Asthma in Australia

2003

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ACAM
Australian Centre for Asthma Monitoring

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Foreword

The prevalence of asthma in Australia is amongst the highest in the world. In recognition of the resultant health and economic burden, Australian Health Ministers declared asthma as the sixth National Health Priority Area in 1999. Implicit in this action was the confidence that a strategic and systematic approach to the diagnosis and management of asthma will result in improved health outcomes.

There is little doubt that the introduction of more effective drugs, together with development of the world's first asthma management plan, has enabled many more patients with asthma to lead normal lives as well as reduced asthma associated mortality. A coordinated awareness campaign, aimed at the public and health professionals undertaken by the National Asthma Council, has also contributed significantly to reducing the burden of asthma.

The effectiveness of various asthma management strategies, however, can be vastly improved if they are based on good knowledge and evidence base. We need to track the prevalence of asthma in Australian communities in order to identify potential risk and protective factors. In particular, it is important to understand the effects of age, gender, race, economic status and cultural differences on its prevalence. To appropriately target future interventions, we also need to study the impact of previous interventions and evaluate their effectiveness.

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, has put together this most complete record of asthma statistics in Australia. They have accessed a wide range of administrative and research collections, held by Federal and State agencies as well as other learned bodies and industry, for data included in this report. In the process, several irksome asthma-related data issues, including some that are highly controversial, have been resolved. However, there remain a variety of data issues that should be addressed over the coming years.

This first, baseline report is not only an outstanding resource document on asthma in Australia but also makes compelling reading for anyone interested in the subject. It points to both the strengths and weaknesses in our current asthma programs, potentially fruitful areas of intervention, as well as raises many questions for further research. The challenge now is to develop the means to regularly update the vast amount of information contained therein.

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Highlights

Asthma is an important health problem in Australia. This report brings together data from a wide range of sources to describe the status of asthma in Australia in 2003 and provides information on the number of people who have asthma, who receive various treatments for asthma, who have written asthma action plans, and who visit their GP, are hospitalised or die due to asthma. The report shows differences in these measures between Indigenous and non-Indigenous Australians (where data are available), men and women, younger and older people, those who are well-off and those less well-off, people living in major cities, regional centres and the bush. Changes over time and differences between Australia and some other countries are also reported.

Prevalence

- Recent surveys show that 14 to 16% of children and 10 to 12% of adults have a diagnosis of asthma that remains a current problem. A higher proportion (20 to 30%) say that they have had wheezing in the last year.
- There was an increase in the proportion of children with asthma in the 1980s and early 1990s. It is not clear whether there has been any change since that time.
- The prevalence of asthma in Australia is high by international standards.
- More boys than girls have asthma. However, after teenage years, asthma is more common in women than in men.
- The prevalence of asthma, reported as a long-term condition, is higher among Indigenous Australian adults than among non-Indigenous Australian adults. The excess prevalence increases with increasing age and is greater in females than in males.
- Those living in the most socioeconomically disadvantaged localities do not have a substantially different prevalence of asthma compared with those in less disadvantaged areas.
- Overall, the prevalence of asthma does not differ substantially between major cities, inner regional areas and outer regional and remote areas.
- A number of different methods have been used to count the number of cases of asthma in the population. The results obtained using different methods cannot be compared with one another easily.

Quality of life, severity and disability

- In a major Australian survey, people with asthma rated their health lower than people without asthma.
- Females with asthma rated their health lower than males with asthma.
- A greater proportion of people with asthma reported having days away from work or study over a 2 week period (11.4%) than people without asthma (7.9%).
- Of all people with asthma, 2.6% reported taking days away from work or study and 3.2% reported other days of reduced activity, which they attributed to asthma, in the 2 weeks preceding the 2001 National Health Survey.
- Approximately one-third to one-half of adults with asthma have moderate or severe disease.
- There is a higher prevalence of depression in people with asthma compared to people without asthma.

Mortality

- There was an increase in the number of deaths from asthma during the 1980s. Since 1989 there has been a decline in the number of deaths from asthma.
- The risk of dying from asthma increases with age. The majority of deaths occur in people aged 65 years and over.
- People who live in rural and remote areas or in more disadvantaged areas are more likely to die from asthma than people in cities and large towns or in less disadvantaged areas. These differences are similar to those seen for deaths due to other causes.
- People with asthma who were born overseas and do not speak English as a first language have a higher risk of death from asthma.
- Older people with asthma have an increased risk of dying from asthma during winter.

Smoking in people with asthma

- The 2001 National Health Survey found that the proportion of smokers among people with asthma was higher than the proportion of smokers among people without asthma.

- The highest proportion of current smokers among people with asthma was in the 18 to 34 years age group and the proportion decreased as age increased.
- 40.5% of males aged 18 to 24 years with asthma were current smokers, compared to 31.0% of females with asthma in the same age group.
- The proportion of smokers increased as socioeconomic disadvantage increased.
- Young males, aged 18 to 34 years, living in the most disadvantaged areas were the most likely to smoke. In this group there were more smokers with asthma (68.3%) than without asthma (42.1%).

Passive smoke exposure in children with asthma

- The 2001 National Health Survey found that among children with asthma, 41.9% of boys and 38.9% of girls reported living with one or more regular smokers.
- More boys with asthma (41.9%) than boys without asthma (36.7%) had one or more regular smokers in their household.
- Children with asthma from areas of greater relative socioeconomic disadvantage were more likely to be living with a regular smoker.
- More children with asthma (60.1%) than without asthma (49.1%) who were living in areas of greater relative socioeconomic disadvantage had one or more regular smokers in their household.

Asthma-related general practice encounters

- During the period 1998–99 to 2001–02, the average rate of general practice encounters at which asthma was managed was 16 per 100 population per year. This represents 3.0% of all general practice encounters over that period.
- Boys aged 0 to 4 years had the highest rate of asthma-related general practice encounters.
- The rate of general practice encounters for asthma has declined over the last 4 years, particularly in children aged 0 to 4 years.
- Seasonal fluctuations in the annual rate of asthma-related general practice encounters are consistent with the seasonal fluctuations in hospitalisations and Emergency Department attendance rates for asthma.

Asthma action plans

- Written instructions on how to recognise when asthma is getting worse, and what action to take when it does, can help many people control their asthma and stay out of hospital. These instructions are known as asthma action plans.
- Most people with asthma do not have asthma action plans. 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 asthma action plans has actually decreased during the period 1995 to 2001 (at least in South Australia, the only state where this has been monitored).
- Young adults, adult men, and persons living in outer regional and remote areas and in less well-off areas are least likely to have a written asthma action plan.

Medication use

- The most common type of asthma medication used in all age groups is reliever medication (short-acting beta agonists).
- Most reliever medication is given by puffers (metered dose inhalers) but a large amount (approximately one-quarter) is supplied for use in nebulisers.
- Although inhaled corticosteroids are the second most commonly used asthma drug, there is evidence that not all people who should use them are doing so.
- Inhaled corticosteroids, commonly known as preventer medications, are used more often by older people with asthma than by younger people.

