD) per 1,000 persons per day, Australia, 1996–2004

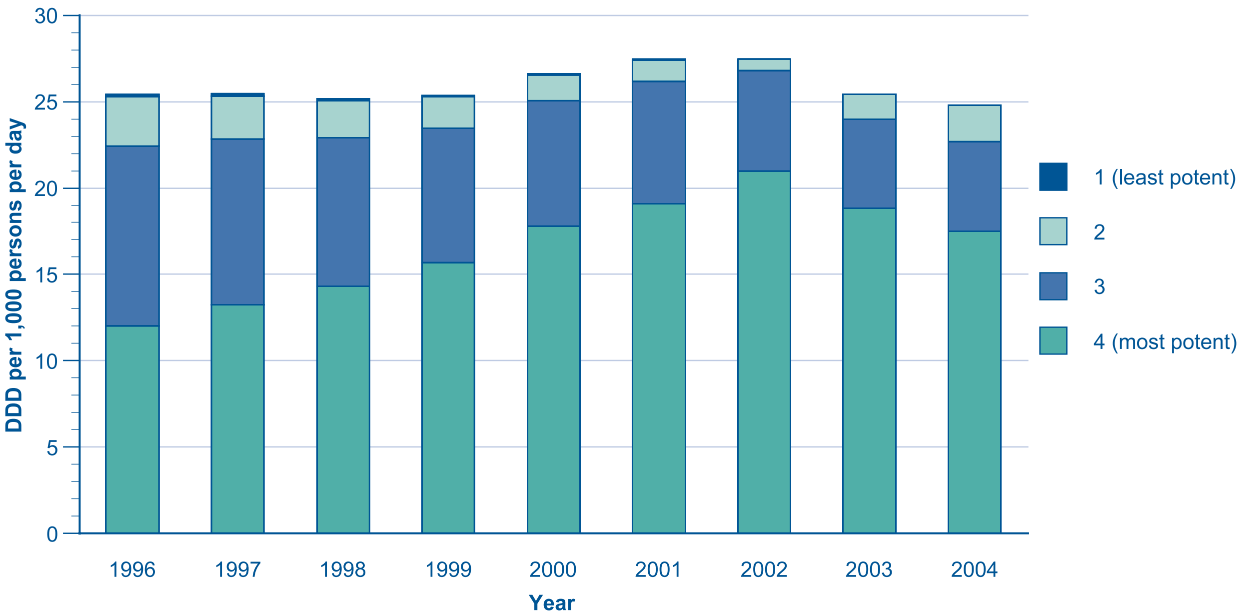


Sources: IMS Health; Australian Bureau of Statistics.

The proportion of DDDs of inhaled corticosteroids that were supplied in the most potent formulations, that is, the highest doses of budesonide and fluticasone, increased from 47% in 1996 to 76% in 2002. It then decreased slightly to 70% in 2004 (Figure 6.9). The major increase in the use of combined medications since 2000 (Figure 6.8) should lead to a further decrease in the frequency of use of the most potent formulations of inhaled corticosteroid as there is evidence that combined therapy allows equivalent effectiveness at lower corticosteroid doses (Greening et al. 1994). Furthermore, as noted above, recent analysis has highlighted the fact that most of the benefits of inhaled corticosteroids can be achieved at relatively low doses (Powell & Gibson 2003).

Figure 6.9

Relative potency of inhaled corticosteroids supplied by wholesalers separately or as part of combined therapy, by defined daily dose (DDD) per 1,000 persons per day, Australia, 1996–2004



Notes

1: (least potent): Includes Pulmicort MDI 50, BDP (CFC) MDI 50, BDP rotahaler 100.

2: Includes Flixotide/Seretide AH 100, MDI 50; Pulmicort TH/MDI 100; Symbicort 200; Qvar 50; BDP(CFC) 100.

3: Includes Flixotide/Seretide AH 250, MDI 125; Pulmicort TH/MDI 200; Symbicort 400; Qvar 100; BDP(CFC) 250.

4: (most potent): Includes Flixotide/Seretide AH 500, MDI 250; Pulmicort TH 400.

Sources: IMS Health; Australian Bureau of Statistics.

Differentials in the use of asthma medication

Data on reported medication use by people with asthma are available from the ABS National Health Survey.

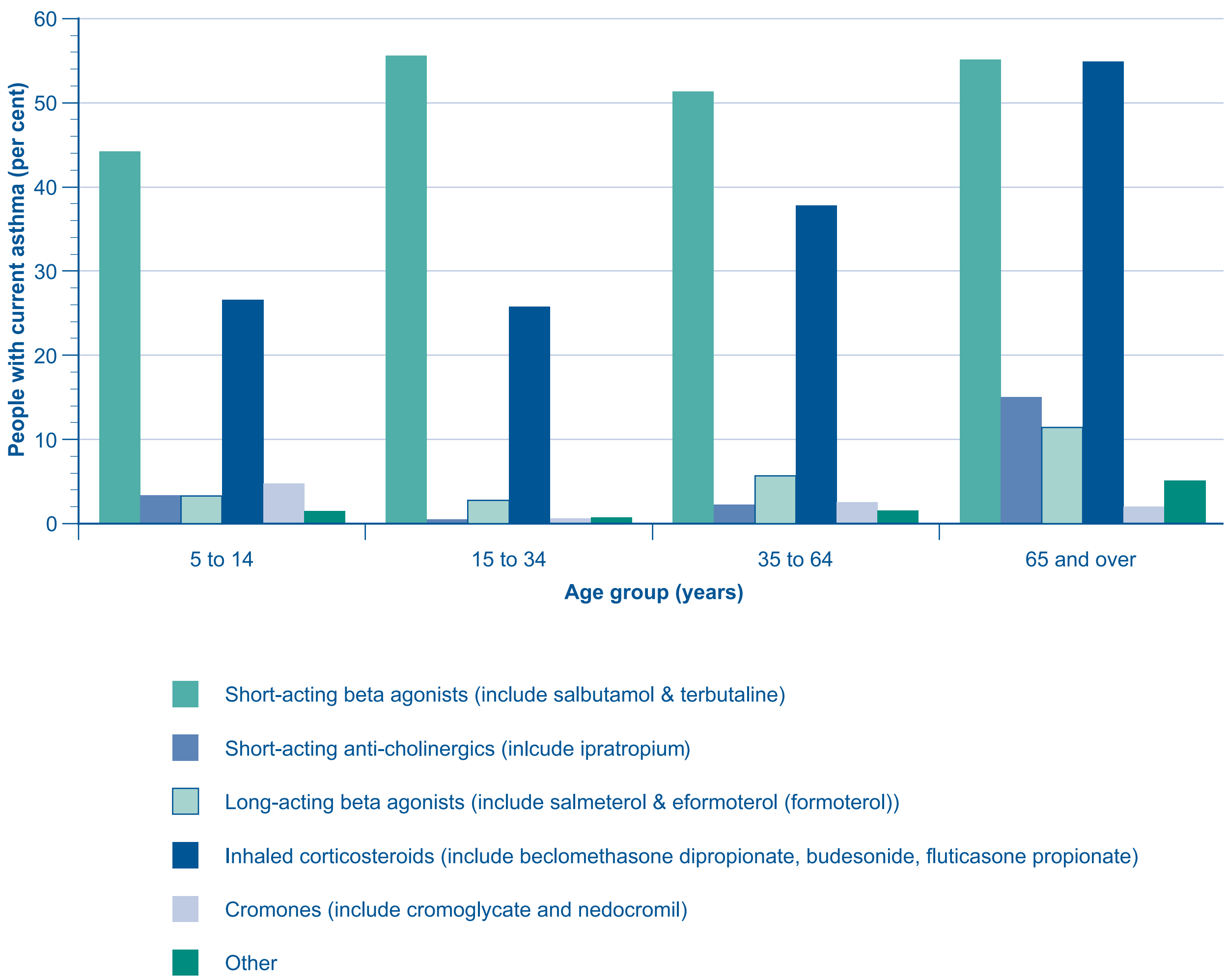
Age groups

Short-acting beta agonists (relievers) were the most commonly used medications for asthma in all age groups (Figure 6.10). Inhaled corticosteroid use increased with increasing age, as did the use of short-acting anti-cholinergics and long-acting beta agonists. This reflects the increasing severity and persistence of the condition with increasing age. In older age groups, the distinction between asthma and COPD is less certain and it is possible that some medication use that has been attributed to asthma would more appropriately be attributed to COPD.

Only 25% of young adults with asthma reported using inhaled corticosteroids for treatment of their illness in the preceding 2 weeks. This finding is consistent with the observation in an earlier study in New South Wales that only 30% of adults with asthma used inhaled corticosteroids daily or most days during 1997 (Marks et al. 2000). In that study, only 43% of a subset of respondents who had features of moderate to severe asthma, and hence would have benefited from regular use of this class of medications, were using them regularly. The more recent, nationwide survey almost certainly supports that conclusion.

Figure 6.10

Use of asthma medication in the last 2 weeks in people with current asthma, by broad age group and type of medication, people aged 5 years and over, Australia, 2001



Source: ABS National Health Survey 2001.

Remoteness and socioeconomic status

In the 2001 National Health Survey, the prevalence of use of inhaled corticosteroids and long-acting beta agonists among people with asthma did not differ between urban, regional and remote communities (ACAM 2003). There was also little variation in reported use of inhaled corticosteroids or short- and long-acting beta agonists across socioeconomic groups in 2001 (ACAM 2003) (data not shown).

Summary

Inhaled short-acting beta agonists and inhaled corticosteroids are the most commonly used medications among people with asthma. Almost all bronchodilator medication is delivered by inhalation, the majority by metered dose inhaler. The use of nebulised solutions for administration of bronchodilators is decreasing in accordance with current recommendations.

Most inhaled corticosteroids are delivered in the most potent available formulation. It is unlikely that this dosage level is required in all individuals who are receiving it. Since 2003, the majority of inhaled corticosteroid doses have been delivered in combination with long-acting beta agonists. This should lead to reduction in the potency of inhaled corticosteroid that is required.

Despite evidence of relatively high doses of inhaled corticosteroids being delivered to those that are taking them, there is also evidence that the majority of people with asthma do not use inhaled steroids regularly. This almost certainly includes a substantial proportion of people who would stand to benefit from using this class of medications.

6.3 Spirometry

Measurement of lung function has an important role in the diagnosis, assessment and follow-up of patients with asthma (NAC 2002). Spirometry is used to establish the presence of airflow obstruction and its reversibility in response to the inhalation of a bronchodilator. This is an important feature in the diagnosis of asthma. The degree of airflow obstruction is an indicator of one aspect of the severity of asthma, and guidelines for the assessment of impairment and disability due to asthma, based upon spirometric function, have been published (American Thoracic Society 1993). Finally, change in spirometric function has an important role in the periodic assessment of patients with asthma: both at times of symptomatic deterioration and, routinely, to assist in the management of back-titration of medication and maintenance of optimal asthma control. It is for this reason that the measurement of spirometric function is recommended as part of the initial GP consultation in the Asthma 3+ Visit Plan (DoHA 2003).

In addition to providing clinicians with important information relevant to the management of asthma, spirometry has a role in providing patients with objective evidence about the presence and severity of their asthma.

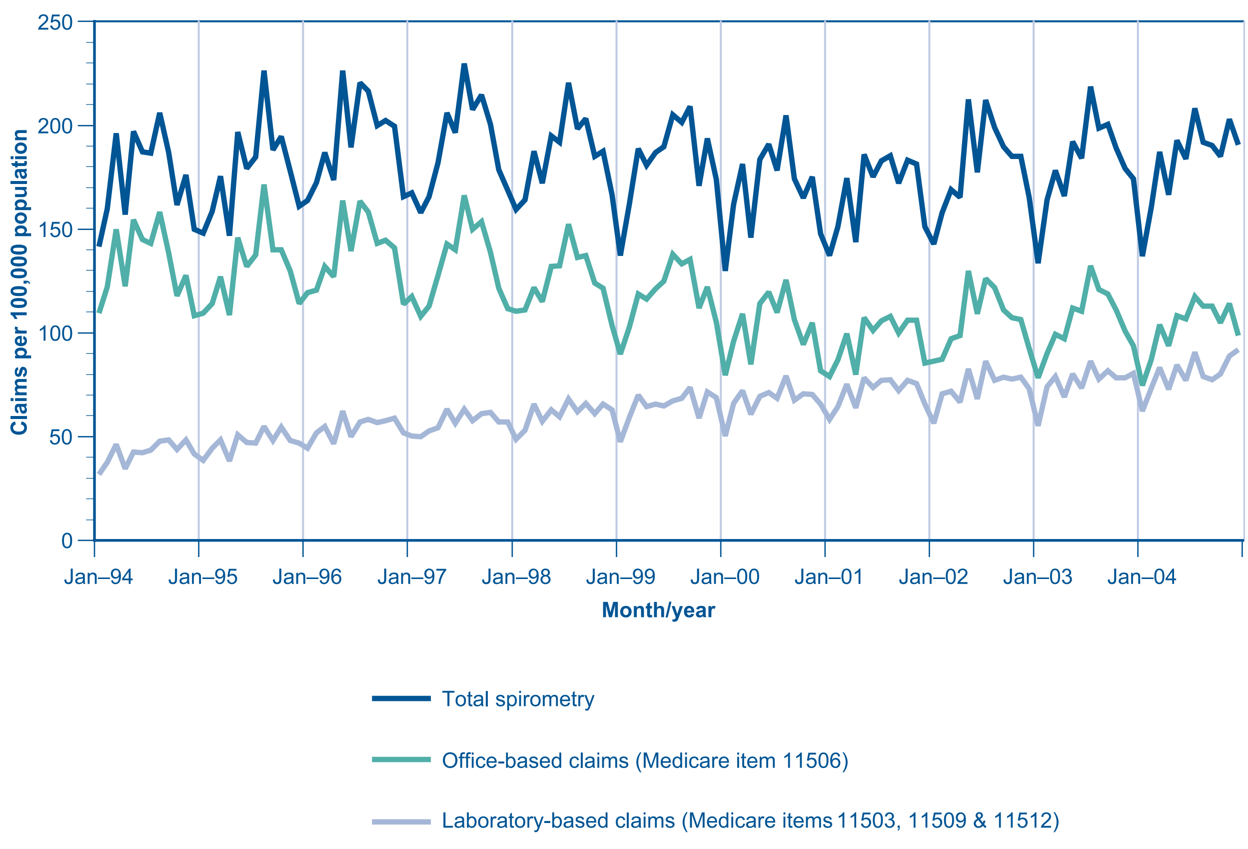
The main source of information about the performance of spirometry in Australia is data derived from claims for reimbursement of the fee for performing this test. The level of payment, and hence the item number, for the performance of spirometry depends on the setting in which it was performed. For the purpose of this analysis we have divided the claims into those that were performed outside a lung function laboratory (item 11506, which includes most office-based spirometry) and spirometry that was performed in a lung function laboratory (item numbers 11503, 11509, and 11512, depending on what other tests are performed at the same time).

Spirometry is not solely used for the diagnosis and assessment of asthma. It may be used in the assessment of a range of other lung diseases, most commonly chronic obstructive pulmonary disease (COPD), and also to exclude disease. In order to provide a more valid indicator of the use of spirometry in people with asthma, we have conducted a secondary analysis of the data in the subset of people aged 5 to 34 years, in whom we believe most spirometry measurements would have been made for the assessment of asthma, as opposed to other respiratory diseases (see Appendix 1, Section A1.7, for a further discussion on this data source).

Time trends in spirometry use

There was no long-term increase or decrease in the rate of claims for spirometry in Australia over the period 1994 to 2004 (Figure 6.11). However, during this period there was a gradual decline in claims for office-based spirometry (that is, tests performed in the doctor's examination room) and an increase in claims for lung function laboratory-based tests. Among people aged 5 to 34 years, in whom we believe most spirometry would be performed for the assessment of asthma, there was an overall decline in total spirometry claims between 1994 and 2000 (Figure 6.12). There was a small rise in claims for office-based spirometry from 2000 in those aged 5 to 34 years, for whom the claims are more likely to reflect those for asthma management or assessment. The increase, which arrests the previous downward trend, coincides with the introduction of the Asthma 3+ Visit Plan. The performance of office-based spirometry declined steadily during the period 1996 to 2004, apart from a small reversal of this trend in 2002–03. This trend was only partially offset by the small rise in claims for the performance of spirometry in the lung function laboratory in this age group, during this period.

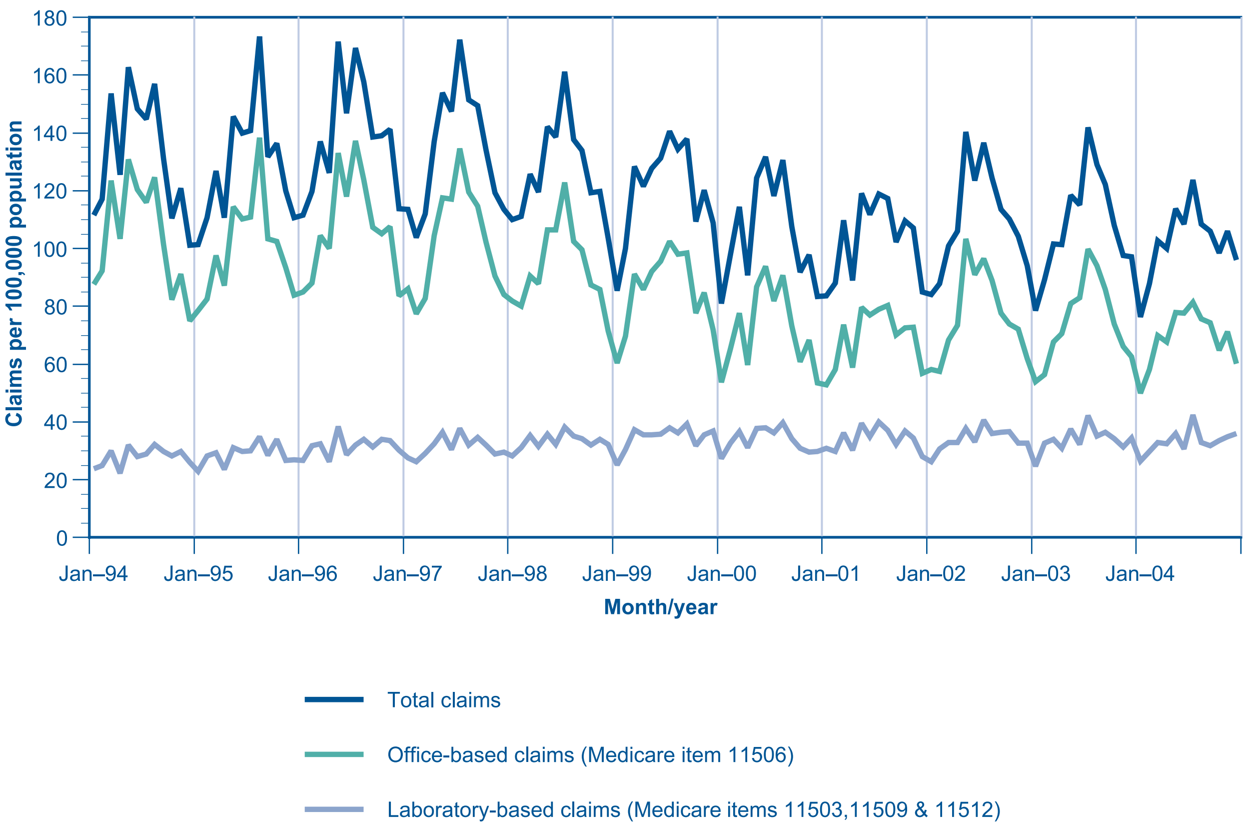
Figure 6.11
Claims for the performance of spirometry and complex lung function tests which included spirometry per 100,000 population, all ages, Australia, 1994–2004



Sources: HIC health statistics; Australian Bureau of Statistics.

There was evidence of marked seasonal fluctuations in the use of office-based spirometry for all ages (Figure 6.11) and also for people aged 5 to 34 years (Figure 6.12). The number of spirometry procedures performed peaked in the winter months, when respiratory tract infections are most common, and was generally lowest in the summer months. There was a small increase in the number of spirometry procedures performed in February and March. This period coincides with the beginning of the school year and has been shown to be a period of increased risk of asthma exacerbations in school-aged children (Sheppeard et al. 2001).

Figure 6.12
Claims for the performance of spirometry and complex lung function tests which included spirometry per 100,000 population, people aged 5 to 34 years, Australia, 1994–2004



Sources: HIC health statistics; Australian Bureau of Statistics.

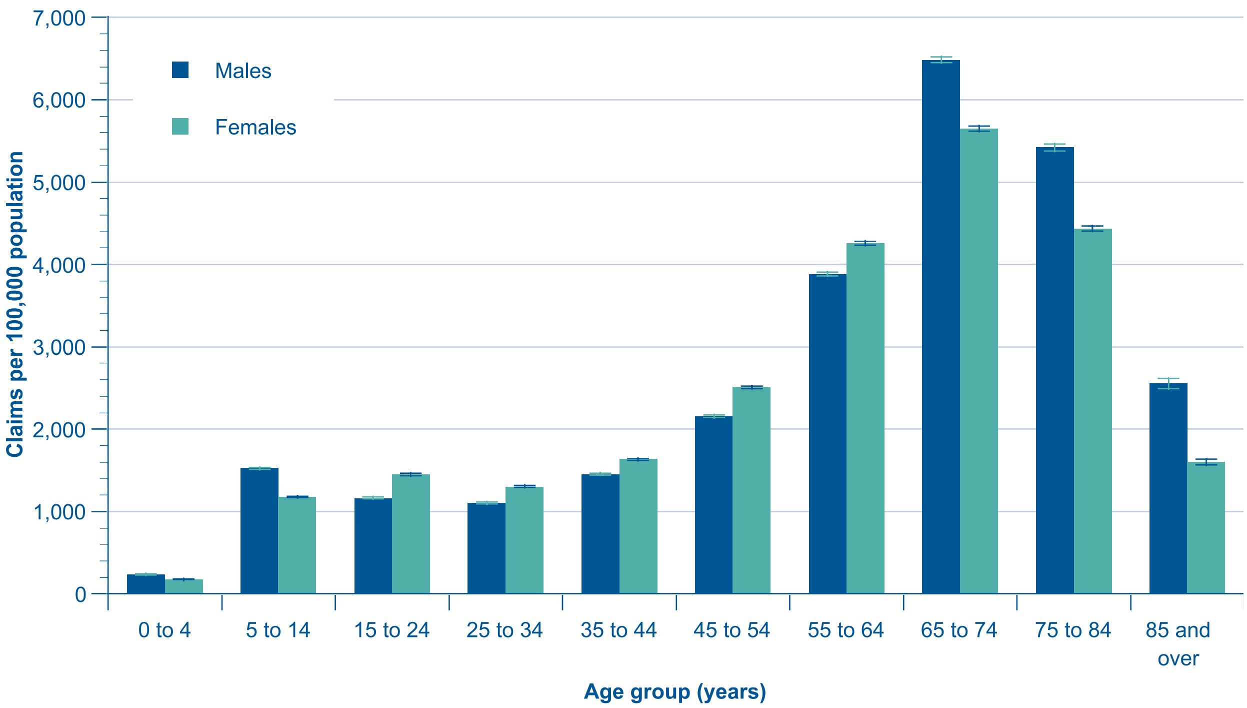
Differentials in spirometry use

Age and sex

The rate of claims for the performance of spirometry increased with increasing age over the range 35 to 74 years (Figure 6.13). This suggests that most measurements are performed in persons with known or suspected COPD. There were equal numbers of claims for males and females for most age groups except for those aged 65 years and over, among whom claims for spirometry among males exceeded claims among females. Once again, this is consistent with the higher prevalence of COPD among males than females (AIHW 2002c, 2004b).

Figure 6.13

Total claims for the performance of spirometry and complex lung function tests which included spirometry per 100,000 population, by age group and sex, Australia, 2002–2004



Note: Data are aggregated from 2002, 2003 and 2004 claims for Medicare items 11503, 11506, 11509 and 11512. Population is Australian population as estimated by the ABS for the relevant years.

Sources: HIC health statistics; Australian Bureau of Statistics.

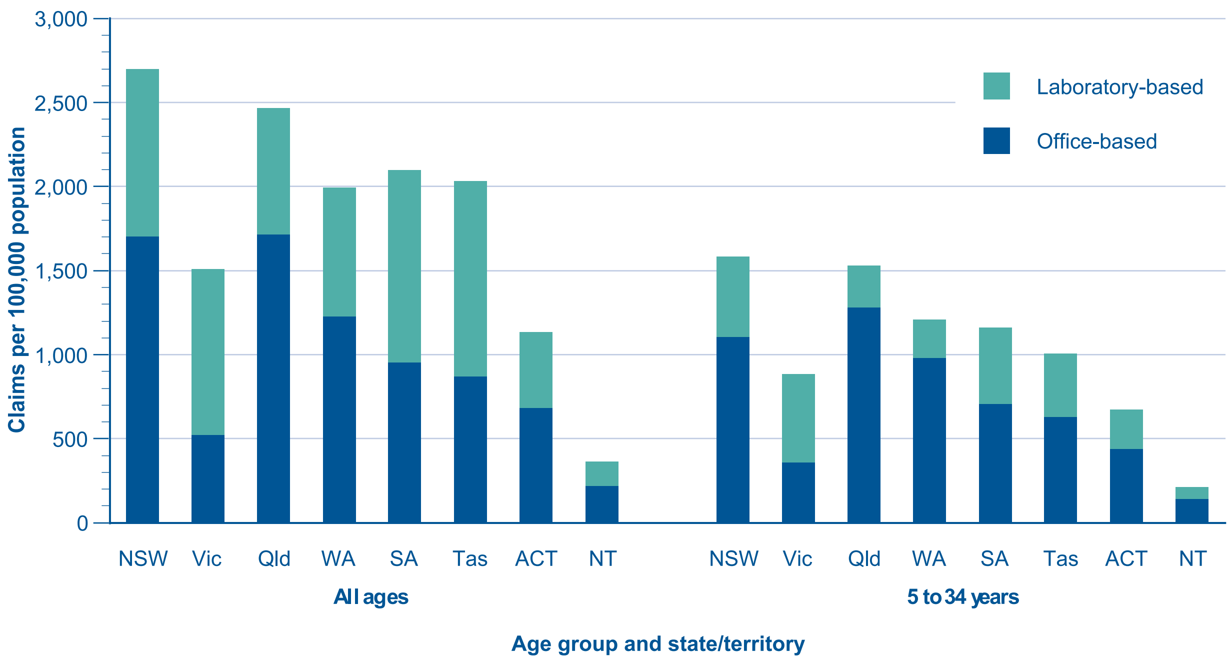
States and territories

There was substantial variation between states and territories in the rates of claims for office-based spirometry between 2002 and 2004, with higher rates in New South Wales and Queensland and lower rates in Victoria than average (Figure 6.14). This variation was not offset by claims for laboratory-based spirometry and is largely unexplained. A similar pattern was reflected in the data for 5 to 34 year olds, except that the proportion of laboratory-based testing was lower in this age group. This would be consistent with the procedure being performed most commonly as a routine, office-based tool in the management of people with asthma.