Spirometry

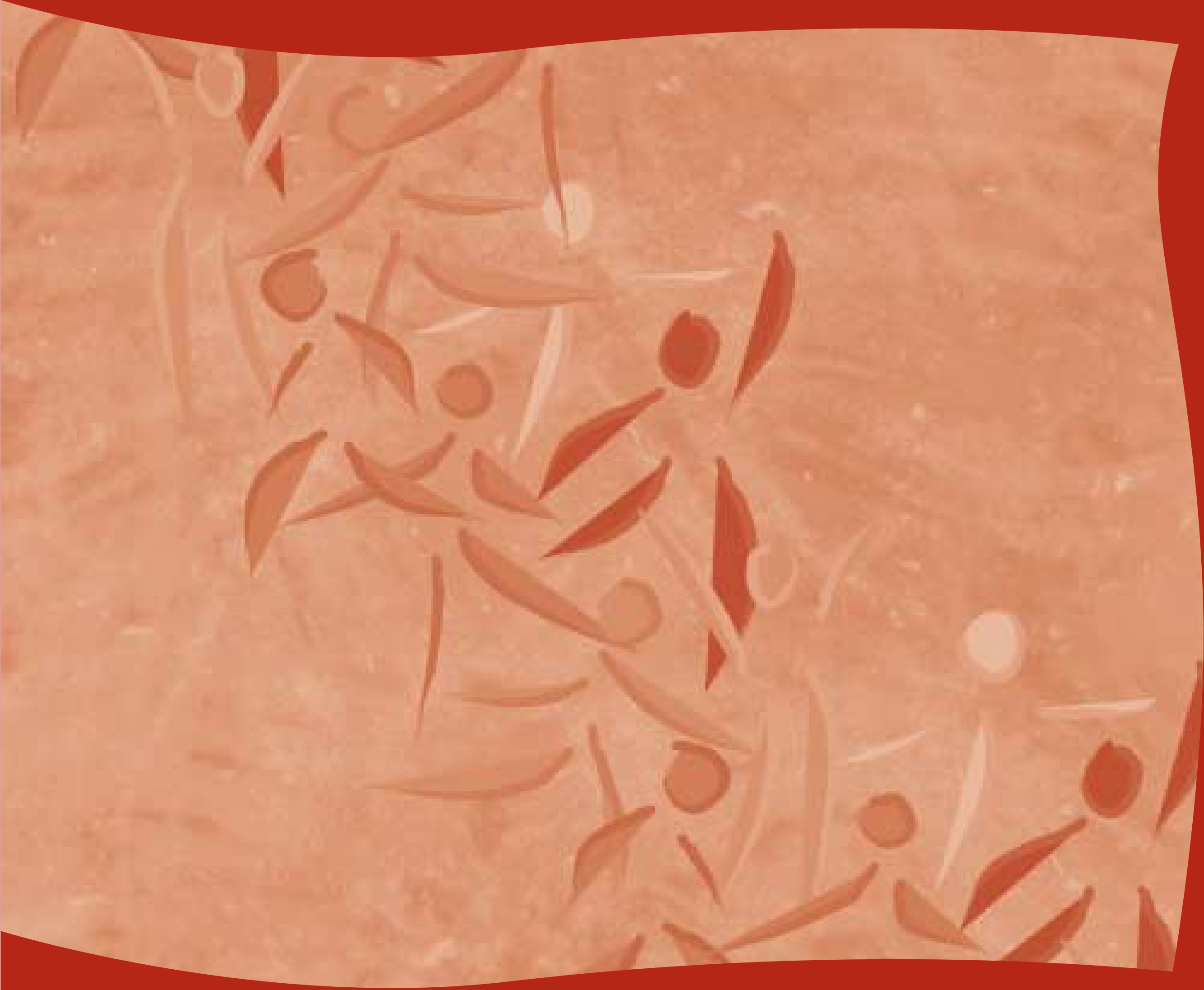
- Spirometry is a breathing test used to help diagnose and monitor asthma and other lung diseases.
- During the 1990s, there was little apparent change in the use of spirometry.
- There is a lot of variation between the states in the number of claims for performing spirometry. The reasons for this variation are not known.

Attendance at hospital Emergency Departments

- Children aged 0 to 4 years are the most likely age group to attend an Emergency Department for asthma.
- Boys are more likely to attend an Emergency Department for asthma than girls. This is reversed in adulthood when females attend more than males.
- People aged 65 years and over and children aged 0 to 4 years are most likely to be admitted to hospital following attendance at an Emergency Department.

Hospitalisations

- Children, particularly, those aged less than 5 years, have higher rates of hospitalisation for asthma than adults.
- The rate of hospitalisation for asthma among children has decreased since 1993. However, there has been little change in the hospitalisation rate among adults over the same period.
- Among people aged 65 years and over, rates of hospital admission 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 than girls, in keeping with the higher prevalence of asthma in boys. However, this trend is reversed after the age of 15 years where more females than males are admitted to hospital for asthma.
- Among people aged 35 years and over, rates of hospital admission for asthma are higher in people living in more remote areas.
- Indigenous Australians have higher rates of hospitalisation for asthma in all age groups except children aged 5 to 14 years, where the rates are very similar.
- Rates of hospital admission for asthma are higher among people living in areas that are comparatively more disadvantaged socioeconomically.



1 Introduction

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 chronic inflammation of the air passages, which also tend to over-react by narrowing too often and too much in response to triggers such as exercise and exposure to pollens and other factors.
- The symptoms of asthma are usually reversible, either spontaneously or with treatment. Since the degree of airway narrowing and obstruction varies with the condition and treatment, the symptoms can also vary from being absent, to low grade or occasional problems through to severe or persistent.
- 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.
- The National Asthma Council (formerly National Asthma Campaign) was launched in 1990, after a few years of activity, to improve community awareness of asthma and improve the management of asthma.
- In 1999 asthma was made a National Health Priority Area. This has resulted in a number of government-funded activities and projects to improve asthma management and care.
- This report describes information on the number of people who have asthma, who receive various treatments for asthma, who have written asthma action plans, and who visit their GP, are hospitalised or die due to asthma.
- The report shows differences in these measures between Indigenous and non-Indigenous Australians (where data are available), men and women, younger and older people, those who are well-off and those less well-off, people living in major cities, regional centres and the bush. Changes over time and differences between Australia and some other countries are also reported.

This report describes the status of asthma in Australia in 2003. The report has incorporated data from a wide range of sources. It aims to provide health professionals, health planners and policy officers, academics, consumers and interested readers with concise summaries of the latest available data and trends for asthma in Australia.

In this introductory chapter, we first describe the background to the development of the report and the context in which it has arisen. We then give an overview of the scope of the report and an outline of each section. Finally, we briefly describe the nature of asthma and refer to some of the difficulties inherent in measuring the disease in populations.

Background and context

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).

National Asthma Campaign

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). The NAC, since renamed the National Asthma Council Australia and now including the Australasian Society of Clinical Immunology and Allergy, has continued to play a major role in professional and community education about asthma and in policy development (Boston Consulting Group 1992; Coughlan et al. 1999; DoHA 2003; NAC 1999; National Asthma Campaign 1994, 1996, 1999).

During the 1990s it became clear that the NAC's National Asthma Strategy Goals and Targets could not be implemented without Federal 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.

State and territory asthma programs

Concurrently with the activities of the NAC, some state and territory health authorities 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.

Asthma as a National Health Priority Area

In recognition of the size of the burden of disease across many community sectors, the potential for benefit with proven effective strategies and the existing stakeholder commitment and cooperation, the Australian Health Ministers and the Commonwealth Government announced in 1999 that asthma was to be a National Health Priority Area (NHPA). Following this decision a range of initiatives were put in place (DoHA: Li et al. 2002). A National Asthma Action Plan 1999–2003 was developed to provide a framework for action and a National Asthma Reference Group was established to provide expert advice on key asthma issues. Specific initiatives included an incentive program for general practitioners, the Asthma 3+ Visit Plan, which promotes a structured approach to asthma care. A number of other initiatives affecting asthma care in the community, in schools and among specific high-risk sectors of the population have also been implemented.

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 Commonwealth 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:

- advising on the development of national indicators for asthma. After consultations with stakeholders and a review of available data sources, an initial report and recommendations have been published (Baker et al. 2003); and
- producing this report on the status of asthma in Australia in 2003. Using the recommended national asthma indicator set as a basis, it reports available data on population-based disease levels, aspects of disease impact, risk factors, management and care and service utilisation.

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. Future reports will include recommendations for the measurement of new indicators and more detailed analyses of data as they become available.

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 it. 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 define the disease in terms of the underlying chronic abnormality rather than its intermittent or episodic manifestations.

The descriptive 'definition' of asthma shown in Box 1 has been adopted by several international expert bodies since 1997 (DoHA: Li et al. 2002; GINA 2002; NAC 2002).

Box 1: A definition of asthma

'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.'

Source: 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.

An early distinction between intrinsic (non-allergic) and extrinsic (allergic) asthma found acceptance in the International Classification of Disease. However, this distinction is now rarely applied since it has been shown that the two types share many of the same pathological features.

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.

Approach for this report

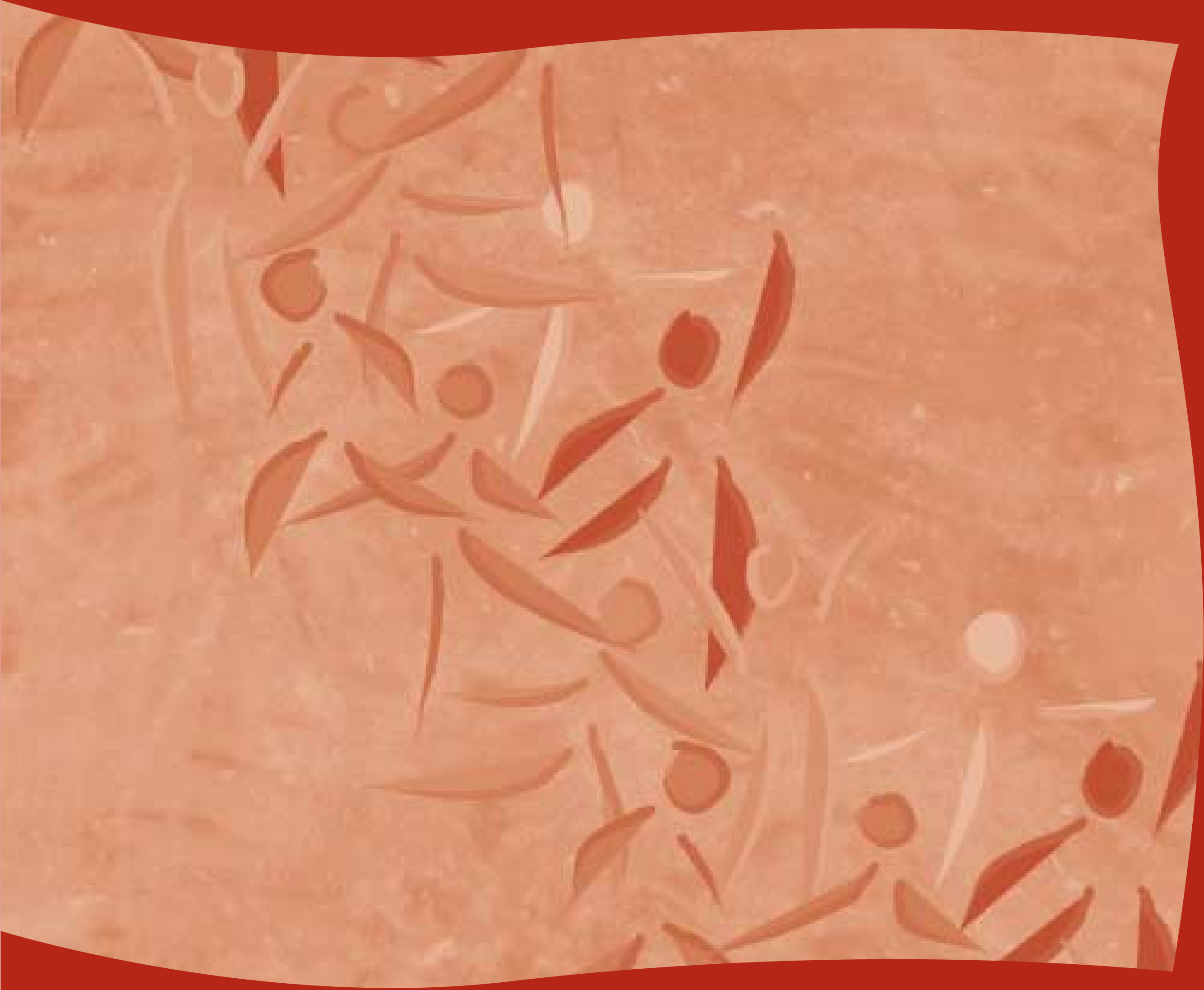
The complexity that underlies the entity commonly known as 'asthma' poses major problems in identifying a single surveillance definition for the disease. In the future, it is hoped that improved understanding of the nature of asthma, together with the evolution of data monitoring systems, will mean that 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 2003.

Outline of this report

As mentioned above, 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. 2003). It includes data on disease prevalence (Chapter 2), impacts, including severity, quality of life and disability, and mortality (Chapter 3), exposure to smoking and environmental tobacco smoke among people with asthma (Chapter 4), and disease management including health service utilisation, the application of asthma action plans, use of pharmaceuticals, and measurement of lung function (Chapter 5).

The report describes recent time trends and seasonal patterns in these indicators and, where data are available, examines differences between age groups, between sexes, 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 methods is included in Appendix 1, and Appendix 2 includes statistical data tables for all the indicators ACAM has recommended as sufficiently developed to consider for inclusion in the National Health Data Dictionary. A full description of the data sources used and some of their limitations can be found in the report *Technical Review and Documentation of Proposed NHPA Asthma Indicators and Data Sources* (Baker et al. 2003), available from <www.asthmamonitoring.org>.



2 Prevalence

Key points

- Recent surveys show that 14 to 16% of children and 10 to 12% of adults have a diagnosis of asthma that remains a current problem. A higher proportion (20 to 30%) say that they have had wheezing in the last year.
- There was an increase in the proportion of children with asthma in the 1980s and early 1990s. It is not clear whether there has been any change since that time.
- The prevalence of asthma in Australia is high by international standards.
- More boys than girls have asthma. However, after teenage years, asthma is more common in women than in men.
- The prevalence of asthma, reported as a long-term condition, is higher among Indigenous Australian adults than among non-Indigenous Australian adults. The excess prevalence increases with increasing age and is greater in females than in males.
- Those living in the most socioeconomically disadvantaged localities do not have a substantially different prevalence of asthma compared with those in less disadvantaged areas.
- Overall, the prevalence of asthma does not differ substantially between major cities, inner regional areas and outer regional and remote areas.
- A number of different methods have been used to count the number of cases of asthma in the population. The results obtained using different methods cannot be compared with one another easily.

Introduction

There is much public interest in the widespread reports that asthma is becoming more common, particularly in Western nations (Burney 2002; Peat et al. 1994; Robertson et al. 1991). However, the lack of a universally applied definition for asthma makes it difficult to interpret the reported increases and variations in prevalence. Asthma prevalence 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), 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 use of bronchial provocation challenge tests and bronchodilator reversibility tests (Kim et al. 1997) and measurement of 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 below, the observed variation in the prevalence of asthma owes more to the differences in definitions than to real variation.

Confident conclusions about time trends in the prevalence of asthma in Australia 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 (among those listed above).
- 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.

Although the problem of asthma has been studied extensively in Australia, at present these criteria have not been met. Hence, it is not possible to draw confident conclusions about trends in the prevalence of asthma in Australia at this stage.

Over the last decade the prevalence of asthma in Australia has been measured in a range of population health surveys including the 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 1998b; Robertson et al. 1998), and there are results from studies of local populations (Haby et al. 2001; Peat et al. 1994).

The findings from these and other Australian studies are reported in this chapter. Other results reported in this chapter are from the 2001 National Health Survey.

Prevalence of asthma

The prevalence of various conditions related to asthma has been reported in a number of population-based studies conducted in children and adults in Australia (Tables 2.1 and 2.2). The studies cited here are limited to those conducted in the past 10 years, except where earlier studies form part of a time series extending into the past decade. Studies are presented for children (Table 2.1) and adults (Table 2.2) and are grouped by the definition used in the study.