In some areas, particularly remote regions, spirometry may be performed in community health centres that do not claim for Medicare reimbursement from the HIC. In states and territories with substantial non-metropolitan areas, claims per 100,000 population may underestimate the rate of spirometry tests being conducted.

Figure 6.14

Claims for the performance of spirometry and complex lung function tests which included spirometry per 100,000 population, by state and territory and type, Australia, 2002–2004



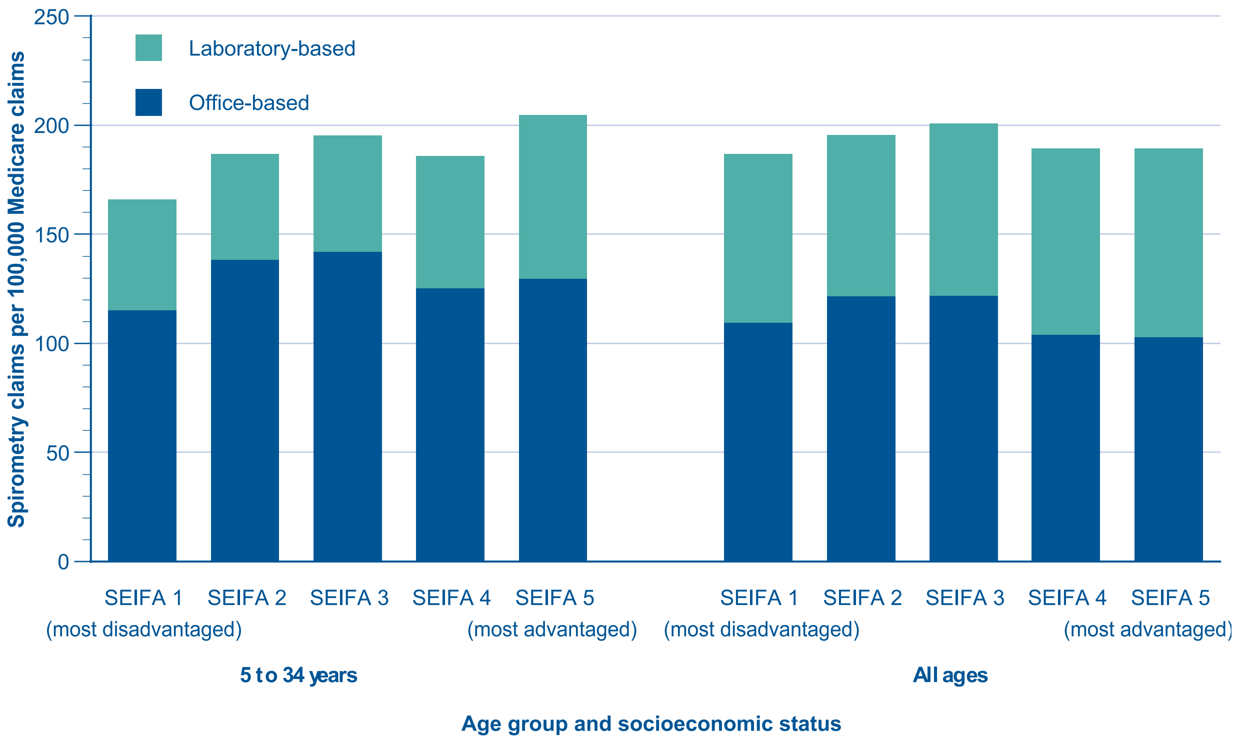
Note: Data are aggregated from 2002, 2003 and 2004. Laboratory-based claims include claims for Medicare items 11503, 11509 and 11512. Office-based claims comprise claims for Medicare item 11506 only. Population is Australian population as estimated by the ABS for the relevant years.

Sources: HIC health statistics; Australian Bureau of Statistics.

Socioeconomic disadvantage

There was no obvious trend in the spirometry claims as a proportion of Medicare claims among people of all ages. However, among people aged 5 to 34 years, this rate was greater among those living in more socioeconomically advantaged localities (Figure 6.15) than those in more disadvantaged localities.

Figure 6.15
Claims for the performance of spirometry per 100,000 Medicare claims, by socioeconomic status, Australia, 2002–2004



Note: Data are aggregated from 2002, 2003 and 2004. Laboratory-based claims include claims for Medicare items 11503, 11509 and 11512. Office-based claims comprise claims for Medicare item 11506 only.

Source: HIC health statistics.

Summary

Measurement of spirometric lung function (spirometry) has an important role in the diagnosis and management of asthma and other lung diseases. It is an objective measure providing information relevant to the establishment of the diagnosis, the assessment of severity, and the monitoring of change over time. The test may be performed at the time of consultation (in the doctor's office) or in a lung function laboratory. In the latter case it would usually form part of a complex range of lung function tests.

Analysis of data from claims for reimbursement demonstrates a trend towards more laboratory-based lung function tests and less office-based spirometry over the last 9 years. Spirometry is most commonly performed in people aged over 55 years. Many of the patients in this age group who have spirometry performed probably have chronic obstructive pulmonary disease, rather than asthma. There is unexplained variation among the states and territories in the rate of claims for this procedure.

Among people aged 5 to 34 years, spirometry rates tend to be higher among those living in more socioeconomically advantaged localities.

Smoking

7

Key points

People with asthma who smoke

- The proportion of smokers among people with asthma is similar to the proportion of smokers among people without asthma.
- Among people with asthma, those who are younger and live in localities that are relatively socioeconomically disadvantaged are most likely to smoke.

Passive smoke exposure in children with asthma

- Forty-one per cent of children with asthma and 38% of children without asthma live with one or more regular smokers.
- The higher rate of household exposure to smokers among children with asthma is most evident among boys aged 5 to 14 years, girls aged less than 5 years and people living in more socioeconomically disadvantaged areas.

Introduction

The adverse effects of active and passive smoking on the general public are well known and people with asthma who smoke have additional morbidity. Smokers with asthma have more symptoms, worse asthma control (Siroux et al. 2000), an accelerated decline in lung function (Lange et al. 1998), more airway inflammation (Chalmers et al. 2001), and a less beneficial response to inhaled corticosteroid treatment (Chalmers et al. 2002; Pedersen et al. 1996) compared with non-smokers with asthma.

In this chapter, we present data on smoking among people with asthma and on exposure to environmental tobacco smoke among children with asthma. The relation between these exposures and asthma outcomes is also discussed.

7.1 People with asthma who smoke

In this section, we present data from the 2001 National Health Survey on smoking status for people who report that they have had asthma diagnosed by a doctor and still get it. Overall, 25.9% (95% CI 23.5–28.2%) of people with current asthma were current smokers, including 27.4% of males and 24.8% of females with current asthma. This rate was not significantly different from that observed in people without asthma: 24.1% (95% CI 23.3–28.2%), including 27.7% of males and 20.6% of females without asthma.

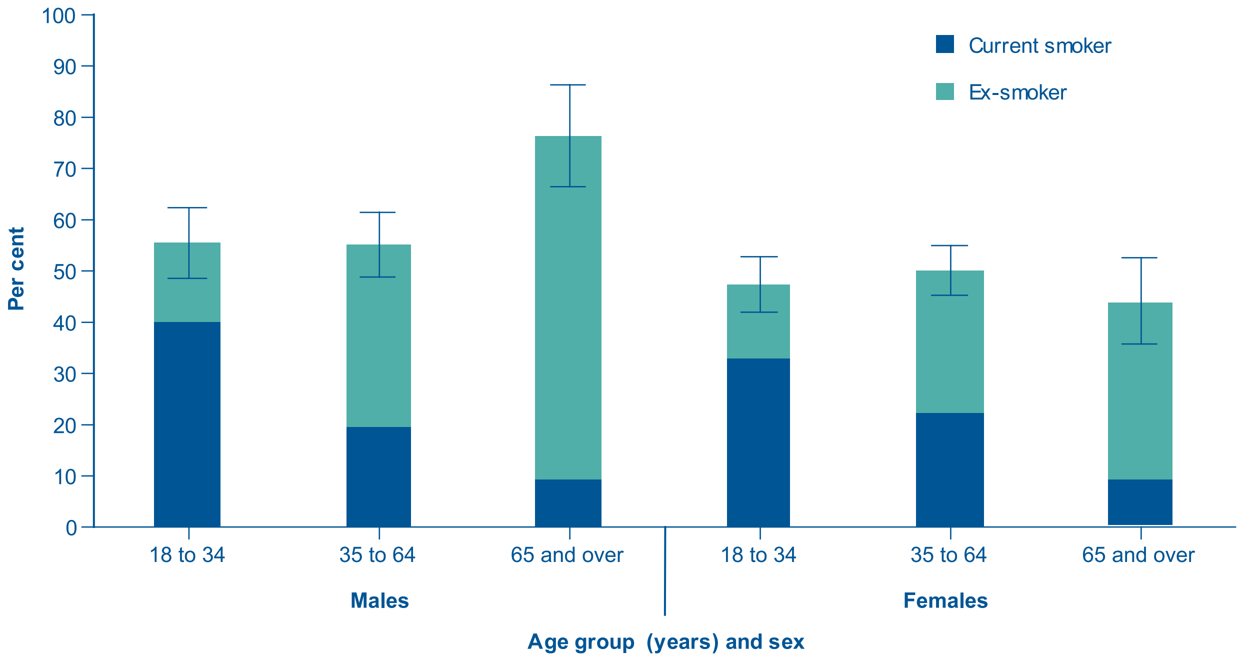
Differentials in smoking

Age and sex

The proportion of people with asthma who were current smokers decreased markedly with age (Figure 7.1). The highest proportions of current smokers among people with asthma were in the 18 to 34 years age group. In this group, 40% of males and 33% of females were current smokers. More females than males with asthma reported never having smoked. This was most pronounced in the 65 years and over age group, where 55.8% of females compared to 23.6% of males with asthma had never smoked. In the older age groups there was also a greater percentage of male ex-smokers. This raises the possibility that a substantial proportion of these older men actually had smoking-related lung disease, that is, COPD, rather than asthma and had quit smoking because of asthma.

Figure 7.1

Smoking status among people with current asthma, by age group and sex, people aged 18 years and over, Australia, 2001



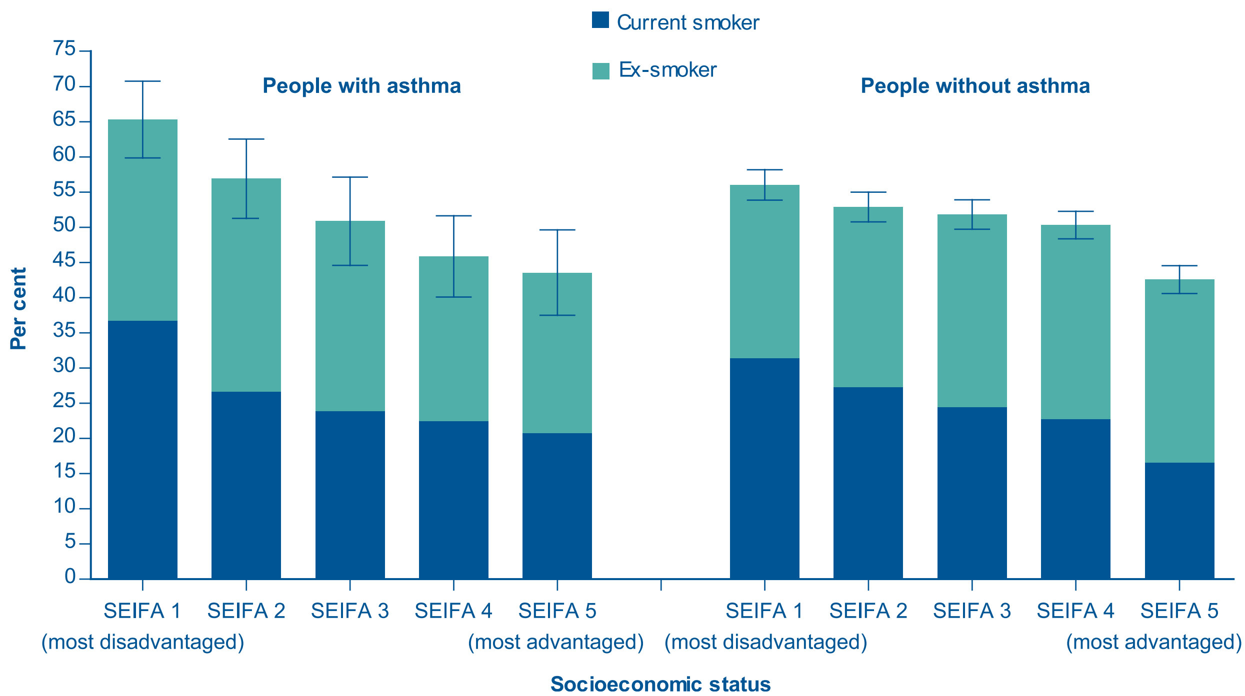
Source: ABS National Health Survey 2001.

Socioeconomic disadvantage

Among people with asthma, those living in more socioeconomically disadvantaged localities had a higher prevalence of smoking than those living in less disadvantaged localities (Figure 7.2). This differential was more marked than that observed in the people without asthma and, hence, the prevalence of current smoking among people with asthma in the most disadvantaged group (36.7%) was higher than that observed among people without asthma (31.4%, p trend<0.001).

Figure 7.2

The proportion of current smokers and ex-smokers in people with and without asthma, by socioeconomic status, people aged 18 years and over, Australia, 2001



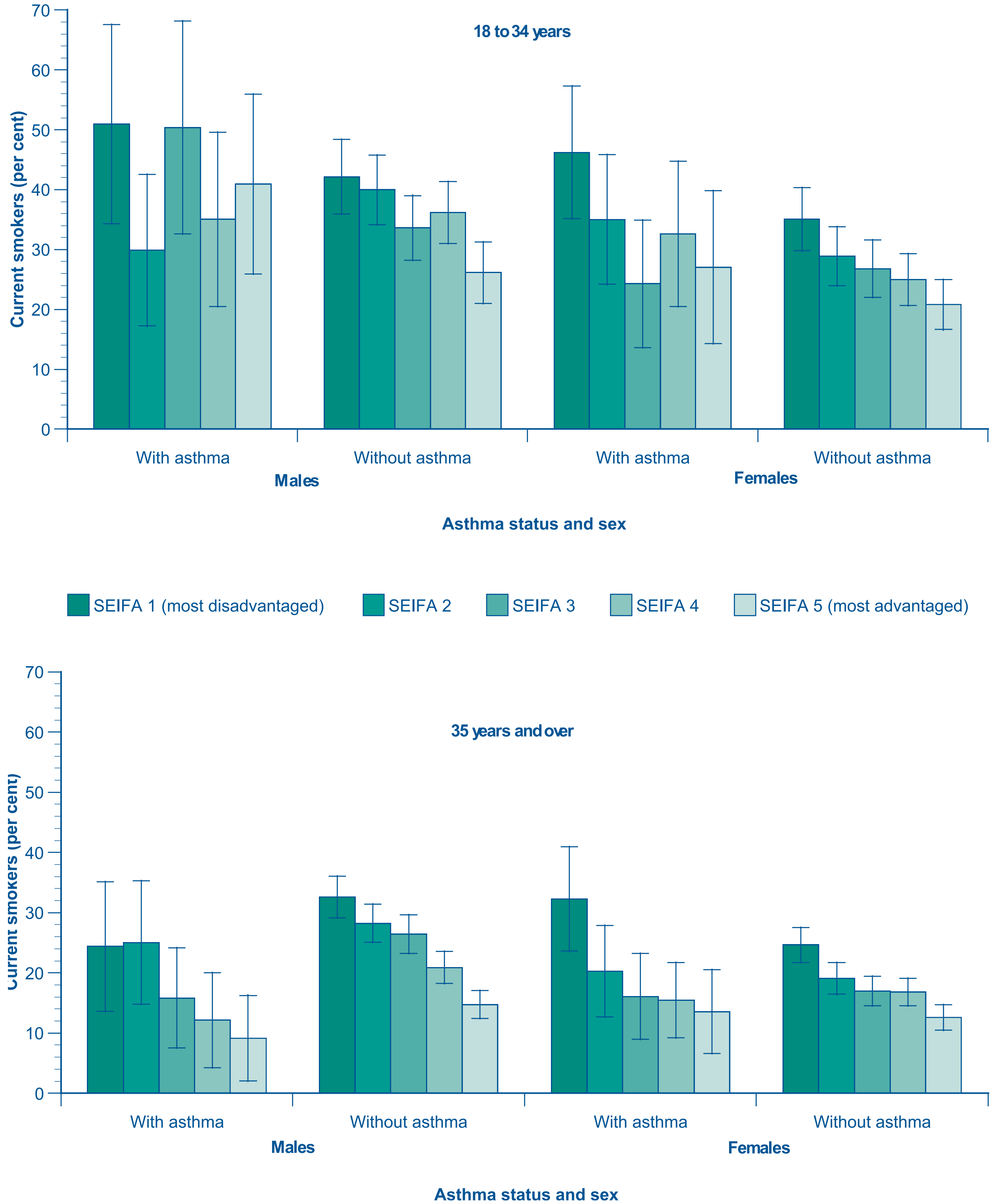
Note: SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Source: ABS National Health Survey 2001.

People aged 18 to 34 years had higher smoking rates than people aged 34 years and over. Moreover, people aged 18 to 34 years with asthma often smoked more than those without asthma in the corresponding socioeconomic groups (Figure 7.3).

The trend for an increasing proportion of smokers with increasing socioeconomic disadvantage was most pronounced in females with asthma aged 35 years and over, with 13.6% in the most advantaged group reporting current smoking compared to 32.3% of those in the most socioeconomically disadvantaged group. This latter proportion was much higher than the proportion of female smokers aged 35 years and over without asthma for the same socioeconomic group (24.6%).

Figure 7.3
Proportion of people who are current smokers in people with and without asthma, by broad age group, sex and socioeconomic status, people aged 18 years and over, Australia, 2001



Note: SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Source: ABS National Health Survey 2001.

Summary

Young people with asthma and people living in socioeconomically disadvantaged areas are more commonly smokers than their contemporaries who do not have asthma. This places them in double jeopardy: from their asthma and from their smoking habit. Further investigation is required to understand the basis of this association and to develop appropriate public health action.

7.2 Passive smoke exposure in children with asthma

Exposure to environmental tobacco smoke (ETS) in childhood is a recognised risk factor for the development of asthma symptoms and also for the worsening of pre-existing asthma. It has been shown that exposure to ETS increases the risk of onset of wheezing illness in young children (Martinez et al. 1992) and that the association between ETS exposure and childhood wheezing illness is most consistent at high levels of exposure (NHMRC 1997). These findings are supported by evidence from international studies which conclude that parental smoking is associated with more severe asthma in children (Strachan & Cook 1998), and that exposure to ETS after birth is a likely cause of wheezing or other acute respiratory illness in young children (Strachan & Cook 1997). Cohort studies have shown that children with pre-existing asthma who are exposed to ETS have increased morbidity and asthma symptoms (Murray & Morrison 1989), more frequent exacerbations (Chilmonczyk et al. 1993), more severe asthma symptoms (Murray & Morrison 1993; Strachan & Cook 1998), impaired lung function (Chilmonczyk et al. 1993; Murray & Morrison 1989), and increased airway reactivity (Murray & Morrison 1989; Oddoze et al. 1999) or peak flow variability (Fielder et al. 1999; Frischer et al. 1993). There is also evidence that health service use is increased in children exposed to ETS. Such children are more likely to attend emergency departments with asthma (Evans et al. 1987). Prevention of indoor smoking leads to a reduction in hospital admissions in children with asthma (Gurkan et al. 2000). Recovery after hospitalisation, measured by use of reliever medication and number of symptomatic days, is also impaired in children exposed to ETS (Abulhosn et al. 1997).

In 2001, 41% of children aged 0 to 14 years with asthma had one or more regular smokers in their household and were potentially exposed to cigarette smoke in their home. This was higher than the proportion of children without asthma who were similarly exposed (38%, p=0.04) (ABS National Health Survey (confidentialised unit record files)).

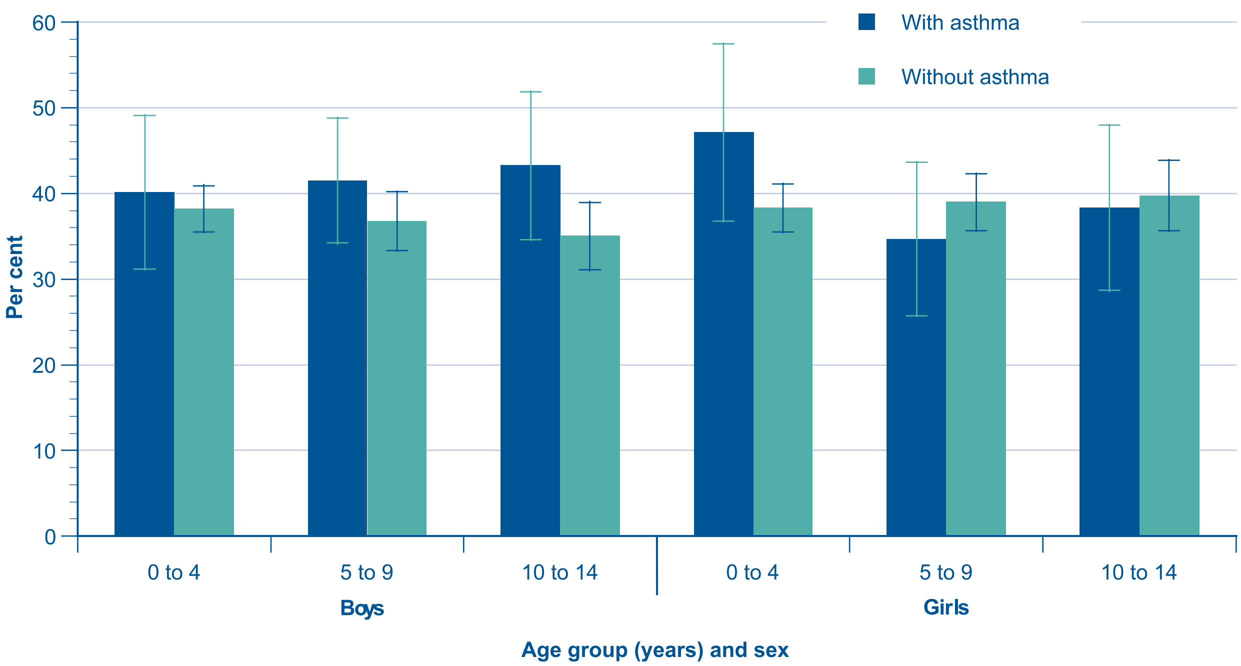
Differentials in children exposed to passive smoke

Age and sex

Among boys of all ages and girls aged less than 5 years who had current asthma, a higher proportion lived with a smoker than children of similar age and sex who did not have asthma. This difference was not evident among girls aged 5 years and over (Figure 7.4).

Figure 7.4

Percentage of children with and without current asthma with one or more cigarette smokers in the household, by age group and sex, age 0 to 14 years, Australia, 2001

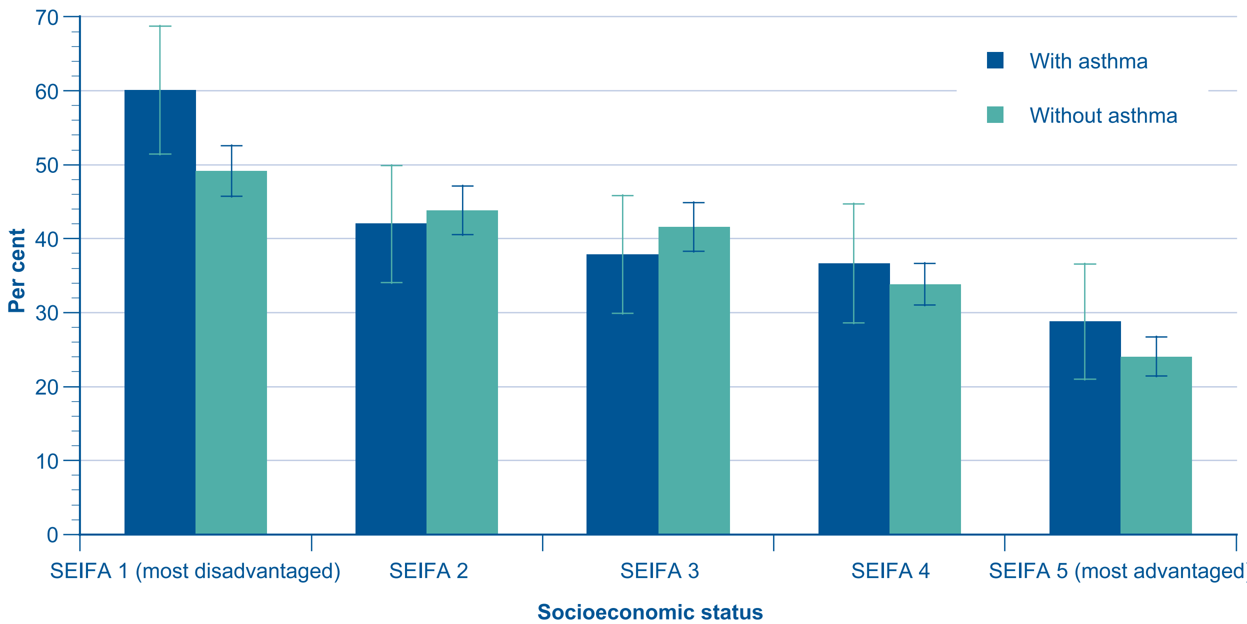


Source: ABS National Health Survey 2001.

Socioeconomic disadvantage

There were more children with current asthma who had one or more regular smokers living in the household in areas of relative socioeconomic disadvantage compared to more advantaged areas ($p < 0.001$ for comparison of the most disadvantaged quintile with the two most advantaged quintiles) (Figure 7.5). Within the area of most socioeconomic disadvantage, 60.1% of children with asthma lived with one or more cigarette smokers compared to 49.1% of children without asthma.

Figure 7.5
Children with and without current asthma with one or more cigarette smokers in the household, by socioeconomic status, age 0 to 14 years, Australia, 2001



Note: SEIFA 1 represents the most disadvantaged socioeconomic quintile and SEIFA 5 the most advantaged.

Source: ABS National Health Survey 2001.

Smoking in homes where children reside

Some state health surveys in Australia have included questions investigating whether smoking occurred within the home, which enabled the identification of children who lived in homes where smoking occurred. Children in these households were likely to experience passive smoke exposure. Data from these surveys in New South Wales and Western Australia suggest that there is little difference in exposure to passive smoking for children with and without asthma (Table 7.1).

These data differ from the ABS National Health Survey data, which refer to children residing with a smoker. The data presented in Table 7.1 are more likely to reflect passive smoke exposure.