It can be seen from the tabulated data that prevalence of 'asthma' varies between age groups and, particularly, between the various definitions and survey methods cited. Several recent estimates are worth highlighting. The National Health Survey is the only nationally representative, household survey in which asthma prevalence has been measured. In the most recent survey, conducted in 2001, respondents were asked if they had been diagnosed with asthma and, if so, if they still had asthma. Overall, 11.6% of Australians responded positively to this pair of questions, including 13.9% of children aged 0 to 17 years, and 10.8% of adults aged 18 years and over (ABS 2002b). Surveys conducted among adults in Western Australia (1995), New South Wales (1997–98) and Queensland (2000), and among children in New South Wales in 2001, used an alternative means of identifying people who currently had asthma. They found that in adults 9%, 10.1%, 10.6%, respectively, and in children 15.7%, stated that they had been diagnosed with asthma and they either had symptoms of asthma and/or had taken treatment for asthma in the preceding year. Finally, there is some evidence to suggest that the combination of recent wheeze and airway hyperresponsiveness, an abnormal twitchiness of the airways detected by special tests, identifies a population with more troublesome features of asthma. The prevalence of this syndrome among children in the Belmont area of coastal New South Wales was 11.3% in 2002.

Wheeze is a prominent symptom of asthma and may indicate undiagnosed asthma. However, it is also a common result of viral respiratory tract infections in some predisposed children and a feature of chronic obstructive pulmonary disease in older adults. The prevalence of wheeze in children is substantially higher than the prevalence of asthma, measured in the manner described above (Table 2.1). The extent to which this higher prevalence of wheeze represents undiagnosed asthma, as opposed to non-asthma, viral-associated wheeze, cannot be ascertained from the available data.

Table 2.1:
Prevalence of asthma in children, Australia, 1982–2002

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Ever doctor diagnosed asthma						
2 to 12 years	All NSW (n=7,916)	2001	26.4%	(25.4–27.4%)		Centre for Epidemiology and Research 2002
8 to 11 years	Sydney, NSW (n=654)	1996	28.0%	(24.6–31.4%)		Faniran et al. 1999
0 to 12 years	All WA (n=996)	2001	19.7%	(17.2–23.3%)		Daley & Roberts 2002
0 to 5 years	Perth, WA (n=846)	1995	18%	(15.5–20.8%)	Attending childcare and family day care	Slack-Smith et al. 2002
4 to 5 years	Perth, WA	1995	26%		Sub group of the above	Slack-Smith et al. 2002
6 years	Perth, WA (n=2,187)	1995–98	31%	(29.1–33.0%)	Follow-up of birth cohort	Oddy 2000
3 to 5 years	Lismore, NSW (n=383)	1995	30.0%	(25.5–34.9%)		Haby et al. 2001
3 to 5 years	Wagga Wagga, NSW (n=591)	1995	27.3%	(23.7–31%)		Haby et al. 2001
5 to 12 years	Eastern Australia (n=10,106)	1993	17.5%	(16.8–18.3%)	NAC study 2	Comino et al. 1996
5 to 12 years	Eastern Australia (n=8,746)	1990	17.2%	(16.4–18.0%)	NAC study 1	Comino et al. 1996
8 to 10 years	Wagga Wagga, NSW (n=769)	1982	12.9%	(10.7–15.5%)		Downs et al. 2001a; Peat et al. 1994
8 to 11 years	Wagga Wagga, NSW (n=850)	1992	30.5%	(27.4–33.7%)	29.7% in 8 to 10 year olds (n=795)	Downs et al. 2001a; Peat et al. 1994
8 to 11 years	Wagga Wagga, NSW (n=1,016)	1997	38.6%	(35.5–41.7%)		Downs et al. 2001a
8 to 10 years	Belmont, NSW (n=718)	1982	9.1%	(7.1–11.5%)		Peat et al. 1994
8 to 11 years	Belmont, NSW (n=907)	1992	38.3%	(35.1–41.6%)		Peat et al. 1994; Toelle et al. 2003
8 to 11 years	Belmont, NSW (n=804)	2002	31.0%	(27.8–34.3%)		Toelle et al. 2003
Ever had asthma						
5 to 6 years (school entry)	ACT (n=4,539)	1999	24.4%	(23.2–25.7%)	New primary school entrants	Glasgow et al. 2001
7 years	Tasmania (n=6,378)	1995	32.4%	(31.2–33.6%)	Core questions from ISAAC study	Ponsonby et al. 2000
6 to 7 years	Perth, WA (n=2,193)	1994	28.4%	(26.5–30.4%)	ISAAC protocol	Robertson et al. 1998
6 to 7 years	Melbourne, Vic (n=2,843)	1993	28.6%	(26.9–30.3%)	ISAAC protocol	Robertson et al. 1998
6 to 7 years	Sydney, NSW (n=2,807)	1993	24.4%	(22.8–26.0%)	ISAAC protocol	Robertson et al. 1998
6 to 7 years	Adelaide, SA (n=3,071)	1993	27.4%	(25.8–29.0%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Perth, WA (n=3,650)	1994	30.2%	(28.7–31.7%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Melbourne, Vic (n=2,759)	1993	26.6%	(25.0–28.3%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Sydney, NSW (n=2,841)	1993	24.9%	(23.3–26.5%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Adelaide, SA (n=3,030)	1993	30.4%	(28.8–32.1%)	ISAAC protocol	Robertson et al. 1998

(continued)

Table 2.1 (continued): Prevalence of asthma in children, Australia, 1982–2002

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Current asthma: ever doctor diagnosed asthma AND symptoms of asthma or taken treatment for asthma in last 12 months						
2 to 12 years	All NSW (n=8,500)	2001	15.7%	(14.7–16.8%)		Centre for Epidemiology and Research 2002
Current asthma: ever doctor diagnosed asthma AND 'yes' to 'do you still have asthma'?						
0 to 17 years	Australia	2001	13.9%	(13.9–14.0%)		ABS 2002b
Current asthma: ever doctor diagnosed asthma AND wheezed in the last 12 months						
3 to 5 years	Lismore, NSW (n=383)	1995	30.8%	(26.3–35.7%)		Haby et al. 2001
3 to 5 years	Wagga Wagga, NSW (n=591)	1995	28.8%	(25.2–32.7%)		Haby et al. 2001
Current wheeze: history of wheeze or whistling in the chest over the past 12 months						
5 years	All ACT (n=4,539)	1999	15.7%	(14.7–16.8%)	Primary school entrants	Glasgow et al. 2001
6 years	Perth, WA (n=2,187)	1995–98	22%	(20.3–23.8%)	Follow-up of birth cohort	Oddy 2000
7 years	All Tasmania (n=6,378)	1995	25.8%	(24.7–26.9%)	ISAAC protocol	Ponsonby et al. 2000
6 to 7 years	Perth, WA (n=2,193)	1994	22.1%	(20.4–23.9%)	ISAAC protocol	Robertson et al. 1998
6 to 7 years	Melbourne, Vic (n=2,843)	1993	27.2%	(25.6–28.9%)	ISAAC protocol	Robertson et al. 1998
6 to 7 years	Sydney, NSW (n=2,807)	1993	22.3%	(20.8–23.9%)	ISAAC protocol	Robertson et al. 1998
6 to 7 years	Adelaide, SA (n=3,071)	1993	26.2%	(24.7–27.8%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Perth, WA (n=3,650)	1994	31.4%	(29.9–32.9%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Melbourne, Vic (n=2,759)	1993	27.3%	(25.7–29.0%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Sydney, NSW (n=2,841)	1993	24.5%	(22.9–26.1%)	ISAAC protocol	Robertson et al. 1998
13 to 14 years	Adelaide, SA (n=3,030)	1993	33.5%	(31.8–35.2%)	ISAAC protocol	Robertson et al. 1998
5 to 12 years	Eastern Australia (n=8,746)	1990	19.5%	(18.7–20.3%)	First NAC study	Comino et al. 1996
5 to 12 years	Eastern Australia (n=10,106)	1993	21.2%	(20.4–22.0%)	Second NAC study	Comino et al. 1996
8 to 10 years	Wagga Wagga, NSW (n=769)	1982	15.5%	(13.1–18.3%)		Peat et al. 1994
8 to 11 years	Wagga Wagga, NSW (n=850)	1992	22.1%	(19.4–25.1%)	23.1% in 8–10 year olds (n=795)	Downs et al. 2001a; Peat et al. 1994
8 to 11 years	Wagga Wagga, NSW (n=1,016)	1997	27.2%	(18.4–39.7%)		Downs et al. 2001a
8 to 10 years	Belmont, NSW (n=718)	1982	10.4%	(8.3–12.9%)		Peat et al. 1994
8 to 11 years	Belmont, NSW (n=907)	1992	28.6%	(25.7–31.7%)	27.6% among 8–10 year olds	Peat et al. 1994; Toelle et al. 2003
8 to 11 years	Belmont, NSW (n=795)	2002	23.7%	(20.8–26.8%)		Toelle et al. 2003
Wheezing or asthma attack in the last 12 months						
13 to 19 years	Melbourne, Vic (n=9,794)	1995	18.9%	(18.0–19.9%)		Powell et al. 1999