Table 7.1
Children who live in homes where smoking occurs in the home, Australia, 2001–2004

			Rates (%)			
Population/study	Measure	Response	With asthma	(95% CI)	Without asthma	(95% CI)
2001 NSW Child Health Survey Age 0 to 12 years (n=9,425)	Do you or the other smokers living in this house-hold....?	Always or usually smoke outside	25.8%	(21.1 to 30.5)	23.7	(22.5 to 25.0)
		Sometimes/usually/ always smoke inside	11.1%	(8.8 to 13.3)	10.1%	(9.3 to 11.0)
2004 Health and Wellbeing Surveillance System, Western Australia Age 0 to 15 years (n=715)	Which of the following best describes your home situation?	My home is smoke free (includes smoking is allowed outside only)	91.0%	(85.1–97.0)	90.4	(88.1–92.7)
		People occasionally smoke in the house	4.0%	(1.1–10.1)	5.4	(3.8–7.5)
		People frequently smoke in the house	5.0%	(1.6–11.8)	4.2	(2.9–6.1)

Note: Definition for current asthma was child ever been told by a doctor, nurse or at a hospital has asthma AND had symptoms of asthma or medication for treatment or prevention of asthma in the last 12 months.

Sources: NSW Child Health Survey 2001 (Centre for Epidemiology and Research 2002); 2004 Health and Wellbeing Surveillance System, Health Information Centre, WA Department of Health (unpublished data) 2005.

Summary

Many children with asthma live with smokers and are, therefore, potentially exposed to cigarette smoke in their home. The association between household exposure to a smoker and the presence of asthma was most evident in boys aged 5 to 14 years and girls aged less than 5 years and also among children living in more socioeconomically disadvantaged areas.

8

Quality of life and markers of asthma control

Key points

- People with asthma rate their health lower and have worse health-related quality of life than people without asthma.
- This difference is evident in physical, psychological and social domains of quality of life.
- There is a higher prevalence of depression and psychological distress in people with asthma than in people without asthma.
- A greater proportion of people with asthma report having days away from work or study over a 2-week period (11.4%) than people without asthma (7.9%).
- Approximately one-third to one-half of adults with asthma have moderate or severe disease.
- Disturbed sleep is a common problem among both adults and children with asthma.

Introduction

Traditional measures of disease impact, such as prevalence, mortality and hospitalisation rates, are important but are of limited use in understanding the extent of the effect of a disease on an individual. Health-related quality of life (HRQoL) is a term often used to describe an individual's perception of how a disease or condition affects their physical, psychological and social wellbeing. It is often used to measure the impact of a disease, such as asthma, on a person's health and everyday functioning (ACAM 2004). HRQoL measures can be used to describe and predict health outcomes, guide and assess clinical management, and direct clinical policy and the allocation of health resources. The effect that a health condition has on physical, psychological and social wellbeing depends upon the features of the condition and also on individual factors such as perception of health and the relative importance of each domain, which is based on their beliefs, experiences and expectations.

Measures of HRQoL may focus on impacts that are relevant to a specific disease (disease-specific) or, alternatively, on impacts that are relevant to a broad range of health conditions (generic). Both generic and disease-specific measures have a role in the assessment of HRQoL. Measures that are generic are most frequently used in health surveys to assess the overall impact of a person's health status on their quality life. Measures of HRQoL can be both brief and broadly focused, such as asking someone to rate their overall health status. Alternatively, they can be more complex and precise, such as a HRQoL profile, which measures impacts on physical, psychological and social wellbeing using a series of specifically targeted questions. The broadest measures endeavour to summarise the domains of HRQoL globally in a single question (global measures). A widely used example is the question 'In general, would you say your health is excellent, very good, good, fair or poor?' This question, which is the first question of the 36-item Medical Outcomes Study Short-Form (SF-36), is often referred to as the SF-1. It measures global HRQoL with less precision than the entire SF-36. However, the single question is more feasible than the 36-item question for use in large, multi-purpose surveys.

The SF-36 is an example of a HRQoL profile that has been widely used (McHorney et al. 1993, 1994). It measures eight dimensions of physical and psychological health referred to as: physical functioning, role physical, bodily pain, vitality, general health, social functioning, role emotional, and mental health. The questions can be summarised into a physical component summary score (PCS) and mental component summary score (MCS). Information from generic measures can be used to assess the quality of life of subgroups, such as those with asthma, relative to members of the general population or relative to reference values. The limitation of these generic questionnaires is that they may not adequately focus on those aspects of HRQOL that are particularly relevant to the people with specific diseases, such as asthma. Disease-specific measures, on the other hand, focus on the impacts that are relevant to a specific disease. These measures are designed for specific diagnostic or population groups, such as people diagnosed with asthma. The rationale for these questionnaires is that they will be more relevant and more sensitive to the differences between population subgroups with the disease and responsive to changes over time (Patrick & Deyo 1989).

Among people with asthma, disease severity, the level of disease control and the impact of the disease on HRQoL are interrelated. People with inherently severe asthma can be expected, on average, to have worse outcomes and, hence, worse HRQoL than people with less severe disease. The extent to which asthma severity is modified by environmental factors and treatment reflects asthma control. During periods of poor asthma control, people with asthma report poorer HRQoL (Vollmer et al. 1999). Markers of asthma control such as increasing frequency and severity of asthma symptoms, increased used of 'relievers' and being woken up frequently at night due to asthma can, therefore, be used as predictors of asthma outcomes.

A number of aspects of the physical impact of disease and its effect on social functioning or role performance can be considered markers of disease control. These include reduced activity days, restricted physical activity, reduced functioning ability, and days lost from work or school. This chapter presents information on HRQoL and markers of control for asthma using data from the ABS National Health Survey and state health surveys.

8.1 Impact of asthma on self-assessed health

The presence of asthma is associated with a worse self-assessed health status. In the 2001 National Health Survey, respondents with asthma rated their health significantly worse than respondents without asthma (p trend <0.001). Although the definitions of asthma varied, in all surveys listed in Table 8.1, the distribution of responses on self-assessed health status was shifted towards a more adverse health status among people with asthma.

Table 8.1
Self-assessed health in adults with and without current asthma, Australia, 1998–2004

		Results (%)			
Population/ study	Response	With asthma	(95% CI)	Without asthma	(95% CI)
In general, would you say your health is: excellent, very good, good, fair or poor?					
National Health Survey 2001 (1)	Excellent	10.8	(9.3–12.4)	19.9	(19.2–20.6)
Age 15 years and over	Very good	27.5	(25.2–29.8)	33.5	(32.6–34.3)
	Good	34.0	(31.6–36.4)	29.8	(28.9–30.6)
	Fair	20.0	(18.0–22.0)	12.5	(11.9–13.1)
	Poor	7.6	(6.3–8.8)	4.4	(4.0–4.8)
		(n=3,116)		(n=26,863)	
WA Health and Wellbeing Surveillance System 2004 (2)	Excellent	19.5	(16.0–23.1)	30.4	(29.0–31.9)
Age 15 years and over	Very good	33.7	(29.5–37.9)	39.1	(37.5–40.6)
	Good	28.6	(24.6–32.6)	21.9	(20.4–23.1)
	Fair	11.0	(8.2–13.7)	7.0	(6.2–7.8)
	Poor	7.2	(4.8–10.4)	1.8	(1.4–2.2)
		(n=399)		(n=3,607)	
Queensland Omnibus Survey 2004 (3)	Excellent	10.4	(7.1–13.7)	17.4	(15.7–19.1)
Age 18 years and over	Very good	34.2	(29.1–39.3)	38.1	(35.9–40.3)
	Good	33.6	(28.6–38.7)	30.0	(27.9–32.1)
	Fair	15.5	(11.6–19.4)	10.9	(9.5–12.3)
	Poor	5.4	(3.0–7.8)	3.5	(2.7–4.3)
		(n=336)		(n=1,895)	
NSW Health Survey 1998 (4)	Excellent	9.9	(8.1–11.7)	19.1	(18.2–19.9)
Age 16 years and over	Very good	33.8	(30.7–36.8)	35.8	(34.8–36.8)
	Good	32.2	(29.2–35.1)	29.8	(28.9–30.8)
	Fair	16.9	(14.8–18.9)	12.1	(11.4–12.7)
	Poor	7.2	(5.8–8.7)	3.0	(2.7–3.4)
		(n=3,764)		(n=15,597)	

(continued)

Table 8.1 (continued)
Self-assessed health in adults with and without current asthma, Australia, 1998–2004

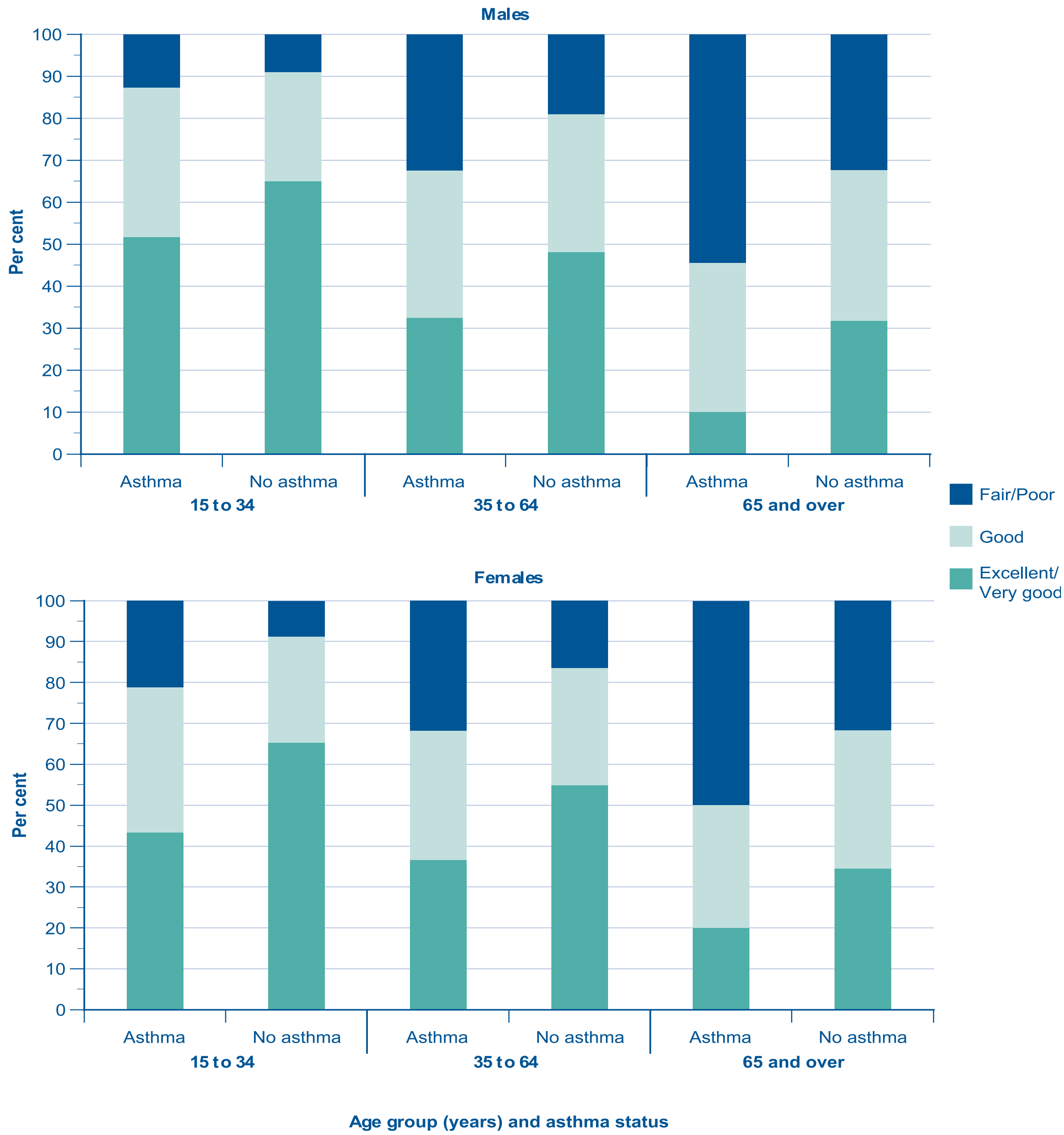
		Results (%)			
Population/ study	**Response**	**With asthma**	**(95% CI)**	**Without asthma**	**(95% CI)**
Victorian Population Health Survey 2003 (5)	Excellent	9.5	(4.5–11.5)	13.0	(11.8–14.2)
	Very good	29.0	(25.8–32.1)	34.9	(33.3–36.5)
Age 18 years and over	Good	42.3	(39.0–45.6)	37.7	(35.9–39.4)
	Fair	14.4	(12.2–16.6)	12.3	(11.1–13.5)
	Poor	4.6	(4.2–5.0)	2.1	(0.7–3.5)
		(n=877)		(n=6623)	
Overall, how would you rate your health during the past 4 weeks? Excellent, very good, good, fair, poor or very poor?					
NSW Health Survey 2003 (4)	Excellent	14.6	(11.8–17.5)	23.3	(22.2–24.5)
Age 16 years and over	Very good	25.9	(22.5–29.3)	31.0	(29.7–32.2)
	Good	30.1	(26.6–33.5)	27.6	(26.5–28.8)
	Fair	19.4	(16.6–22.2)	12.6	(11.7–13.4)
	Poor	7.5	(5.8–9.1)	4.2	(3.7–4.7)
	Very poor	2.5	(1.6–3.4)	1.2	(0.9–1.4)
		(n=1,524)		(n=11,484)	
NSW Health Survey 2002 (4)	Excellent	13.0	(10.4–15.5)	24.5	(23.3–25.7)
Age 16 years and over	Very good	24.5	(21.2–27.8)	30.0	(28.7–31.2)
	Good	31.6	(28.0–35.3)	27.8	(26.6–29.0)
	Fair	19.9	(16.8–23.1)	12.3	(11.4–13.2)
	Poor	8.2	(6.4–9.9)	4.0	(3.5–4.5)
	Very poor	2.8	(1.9–3.7)	1.3	(1.0–1.7)
		(n=1,468)		(n=11,154)	

Note: The definitions for current asthma were: NSW Health Survey, Queensland Omnibus Survey and WA Health and Wellbeing Surveillance System: Doctor diagnosis of asthma plus treatment or symptoms of asthma in the last 12 months; Victorian Population Health Survey: Doctor diagnosis of asthma plus symptoms of asthma in the last 12 months; National Health Survey: 'Yes' to the question 'Have you ever been diagnosed by a doctor with asthma?' and 'Yes' to 'Do you still get asthma?'

Sources: (1) ABS National Health Survey 2001 (CURF); (2) Health and Wellbeing Surveillance System unpublished data, 2004, Health Information Centre, Department of Health WA, 2004; (3) Queensland Omnibus Survey 2004, unpublished data, Health Information Branch, Queensland Health, 2004; (5) Victorian Population Health Survey 2003, Department of Human Services (unpublished data); (4) Centre for Epidemiology and Research 2003, 2004; Public Health Division 2001.

This disparity was evident in all age groups but it was greatest in the oldest age group, in both males and females, and least among young males (Figure 8.1).

Figure 8.1
Self-assessed health status in adults with and without current asthma, by broad age group and sex, people aged 15 years and over, Australia, 2001

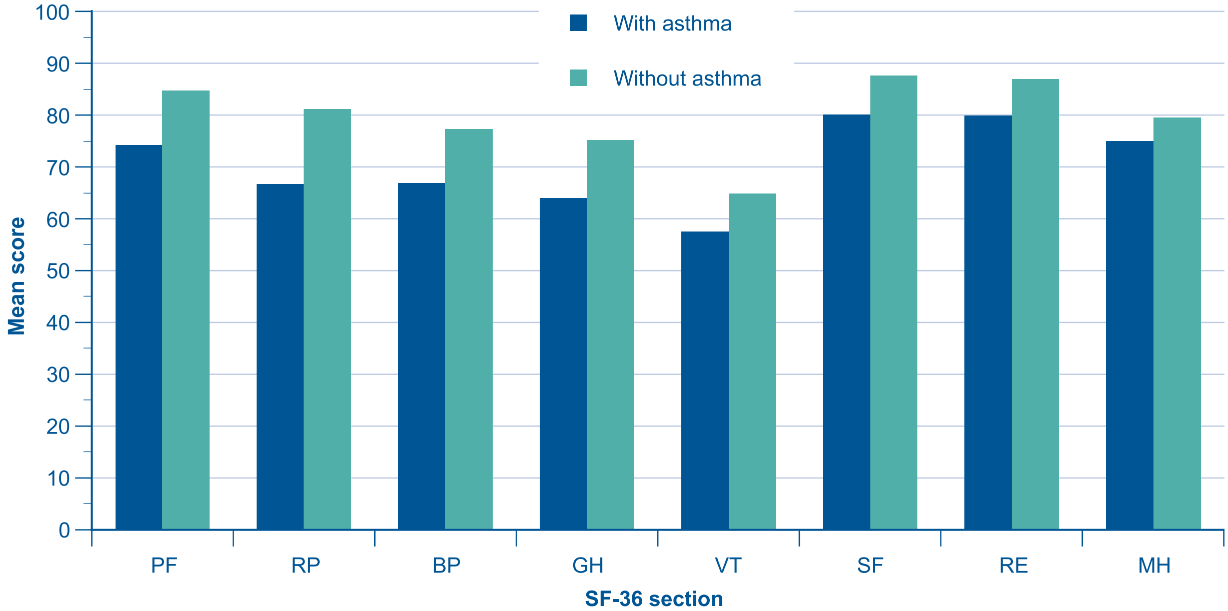


Source: ABS National Health Survey 2001.

8.2 Impact of asthma on the domains of HRQoL

Health-related quality of life measures are commonly described in terms of dimensions that fall into the physical, psychological and social domains. Available evidence suggests that in most dimensions, the HRQoL of people with asthma is worse than that observed in people without the disease. In a survey conducted in South Australia in 1998 (Wilson et al. 2002), people with asthma had lower (worse) scores than people without asthma for all eight dimensions of the SF-36 (Figure 8.2).

Figure 8.2
SF-36 scores in people with and without asthma, people aged 15 years and over, South Australia, 1998



Note: PF—physical functioning, RP—role: physical, BP—bodily pain, GH—general health, VT—vitality, SF—social functioning, RE—role: emotional, MH—mental health. There was a significant difference between the mean scores of people in metropolitan areas with and without asthma for all domains (p<0.001 except for RE, where p=0.003).

Source: Wilson et al. 2002.

The tables in the following sections summarise the available data on the three core domains of HRQoL (physical, psychological and social) measured in people with asthma. Where available, comparative data from the same survey in people without asthma are also provided.

Physical domain of HRQoL

In the South Australian survey (Wilson et al. 2002), adults with asthma had lower (worse) scores in the three physical components of the SF-36 health questionnaire (physical functioning, role: physical, and bodily pain) than people without asthma (Figure 8.2). Two other population surveys found that adults with asthma had lower physical component summary scores from the SF-12 (an abbreviated version of the SF-36) than those without asthma (Table 8.2).

Table 8.2
Physical component of quality of life, adults, Australia, 1998–2001

		Results (95% CI)			
Population/study	Response	With asthma	(95% CI)	Without asthma	(95%CI) p value
Physical Component Summary Score (PCS) for SF-12					
SA Health and Wellbeing Survey 2000 (1) Age 18 years and over	PCS (mean score)	46.2 (n=324)	(45.2–47.2)	49.7 (n=2,212)	(49.3–50.1) p<0.05
WANTS Survey 2000 (WA, NT and SA) (2) Age 18 years and over	PCS (mean score)	47.6 (n=834)		50.2 (n=6,609)	p<0.01

Note: The definitions for current asthma were: 'Yes' to the question 'Have you ever been diagnosed by a doctor with asthma?' and 'Yes' to 'Do you still have/get asthma?'

Sources: (1) Avery et al. 2004a; (2) Adams et al. 2004b.

Psychological domain of HRQoL

People with asthma report worse psychological health than people without asthma. When general measures of psychological health are used, such as those in the SF-12 (Table 8.3) and SF-36 (Figure 8.2), these differences are small but statistically significant. Specific measures of anxiety and depression levels have identified greater differences between people with and without asthma. A recent study from South Australia reported a higher prevalence of depression among people with asthma compared to people without asthma (Goldney et al. 2003). Furthermore, this study found that people with more severe symptoms of asthma (shortness of breath, waking at night with asthma symptoms or morning symptoms) were more likely to suffer from major depression than those without severe symptoms.

Table 8.3
Psychological component of quality of life, adults, Australia, 1998–2004

		Results			
Population/study	Response	With asthma	(95% CI)	Without asthma	(95% CI) p value
Mental component summary (MCS) for SF-12					
SA Health and Wellbeing Survey 2000 (1) Age 18 years and over	MCS (mean score)	51.5 (n=324)	(50.5–52.4)	52.4 (n=2212)	(52.0–52.7)
WANTS Survey, WA, NT and SA 2000 (2) Age 18 years and over	MCS (mean score)	50.9 (n=834)		52.2 (n=6,609)	p<0.05
Kessler-10 Psychological Distress Scale					
WA Health and Wellbeing Surveillance System, 2004 (3) Age 18 years and over	Low (<16) Moderate (16–21) High (22–29) Very high (>=30)	57.3% 23.9% 11.3% 7.7% (n=399)	(52.9–61.6) (20.0–27.6) (8.2–15.1) (4.6–11.9)	74.9% 16.8% 6.0% 2.3% (n=3,208)	(73.6–76.3) (15.6–17.9) (5.2–6.7) (1.8–2.8)
SA Monitoring and Surveillance system July 2002–June 2004 (4) Age 16 years and over	Low/ mod (<21) High/ very high (>=22)	84.7% 15.6% (n=1,433)	(82.5–86.3) (13.3–17.6)	90.2% 9.8% (n=11,450)	(89.6–90.8) (9.2–10.4)
NSW Health Survey 2003 Age 16 years and over (5)	Low (<16) Moderate (16≤21) High (22≤30) Very high (≤30)	57.8% 25.7% 10.5% 6.0% (n=1,505)	(54.1–61.5) (22.4–29.1) (8.4–12.6) (4.4–7.6)	68.4% 21.2% 8.1% 2.4% (n=11,347)	(67.1–69.6) (20.1–22.3) (7.3–8.8) (2.0–2.8)
Victorian Population Health Survey 2003, (6) Age 18 years and over	Low (<16) Moderate (16–21) High (22–29) Very high (≤30)	53.6% 26.9% 11.7% 5.6%	(49.2–56.9) (23.0–30.8) (8.8–14.6) (3.8–7.4)	68.1% 20.0% 7.8% 2.2%	(66.5–69.7) (18.6–21.4) (6.8–8.8) (1.8–2.6)
WANTS Survey WA, NT and SA 2000 (2) Age 18 years and over	12–15 (low risk) 16–29 (medium risk) 30–50 (high risk)	59.5% 36.9% 3.6% (n=834)		68.9% 28.5% 2.7% (n=6,609)	p<0.01 for difference between the groups
PRIME-MD questionnaire					
SA Omnibus 1998 (7) Age 15 years and over	Major depression* All depression**	14.4% 22.1% (n=299)	(10.4–18.4) (17.4–26.8)	5.7% 16.7% (n=2,711)	(4.8–6.6) (15.3–18.1) * p=0.000 **p=0.03

Notes: The definitions for current asthma were: NSW Health Survey, SA Monitoring and Surveillance System and WA Health and Wellbeing Surveillance System: Doctor diagnosis of asthma plus treatment or symptoms of asthma in the last 12 months; Victorian Population Health Survey: Doctor diagnosis of asthma plus symptoms of asthma in the last 12 months; National Health Survey, SA Health and Wellbeing, SA Omnibus and WANTS survey: 'Yes' to the question 'Have you ever been diagnosed by a doctor with asthma?' and 'Yes' to 'Do you still have/get asthma?'

Sources: (1) Avery et al. 2004a; (2) Adams et al. 2004b; (3) Health Information Centre, Department of Health WA, unpublished data, 2004; (4) Avery et al. 2004b; (5) Centre for Epidemiology and Research 2004; (6) Victorian Department of Human Services, unpublished data, 2004; (7) Goldney et al. 2003.

Social domain of HRQoL

The social domain of HRQoL refers to the ability to perform roles and activities. This has most commonly been measured as time away from work or other usual activities.

Asthma accounts for a large proportion of days lost from work or study (Table 8.4). In the 2001 ABS National Health Survey, the proportion of people with current asthma who had taken time off work or study in the previous 2 weeks because of any illness (11.4%) was higher than the proportion of people without asthma who had taken time off for any illness (7.9%, p<0.001). The proportion of people with asthma who actually attributed days off work or study to asthma was 2.6%. Among children aged 2 to 12 years with asthma, 58% were limited in their normal activity in the last year, resulting in an average of 9.3 days of reduced activity in 2001.

Table 8.4

Social component of quality of life, adults and children with current asthma, Australia, 1998–2001

Population/study	Measure	Results	(95% CI)
Days away from work school or usual activities			
National Health Survey 2001(1) All ages	Any days away from work/study in last 2 weeks	11.4% with asthma (n=3,157)	(10.1–12.7%)
		7.9% without asthma (n=23,705)	(7.5–8.3%)
	Any days away from work/school due to asthma in last 2 weeks	2.6% (n=1,926)	(1.9–3.2%)
Queensland Chronic Disease Survey 2000 (2) Age 18 years and over	Days in the last 12 months when could not work/study/manage day-to-day activities due to asthma		
	None	23.4%	(18.5–28.3%)
	1–2 days	12.0%	(8.3–15.7%)
	3–4 days	10.3%	(6.8–13.8%)
	5–9 days	17.5%	(13.1–21.9%)
	10–19 days	10.7%	(7.2–14.3%)
	20+ days	26.1%	(21.1–31.2%)
		(n=291)	
SA Omnibus Survey 1998 (3) Age 15 years and over	Number of days lost due to asthma	13.6	(10.1–18.0)
Activity limitations			
National Health Survey 2001 (1) All ages	Any other days of reduced activity in the last 2 weeks (other than days off work/school)	17.5% with asthma (n=3,157)	(15.9–19.7%)
		10.0% without asthma (n=23,705)	(9.5–10.4%)
	Any other days of reduced activity due to asthma in last 2 weeks (other than days off work/school)	3.2% (n=1,926)	(2.5–4.0%)
NSW Health Survey 1998 (4) Age16 years and over	Days in the last 12 months when asthma interfered with ability to work/study/ manage day-to-day activities		
	None	79.9%	(78.2–81.6)
	1–2 days	5.6%	(4.5–6.6)
	3–4 days	3.8%	(2.9–4.6)
	5–9 days	3.9%	(3.1–4.6)
	10–19 days	3.0%	(2.2–3.7)
	20+ days	3.9%	(3.2–4.7)
		(n=3,764)	
Qld Chronic Disease Survey 2000 (2) Age 18 years and over	Did asthma interfere with ability to work/study/ manage day-to-day activities last 12 months? (If 'Yes' for the first question they were asked to respond to the second part)		
	Yes	36.7%	(33.4–40.1) (n=795)
	A little bit	23%	(18.2–27.8)
	Moderate	32%	(26.6–37.4)
	Quite a lot	28.5%	(23.3–33.7)
	Extremely	16.5%	(12.2–20.8)
		(n=291)	

(continued)

Table 8.4 (continued)
Social component of quality of life, adults and children with current asthma, Australia, 1998–2001

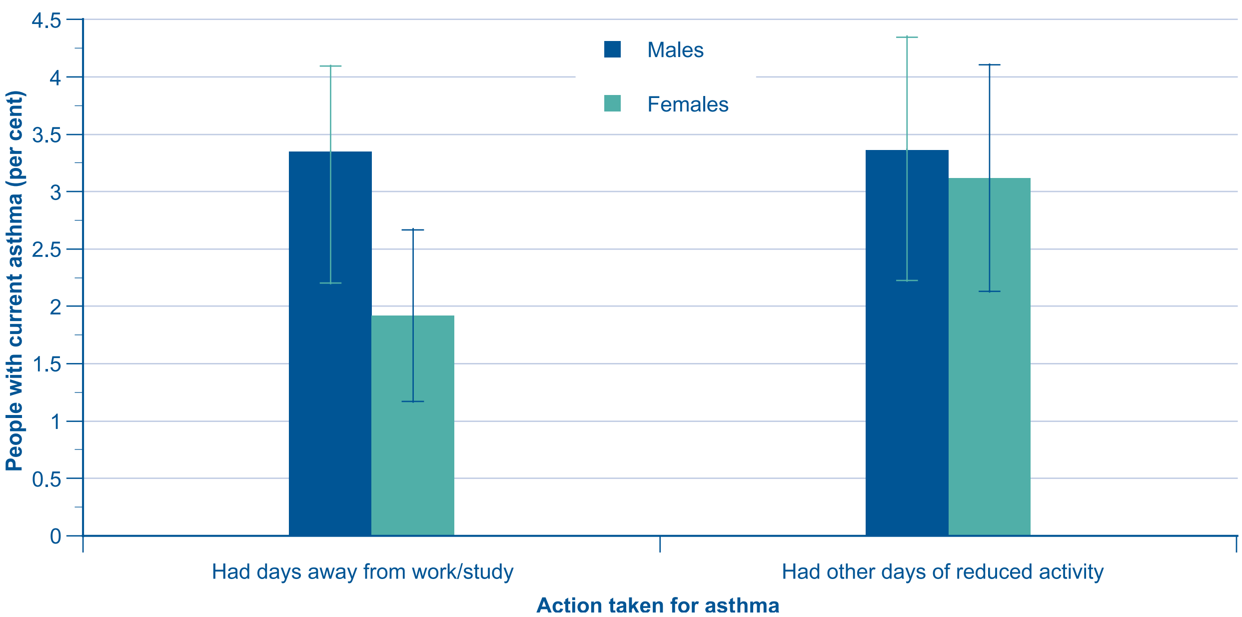
Population/study	Measure	Results	(95% CI)
NSW Health Survey 1998 (4) Age 16 years and over	Yes	33.1% (n=1,897)	(30.2–35.9)
	A little bit	33.0%	(27.9–38.0)
	Moderately	34.3%	(29.3–39.4)
	Quite a lot	19.9%	(16.2–23.6)
	Extremely	12.6% (n=680)	(9.4–15.8)
CHILDREN **Limitations in core activities in last 12 months**			
NSW Child Health Survey 2001 (5) Age 2 to 12 years	Asthma limited the child's usual activities in the last 12 months	58.2% Mean of 9.3 days Median 2 days (n=1,243)	(55.5–60.9)

Note: The definitions for current asthma were: NSW Health Survey and Queensland Chronic Disease Survey: Doctor diagnosis of asthma plus treatment or symptoms of asthma in the last 12 months; SA Omnibus Survey and National Health Survey: 'Yes' to the question 'Have you ever been diagnosed by a doctor with asthma?' and 'Yes' to 'Do you still have/get asthma?'

Sources: (1) ABS 2001 National Health Survey (CURF); (2) Epidemiology Services Unit 2002; (3) Wilson et al. 2002; (4) Epidemiology Services Unit 2002; (5) Centre for Epidemiology and Research 2002.

Among participants in the 2001 National Health Survey who had current asthma, more males than females had taken days off work or study because of asthma in the previous 2 weeks (p=0.02) (Figure 8.3). There was no difference in the proportion of males and females who had other days of reduced activity due to their asthma (p=0.39).

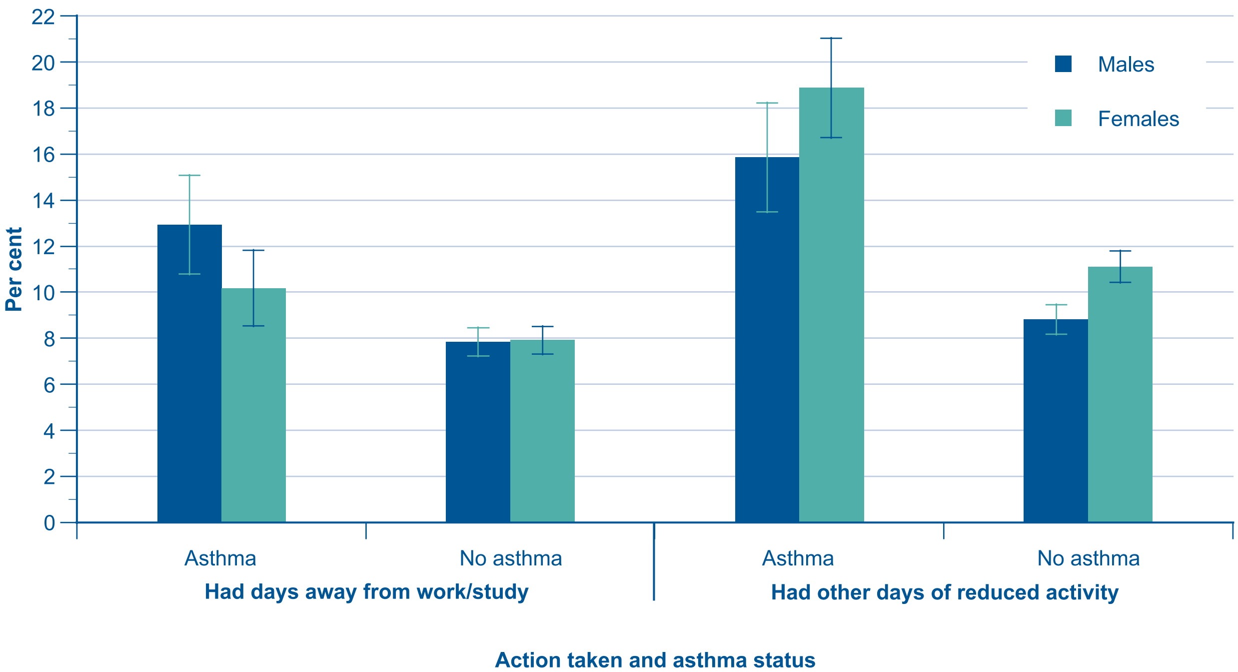
Figure 8.3
Action taken in last 2 weeks for asthma, by sex, all ages, Australia, 2001



Source: ABS National Health Survey 2001.

More people with asthma (17.5%) than people without asthma (10%) reported having reduced activity days, other than those related to work or study, in the previous 2 weeks (Figure 8.4) ($p<0.001$). Only 3.2% of people with asthma attributed these reduced activity days to asthma. These observations imply either that people with asthma underestimate the impact of asthma on their ability to undertake activities, or that people with asthma are more likely to have other illnesses that interfere with these activities.

Figure 8.4
Action taken in last 2 weeks for any reason, people with and without current asthma, by sex, all ages, Australia, 2001



Source: ABS National Health Survey 2001.

8.3 Markers of asthma control

There is a clear relationship between asthma severity and asthma control. The underlying severity of asthma in an individual may be modified by changes in the environment (e.g. reduction in exposure to known triggers of asthma such as dust mites). It may also be influenced by treatment for asthma. Ultimately, the changes in these environmental and treatment factors will impact on the individual's symptoms and their ability to function. This outcome is referred to as 'asthma control'. It reflects the combined effect of underlying disease severity, environmental exposures, and the effectiveness of treatment.

Several markers of asthma control have been used in population and clinical studies. These include increasing frequency and severity of asthma symptoms, increased use of bronchodilators ('relievers'), being woken up frequently at night due to asthma, reduced days of activity, restricted physical activity, reduced functioning ability, and days lost from work or school. These last four markers of asthma control overlap with the impact of asthma on the social domain of HRQoL reported in the previous section.

Assessment of the severity of asthma

The National Asthma Council (NAC 2002) recommends using a number of indicators to classify asthma severity at diagnosis.

Children with asthma are grouped into three broad patterns of asthma, which can be considered to reflect disease severity, using the NAC guidelines:

- Infrequent episodic asthma—isolated episodes of asthma which can last 1–2 days up to 1–2 weeks and are usually triggered by an environmental allergen or an upper respiratory tract infection. These children are asymptomatic in between the episodes, which are usually 6–8 weeks apart.
- Frequent episodic asthma—the interval between the episodes is shorter than for infrequent episodic asthma (less than 6 weeks) and the children have minimal symptoms in the interval period (e.g. exercise-induced wheeze).
- Persistent asthma—these children may have acute episodes like those seen in frequent and infrequent episodic asthma, but they also have symptoms on most of the days in the interval periods (e.g. sleep disturbance due to wheeze or cough, early morning chest tightness, exercise intolerance and spontaneous wheeze). Some children may have mild symptoms 4–5 days per week, while others may have frequent severe symptoms.

Among adults, persistent asthma is graded as mild, moderate or severe using the criteria listed in Table 8.5. The individual is assigned to the most severe grade in which a feature occurs (NAC 2002).

Table 8.5
NAC Asthma Management Handbook assessment of asthma severity in adults

Symptoms/indicators	Mild	Moderate	Severe and/or life-threatening
Wheeze, tightness, cough, dyspnoea	Occasional (e.g. with viral infection or exercise)	Most days	Every day
Nocturnal symptoms	Absent	<once/week	>once/week
Asthma symptoms on wakening	Absent	<once/week	>once/week
Hospital admission or ED attendance in past year (for adults)	Absent	Usually not	Usually
Previous life-threatening attack (ICU or ventilator)	Absent	Usually not	May have a history
Bronchodilator use	< twice/week	Most days	>3 to 4 times/day
FEV_1 (% predicted)	>80%	60–80%	<60%
Peak flow on waking (% recent best)	>90%	80–90%	<80%

The supplementary (SAND) asthma module of the BEACH general practice survey (see Appendix 1, Section A1.3) was used on four occasions between 1999 and 2002, to estimate the distribution of severity of asthma among patients attending GPs (AIHW GPSCU 2000, 2001). Severity was categorised based on the groupings in Table 8.5, with the addition of a 'very mild' category for those with episodic asthma only. The distribution of patients among the levels of severity did not change significantly between 1999 and 2002 (Henderson et al. 2004). Thirty-two per cent of adult patients with asthma were classified by GPs as having moderate and severe asthma. In that same period, 23% of children with asthma were classified as have frequent episodic or persistent asthma. Most children and adults attending GPs were assessed as having infrequent episodic asthma and mild or very mild asthma, respectively (Table 8.6).

Table 8.6
Assessment of asthma severity according to the SAND asthma module, adults and children, 1999–2003

Features	1999	2000–01	2002	2003
Adults (≥18 years)				
Severe	7.9%	5.5%	5.5%	Severe + moderate 28%
Moderate	27.7%	24.5%	27.2%	
Mild	27.3%	Mild + very mild 70%	31.4%	
Very mild	32.9%		35.9%	
Children (<18 years)				
Persistent	4.9%	5.1%	2.1%	Persistent + frequent 23.0%
Frequent episodic	21.0%	20.3%	15.5%	
Infrequent episodic	68.5%	74.6%	82.5%	
Time period	30/3/99 to 7/6/99	28/11/00 to 15/01/01	04/04/02 to 06/05/02	23/9/03 to 27/10/03
Sample	4,285 encounters from 213 GPs Patients with asthma (480 adults, 143 children)	5,495 encounters from 95 GPs Patients with asthma (543 adults, 118 children)	3,070 encounters from 105 GPs Patients with asthma (312 adults, 97 children)	2,527 encounters from 87 GPs Patients with asthma (367 total)

Sources: AIHW GPSCU 2000, 2001, 2003, 2004, Henderson et al. 2004.

In the New South Wales Health Survey in 1997, 54% of adults with asthma met one or more of the following criteria, which were adapted for survey use from the NAC criteria for moderate to severe asthma (Marks et al. 2000):

- sleep disturbed by asthma 3–4 nights or more in the last month;
- used reliever medication half the days, or more, during the last month;
- asthma interfered with ability to work, study or manage day-to-day activities to a moderate, or greater, extent during the last month;
- visited general practitioner for an attack of asthma 3 or more times in the last 12 months.

There is a large difference in the proportion of people classified as having moderate or severe asthma when the GP data (Table 8.6) and general population data from the New South Wales Health Survey are compared. This can be partly explained by the differences in the methods used for assessing asthma severity, the populations surveyed, and years when the surveys were conducted. The difference reflects uncertainty about the true proportion of people with moderate to severe asthma in the population.

Sleep disturbance due to asthma

People with severe and/or poorly controlled asthma may be awoken from sleep with asthma symptoms. This sleep disturbance due to asthma is an important adverse outcome of the illness and is also regarded as a valuable marker of disease control. Population surveys confirm that this is a common problem in both adults and children with asthma (Table 8.7). In New South Wales in 2001, 48.2% of children with current asthma had disturbed sleep in the last month that was attributed to asthma (Centre for Epidemiology and Research 2002).

Table 8.7

Proportion of adults with current asthma whose sleep was disturbed by asthma, Australia, 1998–2000

Population/study	Response	Rates	(95% CI)
Number of nights in the last month that sleep been disturbed by asthma			
Qld Chronic Disease Survey 2000 (1)	No nights	52.3%	(46.6–58.0)
Age 18 years and over	1–2 nights	16.2%	(12.0–20.4)
	3–4 nights	9.3%	(6.0–12.6)
	5–9 nights	7.0%	(4.1–9.9)
	10–19 nights	7.2%	(4.2–10.2)
	20+ nights	7.9%	(4.8–11.0)
		(n=291)	
NSW Health Survey 1997–98 (2)	No nights	61.7%	(59.5–63.8)
Age 16 years and over	1–2 nights	15.0%	(13.3–16.7)
	3–4 nights	7.8%	(6.7–9.0)
	5–9 nights	6.2%	(5.0–7.4)
	10–19 nights	5.2%	(4.2–6.1)
	20+ nights	4.1%	(3.4–4.8)
		(n=3,764)	
Woken at night			
SA Omnibus 1998 (3)	Weekly or more	13.3%	(9.9–17.7)
Age 15 years and over			

Sources: (1) Epidemiology Services Unit 2002; (2) Public Health Division 2001; (3) Wilson et al. 2002; (4) Centre for Epidemiology and Research 2002.

Summary

Asthma has a measurable impact on how people assess their overall health status. Most of the impact of asthma is on physical functioning and on the ability to perform social roles, such as work or study. Recent evidence suggests there is an important association between depression and asthma.

There are limited data on the prevalence of various levels of asthma severity and control in the general community. It is likely that between one-third and a half of adults with asthma have moderate or severe disease.

9 Expenditure

Key points

- In the 2000–01 financial year, health expenditure on asthma was $693 million, which represented 1.4% of total allocated health expenditure.
- The proportion of total health expenditure on asthma is highest among children, particularly boys aged 5 to 14 years, where it is 5.5% of annual health expenditure for that age group.
- More than half of expenditure on asthma is attributable to pharmaceuticals.
- Within the hospital care sector, 46% of expenditure on asthma is attributable to children aged 0 to 14 years.
- Per capita health expenditure on asthma increased by 21% between 1993–94 and 2000–01 (adjusted for inflation).

Introduction

The economic impact of asthma on society includes expenditure on health care for people with asthma and indirect costs for individuals with asthma and their families arising from disability and time lost from school and work. This chapter provides information about health expenditure for asthma, which is a component of the overall costs of asthma in Australia. It has drawn on information included in ACAM's report Health Expenditure and Burden of Disease due to Asthma in Australia (ACAM 2005b).

Health expenditure is a term used to describe the actual amount spent on health care services. In this chapter the term 'total health expenditure' refers to the sum of health expenditure for all health conditions, while 'expenditure on asthma' is the component of total health expenditure that is attributable to health care for asthma. The data presented here represent allocated, recurrent health expenditure. This excludes expenditure that could not be allocated to specific diseases and also excludes capital expenditure.

This chapter examines asthma expenditure in terms of (1) the rate of expenditure per capita (i.e. per person in the population); (2) the proportion of expenditure spent by age group or sex; (3) the distribution of expenditure by health sector; and (4) changes in expenditure between 1993–94 and 2000–01.

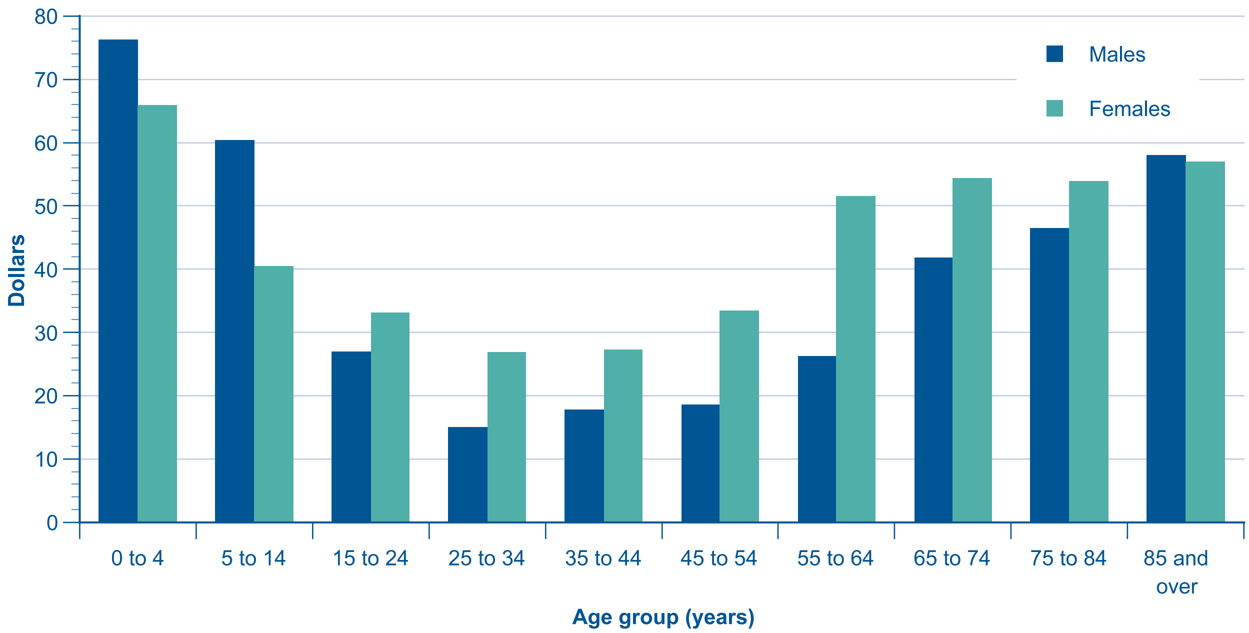
The methods and data used in this section are described in Appendix 1, Section A1.5. Summarised data are provided in Appendix 2, Tables A2.12 and A2.13.

9.1 Overall expenditure on asthma

In 2000–01, total allocated, recurrent health expenditure for government and non-government services in Australia was $49.2 billion. In the same year, health expenditure attributable to asthma was $693 million (1.4% of total allocated recurrent health expenditure) (AIHW 2004c).

Children aged 0 to 4 years had the highest per capita rate of health expenditure for asthma ($76 per boy and $66 per girl) (Figure 9.1). Per capita expenditure on asthma was lowest among those aged 25 to 34 years and rose again in older people, though not as high as for children. Among adults, per capita health expenditure was generally higher for females than males.

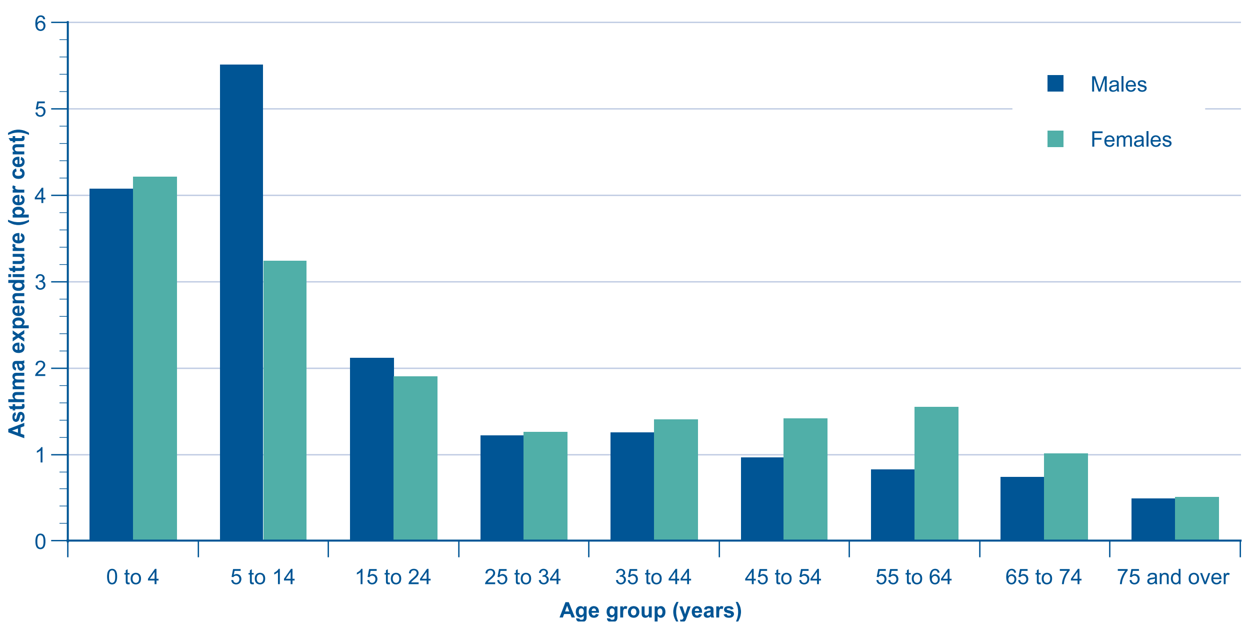
Figure 9.1
Expenditure on asthma per capita, by age group and sex, Australia, 2000–01



Source: AIHW health care expenditure database.

The proportion of total health expenditure attributable to asthma was higher among children, particularly boys aged 5 to 14 years, where 5.5% of total health expenditure in this age group was attributable to asthma. On the other hand, among the elderly, asthma represented a substantially lower proportion of health expenditure (0.5%) (Figure 9.2). This is because there are many other causes of health expenditure in the elderly.

Figure 9.2
Proportion of total health expenditure attributed to asthma, by age group and sex, Australia, 2000–01



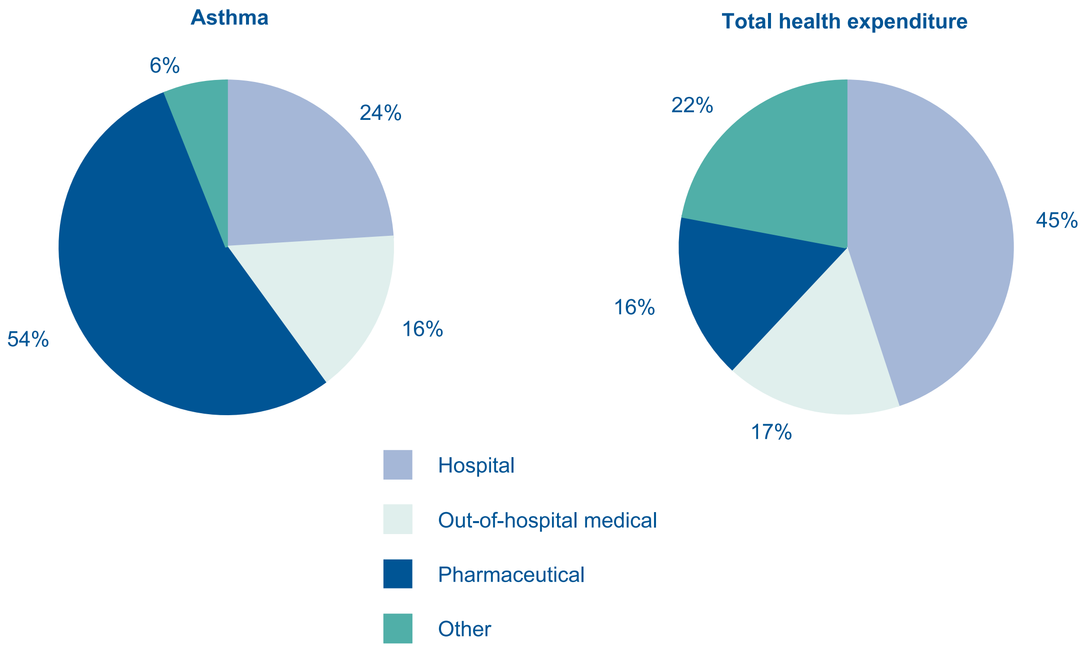
Source: AIHW health care expenditure database.

9.2 Expenditure by health care sector

In this section, four health care sectors are considered: (1) hospital, which includes inpatient, emergency and outpatient care (both public and private); (2) out-of-hospital medical care, which is primarily care in the community from general practitioners as well as specialists, imaging and pathology services; (3) pharmaceuticals, including prescribed and over-the-counter medications; and (4) other expenditure which comprises aged care services, community allied health services and research.

Over half (54%) of the expenditure on asthma was attributable to pharmaceuticals (Figure 9.3). This was substantially higher than the proportion of total health expenditure that was attributable to pharmaceuticals (16%). On the other hand, a substantially lower proportion of expenditure on asthma was attributable to hospital care (24%) compared to total health expenditure (45%).