(continued)

Table 2.1 (continued):
Prevalence of asthma in children, Australia, 1982–2002

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Probable asthma: 3 or more episodes of wheeze in last 12 months, cough at night at least once a week in last 12 months, or diagnosis of asthma						
5 to 12 years	Eastern Australia (n=8,746)	1990	20.7%	(19.9–21.6%)	NAC study	Comino et al. 1996
5 to 12 years	Eastern Australia (n=10,106)	1993	23.2%	(22.4–24.0%)	NAC study	Comino et al. 1996
Does (name) have any long-term conditions that have lasted or will last 6 months or more? If yes, which of these (asthma in a list of conditions)?						
0 to 14 years	Port Adelaide, SA (n=388)	1995	18.8%	(15.1–23.1%)		Pilotto et al. 1999
< 5 years	Port Adelaide, SA (n=128)	1995	6.9%	(3.4–13.1%)		Pilotto et al. 1999
5 to 14 years	Port Adelaide, SA (n=260)	1995	24.6%	(19.6–30.4%)		Pilotto et al. 1999
Wheeze in last 12 months and airway hyperresponsiveness						
8 to 10 years	Wagga Wagga, NSW (n=769)	1982	6.6%	(5.0–8.7%)		Peat et al. 1994
8 to 11 years	Wagga Wagga, NSW (n=850)	1992	9.5%	(7.5–11.5%)	9.4% in 8 to 10 year olds (n=795)	Peat et al. 1994
8 to 10 years	Belmont NSW (n=718)	1982	4.5%	(3.2–6.4%)		Peat et al. 1994
8 to 11 years	Belmont NSW (n=926)	1992	12.4%	(10.3–14.8%)	12% in 8 to 10 year olds (n=873)	Peat et al. 1994; Toelle et al. 2003
8 to 11 years	Belmont NSW (n=549)	2002	11.3%	(8.8–14.3%)		Toelle et al. 2003

Table 2.2:
Prevalence of asthma in adults, Australia, 1990–2001

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Ever doctor diagnosed asthma						
18 years and over	All Vic (n=7,494)	2001	22%	(21.1–23.0%)		Rural and Regional Health and Aged Care Services Division 2002
18 years and over	All Qld (n=1,625)	2000	21.4%	(19.4–23.5%)		Epidemiology Services Unit 2002
18 years and over	All NT (n=2,500)	2000	16.8%	(15.4–18.4%)		D'Espaignet et al. 2002
16 years and over	All NSW (n=35,025)	1997–98	16.6%	(16.1–17.2%)		Public Health Division 2001
20 to 44 years	Melbourne, Vic (n=3,194)	1998	18%	(17–20%)	ECRHS methodology	Woods et al. 2001
Parents of primary school children	Eastern Australia (n=16,844)	1998	8.8%	(8.4–9.2%)		Gibson et al. 2000
Parents of primary school children	Eastern Australia (n=13,991)	1993	7.2%	(6.8 –7.6%)		Comino et al. 1996
Parents of primary school children	Eastern Australia (n=13,086)	1990	7.1%	(6.7–7.6%)		Comino et al. 1996
15 years and over	All SA (n=3,001)	1995	18.6%	(17.2–20.0%)		Beilby et al. 1997
15 years and over	All SA (n=3,019)	1992	15.7%	(14.4–17.1%)		Wakefield et al. 1995

(continued)

Table 2.2 (continued):
Prevalence of asthma in adults, Australia, 1990–2001

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
18 years and over	Melbourne, Vic (n=3,095)	1990	13%	(11–14%)		Abramson et al. 1992
20 to 44 years	Riverina, NSW (n=3,106)		24%	(22.5–25.5%)	ECRHS methodology	Woods et al. 2000
Current asthma: ever doctor diagnosed asthma AND symptoms of asthma or taken treatment for asthma in last 12 months						
18 years and over	All Qld (n=1,625)	2000	10.6%	(9.2–12.2%)		Epidemiology Services Unit 2002
18 years and over	Australia	2001	10.8%			ABS 2002b
16 years and over	All NSW (n=35,025)	1997 and 1998	10.1%	(9.7–10.5%)		Public Health Division 2001
Current asthma: ever doctor diagnosed asthma plus 'yes' to 'do you still have asthma'?						
18 years and over	All Vic (n=7,494)	2001	12.3%	(11.6–13.1%)		Rural and Regional Health and Aged Care Services Division 2002
18 years and over	All SA (n=3,000)	2001	8.9%	(7.9–10.0%)	Follow-up to the above: Population health survey to monitor trends in physical activity levels	Gill et al. 2001
18 years and over	Rural WA	2000	9.4% males, 12.2% females			Daley et al. 2001
18 years and over	Perth, WA	2000	8.7% males, 11.7% females			Daley et al. 2001
18 years and over	All NT (n=2,500)	2000	9.8%	(8.7–11.1%)		D'Espaignet et al. 2002
15 years and over	All SA (n=3,037)	2001	12.8%	(11.6–14.1%)	SA Omnibus studies	Wilson et al. 2003
15 years and over	All SA (n=3,027)	2000	12.2%	(11.7–14.1%)		Wilson et al. 2003
15 years and over	All SA (n=3,013)	1999	11.8%	(10.7–13.0%)		Wilson et al. 2003
15 years and over	All SA (n=3,010)	1998	11.5%	(10.4–12.8%)		Wilson et al. 2002
15 years and over	All SA (n=3,019)	1997	12.2%	(11.1–13.6%)		Wilson et al. 2002
15 years and over	All SA (n=3,010)	1996	11.6%	(10.5–12.9%)		Wilson et al. 2002
15 years and over	All SA (n=3,017)	1995	11.4%	(10.3–12.7%)	SA Omnibus studies (continued)	Wilson et al. 2002
15 years and over	All SA (n=3,101)	1994	9.5%	(8.5–10.7%)		Wilson et al. 2002
15 years and over	All SA (n=3,004)	1993	10.2%	(9.1–11.4%)		Wilson et al. 2002
15 years and over	All SA (n=3,109)	1992	9.3%	(8.2–10.4%)		Wilson et al. 2002
15 years and over	All SA (n=2,559)	1990	8%	(7.0–9.1%)		Wilson et al. 2003
Ever doctor diagnosed asthma and nocturnal dyspnoea or current asthma or use of asthma medication						
18 years and over	NW Adelaide, SA (n=2,523)	2000	11.6%	(10.4–12.9%)		Department of Human Services 2002

(continued)