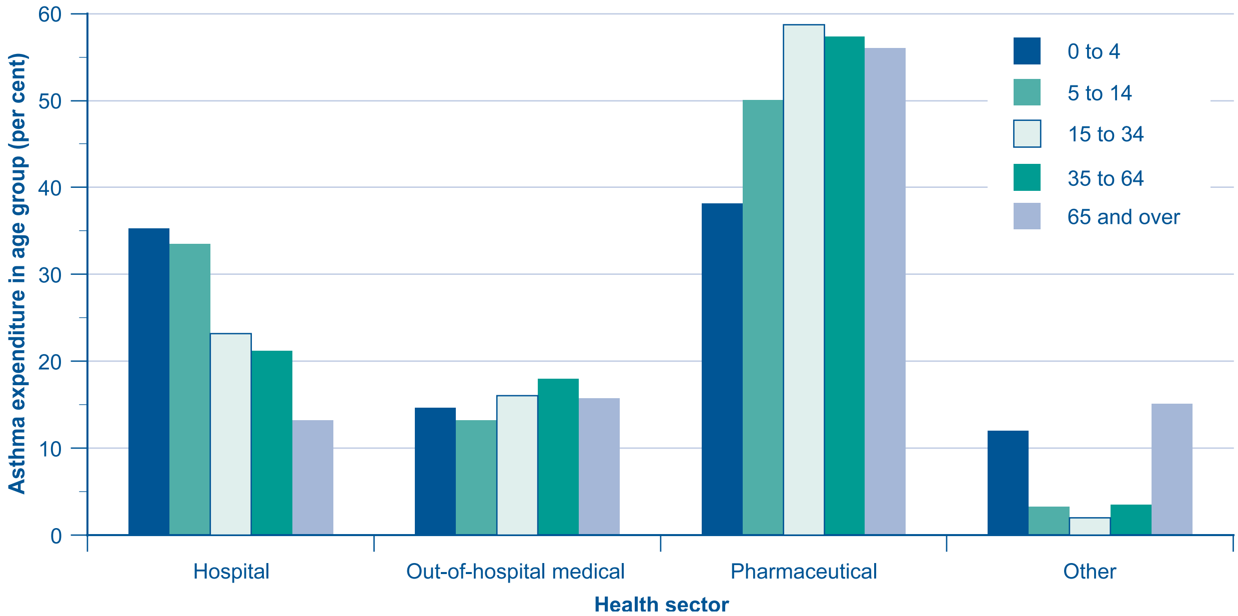
Figure 9.3
Distribution of expenditure on asthma and total health expenditure among health sectors, Australia, 2000–01



Source: AIHW health care expenditure database.

The highest proportion of expenditure on asthma in all age groups was attributable to pharmaceutical costs (Figure 9.4). Pharmaceutical expenditure comprised a greater proportion of expenditure on asthma in adult age groups than in children, particularly young children. A relatively greater proportion of expenditure on asthma in children occurred in the hospital care sector.

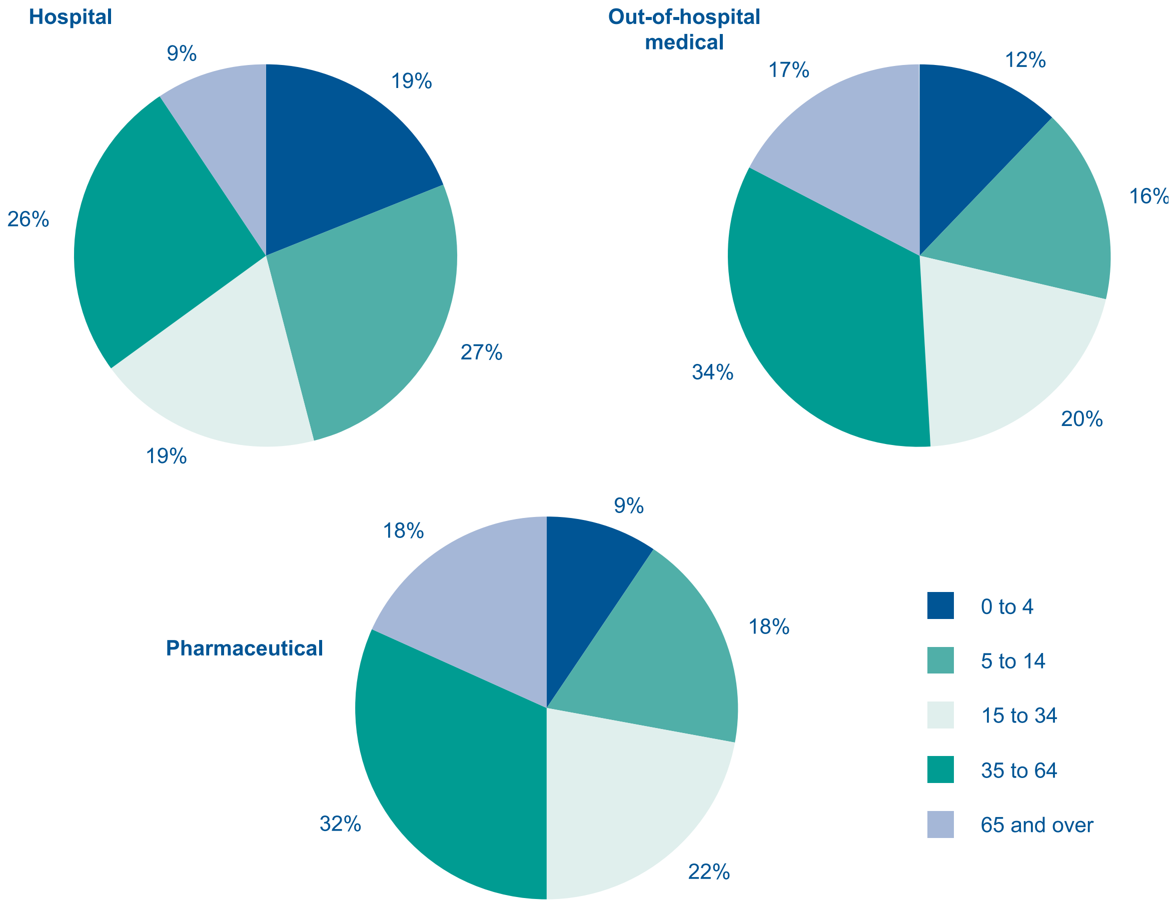
Figure 9.4
Proportions of expenditure on asthma in each age group, by health sector, Australia, 2000–01



Source: AIHW health care expenditure database.

In each health sector, over 25% of asthma-related health expenditure was for children aged 0 to 14 years (Figure 9.5). In the hospital sector, nearly half (46%) of hospital expenditure on asthma was for this age group. In the out-of-hospital medical sector, children aged 0 to 14 years accounted for 28% of expenditure on asthma, while 55% was for adults aged 15 to 64 years.

Figure 9.5
Expenditure on asthma, by health sector and age group, Australia, 2000–01



Source: AIHW health care expenditure database.

9.3 Changes in expenditure on asthma, 1993–94 to 2000–01

Between 1993–94 and 2000–01 there was a 21% increase in per capita expenditure on asthma, after adjustment for inflation (Table 9.1). The increase was 17% for expenditure on asthma in males and 27% for expenditure on asthma in females. However, among children aged 0 to 14 years, this increase was substantially smaller and among boys aged 0 to 4 years, the group with the highest per capita expenditure on asthma (see Figure 9.1), there was actually an 11% decrease in expenditure on asthma, reflecting the reduction in hospitalisations for asthma among children over this time period (see Figure 5.20).

Table 9.1
Expenditure on asthma per capita, Australia, 1993–94 and 2000–01

Sex/age group (years)	1993–94 expenditure ($2000–01 prices)	2000–01 expenditure ($)	Per cent change
Males			
0 to 4	85.38	76.24	–11
5 to 14	57.78	60.42	5
15 to 24	18.58	26.98	45
25 to 34	10.83	15.02	39
35 to 44	12.16	17.73	46
45 to 54	14.01	18.61	33
55 to 64	20.51	26.27	28
65 to 74	34.28	41.86	22
75 and over	35.56	48.70	37
All males	**27.87**	**32.73**	**17**
Females			
0 to 4	63.03	65.91	5
5 to 14	40.10	40.44	1
15 to 24	24.46	33.15	36
25 to 34	18.26	26.92	47
35 to 44	19.85	27.28	37
45 to 54	23.79	33.49	41
55 to 64	38.28	51.54	35
65 to 74	39.60	54.45	38
75 and over	41.38	54.77	22
All females	**30.87**	**39.12**	**27**
Persons			
0 to 4	74.49	71.21	–4
5 to 14	49.17	50.68	3
15 to 24	21.46	30.01	40
25 to 34	14.54	21.00	44
35 to 44	16.00	22.53	41
45 to 54	18.80	26.05	39
55 to 64	29.35	38.75	32
65 to 74	37.10	48.36	30
75 and over	39.19	52.40	34
All persons	**29.66**	**35.95**	**21**

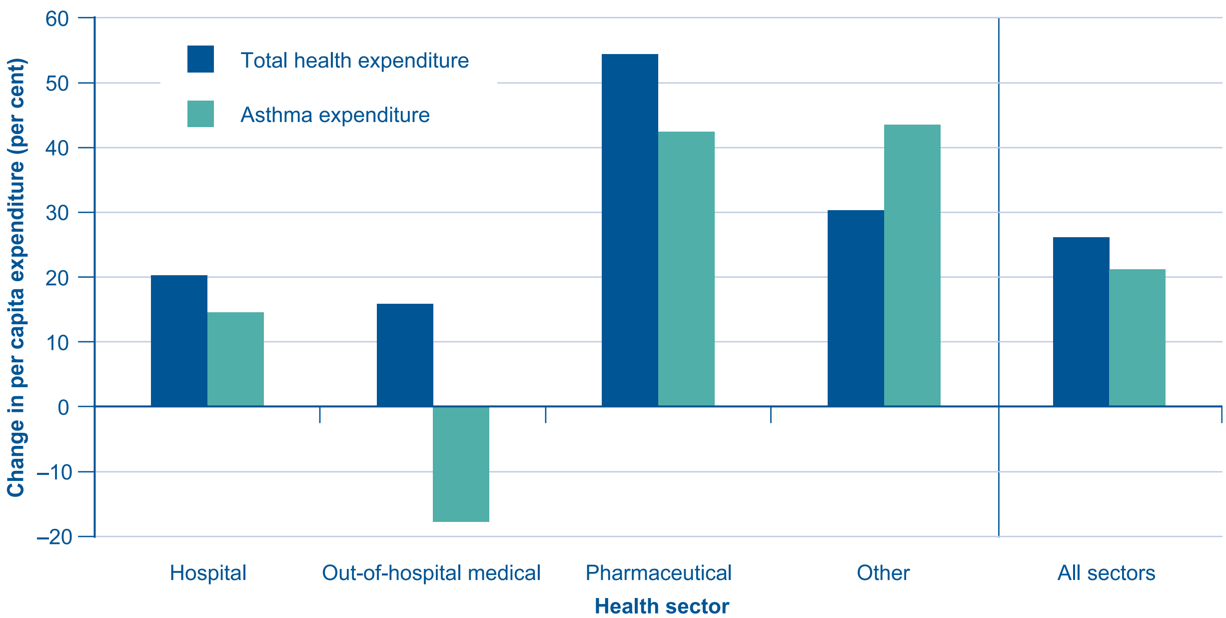
Note: 1993–94 dollars converted to 2000–01 dollars to control for inflation.

Source: AIHW health care expenditure database.

The increase in per capita expenditure on asthma during the period 1993–94 to 2000–01 (21%) was slightly less than the increase in total health expenditure over this period (26%) (Figure 9.6). The greatest difference between expenditure on asthma and total health expenditure was in the out-of-hospital medical sector, where expenditure on asthma decreased by 18% while total health expenditure increased by 16%. This is consistent with the observed decrease in GP episodes of care for asthma (see Figure 5.2 and Figure 5.3). Although the largest increase in expenditure on asthma was in pharmaceuticals, the increase in pharmaceutical expenditure for asthma was less than the increase in total health expenditure for pharmaceuticals. It is also noteworthy that while expenditure on asthma increased in the hospital sector, hospitalisation rates decreased (see Figure 5.20). This suggests that expenditure per hospital admission on asthma increased over this period.

Figure 9.6

Change in per capita health expenditure, total and for asthma, by health sector, Australia, 1993–94 to 2000–01

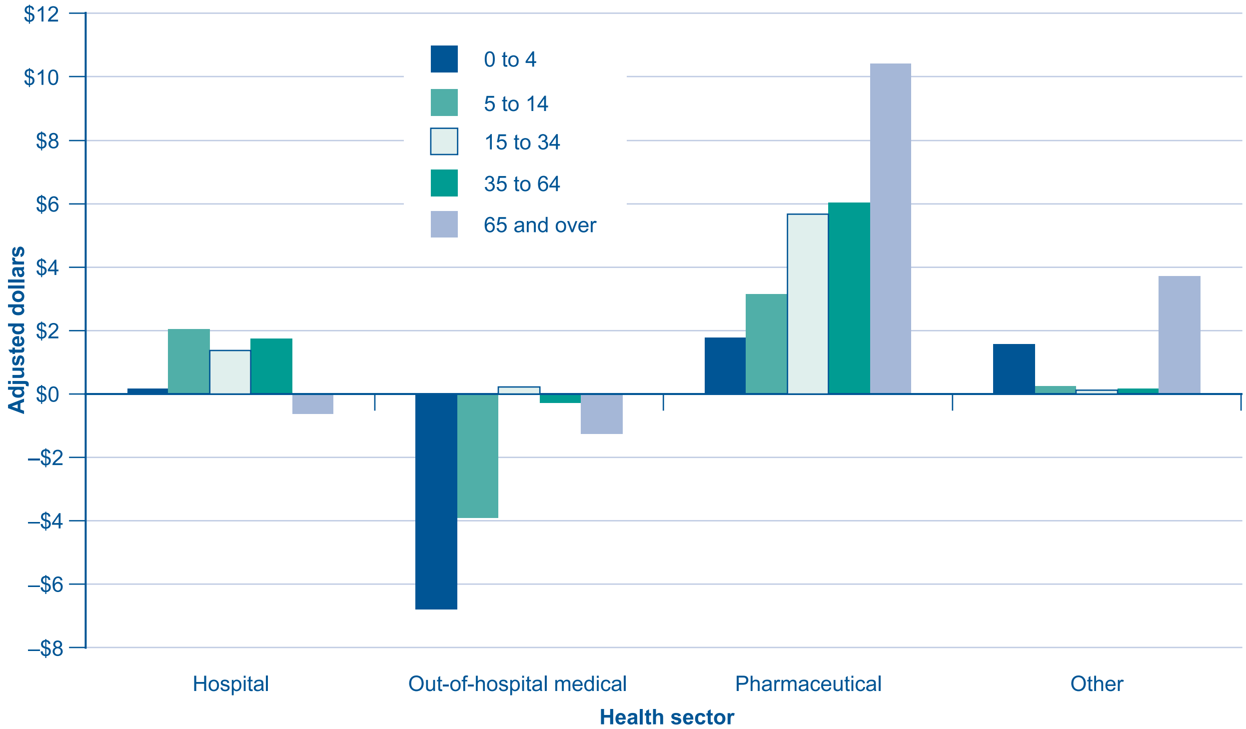


Note: 1993–94 dollars converted to 2000–01 dollars to control for inflation.

Source: AIHW health care expenditure database.

Inflation-adjusted per capita expenditure for out-of-hospital medical care decreased in most age groups between 1993–94 and 2000–01, apart from a small increase in people aged 15 to 34 years (Figure 9.7). Expenditure on asthma pharmaceuticals increased in all age groups, with increases of more than $10 per capita in the 65 years and over age group. This increase occurred over a time when the prevalence of asthma had remained stable, and possibly even decreased slightly (see Figure 3.1 and Figure 3.2). This implies that either a relatively higher proportion of people with asthma were receiving pharmaceutical treatment for asthma, or they were being treated with more expensive pharmaceuticals, or both. A possible alternative explanation is that the decline in asthma prevalence among children was illusory and that the continued rise in expenditure for asthma pharmaceuticals in this age group implies that they were being relabelled with an alternative diagnosis.

Figure 9.7
Change in per capita expenditure on asthma, by age group and health sector, Australia, 1993–94 to 2000–01



Note: 1993–94 dollars converted to 2000–01 dollars to control for inflation.

Source: AIHW health care expenditure database.

Summary

Overall, expenditure on asthma represented a rather small proportion of total health expenditure in Australia in 2000–01. Many features of the distribution of expenditure are predictable on the basis of the nature of the disease, its treatment and its known epidemiology. For example, the observed gender differences in expenditure on asthma also reflect known differences in prevalence and health service use, with more asthma in boys than girls and more in adult women than men. As reported in Section 5.4, hospitalisation rates were highest in children, hence the proportion of expenditure attributable to hospital care in children was greater than in adults. The major therapeutic intervention for asthma is pharmaceutical, and this was reflected in the relatively high proportion of expenditure on asthma in the pharmaceutical sector. Furthermore, the proportion of expenditure on asthma attributable to pharmaceuticals was higher in adults than in children, in whom regular preventer therapy is less widely recommended and used.

There has been a substantial inflation-adjusted rise in expenditure on asthma in all age groups except under-5 year olds and across most sectors except out-of-hospital medical care. In fact, there was a reduction in expenditure on out-of-hospital medical care for children during the period 1993–94 to 2000–01. This probably reflects the observed decline in GP episodes of care for asthma.

The largest proportion of expenditure on asthma was for pharmaceuticals. This was also the sector with the largest increase in expenditure since 1993–94, particularly in adults.

Appendix 1: Data sources, definitions and population groups

1

A1.1 Analysis methods

A1.1.1 Rates

Rates are used to describe the incidence of an event or the prevalence of a condition in a population or a population subgroup. Incidence rates refer to the number of events occurring in a population over a specified time interval divided by the size of the population. Prevalence rates refer to the number of people with a specified condition within a population divided by the size of the population. For rare events, rates per 100,000 persons have been calculated. For less rare events or conditions, other bases (e.g. per 100 persons or percentage) have been used.

Population-based rates

Crude rates

Crude rates have been calculated by dividing the number of people with a condition in a population or the number of events that occurred in a population in a year by the size of that population at the middle of that year. The mid-year population is an estimate of the average population during the whole year.

n/population x 100,000

where n=number of persons with a condition or number of events, and population is the mid-year population for the relevant year.

Age- and sex-specific rates

Where required, rates have been estimated separately for individual age groups and for males and females. In this case the relevant cases or events (for the numerator) are those within the specific age–sex group and the relevant population (for the denominator) is the specified age–sex group within the whole population.

Age-standardised rates

Age-standardised rates are used in this report to adjust for differences in population age structures when comparing rates for different periods of time, geographic areas, and/or population subgroups.

Age-standardised rates have been calculated using the following formula:

$SR = \sum(r_i P_i)/\sum P_i$

where

SR is the standardised rate for the population being studied

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 sex and age group i in the standard population

The Australian population as at 30 June 2001 was the standard population in all analyses.

For trend data that are presented in broad age groups (e.g. 5–14 years, 15–34 years, 35–64 years, 65 years and over) the rates for these broad groups are age-standardised to adjust for variation in age structure within them.

Asthma case-based rates

For some analyses, in which the event or condition is only relevant to people with asthma (e.g. treatment), rates are expressed as case-based rates in which the population with asthma is the denominator. These are based on the number of people with asthma as estimated from the ABS National Health Survey conducted in 2001.

For some analyses, both population-based rates and case-based rates are presented. This demonstrates the extent to which variation in population-based rates (e.g. in hospitalisations for asthma) are attributable to variation in the prevalence of asthma.

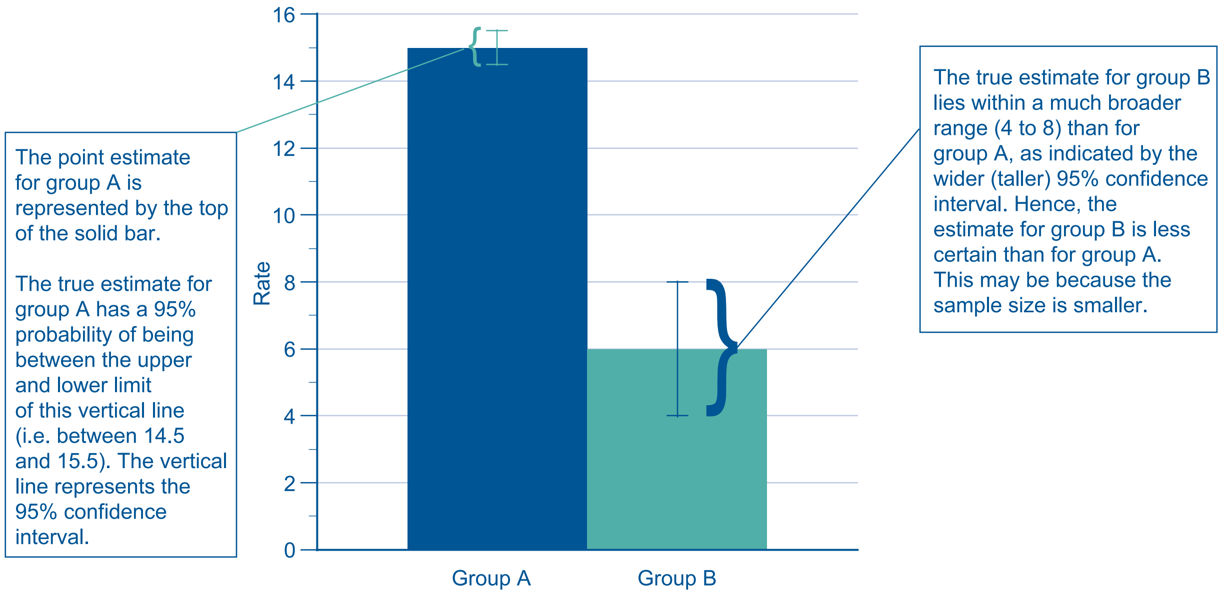
It should be noted that, for reasons discussed in this report, the estimation of the prevalence of asthma entails inherent uncertainty. Hence, rates that include this estimate as a denominator are subject to this uncertainty.

A1.1.2 Confidence intervals

The rates and proportions contained within this report represent estimates derived from the available enumerated sample or aggregated data. These estimates contain inherent uncertainty, which is larger where the size of the sample or population from which it was estimated is smaller. Confidence intervals are used to demonstrate the extent of this uncertainty (that is, the precision of the estimates). The 95% confidence interval is an estimate of the range of values within which the 'true' population value is expected to lie, with 95% certainty (see Figure A1.1).

In the tables, 95% confidence intervals are presented as ranges of values (in the form, xx to xx). In the figures, 95% confidence intervals are depicted by vertical lines extending above and below each point or column.

Figure A1.1
Point estimates and 95% confidence intervals



The quadratic method of Fleiss was used to calculate 95% confidence intervals for rates (Fleiss 1981). This method gives an asymptotic confidence interval that does not include logically impossible negative numbers. It differs from the more familiar normal approximation only for rates near zero.

A1.1.3 Tests of statistical significance

Linear trends in rates have been tested using the chi square test for trend. Differences in rates among groups have been tested by the chi square test.

Multivariate regression methods are used to assess the independent effects of age, gender, socioeconomic disadvantage (SEIFA quintile), remoteness (ASGC classification) and Indigenous status on mortality, hospitalisation rates and smoking status. Logistic models have been constructed in which the independent effects of these characteristics on event rates are estimated. Interactions between factors have been tested and, where these were found to be significant, subgroup analyses have been presented. Results are expressed as adjusted (independent) odds ratios, with 95% confidence intervals and/or as p values for the relevant chi square test.

A1.2 Asthma definitions used for measuring prevalence

A number of definitions for asthma have been applied in the various surveys cited in this report. These have been used where the estimation of the prevalence of asthma is the primary purpose or where the purpose is to measure the prevalence of outcomes or treatments in people with asthma. In the latter case, the definition of asthma is used to identify a denominator population. Table A1.1 lists the definitions of 'ever asthma' and 'current asthma' that have been used in the surveys most commonly cited within this report.

Table A1.1
Asthma definitions used in the National Health Survey and state CATI surveys

Ever asthma	Current asthma	Survey(s)
Have you ever been told by a doctor or a nurse that you have asthma?	Do you still get asthma?	2001 ABS National Health Survey
	In the last 12 months, have you had symptoms of asthma? In the last 12 months, have you taken treatment for asthma?	Western Australia Health and Wellbeing Surveillance System
Have you ever had asthma? Was your asthma confirmed by a doctor?	Do you still have asthma?	Social, Environmental and Risk Context Information System South Australian Omnibus Survey WANTS Health and Wellbeing Survey
	Symptoms of asthma include coughing, wheezing, shortness of breath and chest tightness when you don't have a cold or respiratory infection. During the past 12 months, did you have any symptoms of asthma? During the past 12 months, did you take asthma medication that was prescribed or given to you by a doctor? This includes using an inhaler, puffer or nebuliser.	South Australian Monitoring and Surveillance System
Have you ever been told by a doctor that you have asthma?	In the last 12 months, have you had asthma symptoms (wheezing, coughing, shortness of breath, chest tightness)?	Victorian Population Health Survey
Have you ever been told by a doctor or at a hospital that you have asthma?	Have you had symptoms of asthma or taken treatment for asthma in the last 12 months?	New South Wales Health Survey (child and adult) Queensland Omnibus Survey (2004)
	Symptoms of asthma include coughing, wheezing, shortness of breath and chest tightness when you don't have a cold or respiratory infection. During the past 12 months, did you have any symptoms of asthma? During the past 12 months, did you take asthma medication that was prescribed or given to you by a doctor? This includes using an inhaler, puffer or nebuliser.	Queensland Chronic Disease Survey 2000

A1.3 BEACH (Bettering the Evaluation and Care of Health) and SAND (Supplementary Analysis of Nominated Data)

The BEACH data are collected through a continuous survey of general practice activity in Australia, which began in 1998–99. BEACH is an activity of the General Practice Classification and Statistics Unit (GPSCU), a collaborating Unit of the Family Research Centre of the University of Sydney and the AIHW. A rolling random sample of GPs is selected from the HIC Medicare database (Britt et al. 2001). To be eligible to participate, GPs must have claimed at least 375 general practice Medicare items in the previous 3 months. Approximately 1,000 GPs participate annually, with about 20 GPs recording each week. Data are collected for 50 weeks each year. Each GP collects information on 100 consecutive encounters using a recording pack containing 100 forms. Each form is divided into two main sections. The first and larger section collects information on the current encounter for the BEACH data (see Section A1.3.1) and the data items/questions do not vary. The bottom section collects data for the SAND collection (see Section A1.3.2).

A1.3.1 BEACH data

The BEACH collection includes information about the following:

the encounter

- date and type of consultation;
- up to four diagnoses or problems managed; and
- Medicare/Veterans' Affairs item number.

the patient

- age and sex;
- postcode of residence;
- health care card status; Veterans' Affairs card status;
- non-English-speaking background status; and
- whether the patient identifies as Aboriginal and/or Torres Strait Islander;
- up to three reasons for the encounter.

the management of each problem

- medications prescribed, supplied or advised including brand, form, strength, and dosage; and
- non-pharmacological management including counselling, referrals, procedures, pathology and imaging ordered.

the GP characteristics

- age and sex;
- years working in general practice;
- number of sessions worked per week; and
- postcode of main practice, etc (Britt et al. 2001).

For further information on BEACH see www.fmrc.org.au/beach.htm.

A1.3.1.1 International Classification of Primary Care

Information on diagnosis and problem managed during GP encounters, obtained from the BEACH dataset, has been classified according to the International Classification of Primary Care—2nd edition (ICPC-2) (WICC Britt et al. 2001; 1998). To classify 'asthma' from BEACH data we have selected ICPC-2 rubric R96 and excluded code R96006 'extrinsic allergic alveolitis'. The following ICPC-2 PLUS codes were included:

R96001—asthma

R96002—bronchitis; asthmatic

R96003—bronchitis; allergic

R96005—status asthmaticus

R96007—bronchitis; wheezy

R96008—hyperactive airways

A1.3.1.2 Analysis of BEACH data

Estimating the rate of general practice encounters for asthma

The number of general practice encounters where asthma was managed (i.e. general practice encounters for asthma) per 100 encounters is estimated from the BEACH data using a method which adjusts for the cluster (practice-based) sampling used in BEACH and also incorporates post-stratification weights to account for differences in age between the GP sample and the GP population. The data are also weighted for each participant's Medicare activity level, in order to better reflect total GP–patient encounters for Australia. This has been implemented using the SURVEYMEANS® Procedure in SAS software version 8.1 (SAS Institute Inc. © 1999–2001).

The estimated number of general practice encounters for asthma per 100 population is then estimated using the following information and formula:

$$\text{The estimated number of general practice encounters for asthma per 100 population} = \frac{\text{ARGPEs per 100 general practice encounters} \times \text{estimated total number of all general practice visits}}{\text{population}}$$

where

ARGPEs = number of general practice encounters for asthma based on analysis of BEACH data;

population = the mid-year population for the relevant year.

The estimated total number of general practice visits is based on Medicare data for MBS Category 1 Service Items. This category includes all unreferred (i.e. primary care) attendances (Health Insurance Commission 2002).

A1.3.1.3 Limitations of BEACH data

The response rate by GPs to the BEACH survey was 23.7% in 2003–04, 28.9% in 2002–03 and 32.3% in 2001–02 (Britt et al. 2004). The percentage of GPs practicing in remote areas is only 2.4%, hence, the sample from remote areas is relatively small (n=27 in 2003–04) (Britt et al. 2004). To improve the representativeness of the sample, BEACH data are weighted for differences between the GP sample and the general practitioner population and for participants' Medicare activity level.

The BEACH Program has a quality assurance program to ensure the reliability of data entry. This includes computer-assisted error-checking procedures during data entry, the validating of samples of data entered against original recording forms, and logical data checks during the data cleaning and analysis using specific SAS programming (Britt et al. 2002).

Britt et al. (1998) compared the recording of morbidity data by GPs for the BEACH Program, with two trained observers independently viewing a videotape of the encounters. They found good agreement (87%) between the general practitioners observed and the observers (who were also general practitioners) at the broad disease level (ICPC chapter), but agreement at the condition-specific level (ICPC rubric) was lower (67%). Thus the labelling of certain conditions varies between GPs. The GPSCU uses features of the ICPC classification structure to ensure synonymous terms are classified to the correct rubric but this cannot deal with variation among GPs in the way they use the labels 'asthma', 'COPD' or other respiratory disease labels.

A1.3.2 SAND data

The SAND data are collected as a supplementary dataset of the BEACH program (Britt et al. 2001). Organisations sponsoring blocks of SAND data collection ask questions on topics of their choice and have access to the detailed reports. GPs participating in SAND ask and record responses to specific questions in targeted patient groups. SAND modules relevant to asthma have been conducted in 1999, 2000–01 and 2002 (Henderson et al. 2004).

A1.4 Emergency department data

Data on emergency department (ED) visits for asthma have been derived from the New South Wales Emergency Department Data Collection (NSW EDDC) and the Victorian Emergency Minimum Dataset (VEMD). An ED attendance 'index' was calculated for various subgroups of the population as the number of attendances per year per 100,000 population or per 100 persons with asthma in that subgroup. Data are also presented as number of visits for asthma as a proportion of all ED visits.

ED visits for asthma are identified using the 'principal diagnosis' for the visit and are classified using the ICD-9 or ICD-10. Data from the NSW EDDC were accessed using the Health Outcomes Information Statistical Toolkit (HOIST) system. The Victorian Department of Human Services provided data to ACAM from VEMD for the period 1999–2004 for records where the principal diagnosis was asthma or a respiratory condition. In addition, aggregated data for all VEMD records were provided to enable calculation of ED visits for asthma as a proportion of all ED visits.

A 1.4.1 Limitations of emergency department data

In New South Wales, the ED dataset includes data from 56 of the 150 emergency departments in that state. Approximately two-thirds of ED visits in New South Wales are captured in the dataset. Emergency departments in metropolitan Sydney and larger rural hospitals are more likely to be included. In Victoria, the dataset includes information from all 24-hour EDs (38).

This incomplete coverage means that the denominator used in the calculation of the ED attendance index is an overestimate of the true population covered. Hence, the ED attendance index is an underestimate of the true population-based rate. Furthermore, the nature of the missing data means that the ED data tend to under-represent people visiting EDs in rural and remote areas.

A1.5 Expenditure data

Expenditure data used in this report were obtained from the Australian Institute of Health and Welfare's National Health Expenditure Database. This report considers recurrent health expenditure that has been allocated by health sector and disease. The analyses presented do not include non-recurrent (capital) health expenditure or expenditure that is not allocated to a specific health sector or disease (unallocated). Therefore, in this report, references to health care expenditure always imply 'allocated recurrent' health care expenditure. Expenditure within each age and sex group is described on a per capita basis. Per capita expenditure has been calculated by dividing the total allocated recurrent expenditure on persons within an age–sex category, by the Australian resident population in that age–sex group in 2000–01. All expenditure data are in 2000–01 dollars.

A1.5.1 Expenditure for hospital care

Expenditure for hospital care comprises expenditure for care of admitted and non-admitted patients. Expenditure estimates relating to admitted patients in public hospitals were obtained from those published in *Australian Hospital Statistics 2001–02* (AIHW 2003a). Expenditure relating to private hospitals was derived from the Australian Bureau of Statistics Private Health Establishments Survey.

Hospital encounters for asthma were identified as those where the principal diagnosis was asthma (International Classification of Diseases version 10 codes J45 or J46). The National Hospital Costs Data Collection was used to estimate the costs of individual episodes of acute hospitalisation, based on Diagnostic Related Groups and length of stay, with adjustment for the type of hospital. Sub-acute and non-acute hospital costs were extrapolated from the sub- and non-acute patient (SNAP) study (Eagar et al. 1997) and adjusted to 2000–01 values (AIHW 2002b). Health Insurance Commission data were used to estimate the cost of specialist medical services for private inpatients.

Care administered by medical practitioners within a hospital and hospital-dispensed pharmaceuticals are included within this category, rather than other categories listed below (A1.5.2 and A1.5.3).

Non-admitted patients include those visiting emergency departments and attending outpatient services. Expenditure estimates for non-admitted patients were based on *Australian Hospital Statistics 2001–02* (AIHW 2003a). Individual episodes were differentiated by disease based on the demographic pattern in the 1993–94 non-admitted patient disease expenditure (Mathers & Penm 1999).

A1.5.2 Out-of-hospital medical care expenditure

This comprises expenditure for private medical services in the community including general practitioners (GPs) and specialists. The Bettering the Evaluation and Care of Health (BEACH) survey data (see Section A1.3) and earlier similar studies were used to allocate: (1) expenditure on out-of-hospital medical services by disease using BEACH disease codes; (2) expenditure for unreferred attendances such as imaging and pathology; and (3) expenditure for other medical services, such as specialists, based on referral patterns recorded in these data. Where there were multiple presenting problems in a GP encounter, allocation of expenditure was done on a pro-rata basis. Care administered by doctors in hospitals was included in hospital care expenditure.

A1.5.3 Pharmaceutical expenditure

This includes prescription and over-the-counter medications. Data on expenditure on prescription medications were obtained from the Pharmaceutical Benefits Scheme (PBS) and the Department of Veterans' Affairs Repatriation Pharmaceutical Benefits Scheme (RPBS). Data on expenditure for medications purchased on private (i.e. non-PBS/RPBS) prescriptions and for prescribed medications whose cost is below the co-payment threshold were obtained from the Pharmacy Guild Survey. The BEACH survey data were then used to allocate these expenditure data to diseases according the GP prescribing patterns for problems managed. To estimate expenditure for specialist-written prescriptions, an assumption was made that specialist prescribing patterns were the same as GPs.

There are no data on over-the-counter pharmaceuticals. Total expenditure on over-the-counter pharmaceuticals was calculated by deducting expenditure on prescriptions below the co-payment threshold and private prescriptions from all non-benefit pharmaceutical expenditure, as reported in *Health Expenditure Australia 2001–02* (AIHW 2003b). Expenditure on over-the-counter medications was allocated to specific diseases, including asthma, using information on medication use obtained in the 1989–90 ABS National Health Survey (Mathers & Penm 1999). The same data were used for allocation of over-the-counter expenditure to disease in both the 1993–94 analysis and the 2000–01 analysis. For the latter analysis, the data were adjusted for demographic change over the interval between 1993–94 and 2000–01.

Hospital dispensed pharmaceuticals were included in hospital care costs.

A1.5.4 Other costs

Remaining expenditure for asthma is classified as 'other costs'. This comprises expenditure for other medical services, such as allied health outside of hospitals (e.g. physiotherapy) and research. Allied health expenditure was allocated to disease using the previous expenditure estimates from 1993–94, adjusted for demographic change. As such, these are approximations and should be interpreted with caution. Research expenditure was allocated using the Australian Bureau of Statistics research and experimental development surveys. This should also be interpreted with caution when reviewing expenditure in subgroups within the population.

A1.5.5 Limitations of expenditure data

Expenditure estimates for disease are based on the attribution of allocated recurrent health expenditure using the available information about the mix of diseases and health sector utilisation. The accuracy of the expenditure estimates is limited by the accuracy of the source data on health care utilisation. In relation to asthma there are substantial problems with diagnostic misclassification (Baker et al. 2004). These problems will particularly influence the estimates of expenditure on asthma in the elderly. Often in this age group, there is no certain clinical basis for distinguishing asthma from chronic obstructive pulmonary disease. However, the substantially higher cost-weight for chronic obstructive pulmonary disease, compared with asthma (National Centre for Classification in Health 2004), is an incentive for health care providers to assign admissions to chronic obstructive pulmonary disease, rather than asthma. This may lead to underestimation of hospital bed utilisation, and, hence, expenditure for asthma in the elderly. There is less incentive for misclassification in the BEACH survey data but diagnostic uncertainty remains an issue.

Furthermore, in some instances, data were not available regarding how costs should be attributed. For example, there are no data relating to the patterns of prescriptions by specialists, therefore it was assumed these would be the same as for general practitioners. The validity of this assumption is untested and, hence, these data should be interpreted with some caution. Also, the data on expenditure for over-the-counter medications for asthma were derived from a survey conducted in 1989–90. These survey data may not reflect current patterns of use of over-the-counter medications.

A1.6 Health survey data

A1.6.1 National Health Survey

The National Health Survey (NHS), conducted by the ABS periodically since 1977, is designed to collect information on the health status, use of health services and facilities, and health and lifestyle characteristics of residents across Australia. It aims to obtain national information on a range of health issues, provide information on health indicators for National Health Priority Areas and for important population subgroups, and, where possible, enable trends to be monitored over time (ABS 2001b).

In this report, data from the 2001 survey are used. The 2001 survey collected information from 26,900 respondents between February and November of that year (ABS 2002a). The estimate of the prevalence of current asthma is derived from two questions asked in the survey (see Table A1.1). The proportion of the sample who had 'current' asthma (i.e. 'still get asthma') has been estimated. This subgroup of the population was asked additional questions from the asthma module of the survey described in Table A1.2.

The 2001 ABS National Health Survey data presented in this report have been accessed through the ABS Remote Access Data Libraries (RADL). This facility is available to authorised users to access Confidentialised Unit Record Files, which are de-identified record-level data. Grouping variables are incorporated in these data (e.g. region of birth, age group) to ensure that information from these records cannot be used to identify an individual.

Table A1.2
Questions from the asthma module of the ABS National Health Survey 2001

Question	Section of this report where data presented
Do you have a written asthma action plan?	Section 5.2 (Written asthma action plans)
Have you taken any medication for asthma in the last 2 weeks?	Section 5.3 (Medication)
What are the names or brands of all the asthma medication you have used in the last 2 weeks?	
Have you taken any of these actions for your asthma in the last 2 weeks: Had days(s) away from work/school? Had other days of reduced activity?	Section 7 (Quality of life)

A1.6.2 National Health Survey (Indigenous)

Data on Indigenous Australians were obtained from 290 private dwellings from the 2001 National Health Survey (general) sample and a supplementary sample of 1,947 Indigenous residents from rural and urban areas of all states and territories (ABS 2002b). Sparsely settled areas were also included in the supplementary sample. It should be noted that the questionnaire administered to Aboriginal and Torres Strait Islander people living in sparsely-populated remote areas differed slightly from that used in other regions, for linguistic reasons. One difference relevant to this report is that this questionnaire did not distinguish between 'asthma' and 'breathing problems'. Hence, reported estimates of the prevalence of asthma in Aboriginal and Torres Strait Islander Australians living in sparsely-populated remote areas are actually estimates of the prevalence of asthma and 'breathing problems' in those areas.

A1.6.3 State/territory CATI surveys

Most Australian states and territories now regularly conduct general health surveys within their jurisdictions. These are usually carried out using computer-assisted telephone interview (CATI) surveys that sample the population using random digit dialling. In this report, CATI survey data have been provided by New South Wales Department of Health, Queensland Health, South Australian Department of Human Services, Victorian Department of Human Services and Western Australian Health Department. The questions used to define 'ever asthma' and 'current asthma' in these surveys is shown in Table A1.1.

A1.7 Medical Benefits Schedule statistics

The Health Insurance Commission (HIC) provides statistics on the claims submitted to and paid by the Medical Benefits Schedule (MBS). These include items claimed by general practitioners, doctors and specialists in the community. Data from the HIC were obtained for the Asthma 3+ Visit Plan Practice Incentive Program (PIP) and for spirometry. Online interactive data reports were accessed at: <http://www.hic.gov.au/statistics/dyn_mbs/forms/mbs_tab4.shtml> and collated by time period, state/territory, and age and sex (where available).

A1.7.1 Asthma 3+ Visit Plan Practice Incentive Program

The Asthma 3+ Visit Plan Practice Incentive Program (PIP) is an incentive scheme funded by the Australian Government since 2001–02. The scheme encourages a structured approach to diagnosis, assessment, and management of patients with moderate or severe asthma in general practice (DoHA 2002). The PIP item numbers that were analysed for this report were 2546–2559 and 2664–2677. These items can only be claimed when the requirements of the Asthma 3+ Visit Plan have been met for an individual patient. In other words, the items can only be claimed when three visits have been completed within one year.

A1.7.2 Spirometry

The principal items that are used in this report in the spirometry section are item numbers 11506 (office-based spirometry) and 11503, 11509 and 11512 (laboratory-based spirometry) (see Table A1.3 for MBS code descriptions).

Table A1.3
Medical Benefits Schedule item numbers for spirometry

MBS code	Description
Office-based spirometry	
11506	Measurement of respiratory function involving a permanently recorded tracing performed before and after inhalation of bronchodilator—each occasion at which one or more such tests are performed
Laboratory-based spirometry	
11503	Measurement of the mechanical or gas exchange function of the respiratory system, or of respiratory muscle function, or of ventilatory control mechanisms, using measurements of various parameters including pressures, volumes, flow, gas concentrations in inspired or expired air, alveolar gas or blood, electrical activity of muscles (the tests being performed under the supervision of a specialist or consultant physician or in the respiratory laboratory of a hospital)—each occasion at which one or more such tests are performed
11509	Measurement of respiratory function involving a permanently recorded tracing and written report, performed before and after inhalation of a bronchodilator, with continuous technician attendance in a laboratory equipped to perform complex respiratory function tests (the tests being performed under the supervision of a specialist or consultant physician or in the respiratory laboratory of a hospital)—each occasion at which one or more such tests are performed
11512	Continuous measurement of the relationship between flow and volume during expiration or inspiration involving a permanently recorded tracing and written report, performed before and after inhalation of a bronchodilator, with continuous technician attendance in a laboratory equipped to perform complex lung function tests (the tests being performed under the supervision of a specialist or consultant physician or in the respiratory laboratory of a hospital)—each occasion at which one ore more such tests are performed

Limitations of spirometry data from MBS

There is no published information on the quality of MBS statistics. These data only include those services that qualified for a Medicare benefit—that is, that were performed by a registered provider and for which a claim was processed by the HIC. Services that are not eligible for Medicare funding are not included in these data. For example, the data do not include services provided by public hospital doctors to public patients or for services qualifying for a benefit under the Department of Veterans' Affairs National Treatment Account, thus underestimating total episodes of care. Similarly, they do not include spirometry performed in community health centres, which are not funded through Medicare.

The MBS data do not include any information on the characteristics of the patients for whom claims were made. Hence, no diagnostic or demographic information is available. There are no available data directly linking asthma status with the performance of the spirometry. For this reason, we have included a secondary analysis of the data in the subset of people aged 5 to 34 years, in whom we believe most spirometry measurements would have been made for the assessment of asthma, as opposed to other respiratory diseases.

The other limitation of the HIC data is that, in the form available, they provide information on numbers of claims, not individuals. Hence, we cannot know the extent to which the number of claims for spirometry reflects multiple claims for individuals within a given year.

A1.8 Medication data

A1.8.1 IMS Health pharmaceutical data

Data on sales of pharmaceutical products into the Australian market are collected and provided by IMS Health Australia. The value of these data is that they reflect supply (and, hence, purchases) of specific medications. As many of these medications are sold without prescription or are below the PBS subsidy threshold, equivalent data are not available through the PBS.

We have calculated the annual aggregate number of packs (sale units) distributed each year for each product relevant to the treatment of asthma for the period January 1996 to December 2004. Parenteral forms were excluded. Data reflect sales from major manufacturers and wholesalers operating in Australia. Usage, measured in units of defined daily doses (DDDs)/1,000 persons/day were calculated according to methods presented in Section A1.8.3.

Limitations of IMS data

The nature of the IMS data is that they contain no information on the characteristics of the purchasers or consumers. As most of the drugs used by people with asthma are also commonly used by people with COPD, it is not possible to directly ascribe the trends and differentials observed in these data to the population with asthma. Furthermore, socioeconomic and geographic trends and differentials in the utilisations of drugs cannot be assessed using these data.

A1.8.2 Pharmaceutical Benefits Scheme and Repatriation Pharmaceutical Benefits Scheme data

Data on the number of subsidised prescriptions dispensed per year for each drug available on the PBS and the RPBS were calculated using HIC online interactive data reports at: <http://www.hic.gov.au/statistics/dyn_pbs/forms/pbs_tab1.shtml>. These data were then used to calculate the DDDs/1,000 persons/day for each PBS item using the methods described in Section A1.8.3.

Limitations of PBS and RPBS data

Most respiratory medications are subsidised under the PBS and the RPBS. However, some 'reliever' medications are frequently purchased without prescription (over-the-counter) and, when purchased on prescription, cost less than the minimum subsidy for general patients. These drugs do attract a subsidy when purchased on prescription by health care cardholders or pensioners. Leukotriene receptor antagonists only attract a PBS/RPBS subsidy when prescribed for children. Hence, for some medications the PBS/RPBS data only record purchase by a section of the Australian population and substantially underestimate total usage.

The PBS does not collect any information on the underlying disease or the reasons for prescribing. Thus, there is no way of identifying whether a patient using these medications has asthma, COPD or an acute respiratory infection. At present, data on the demographic characteristics of PBS/RPBS claimants linked to prescription items are not available.

A1.8.3 Calculation of defined daily dose per 1,000 population per day

Medication usage, measured as defined daily doses per 1,000 people per day (DDD/1,000/day), is used in this report to compare respiratory drug sales and reimbursed prescriptions dispensed over time and across drug groups where information about actual drug consumption is not available. The information in this report is based on unpublished data prepared and supplied by IMS Health Australia and published data from the PBS and RPBS item reports calculated at the HIC web site.

For each medication, the relevant defined daily dose (DDD) was obtained from the web site of the WHO Collaborating Centre for Drug Statistics Methodology (<www.whocc.no/atcddd>) (see Table A1.4). The DDD is defined as 'the assumed average maintenance dose per day for a drug used for its main indication in adults'. The DDD is used internationally as a unit of measurement for drug utilisation studies. Each medication pack or sale unit (for IMS Health data) or maximum quantity dispensed (for PBS or RPBS items) is converted to a number of DDDs per unit or item.

For each of these items the DDD/1,000 persons/day (DoHA 2004) is then calculated using the following formula:

$$\frac{N \times M \times Q \times 1{,}000}{DDD \times P \times D}$$

Where:

N = total number of subsidised prescriptions dispensed per year (HIC data) or total number of items sold
per year (IMS Health data)

M = mass of each dosage unit (e.g. mg per tablet or mcg per inhaler dose)

Q = total number of dosage units dispensed per prescription or sold unit

P = mid-year Australian population (ABS mid-year population estimates) for year of data collection

D = number of days in the year

The DDD/1,000 persons/day for individual medications are then summed across the members of each class of medications to estimate the total number of DDD/1,000 persons/day for each class. Combined medications contribute DDDs to both classes of medications they contain.

Table A1.4
Classification of respiratory medications

Category	Medications included	DDDs / formulation
Short-acting beta agonists	Fenoterol	0.6 mg Inhalation aerosol 0.6 mg Inhalation powder 4 mg Inhalation solution
	Orciprenaline	60 mg Oral
	Salbutamol	0.8 mg Inhalation aerosol 0.8 mg Inhalation powder 10 mg Inhalation solution
	Terbutaline	2 mg Inhalation aerosol 2 mg Inhalation powder 20 mg Inhalation solution
Long-acting beta agonists	Salmeterol	0.1 mg Inhalation aerosol 0.1 mg Inhalation powder
	(e)Formoterol	24 mcg Inhalation aerosol 24 mcg Inhalation powder
Short-acting anti-cholinergics	Ipratropium	0.12 mg Inhalation aerosol 0.12 mg Inhalation powder 0.3 mg Inhalation solution
Long-acting anti-cholinergics	Tiotropium bromide	18 mcg Inhalation powder
Cromones	Cromoglycate	40 mg Inhalation aerosol 80 mg Inhalation powder 80 mg Inhalation solution
	Nedocromil	8 mg Inhalation aerosol
Inhaled corticosteroids	Beclomethasone	0.8 mg Inhalation aerosol 0.8 mg Inhalation powder 1.5 mg Inhalation solution
	Budesonide	0.8 mg Inhalation aerosol 0.8 mg Inhalation powder 1.5 mg Inhalation solution
	Fluticasone	0.6 mg Inhalation aerosol 0.6 mg Inhalation powder 1.5 mg Inhalation solution
Xanthines	Theophylline Choline Theophyllinate	0.4 g Oral 0.6 g Oral
Leukotriene receptor antagonists	Montelukast Zafirlukast	10 mg Oral 40 mg Oral

A1.9 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. Each of the states and territories collect data for hospital separations and provide a specified subset of these data to AIHW for inclusion in the NHMD. The data are organised in financial year periods. Whilst the dataset contains details of principal and additional diagnoses, in this report data relate to the principal diagnosis only, unless otherwise stated.

A1.9.1 Limitations of the National Hospital Morbidity Database

There are a number of issues affecting the reliability and validity of hospitalisations attributed to asthma. In particular, the reliability of coding of hospital separations will be influenced by variation in the propensity of attending medical practitioners to diagnose and label patients as having asthma. There has been no recent validation of the coding of diagnosis of asthma during hospital admissions in Australia. International evidence suggests that diagnostic coding of asthma is reasonably accurate in children and younger adults (Krueger et al. 2001; Osborne et al. 1992), but this accuracy decreases with age (Osborne et al. 1992).

A1.9.2 Hospital diagnosis codes

Hospital diagnosis is classified according to the principal diagnosis and was coded using the International Classification of Diseases 9th Revision, Clinical Modification (ICD-9-CM), for hospital separations from 1993 to 1997, and the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), for separations from 1998 onwards. A principal diagnosis is the diagnosis chiefly responsible for the episode of hospital care. Comparability factors were also applied to data on hospital separations prior to 1998, which were coded under ICD-9, to enable comparison with more recent data coded using ICD-10 (see Section A1.9.3).

A1.9.3 Comparability factors for hospitalisation data

Table A1.5 shows the age-group specific comparability factors calculated for converting ICD-9-CM to ICD-10-AM. The method for calculating these comparability factors has been described previously (ACAM 2003, Section A1.2).

Table A1.5
Comparability factors for hospital separations for asthma

Age group	Conversion factor
<35 years	1.0 (i.e. no conversion)
35 to 64 years	0.64
65 years and over	0.53

1.9.4 Mechanical ventilation

The National Hospital Morbidity Database includes information relating to specific aspects of care, such as the use of mechanical ventilation. Invasive mechanical ventilation is a medical intervention used in situations where patients become unable to breathe by themselves. It involves the use of a positive pressure ventilator to maintain respiration via an endotracheal tube. This intervention is generally administered in hospital intensive care units. The National Hospital Morbidity Database has collected data on the use of invasive mechanical ventilation since 1993–94. Where possible, data for the period 1993–94 to 2001–02 have been analysed, though some analyses have been restricted to the period 1995–96 to 2001–02 due to incomplete data from some jurisdictions.

The data presented in this report do not include episodes of non-invasive ventilation. Available data on non-invasive ventilation are incomplete and not suitable for analysis.

A1.9.5 Re-attendance data

In order to identify multiple health care attendances for asthma by the same individual in emergency departments (EDs) and/or hospitals, this report has used linked hospital attendance and ED data from New South Wales and Victoria where the principal diagnosis was asthma. In New South Wales, the Inpatients Statistics Collection (ISC) was linked with the Emergency Department Data Collection (EDDC), and in Victoria, the Victorian Admitted Episodes Dataset (VAED) was linked with the Victorian Emergency Minimum Dataset (VEMD).

Briefly, in New South Wales, this was done by extracting records where asthma was a principal diagnosis (classified using ICD-9-CM or ICD-10-AM) from the ISC and the EDDC for the period July 2000 to June 2003. Records consist of a range of demographic data items (e.g. name, date of birth, residential address, language spoken at home, country of birth), administrative variables (e.g. date of visit or admission, and date of separation or departure), and clinical items (such as procedure codes). Records were linked using many demographic and administrative variables available in the ISC and EDDC, and involved probabilistic record linkage using Automatch probabilistic record linkage software (MatchWare Technologies 1997).

In Victoria, the Department of Human Services carried out linkage of all records in the VAED and VEMD for the period July 1999 to June 2003. These records also contained a range of demographic and administrative variables that were used to implement a stepwise deterministic linkage methodology developed for this purpose (Personal communication, Dr V. Sundararajan, 2004). Records where the principal diagnosis in either the VEMD or VAED was asthma or a related respiratory condition were provided to ACAM.