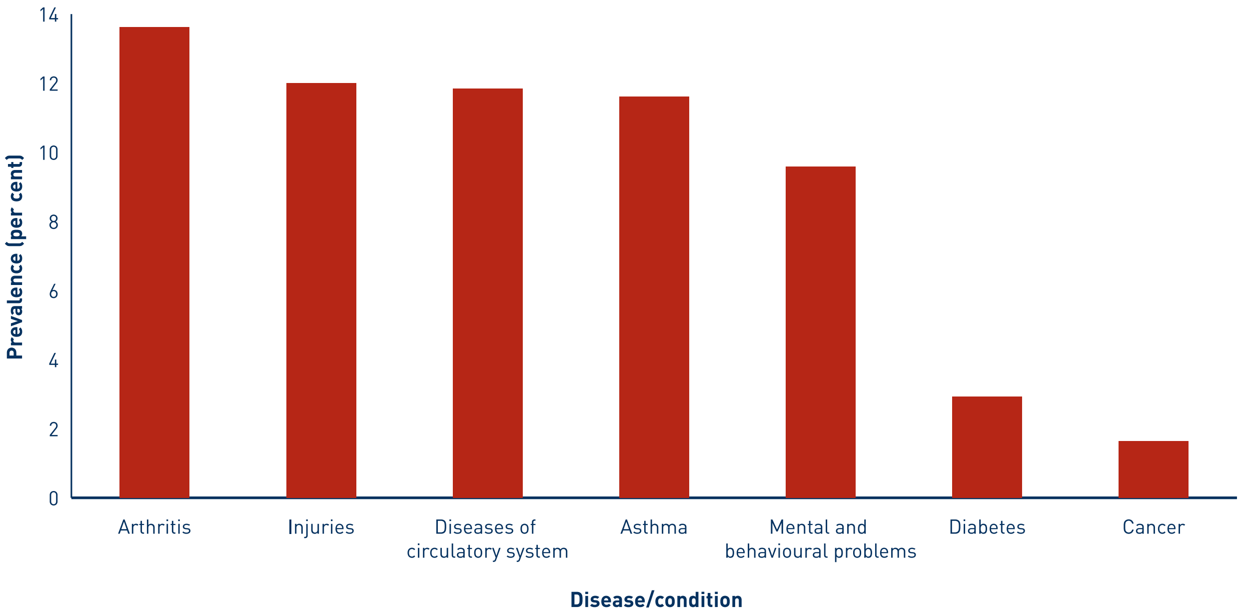
Table 2.2 (continued):
Prevalence of asthma in adults, Australia, 1990–2001

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Ever doctor diagnosed asthma and wheeze in the last 12 months						
Adults (parents of children in the same study)	Eastern Australia (n=16,844)	1998	20.2%	(19.6–20.8%)	NAC study	Gibson et al. 2000
Adults (parents of children in the same study)	Eastern Australia (n=13,999)	1993	18.1%	(17.5–18.8%)	NAC study	Comino et al. 1996
Adults (parents of children in the same study)	Eastern Australia (n=13,086)	1990	19.1%	(18.4–19.8%)	NAC study	Comino et al. 1996
Wheeze in the last 12 months						
20 to 44 years	Melbourne, Vic (n=3,194)	1998	26%	(24–28%)	ECRHS methodology	Woods et al. 2001
20 to 44 years (n=3,200)	Melbourne, Vic	1992	28.1%	(26.5–29.7%)	ECRHS methodology	Abramson et al. 1996
18 years and over	Melbourne, Vic (n=3,095)	1990	22%	(20–23%)		Abramson et al. 1992
Asthma attack (current asthma) in the last 12 months						
20 to 44 years	Melbourne, Vic (n=3,194)	1998	9%	(8–10%)	ECRHS methodology	Woods et al. 2001
20 to 44 years	Melbourne, Vic (n=3,200)	1992	9.7%	(8.6–10.7%)	ECRHS methodology	Abramson et al. 1996
Ever doctor diagnosed asthma AND 'yes' to 'have you had asthma in last 12 months?'						
18 to 74 years	All Tas (n=25,000)	1998	9.6%	(9.2–10.0%)		Health and Wellbeing Outcomes Unit 1999
Do you have any long-term conditions that have lasted or will last 6 months or more? If yes, which of these (asthma in a list of conditions)?						
All ages (adults and children)	Australia (n=53,828)	1995	11.3%	(11.0–11.6%)	National Health Survey	ABS 1998a
15 years and over	All WA (n=10,000)	1995	9.2%	(8.3-9.8%)	WA Health Survey	Health Department WA 1996
15 years and over	Port Adelaide, SA (n=1558)	1995	10.7%	(9.2–12.4%)		Pilotto et al. 1999
15 to 24 years	Port Adelaide, SA (n=186)	1995	16.2%	(11.3–22.3%)		Pilotto et al. 1999
25 to 44 years	Port Adelaide, SA (n=577)	1995	11.7%	(9.2–14.7%)		Pilotto et al. 1999
45 to 64 years	Port Adelaide, SA (n=441)	1995	9.1%	(6.6–12.2%)		Pilotto et al. 1999
Nocturnal dyspnoea or nocturnal cough or use of asthma medications						
20 to 44 years	Melbourne, Vic (n=3,200)	1992	17.4%	(8.6–10.7%)	ECRHS protocol. This definition used to identify possible asthma subjects for stage II	Abramson et al. 1996

Comparison with other National Health Priority Area diseases/conditions

The prevalence of asthma, reported as a long-term condition in the National Health Survey 2001, is less than the prevalence of arthritis, approximately equal to the prevalence of injuries and diseases of the circulatory system, and greater than the prevalence of mental and behavioural problems, diabetes and cancer (Figure 2.1). Asthma was the most commonly reported long-term condition in children (both males and females aged 0 to 14 years).

Figure 2.1:
Estimated prevalence of self-reported National Health Priority Area diseases/conditions, all ages, Australia, 2001



Notes

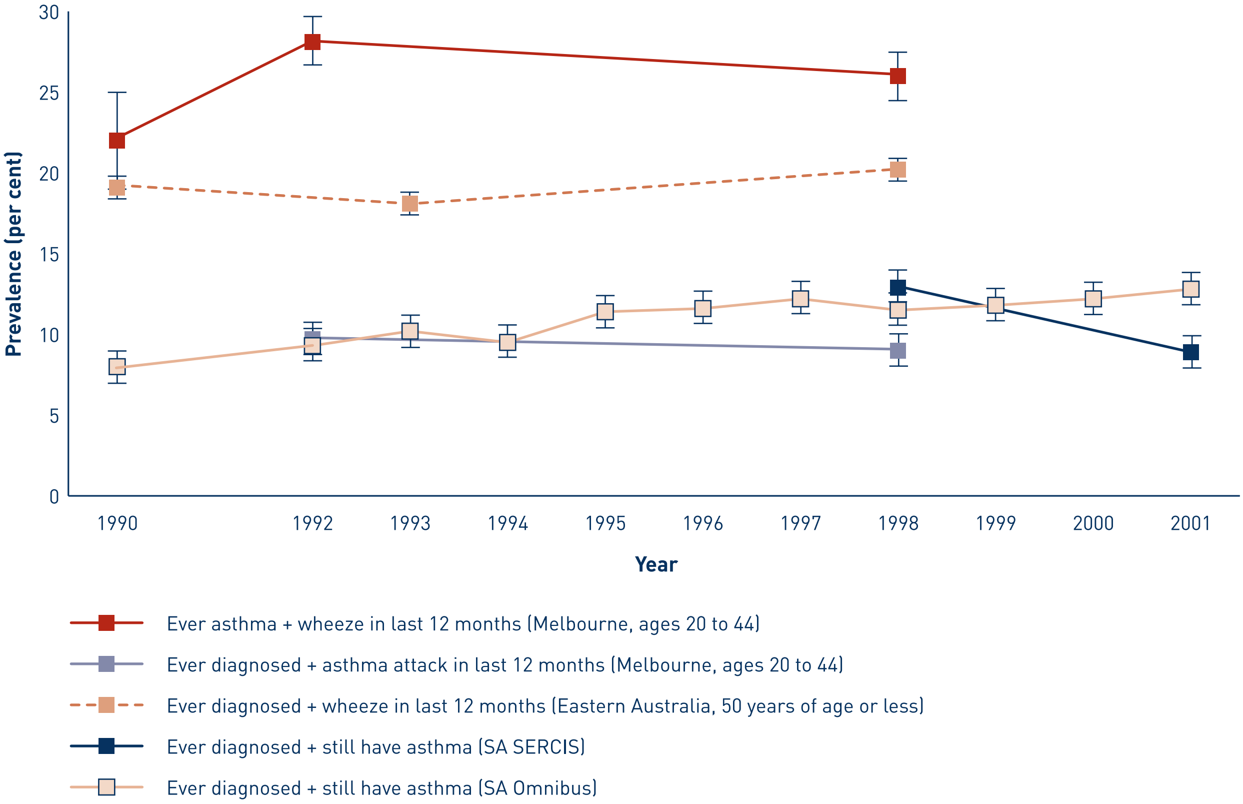
1. Injuries estimates are based on events in the previous 4 weeks that resulted in injury for which the respondent had sought medical treatment or taken some other action.
2. Circulatory system disease consists of self report of hypertensive disease, angina, other ischaemic heart diseases, other heart diseases, tachycardia, diseases of arteries, arterioles and capillaries, other diseases of the circulatory system, cardiac murmurs and cardiac sounds, other symptoms and signs involving the circulatory system reported as a long-term condition.
3. Mental and behavioural problems consists of people reporting organic mental problems, alcohol and drug problems, mood (affective) problems, anxiety-related problems, problems of psychological development, behavioural and emotional problems with usual onset in childhood/adolescence, other mental and behavioural problems, symptoms and signs involving cognition, perceptions, emotional state and behaviour reported as a long-term condition.
4. Cancer includes all people reporting all malignant and benign neoplasms as well as neoplasms of uncertain nature reported as a long-term condition. The NHS excludes persons in hospitals, nursing and convalescent homes and hospices, which we expect would have the greatest effect on the cancer estimates. The cancer prevalence reported here should be interpreted with caution.