The linked datasets from New South Wales and Victoria have enabled the analysis of re-attendances for asthma by individuals who visited an ED or were admitted to hospital, and subsequently returned to an ED or were admitted to hospital within a defined period. The limitations of the ED data noted in Section A1.4 above also apply to these data.

A1.10 Mortality data

Registration of deaths is the responsibility of individual state and territory Registrars of Births, Deaths and Marriages. Information on the cause of death is provided to the Registrar by a medical practitioner certifying a death, or by the Coroner to whom a death is reported. This information is, in turn, supplied to the Australian Bureau of Statistics (ABS) for coding cause of death and compilation into aggregated statistics. Death data from all states and territories are supplied by the ABS to the AIHW for the National Mortality Database. As the registration of deaths is a legal requirement in Australia, this dataset is considered nearly complete, although there has been no formal validation of completeness. The ABS advises that Aboriginal and Torres Strait Islander Australians are probably under-enumerated in some states/territories.

Although data on multiple causes of death are available, death data throughout this report, relate only to the underlying cause of death reported on each certificate.

A1.10.1 Limitations in mortality data

There are a number of issues affecting the reliability and validity of certification of deaths. The reliability of death certification can be influenced by variation in the propensity of attending medical practitioners to diagnose and label patients as dying from asthma. Validation studies of asthma deaths coded on death certificates reveal that adult deaths from asthma can be under-enumerated (Guite & Burney 1996; Hunt et al. 1993; Smythe et al. 1996) or over-enumerated (Jones et al. 1999; Sears et al. 1986; Sidenius et al. 2000). It is generally considered that asthma diagnosis is fairly unambiguous in people aged less than 45 years and data are, therefore, more reliable in these ages. However, a recent study has also demonstrated under-enumeration in children and young adults (Jorgensen et al. 2000). Generally, in older people the attribution of death to asthma, or alternatively to one of a range of illnesses with overlapping clinical features, is problematic and, therefore, the death data for asthma are less reliable in older people (Jones et al. 1999; Sidenius et al. 2000; Smythe et al. 1996). Changes in the classification scheme, or code, have a quantifiable impact on time trends in death data. However, the extent to which changes, over time, in diagnostic fashion affect death data is less well studied.

A1.10.2 Cause of death codes

The classification of asthma as the underlying cause of death was based on the ICD-9 for deaths from 1979 to 1997, and on ICD-10 for deaths from 1998 onwards (Table A1.6). Comparability factors were applied to data classified under ICD-9 to make the data comparable to that coded using ICD-10 (see Section A1.10.3).

Table A1.6
Disease codes

Classification	Codes used	Description
ICD-9	493.0	Extrinsic asthma
Code 493	493.1	Intrinsic asthma
	493.2	Chronic obstructive asthma
	493.9	Asthma, unspecified
ICD-10	J45.0	Predominantly allergic asthma
Codes J45 & J46	J45.1	Non-allergic asthma
	J45.8	Mixed asthma
	J45.9	Asthma, unspecified
	J46.0	Status asthmaticus

A1.10.3 Comparability factors for mortality data

Table A1.7 shows the age-group specific comparability factors calculated for converting number of asthma deaths from ICD-9 to ICD-10. The method for calculating these comparability factors has been described previously (ACAM 2003, Section A1.3).

Table A1.7
Comparability factors for asthma mortality data

Age group	Conversion factor
<35 years	1.0 (i.e. no conversion)
35 to 64 years	0.84
65 years and over	0.68

A1.11 Population data

This report uses population data sourced from the AIHW, which, in turn, are sourced from the ABS Demography section and are updated as revised or new estimates become available. All population estimates currently produced by the ABS are referred to as estimated resident populations.

Estimated resident populations are based on the 5-yearly Census of Population and Housing, to which three significant adjustments are made:

- 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 persons 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>.

A1.12 Population groups

A1.12.1 Aboriginal and Torres Strait Islander Australians

'Indigenous Australians' refers to people who identify themselves as being of Aboriginal or Torres Strait Islander origin. It is important to identify health disadvantages, with respect to asthma, among Aboriginal and Torres Strait Islander Australians so that those issues can be addressed. It is also important to ensure an acceptable level of reliability and validity of the data that are used for this purpose. Data for Indigenous Australians are currently available via several collections, including the 5-yearly Census, other surveys conducted by the ABS, AIHW, state health departments and other agencies, and administrative datasets such as hospital statistics and mortality collections. However, data quality issues around the identification and enumeration of Indigenous Australians exist across the majority of these collections.

There have been substantial increases in the Indigenous Australian population between census collections that cannot be fully explained by natural increase (Ross 1999). The ABS has introduced an experimental methodology which attempts to account for the changing levels of 'unexplained growth' in estimating and projecting the Indigenous population. Using this methodology, ABS has produced consistent series of estimates of the Indigenous population from 1991 to 2009. For further information refer to *Experimental estimates and projections: Aboriginal and Torres Strait Islander Australians* (ABS cat. no. 3238.0).

Indigenous identification and the quality of Indigenous data have been improving over time in a number of data sets through efforts at all levels. Despite this, deficiencies in health data for Indigenous Australians continue to exist in the National Mortality Collection and the National Hospital Morbidity Dataset (NHMD). In 2000–01, all states and territories adopted a standard definition for use in the NHMD. However, data are still only considered acceptable in Western Australia, South Australia and the Northern Territory. Similarly, in the National Mortality Collection from 1990 onwards only data from South Australia, Western Australia and the Northern Territory are considered reliable, and from 1998 onwards Queensland data can be used.

Since 1995, the National Health Survey has over-sampled in Indigenous Australian populations to enable more reliable estimates of their health status. The validity and reliability of other general population surveys (including the state CATI surveys) is less certain. Finally, a voluntary Indigenous identifier has been included recently on Medicare forms. This should help improve data about access to health services by Indigenous Australians.

As there is not the same quantity or quality of information about Aboriginal and Torres Strait Islander health as there is for non-Indigenous Australians, it has not been possible in many cases to provide the same level of information on the prevalence of asthma in Australia's Indigenous population or how this is being managed. However, the information about people living in remote regions and people who are socioeconomically disadvantaged may also be applicable to a large number of Indigenous Australians.

A1.12.2 Culturally and linguistically diverse background

Factors associated with cultural background may have an impact on health status. People whose first language is not English have been identified as population groups who are likely to experience disadvantage when seeking access to health and related services (ABS 1999). As such, it is necessary to describe the health status of people from different backgrounds. The term 'non-English-speaking background' has been used throughout this publication to describe people who have re-settled in Australia but who come from countries where English is not the primary language spoken.

The Department of Immigration and Multicultural and Indigenous Affairs (DIMIA) has 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 (DIMIA 2001).

English-speaking background is defined as those people born in Australia, New Zealand, the United Kingdom, Ireland, the United States of America, Canada or South Africa, which corresponds to the DIMIA English proficiency countries in group 1. These are the main countries from which Australia receives overseas settlers who are likely to speak English. Non-English-speaking background is defined as those people whose country of birth was somewhere other than one of these seven countries. This corresponds to the DIMIA English proficiency countries in the remaining groups 2 to 4.

A1.12.3 Socioeconomic disadvantage

The SEIFA Index of Relative Socioeconomic Disadvantage (IRSD) is one of five indexes developed by the ABS to measure socioeconomic characteristics associated with geographic locations (ABS 1998), based on information from the Australian census. 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 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 (Table A1.8).

Table A1.8
SEIFA quintiles and their corresponding IRSD score

Quintile	IRSD score
1st quintile (most disadvantaged)	<940.5
2nd quintile	940.5–<973.1
3rd quintile	973.1–<1,008.1
4th quintile	1,008.1–<1,064.4
5th quintile (most advantaged)	≥1,064.4
NSW average	1,006

Individual records were classified into quintiles of socioeconomic disadvantage according to the SEIFA index value associated with the statistical local area (SLA) of usual residence of the individual. Quintile 1 (SEIFA 1) includes the most disadvantaged households and quintile 5 (SEIFA 5) includes the most advantaged households.

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

A1.12.4 Urban, rural and remote areas

Accessibility to health and education services plays an important role in the successful treatment and management of asthma. For the majority of sections in this report, urban, rural and remote areas have been identified using the Australian Standard Geographical Classification (ASGC) of remoteness. The GP section of this report uses the Rural, Remote and Metropolitan Areas (RRMA) classification to define remoteness because this is the classification provided in the BEACH dataset.

ASGC categories of remoteness

The ASGC is based on the Accessibility/Remoteness Index of Australia (ARIA), which measures remoteness solely on the basis of geographical accessibility, and excludes urban/rural, socioeconomic and population size factors. This index can be applied to any location in Australia. It is based on physical geography, whereby locations are classified on the basis of the proximity (that is, the distance people must travel on a road network) to the nearest of 545 service centres, which differ in size and, hence, in the availability of education and health services.
The centres with small populations generally have a limited choice of general practitioners, specialists and hospital care.

Values of remoteness for populated localities are calculated by measuring the shortest road distance between a locality and the nearest of each of five different categories of service centres. Each of the populated localities across Australia has been assigned an ARIA index score to assess their remoteness from goods, services and opportunities for social interaction. (For full methodology, see ABS 2001a).

Table A1.9
ABS classes of remoteness, by ASGC and their definition

ASGC classification	ARIA index score	Definition
Major cities of Australia	0–0.2	Geographic distance imposes minimal restriction upon accessibility to the widest range of goods, services and opportunities for social interaction
Inner regional Australia	>0.2–2.4	Geographic distance imposes some restriction upon accessibility to the widest range of goods, services and opportunities for social interaction
Outer regional Australia	>2.4–5.92	Geographic distance imposes a moderate restriction upon accessibility to the widest r ange of goods, services and opportunities for social interaction
Remote Australia	>5.92–10.53	Geographic distance imposes a high restriction upon accessibility to the widest range of goods, services and opportunities for social interaction
Very remote Australia	>10.53–15	Locationally disadvantaged. Geographic distance imposes the highest restriction upon accessibility to the widest range of goods, services and opportunities for social interaction

This report examines data for the five ASGC/ARIA classes where these data are available. However, in some instances the three broader areas of major cities, inner regional, and outer regional or remote areas have been used where cell sizes are too small for accurate estimation in the more detailed classification.

RRMA classification of remoteness

The RRMA classification of remoteness is based on statistical local area (SLA) distances to service centres and other people (DPIE & DHSH 1994). Values of remoteness are calculated by combining a personal distance index (which is based on the population density of the SLA) and partial indices based on measurements of straight-line distances between each SLA and the nearest service centres. This yields three zones of remoteness (metropolitan, rural and remote), which comprise seven different classes (Table A1.10).

It should be noted that all capital cities are categorised as 'capital cities' using this classification, regardless of the relative remoteness of the city and the population size.

For the purposes of this report, we have presented four RRMA categories of remoteness by combining the three rural zones and the two remote zones to create a 'rural' category and a 'remote' category, respectively.

Table A1.10
RRMA classifications of remoteness and their definition

Zone	Class	Category used in this report
Metropolitan zone	Capital cities	Capital cities
	Other metropolitan centres (urban centre population ≥100,000)	Other metropolitan
Rural zone	Large rural centres (urban centre population 25,000–99,999)	Rural
	Small rural centres (urban centre population 10,000–24,999)	
	Other rural areas (urban centre population <10,000)	
Remote zone	Remote centres (urban centre population ≥5,000)	Remote
	Other remote areas (urban centre population <5,000)	

Appendix 2: Statistical tables

Asthma in children

Table A2.1
Proportion of general practice encounters for asthma, by state and territory, children aged 0 to 18 years, Australia, April 2001 to March 2004

State/territory	Percent of general practice encounters	95% confidence interval
New South Wales	4.92	4.43 to 5.41
Victoria	5.90	5.19 to 6.61
Queensland	4.85	4.25 to 5.46
Western Australia	4.86	3.96 to 5.76
South Australia	6.21	4.84 to 7.57
Tasmania	5.58	3.45 to 7.71
Australian Capital Territory	5.07	2.69 to 7.44
Australia	**5.18**	**4.88 to 5.49**

Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. BEACH data year is April to March. Northern Territory excluded as the numbers are too small to produce reliable estimates.

Source: BEACH Survey of General Practice.

Table A2.2
Emergency department visits for asthma per 100 children with asthma, by age group and sex, children aged 0 to 18 years, New South Wales and Victoria, 1999–2004

	Rate (95% confidence interval)					
	Boys		Girls		Children	
0 to 1 year	42.1	(40.8 to 43.4)	54.0	(51.8 to 56.2)	45.4	(44.3 to 46.5)
2 to 4 years	18.4	(18.0 to 18.9)	11.2	(10.8 to 11.5)	15.0	(14.7 to 15.5)
5 to 11 years	4.2	(4.1 to 4.3)	3.9	(3.7 to 4.0)	4.05	(3.96 to 4.14)
12 to 18 years	2.1	(2.0 to 2.2)	2.9	(2.8 to 3.0)	2.45	(2.38 to 2.53)
0 to 18 years	**5.9**	**(5.8 to 6.0)**	**5.1**	**(5.0 to 5.2)**	**5.55**	**(5.48 to 5.62)**

Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; ABS National Health Survey 2001.

Table A2.3
Hospital separations for asthma per 100 children with asthma, by age group and sex, children aged 0 to 18 years, Australia, 2002–03

	Rate (95% confidence interval)					
	Boys		Girls		Children	
0 to 1 year	25.05	(24.26 to 25.85)	20.22	(19.27 to 21.19)	23.26	(22.65 to 23.88)
2 to 4 years	10.59	(10.32 to 10.87)	7.04	(6.79 to 7.29)	8.96	(8.78 to 9.16)
5 to 11 years	2.00	(1.94 to 2.07)	1.82	(1.74 to 1.90)	1.93	(1.88 to 1.98)
12 to 18 years	0.74	(0.70 to 0.79)	0.94	(0.89 to 0.99)	0.84	(0.81 to 0.88)
0 to 18 years	**3.26**	**(3.20 to 3.31)**	**2.51**	**(2.45 to 2.56)**	**2.93**	**(2.89 to 2.97)**

Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Sources: AIHW National Hospital Morbidity Database; 2001 ABS National Health Survey.

Table A2.4
Hospital separations for asthma per 100,000 population, by age group, state and territory, children aged 0 to 18 years, Australia, 2002–03

	Age group (years)			
State/territory	0 to 1 (95% CI)	2 to 4 (95% CI)	5 to 11 (95% CI)	12 to 18 (95% CI)
New South Wales	962.4 (916.4 to 1,009.6)	1,137.2 (1,096.7 to 1,178.4)	332.9 (318.8 to 347.2)	129.0 (120.3 to 138.0)
Victoria	772.6 (723.8 to 823.1)	880.7 (838.5 to 923.9)	269.3 (254.5 to 284.5)	123.1 (113.1 to 133.4)
Queensland	655.8 (606.0 to 707.5)	886.8 (839.9 to 935.0)	259.7 (243.6 to 276.3)	115.2 (104.5 to 126.4)
Western Australia	959.1 (874.1 to 1,048.1)	1,096.2 (1,023.4 to 1,171.6)	364.2 (337.5 to 391.8)	139.0 (123.0 to 155.9)
South Australia	1,301.2 (1,184.9 to 1,422.9)	1,454.9 (1,356.2 to 1,556.9)	514.3 (477.3 to 552.8)	187.9 (166.1 to 211.0)
Tasmania	457.1 (344.4 to 585.6)	517.7 (419.3 to 626.2)	173.2 (137.5 to 212.9)	83.5 (59.7 to 111.3)
Australian Capital Territory	596.6 (439.9 to 776.8)	677.9 (541.5 to 829.5)	126.7 (90.1 to 169.4)	37.1 (19.2 to 60.9)
Northern Territory	581.4 (419.0 to 769.9)	872.0 (701.2 to 1,061.2)	263.7 (202.6 to 332.7)	85.4 (50.6 to 129.1)
Australia	**850.20 (824.9 to 875.9)**	**1,018.20 (995.8 to 1,040.8)**	**311.90 (304.0 to 319.9)**	**127.10 (122.1 to 132.2)**

Note: Age standardised to the Australian population as at 30 June 2001. Asthma classified according to ICD-10 codes J45 & J46.

Source: AIHW National Hospital Morbidity Database.

Prevalence

Table A2.5
Prevalence of ever having doctor-diagnosed asthma, by age group and sex, all ages, Australia, 2001

Age/sex	Estimated number of people with ever doctor-diagnosed asthma	Estimated total people	Per cent of people with ever doctor-diagnosed asthma	95% confidence interval
Males				
0 to 4	94,590	654,164	14.5	11.8 to 17.1
5 to 9	209,174	688,199	30.4	27.0 to 33.8
10 to 14	235,469	681,707	34.5	31.1 to 38.0
15 to 24	389,833	1,305,884	29.9	27.5 to 32.2
25 to 34	279,430	1,378,787	20.3	18.3 to 22.3
35 to 44	221,343	1,436,047	15.4	13.6 to 17.2
45 to 54	177,813	1,297,328	13.7	11.9 to 15.5
55 to 64	107,139	902,137	11.9	9.8 to 14.0
65 to 74	76,944	620,575	12.4	9.8 to 15.0
75 and over	44,448	400,078	11.1	8.0 to 14.2
All ages	**1,836,182**	**9,364,906**	**19.6**	**19.0 to 20.2**
Females				
0 to 4	69,559	621,414	11.2	8.7 to 13.6
5 to 9	141,310	654,568	21.6	18.5 to 24.7
10 to 14	183,139	647,319	28.3	24.9 to 31.7
15 to 24	386,811	1,262,610	30.6	28.2 to 33.0
25 to 34	367,104	1,425,135	25.8	23.6 to 27.9
35 to 44	281,516	1,484,568	19.0	17.1 to 20.8
45 to 54	248,482	1,318,232	18.8	16.8 to 20.9
55 to 64	156,918	897,883	17.5	15.1 to 19.9
65 to 74	112,369	663,512	16.9	14.1 to 19.7
75 and over	78,855	576,117	13.7	10.9 to 16.5
All ages	**2,026,062**	**9,551,358**	**21.2**	**20.6 to 21.8**

Note: Ever asthma based on a positive response to 'Have you ever been told by a doctor that you have asthma?'

Source: ABS National Health Survey 2001.

Table A2.6
Current prevalence of probable asthma, by age group and sex, all ages, Australia, 2001

Age/sex	Estimated number of people with ever doctor-diagnosed asthma	Estimated total people	Per cent of people with ever doctor-diagnosed asthma	95% confidence interval
Males				
0 to 4	56,761	654,164	8.7	6.5 to 10.8
5 to 9	136,131	688,199	19.8	16.9 to 22.7
10 to 14	113,312	681,707	16.6	13.9 to 19.4
15 to 24	203,544	1,305,884	15.6	13.7 to 17.5
25 to 34	139,587	1,378,787	10.1	8.6 to 11.7
35 to 44	110,997	1,436,047	7.7	6.4 to 9.1
45 to 54	93,988	1,297,328	7.3	5.9 to 8.6
55 to 64	62,001	902,137	6.9	5.2 to 8.5
65 to 74	54,843	620,575	8.8	6.6 to 11.1
75 and over	23,513	400,078	5.9	3.6 to 8.2
All ages	**994,676**	**9,364,906**	**10.6**	**10.1 to 11.1**
Females				
0 to 4	47,947	621,414	7.72	5.6 to 9.8
5 to 9	76,291	654,568	11.66	9.2 to 14.1
10 to 14	97,037	647,319	14.99	12.3 to 17.7
15 to 24	214,171	1,262,610	16.96	15.0 to 19.0
25 to 34	216,387	1,425,135	15.18	13.4 to 17.0
35 to 44	156,953	1,484,568	10.57	9.1 to 12.1
45 to 54	164,396	1,318,232	12.47	10.8 to 14.2
55 to 64	109,509	897,883	12.20	10.1 to 14.3
65 to 74	72,098	663,512	10.87	8.5 to 13.2
75 and over	47,816	576,117	8.30	6.0 to 10.6
All ages	**1,202,604**	**9,551,358**	**12.59**	**12.1 to 13.1**

Note: Current asthma based on a positive response to 'Have you ever been told by a doctor that you have asthma?' and 'Do you still get asthma?'

Source: ABS National Health Survey 2001.

Hospitalisations

Table A2.7
Hospital separations for asthma, by age group and sex, Australia, 1993–2004

	Males				Females			
Year/age group	Hospital separations	Population	Hospital separations per 100,000	95% confidence interval	Hospital separations	Population	Hospital separations per 100,000	95% confidence interval
0 to 4 years								
1993–94	12,927	662,989	1,950	1,917 to 1,984	6,712	629,533	1,066	1,041 to 1,092
1994–95	12,857	665,924	1,931	1,898 to 1,964	6,509	632,113	1,030	1,005 to 1,055
1995–96	12,608	666,703	1,891	1,859 to 1,924	6,398	632,821	1,011	987 to 1,036
1996–97	12,683	665,611	1,905	1,872 to 1,939	6,594	631,438	1,044	1,019 to 1,070
1997–98	10,207	665,414	1,534	1,505 to 1,564	5,174	630,850	820	798 to 843
1998–99	11,237	662,117	1,697	1,666 to 1,729	5,979	627,424	953	929 to 977
1999–00	8,734	658,830	1,326	1,298 to 1,354	4,733	625,323	757	736 to 779
2000–01	9,679	655,870	1,476	1,447 to 1,505	5,203	623,100	835	813 to 858
2001–02	8,416	657,499	1,280	1,253 to 1,380	4,504	624,858	721	700 to 742
2002–03	7,935	651,556	1,218	1,191 to 1,245	4,206	619,365	679	659 to 700
2003–04	8,335	648,266	1,286	1,259 to 1,314	4,266	616,395	692	672 to 713
5 to 14 years								
1993–94	9,376	1,305,410	718	704 to 733	6,172	1,239,594	498	486 to 510
1994–95	7,755	1,313,601	590	577 to 604	5,371	1,248,399	430	419 to 442
1995–96	8,056	1,326,681	607	594 to 621	5,373	1,261,913	426	415 to 437
1996–97	7,163	1,339,478	535	523 to 547	4,766	1,274,788	374	363 to 385
1997–98	7,103	1,347,206	527	515 to 540	4,595	1,283,025	358	348 to 369
1998–99	7,224	1,355,317	533	521 to 545	4,811	1,291,019	373	362 to 383
1999–00	5,662	1,366,184	414	404 to 425	3,853	1,300,535	296	287 to 306
2000–01	6,620	1,377,301	481	469 to 492	4,317	1,309,796	330	320 to 340
2001–02	4,984	1,386,873	359	350 to 370	3,032	1,317,968	230	222 to 238
2002–03	4,322	1,391,412	311	301 to 320	2,702	1,321,845	204	197 to 212
2003–04	4,419	1,392,666	317	308 to 327	2,952	1,322,083	223	215 to 232
15 to 34 years								
1993–94	3,469	2,810,134	123	119 to 128	6,961	2,753,439	253	247 to 259
1994–95	2,907	2,802,353	104	100 to 108	6,192	2,745,400	226	220 to 231
1995–96	3,013	2,797,935	108	104 to 112	6,245	2,741,195	228	222 to 234
1996–97	2,917	2,795,430	104	101 to 108	6,071	2,743,091	221	216 to 227
1997–98	3,234	2,779,977	116	112 to 120	6,267	2,734,830	229	224 to 235
1998–99	3,439	2,764,738	124	120 to 129	6,206	2,723,554	228	222 to 234
1999–00	3,314	2,758,243	120	116 to 124	5,798	2,721,471	213	208 to 219
2000–01	3,338	2,763,711	121	117 to 125	5,762	2,730,615	211	206 to 217
2001–02	2,628	2,779,273	95	91 to 98	4,475	2,749,580	163	158 to 168
2002–03	2,133	2,805,935	76	73 to 79	4,093	2,760,675	148	144 to 153
2003–04	2,170	2,839,356	76	73 to 80	4,176	2,793,267	150	145 to 154

(continued)

Table A2.7 (continued)
Hospital separations for asthma, by age group and sex, Australia, 1993–2004

Year/age group	Males				Females			
	Hospital separations	Population	Hospital separations per 100,000	95% confidence interval	Hospital separations	Population	Hospital separations per 100,000	95% confidence interval
35 to 64 years								
1993–94	2,243	3,132,090	72	69 to 75	4,796	3,077,546	156	151 to 160
1994–95	2,207	3,194,835	69	66 to 72	4,703	3,146,513	149	145 to 154
1995–96	2,224	3,268,186	68	65 to 71	4,926	3,224,911	153	149 to 157
1996–97	2,345	3,348,237	70	67 to 73	5,242	3,309,585	158	154 to 163
1997–98	2,581	3,428,459	75	72 to 78	5,694	3,399,118	168	163 to 172
1998–99	2,900	3,508,991	82	80 to 86	7,112	3,486,881	204	199 to 209
1999–00	2,953	3,587,294	82	79 to 85	7,049	3,572,501	197	193 to 202
2000–01	2,820	3,660,750	77	74 to 80	6,745	3,652,919	185	180 to 189
2001–02	2,563	3,730,335	69	66 to 71	6,205	3,731,320	166	162 to 170
2002–03	2,249	3,798,334	59	57 to 62	5,610	3,800,910	148	144 to 152
2003–04	2,260	3,857,069	59	56 to 61	5,610	3,866,726	145	141 to 149
65 years and over								
1993–94	1,658	887,292	187	178 to 196	2,708	1,169,066	232	223 to 241
1994–95	1,640	911,353	180	171 to 189	2,737	1,194,247	229	221 to 238
1995–96	1,719	934,099	184	175 to 193	2,938	1,217,314	241	233 to 250
1996–97	1,948	959,299	203	194 to 212	3,291	1,243,757	265	256 to 274
1997–98	2,145	982,115	218	209 to 228	3,668	1,266,570	290	280 to 299
1998–99	1,454	1,003,511	145	138 to 153	3,510	1,287,719	273	264 to 282
1999–00	1,353	1,025,977	132	125 to 139	3,557	1,309,477	272	263 to 281
2000–01	1,177	1,047,699	112	106 to 119	3,149	1,331,619	236	228 to 245
2001–02	1,171	1,076,672	109	103 to 115	3,040	1,358,862	224	216 to 232
2002–03	1,047	1,105,896	95	89 to 101	2,933	1,385,051	212	204 to 220
2003–04	937	1,134,285	83	77 to 88	2,864	1,411,356	203	196 to 211

Note: All hospital separations prior to 1998–99 data have been converted to ICD-10 using the following conversion factors: less than 35 years =1; 35 to 64 years = 0.64; 65 years and above = 0.53. Asthma is classified according to ICD-9 code 493, and ICD-10 codes J45 and J46.