Source: ABS National Health Survey 2001.

Time trends in the prevalence of asthma

For adults, there is no convincing evidence of any change in the prevalence of asthma, measured in a number of different ways, during the 1990s (Figure 2.2). For children, there is consistent evidence of a rise in prevalence of asthma during the 1980s and into the early 1990s (Figure 2.3). The most recent data from one study suggest that this rising trend may have peaked. However, this needs to be confirmed in other time series studies.

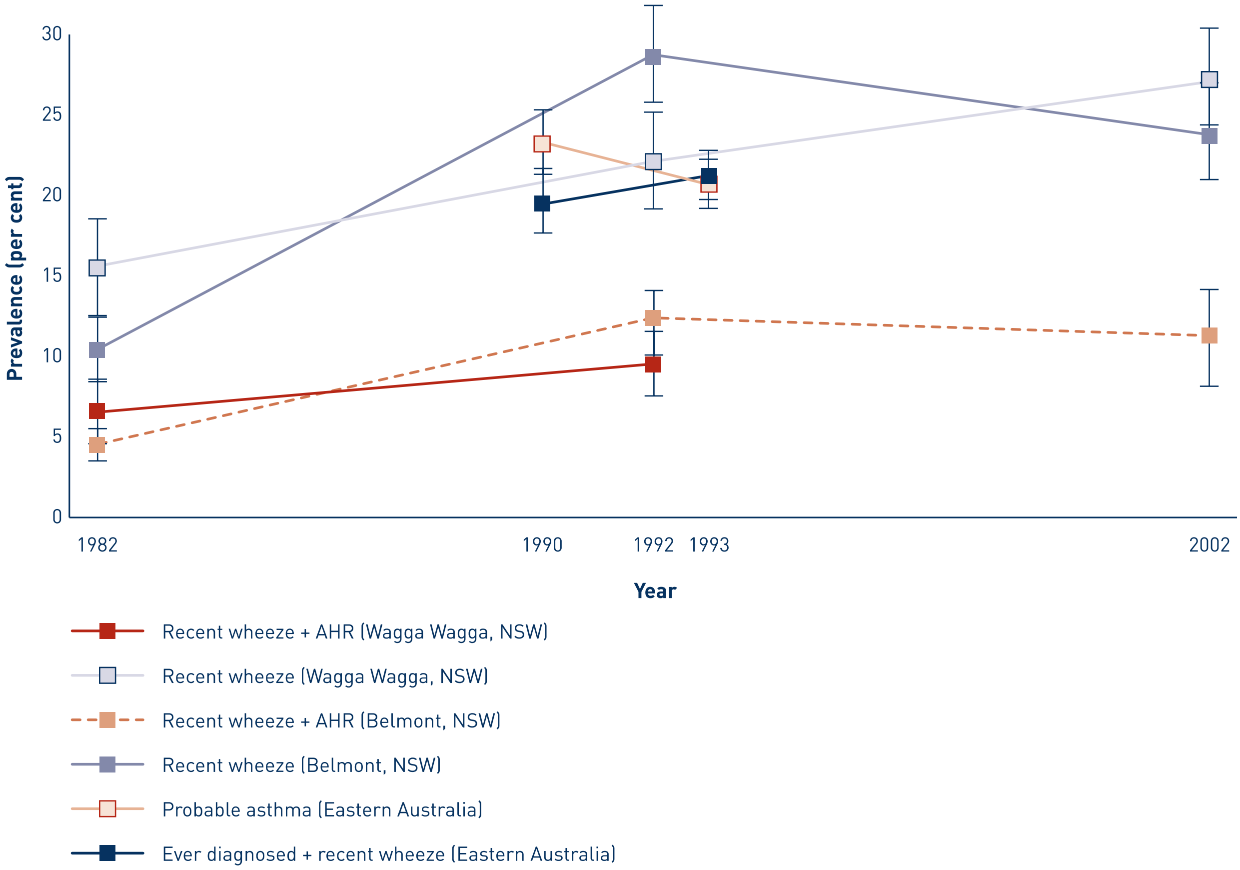
Figure 2.2:
Trends in the prevalence of asthma, adults, Australia, 1990–2001



Note: Chart shows time series but different definitions are used.

Sources: Comino et al. 1996; Taylor et al. 1998; Wilson et al. 2002, 2003; Woods et al. 2001.

Figure 2.3:
Trends in the prevalence of asthma, children aged 13 years and under, Australia, 1982–2002



Note: Chart shows time series but different definitions are used. **Probable asthma**: Asthma = wheeze on 3 or more occasions in last 12 months, or cough at least once a week in the last 12 months, or a diagnosis of asthma. **Recent wheeze** = wheeze in the last 12 months.

Sources: Comino et al. 1996; Downs et al. 2001a; Peat et al. 1994; Toelle et al. 2003

Differentials in the prevalence of asthma

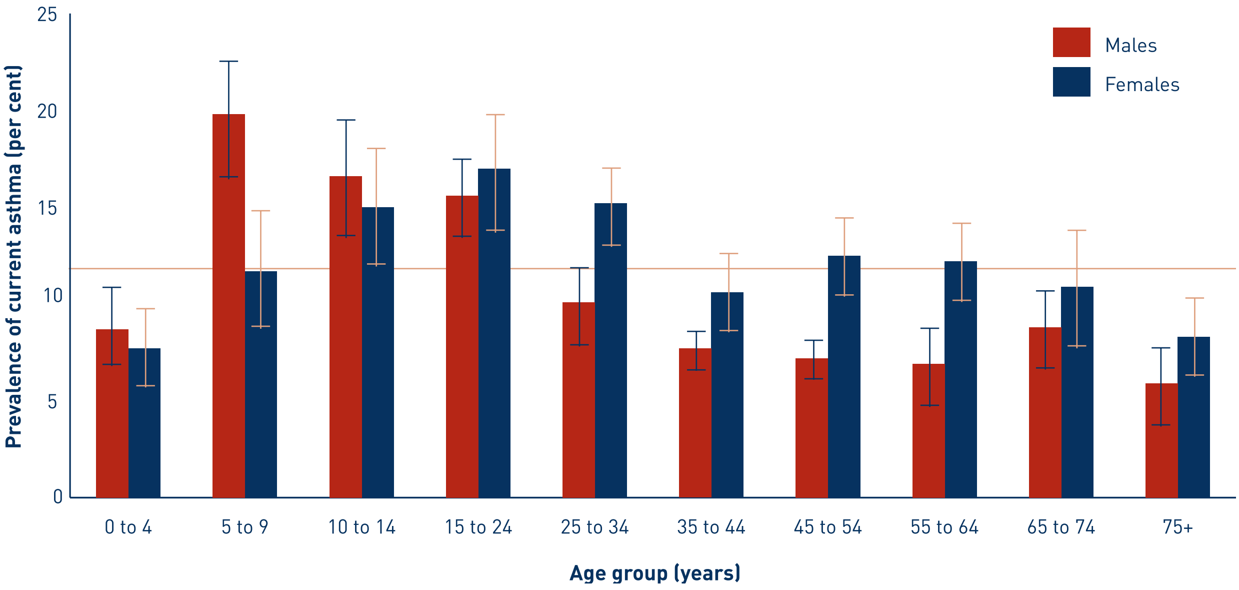
Many local, regional, national and international studies have examined predictors or risk factors for asthma. In this section we report on population differentials in the prevalence of asthma in Australia, using data from the National Health Survey 2001. This is a nationally-representative health survey. Subjects were classified as having current asthma if they reported asthma diagnosed by a doctor and that they still had asthma.