Patient days

Table A2.8
Hospital patient days for asthma per 100,000 population, by age group, Australia, 1993–2004

	Age group (years)					
	0 to 4	5 to 14	15 to 34	35 to 64	65 and over	All ages (95% CI)
Sex (data for 2002–03)						
Males	1,626.6	468.7	136.9	157.7	397.0	321.3 (317.8 to 324.9)
Females	928.7	347.8	288.6	498.6	1,157.9	539.1 (534.5 to 543.7)
Year						
1993–94	2,968.9	1,332.4	474.8	522.3	1,610.9	919.8 (915.3 to 924.4)
1994–95	2,838.1	1,086.9	416.1	503.1	1,505.7	839.7 (835.4 to 844.0)
1995–96	2,688.3	1,064.1	413.0	508.8	1,582.8	837.6 (833.3 to 841.9)
1996–97	2,575.1	929.5	395.6	504.9	1,763.2	827.5 (823.3 to 831.7)
1997–98	2,035.5	897.4	397.6	536.8	1,809.9	806.1 (802.0 to 810.3)
1998–99	2,145.2	867.9	398.7	531.1	1,313.0	745.1 (741.2 to 749.0)
1999–2000	1,641.7	650.6	344.6	499.1	1,230.2	643.4 (639.8 to 647.0)
2000–01	1,687.0	717.1	333.2	437.5	1,031.1	603.8 (600.3 to 607.3)
2001–02	1,423.9	492.1	252.5	389.6	890.8	496.0 (492.9 to 499.2)
2002–03	1,286.5	410.5	212.3	326.7	820.0	431.1 (428.2 to 434.0)
2003–04	1,327.2	419.5	211.0	316.7	728.4	419.3 (416.5 to 422.2)
Remoteness (data for 2002–03)						
Major cities	1,308.3	393.9	185.6	275.0	695.6	380.7 (377.3 to 384.0)
Inner regional	1,123.4	388.5	229.7	348.4	903.1	453.8 (447.3 to 460.4)
Outer regional	1,243.8	469.7	273.7	454.5	1,051.3	542.3 (532.3 to 552.6)
Remote	1,589.2	598.7	323.2	640.7	1,875.9	733.6 (704.6 to 763.9)
Very remote	1,320.3	418.8	313.2	1,026.5	2,648.2	811.0 (768.7 to 855.5)
Culturally and linguistically diverse background (data for 2002–03)						
English-speaking background	1,281.8	416.6	227.0	353.9	822.5	452.5 (449.3 to 455.7)
Non-English-speaking background	1,653.5	270.7	109.4	211.3	817.4	300.7 (294.3 to 307.2)
Socioeconomic status (data for 2002–03)						
SEIFA 1 (most disadvantaged)	1,558.5	499.4	254.4	419.0	929.8	527.8 (520.3 to 535.4)
SEIFA 2	1,401.2	496.5	236.9	359.5	738.9	468.6 (461.7 to 475.6)
SEIFA 3	1,218.0	404.6	213.8	356.2	861.3	446.0 (439.5 to 452.7)
SEIFA 4	1,129.9	324.7	190.6	287.9	820.0	380.1 (374.3 to 386.0)
SEIFA 5 (most advantaged)	1,023.3	301.9	145.2	211.2	684.7	308.9 (303.6 to 314.3)
State/territory (data for 2002–03)						
New South Wales	1,389.5	409.9	198.3	290.3	771.4	413.7 (408.9 to 418.6)
Victoria	1,011.9	327.3	208.4	304.2	818.9	391.5 (385.9 to 397.0)
Queensland	1,030.6	329.4	211.8	374.6	913.2	432.8 (426.1 to 439.6)
Western Australia	1,648.3	554.1	251.0	365.7	830.8	502.4 (492.3 to 512.5)
South Australia	2,194.8	808.5	264.4	422.1	902.8	608.4 (596.0 to 620.9)
Tasmania	670.1	264.7	188.3	194.2	404.7	260.2 (245.9 to 274.8)
Australian Capital Territory	979.5	184.6	115.9	247.1	831.5	322.8 (302.2 to 344.0)
Northern Territory	1,337.2	400.7	251.7	562.3	1,748.5	651.3 (602.9 to 701.2)

Table A2.9
Hospital patient days for asthma per 100,000 population, by age group and Indigenous status, Australia, 2002–03

Indigenous status	0 to 4 years	5 to 14 years	15 to 34 years	35 to 54 years	55 years and over	All ages
Aboriginal and Torres Strait Islander	2214.8	555.2	302.5	1,326.4	3,168.2	1,003.3
Other	1,242.2	403.7	209.5	268.4	645.5	418.0

General practice

Table A2.10
General practice encounters for asthma, by age group, Australia, April 1998 to March 2004

Year/age group	GP encounters for asthma per 100 GP encounters	95% confidence interval	Total annual GP attendances	Population	GP encounters for asthma per 100 population	95% confidence interval
0 to 4 years						
1998–99	5.5	4.6 to 6.5	8,872,329	1,289,541	38.0	31.7 to 44.3
1999–2000	5.3	4.5 to 6.1	8,467,529	1,284,153	34.9	29.8 to 40.0
2000–01	4.6	4.0 to 5.3	8,146,090	1,278,970	29.3	25.2 to 33.5
2001–02	4.3	3.7 to 4.9	7,779,664	1,282,357	26.1	22.3 to 29.8
2002–03	4.1	3.5 to 4.8	7,628,359	1,270,421	24.7	20.9 to 28.5
2003–04	4.3	3.6 to 5.0	7,251,901	1,264,617	24.7	20.8 to 28.5
5 to 34 years						
1998–99	4.1	3.8 to 4.4	33,322,197	8,134,628	16.8	15.6 to 18.1
1999–2000	3.9	3.6 to 4.3	31,963,780	8,146,433	15.5	14.1 to 16.8
2000–01	3.8	3.5 to 4.1	30,910,917	8,181,423	14.4	13.2 to 15.6
2001–02	3.8	3.4 to 4.1	29,795,442	8,233,694	13.6	12.4 to 14.8
2002–03	3.4	3.1 to 3.7	28,935,717	8,312,219	11.8	10.8 to 12.8
2003–04	3.6	3.3 to 4.0	27,494,569	8,326,866	11.9	10.8 to 13.1
35 to 64 years						
1998–99	2.6	2.4 to 2.8	38,021,641	6,995,872	14.2	12.9 to 15.4
1999–2000	2.7	2.5 to 2.9	38,453,076	7,159,795	14.4	13.2 to 15.5
2000–01	2.2	2.0 to 2.4	38,694,630	7,313,669	11.8	10.7 to 12.9
2001–02	2.3	2.1 to 2.6	38,481,049	7,461,655	12.1	11.0 to 13.2
2002–03	2.4	2.2 to 2.6	38,196,778	7,590,140	12.2	11.0 to 13.3
2003–04	2.0	1.8 to 2.2	37,488,856	7,734,740	9.6	8.8 to 10.5
65 years and over						
1998–99	2.2	1.9 to 2.4	21,764,528	2,291,230	20.6	18.4 to 22.9
1999–2000	2.5	2.3 to 2.8	21,875,472	2,335,474	23.6	21.2 to 26.0
2000–01	2.0	1.8 to 2.2	22,035,428	2,379,318	18.7	16.7 to 20.8
2001–02	2.2	1.9 to 2.4	22,161,005	2,435,534	19.6	17.4 to 21.8
2002–03	2.1	1.8 to 2.3	22,541,186	2,490,001	18.7	16.4 to 20.9
2003–04	1.9	1.7 to 2.2	22,669,052	2,546,423	17.2	15.3 to 19.2

Note: Data is presented in 'BEACH years', which extend from April to March.

Mortality

Table A2.11
Deaths due to asthma, by sex, people aged 5 to 34 years, Australia, 1979–2003

	Males				Females			
Year	Deaths due to asthma	Population	Age standardised rate per 100,000	95% confidence interval	Deaths due to asthma	Population	Age standardised rate per 100,000	95% confidence interval
1979	39	3,801,424	1.04	0.74 to 1.39	26	3,666,212	0.71	0.46 to 1.01
1980	40	3,838,662	1.05	0.75 to 1.39	31	3,707,242	0.84	0.57 to 1.16
1981	37	3,886,621	0.97	0.68 to 1.30	47	3,755,136	1.25	0.92 to 1.63
1982	39	3,913,365	0.98	0.76 to 1.40	40	3,780,951	1.09	0.77 to 1.45
1983	41	3,925,054	1.06	0.76 to 1.41	32	3,794,433	0.85	0.58 to 1.17
1984	58	3,929,234	1.45	1.10 to 1.85	41	3,799,641	1.08	0.77 to 1.43
1985	50	3,941,760	1.27	0.94 to 1.64	56	3,810,544	1.44	1.09 to 1.84
1986	62	3,963,505	1.52	1.16 to 1.92	55	3,829,133	1.41	1.06 to 1.81
1987	55	3,993,308	1.38	1.04 to 1.76	55	3,862,446	1.40	1.05 to 1.79
1988	52	4,031,302	1.27	0.95 to 1.64	40	3,900,786	1.01	0.72 to 1.35
1989	54	4,071,700	1.30	0.98 to 1.68	46	3,941,204	1.14	0.83 to 1.49
1990	44	4,102,245	1.07	0.77 to 1.40	47	3,971,569	1.16	0.85 to 1.51
1991	35	4,113,138	0.85	0.59 to 1.15	41	3,986,925	1.01	0.73 to 1.35
1992	27	4,121,361	0.66	0.43 to 0.93	17	3,997,413	0.43	0.25 to 0.66
1993	38	4,115,544	0.91	0.64 to 1.22	33	3,993,033	0.83	0.57 to 1.13
1994	26	4,115,954	0.64	0.41 to 0.90	37	3,993,799	0.93	0.65 to 1.25
1995	26	4,124,616	0.63	0.41 to 0.90	24	4,003,108	0.60	0.39 to 0.87
1996	24	4,134,908	0.58	0.37 to 0.83	19	4,017,879	0.47	0.28 to 0.70
1997	27	4,127,183	0.65	0.43 to 0.92	22	4,017,855	0.55	0.34 to 0.78
1998	26	4,120,055	0.63	0.41 to 0.90	32	4,014,573	0.79	0.54 to 1.08
1999	27	4,124,427	0.66	0.43 to 0.93	25	4,022,006	0.62	0.40 to 0.89
2000	23	4,141,012	0.56	0.35 to 0.81	25	4,040,411	0.61	0.40 to 0.88
2001	30	4,166,146	0.73	0.49 to 1.01	13	4,067,548	0.32	0.17 to 0.51
2002	16	4,197,347	0.38	0.22 to 0.59	17	4,082,520	0.41	0.24 to 0.62
2003	19	4,232,022	0.45	0.27 to 0.67	12	4,115,350	0.28	0.15 to 0.46

Table A2.12
Deaths due to asthma, by sex, all ages, Australia, 1979–2003

	Males				Females			
Year	Deaths due to asthma	Population	Age standardised rate per 100,000	95% confidence interval	Deaths due to asthma	Population	Age standardised rate per 100,000	95% confidence interval
1979	177	7,253,762	3.21	2.70 to 3.75	164	7,261,967	2.60	2.21 to 3.01
1980	201	7,338,060	3.75	3.19 to 4.35	225	7,357,296	3.49	3.04 to 3.97
1981	213	7,448,267	3.75	3.22 to 4.31	213	7,474,993	3.07	2.67 to 3.51
1982	224	7,580,914	3.94	3.39 to 4.52	234	7,603,333	3.46	3.02 to 3.92
1983	236	7,686,346	3.96	3.43 to 4.52	249	7,707,126	3.52	3.09 to 3.97
1984	264	7,778,212	4.15	3.63 to 4.67	257	7,801,179	3.61	3.18 to 4.07
1985	295	7,882,728	5.05	4.43 to 5.70	337	7,905,584	4.55	4.07 to 5.05
1986	315	8,000,187	4.88	4.31 to 5.47	301	8,018,163	3.97	3.53 to 4.43
1987	296	8,118,255	4.53	3.99 to 5.09	363	8,145,619	4.72	4.24 to 5.22
1988	297	8,248,945	4.51	3.98 to 5.08	341	8,283,219	4.40	3.94 to 4.88
1989	334	8,387,589	5.01	4.45 to 5.56	402	8,426,827	5.01	4.52 to 5.51
1990	294	8,511,269	4.36	3.85 to 4.91	335	8,553,859	4.10	3.67 to 4.56
1991	255	8,615,409	3.73	3.26 to 4.23	314	8,668,627	3.72	3.31 to 4.14
1992	253	8,716,147	3.65	3.19 to 4.13	310	8,778,517	3.63	3.23 to 4.05
1993	250	8,797,915	3.54	3.09 to 4.01	336	8,869,178	3.83	3.43 to 4.25
1994	245	8,888,066	3.67	3.20 to 4.16	365	8,966,672	4.04	3.64 to 4.47
1995	212	8,993,604	2.86	2.47 to 3.27	341	9,078,154	3.68	3.30 to 4.08
1996	223	9,108,055	3.05	2.65 to 3.48	314	9,202,659	3.32	2.96 to 3.70
1997	207	9,203,171	2.71	2.34 to 3.10	292	9,314,393	2.97	2.64 to 3.32
1998	187	9,294,674	2.34	2.01 to 2.70	294	9,416,597	2.95	2.62 to 3.29
1999	160	9,396,548	2.02	1.7 to 2.36	264	9,529,307	2.58	2.28 to 2.91
2000	169	9,505,331	2.00	1.71 to 2.32	285	9,648,049	2.71	2.40 to 3.04
2001	175	9,630,652	2.00	1.71 to 2.31	247	9,782,588	2.27	1.99 to 2.56
2002	158	9,753,133	1.89	1.60 to 2.21	239	9,887,846	2.14	1.87 to 2.42
2003	108	9,871,642	1.21	0.99 to 1.46	206	10,009,827	1.75	1.52 to 2.00

Expenditure

Table A2.13
Asthma expenditure per capita and asthma expenditure as a proportion of total health expenditure, by age group and sex, Australia, 2000–01

	Males		Females	
Age group (years)	Per capita asthma expenditure	Proportion of total health expenditure	Per capita asthma expenditure	Proportion of total health expenditure
0 to 4	$76.24	4.08%	$65.91	4.22%
5 to 14	$60.42	5.51%	$40.44	3.24%
15 to 24	$26.98	2.12%	$33.15	1.90%
25 to 34	$15.02	1.22%	$26.92	1.26%
35 to 44	$17.73	1.26%	$27.28	1.40%
45 to 54	$18.61	0.97%	$33.49	1.42%
55 to 64	$26.27	0.82%	$51.54	1.55%
65 to 74	$41.86	0.74%	$54.45	1.01%
75 to 84	$46.55	0.53%	$53.94	0.61%
85 and over	$58.05	0.35%	$57.02	0.34%
Total	**$32.73**	**1.45%**	**$39.12**	**1.37%**

Table A2.14
Expenditure per capita for hospital care, out-of-hospital medical care and pharmaceuticals for asthma, by age group and sex, Australia, 2000–01

	Hospital			Out-of-hospital medical			Pharmaceutical		
Age group (years)	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons
0 to 4	$26.46	$23.66	$50.11	$7.77	$5.62	$13.39	$19.90	$14.92	$34.81
5 to 14	$23.29	$10.30	$33.59	$10.15	$7.90	$18.05	$40.34	$28.05	$68.39
15 to 24	$6.09	$9.66	$15.76	$5.95	$6.83	$12.78	$21.25	$22.83	$44.08
25 to 34	$1.85	$6.25	$8.10	$3.91	$5.70	$9.61	$14.71	$22.96	$37.67
35 to 44	$3.49	$6.92	$10.41	$4.00	$6.95	$10.95	$15.59	$21.25	$36.83
45 to 54	$1.78	$7.68	$9.47	$5.20	$8.15	$13.34	$16.49	$24.93	$41.42
55 to 64	$2.31	$15.23	$17.54	$4.79	$7.77	$12.55	$16.68	$22.43	$39.10
65 to 74	$2.72	$7.81	$10.53	$4.08	$7.80	$11.88	$18.05	$22.11	$40.15
75 to 84	$4.38	$10.17	$14.55	$1.73	$3.47	$5.20	$10.19	$13.27	$23.45
85 and over	$7.79	$9.88	$17.67	$0.60	$1.38	$1.98	$1.59	$2.38	$3.98
Total	**$7.73**	**$9.87**	**$8.81**	**$5.04**	**$6.34**	**$5.69**	**$18.28**	**$20.09**	**$19.19**

Abbreviations

AAP	Asthma action plan
ABS	Australian Bureau of Statistics
ACAM	Australian Centre for Asthma Monitoring
ACS	Automated Coding Software
ACT	Australian Capital Territory
AHR	Airway hyperresponsiveness
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index of Australia
ASGC	Australian Standard Geographical Classification
ASMA	Australian System for Monitoring Asthma
ATC	Anatomical Therapeutic Chemical
BEACH	Bettering the Evaluation and Care of Health
CATI	Computer-assisted telephone interview
CI	Confidence interval
COPD	Chronic obstructive pulmonary disease
CURF	Confidentialised unit record files
DDD	Defined daily dose
DIMIA	Department of Immigration & Multicultural & Indigenous Affairs
DoHA	Department of Health and Ageing (Australian Government)
ECRHS	European Community Respiratory Health Survey
ED	Emergency Department
EDDC	Emergency Department Data Collection (NSW Health Department)
ETS	Environmental tobacco smoke
GINA	Global Initiative for Asthma
FEV1	Forced expiratory volume in 1 second
GP	General practitioner
GPSCU	General Practice Statistics and Classification Unit
HIC	Health Insurance Commission
HOIST	Health Outcomes and Statistical Toolkit (NSW Health Department)
HRQoL	Health-related quality of life
ICD-9	International Classification of Diseases version 9
ICD-9-CM	International Classification of Diseases version 9, Clinical Modification
ICD-10	International Classification of Diseases version 10
ICD-10-A	MInternational Statistical Classification of Diseases, 10th Revision, Australian Modification
ICPC-2	International Classification of Primary Care
IRSD	Index of Relative Socioeconomic Disadvantage
ISAAC	International Study of Asthma and Allergies in Childhood
ISC	Inpatients Statistics Collection
MBS	Medical Benefits Schedule
NAC	National Asthma Council
NAEPP	National Asthma Education and Prevention Program
NARG	National Asthma Reference Group
NHMD	National Hospital Morbidity Database
NHPA	National Health Priority Area
NHS	National Health Survey
NSW	New South Wales
NT	Northern Territory
PBS	Pharmaceutical Benefits Scheme
PIP	Practice Incentive Program
Qld	Queensland
RPBS	Repatriation Pharmaceutical Benefits Scheme
RRMA	Rural, Remoteness and Metropolitan Areas (classification)
SA	South Australia
SAND	Supplementary Analysis of Nominated Data
SEIFA	Socio-Economic Index for Areas
SF-36	Medical Outcomes Study Short-Form 36
SLA	Statistical Local Area
Tas	Tasmania
VAED	Victorian Admitted Episodes Dataset
VEMD	Victorian Emergency Minimum Dataset
Vic	Victoria
WA	Western Australia
WHO	World Health Organization

Glossary

Aboriginal	A person of Aboriginal descent who identifies as an Aboriginal and is accepted as such by the community in which he or she lives.
Admission	Admission to hospital. In this report, the number of separations has been taken as the number of admissions. Hence, admission rate is the same as separation rate.
Age-specific rate	A rate for a specified age group. The numerator and denominator relate to the same age group. See Appendix 1 (Section A1.1) for full description.
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 considerably with age. The age structures of the different populations are converted to the same 'standard' structure, then the disease rates that would have occurred with that structure are calculated and compared.
Airway hyperresponsiveness	Excessive twitchiness or narrowing of the airways in response to certain stimuli. This is a characteristic feature of asthma.
ARIA/ASGC classification	A classification of the level of accessibility to goods and services (such as general practitioners, hospitals and specialist care) based on the proximity to these services (measured by road distance).
Associated cause of death	Diseases, conditions or injuries that contributed to the death directly or indirectly. Compare with *Underlying cause of death*.
Asthma	A chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular mast cells, eosinophils, T lymphocytes, macrophages, neutrophils and epithelial cells. In susceptible individuals this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. The inflammation also causes increases in existing bronchial hyperresponsiveness to a variety of stimuli. .
Asthma action plan	A plan that provides instructions on how to recognise and respond to worsening asthma. It is recommended that these instructions be given in writing ('written asthma action plan'). The action plan is based on symptoms and/or peak expiratory flow measurements and is individualised according to the pattern of the person's asthma. These plans have sometimes been referred to as 'asthma management plans', 'asthma plans', 'self-management plans', 'asthma care plans' or 'personal asthma plans'.
Asthma expenditure	The component of total health expenditure that is attributable to asthma. Compare with *Total health expenditure*.
Asthma management plan	An individualised plan of management for patients with asthma formulated in accordance with the Six Step Asthma Management Plan. (The asthma action plan forms one part of this.)
Asthma 3+ Visit Plan	An incentive scheme funded by the Australian Government aimed at people with moderate to severe asthma. The plan entails three visits to the GP at which asthma is assessed, an individualised asthma management plan is developed and reviewed, and the patient receives appropriate education about asthma.

Average length of stay	The mean number of days of care for inpatient hospitalisations. Calculated by dividing total patient days in a given period by the total number of hospital separations in that period. See *Patient days, Hospital separation* and *Length of stay*.
BEACH survey	A continuous cross-sectional paper-based data collection, which collects information about the reasons for seeking medical care, the type of patients seen, the types of problems managed and treatment provided in general practice across Australia.
Bronchial challenge tests	A test designed to detect the presence of airway hyperresponsiveness. See *Airway hyperresponsiveness*.
Cause of death	The disease or factor contributing to the death. When used technically this term is usually applied to the 'underlying cause' listed on the medical certificate issued at 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 International Classification of Diseases of the day (currently ICD version 10). See *Underlying cause of death and Associated cause of death*.
Confidence interval	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.
Culturally and linguistically diverse	This term is used to describe the multicultural nature of the Australian population, including those from English-speaking countries and those from countries where English is not spoken as the first language.
Defined daily dose	The assumed average maintenance dose per day for a drug used for its main indication in adults.
English-speaking background	Includes anyone born in Australia, New Zealand, United Kingdom, Ireland, United States of America, Canada or South Africa (DIMIA English proficiency Group 1).
Estimated resident population	An estimate of the resident population derived from the 5-yearly Census counts. It is based on the usual residence of the person.
Health-related quality of life	A term used to describe the impact that a disease has on an individual's health status and everyday functioning. It is most often used when referring to chronic diseases.
Health risk factor	Any factor that represents a greater risk of a health disorder or other unwanted condition. Risk factors may be causes of disease or contributors to disease.
Health service use	Use of the available health care services within the population, including hospitals, emergency departments and general practitioners.
Health survey	A research method in which health information is collected from participants at a point in time. In population health monitoring, this typically involves selecting a representative sample of the population and administering questionnaires to the participants. This can be done in person, over the phone or by post. Some surveys have additionally included physiological measurements.
Hospital separation	The formal process by which a hospital records the completion of treatment and/or care for an admitted patient. The episode of care may be completed by an admitted patient's discharge, death, transfer to another hospital or change in the type of care.

Incidence	The number of new cases (of a disease, condition or event) occurring during a given period. Compare with *Prevalence*.
Indigenous Australians	Refers to people of Indigenous origin who identify themselves as being of Aboriginal or Torres Strait Islander origin.
International Classification of Diseases (ICD)	The World Health Organization's internationally accepted statistical classification of disease and injury. The 10th revision is currently in use. In this report, hospital separations prior to 1998–99 and causes of death prior to 1997 under previous revisions have been reclassified to ICD-10.
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. See also *Average length of stay.*
Mechanical ventilation, invasive	A medical intervention used in situations where patients become unable to breathe by themselves. It involves the use of a positive pressure ventilator to maintain respiration via an endotracheal tube. This intervention is generally administered in hospital intensive care units. See also Mechanical ventilation, non-invasive.
Mechanical ventilation, non-invasive	A medical intervention that is similar to invasive mechanical ventilation (see *Mechanical ventilation, invasive*). However, the ventilator is attached to the patient via a facemask rather than an endotracheal tube.
Morbidity	Refers to ill-health in an individual and to levels of ill-health in a population or group.
Mortality	Death.
Non-English-speaking background	This term is used to describe people who have re-settled in Australia but who come from countries where English is not the primary language spoken. Includes people born in all countries not identified as English-speaking-background countries (equivalent to DIMIA English proficiency Groups 2 to 4). See also *English-speaking-background*.
Outcome (health outcome)	A health-related change due to a preventive or clinical intervention or service. (The intervention may be single or multiple and the outcome may relate to a person, group or population or be partly or wholly due to the intervention.)
Patient days	The total number of days for patients who were admitted to hospital for an episode of care and who separated during a specified reference period. A patient who is admitted and separated on the same day is allocated one patient day. Compare with *Length of stay* and *Average length of stay.*
Prescription drugs	Pharmaceutical drugs available only on the prescription of a registered medical practitioner and only from pharmacies.
Prevalence	The number or proportion of people with certain conditions in a population at a given time. Compare with *Incidence*.
Principal diagnosis	The diagnosis established to be chiefly responsible for occasioning the episode of care or attendance at a health care facility.
Re-admission	An admission to the same or different hospital within a defined period following discharge from a hospital.
Re-attendance	An admission to a hospital or visit to the emergency department within a defined period following discharge from hospital or the emergency department.
Risk factor	See *Health risk factor.*

Rural, Remoteness and Metropolitan Areas	Classification of remoteness used in the BEACH survey. Based on the patients' location of residence.
Same day patient	Admitted patients who are admitted and separated on the same day.
SAND data	Additional questions asked of patients in subsamples of general practice encounters, as part of the BEACH survey.
SEIFA Index of Relative Socioeconomic Disadvantage	An index of socioeconomic status which 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.
Separation	See *Hospital separation*.
SF-36	Short-Form 36, a widely used questionnaire containing 36 questions that measure general health and wellbeing.
Six Step Asthma Management Plan	Consensus-based guidelines for the management of asthma. The six steps are: (1) Assess asthma severity; (2) Achieve best lung function; (3) Maintain best lung function: identify and avoid trigger factors; (4) Maintain best lung function: optimise medication program; (5) Develop an action plan; and (6) Educate and review regularly.
Spirometer/spirometry	Spirometry is a measure of lung function performed by a spirometer. Spirometry is used to establish the presence of airflow obstruction and its reversibility in response to bronchodilator, which is an important feature in the diagnosis of asthma.
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 to chance alone. A statistical result is often said to be 'significant' if it would occur by chance only once in twenty times or less often.
Total health expenditure	The sum of health expenditure for all health conditions (i.e. allocated recurrent health expenditure). This excludes expenditure that cannot be allocated to a specific disease (e.g. ambulance services) and capital expenditure (non-recurrent).
Underlying cause of death	The disease or condition considered to be most directly responsible for the death. Compare with *Associated cause of death*.
Wheeze	Breathing difficulty accompanied by an audible whistling sound.

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