Age and sex

The prevalence of current asthma was highest between the ages of 5 and 24 years.

The prevalence 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 2.4). The overall prevalence was 13.3% in children (0 to 14 years) and 11.5% in adults (15 years and over). During childhood (0 to 14 years), prevalence was consistently higher in males; however, from the age of 15 years this was reversed and females demonstrated higher prevalence across all ages. This gender differential, which changes with age, has been observed in most other studies.

Figure 2.4:
Prevalence of current asthma, by age group and sex, Australia, 2001



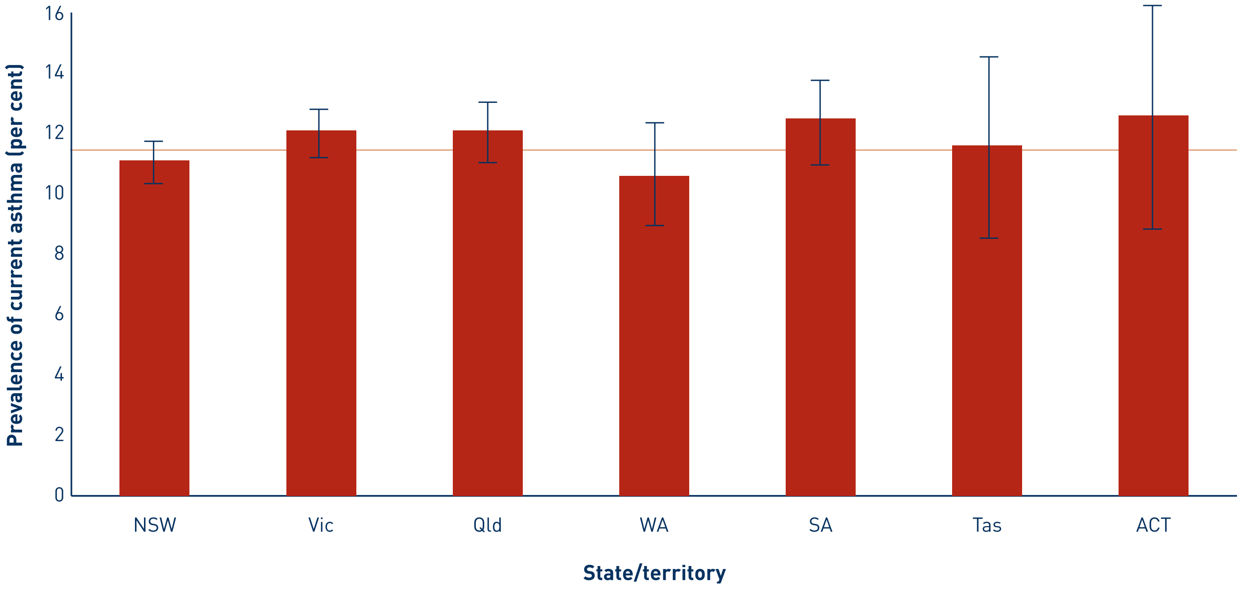
Note: Horizontal line represents the overall prevalence rate (11.6%) for persons of all ages.

Source: ABS National Health Survey 2001.

States and territories

The prevalence of asthma did not differ from the national average in any of the states or territories (Figure 2.5).

Figure 2.5:
Prevalence of current asthma, by state and territory, Australia, 2001



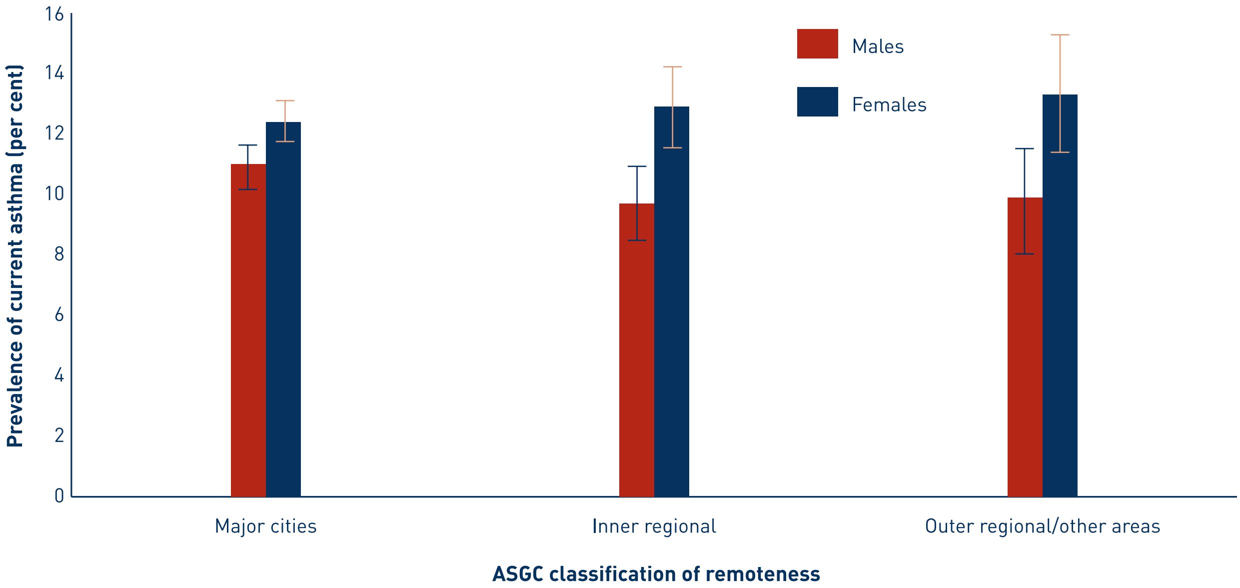
Note: Horizontal line represents national prevalence of asthma (11.6%). NT results not reported due to small numbers.

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 2.6). The excess prevalence of asthma among females was greater in outer regional and remote areas than in major cities.

Figure 2.6:
Prevalence of current asthma, by sex and ASGC classification of remoteness, Australia, 2001



Source: ABS National Health Survey 2001.

Aboriginal and Torres Strait Islander Australians

Research into the prevalence of asthma among Aboriginal and Torres Strait Islander Australians varies, not only in the measures of asthma that have been used, but also in the means of identifying Indigenous status and in the remoteness of their settings (Tables 2.3 and 2.4). All are relatively small studies.

The findings of these studies reveal no consistent trend. While one survey, conducted among Indigenous Australians in four remote communities in Queensland, the Northern Territory and South Australia, found a very low prevalence of asthma, in other surveys the prevalence of asthma and asthma symptoms among Indigenous Australians was broadly similar to that observed in non-Indigenous communities.

The largest relevant data collection is the Indigenous component of the 2001 National Health Survey. This showed that the prevalence of current asthma was higher in Indigenous Australians (17%) than in non-Indigenous Australians (12%). The difference was mainly evident among adults (Figure 2.7) and the excess prevalence of asthma in Indigenous Australians increased with increasing age. The excess prevalence of asthma was higher in Indigenous females (8 percentage points higher across all ages) than among Indigenous males (4 percentage points higher across all ages) (Figure 2.8). 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 in the National Health Survey (Figure 2.9).

Table 2.3:
Prevalence of asthma in Aboriginal and Torres Strait Islander children, Australia, 1990–2001

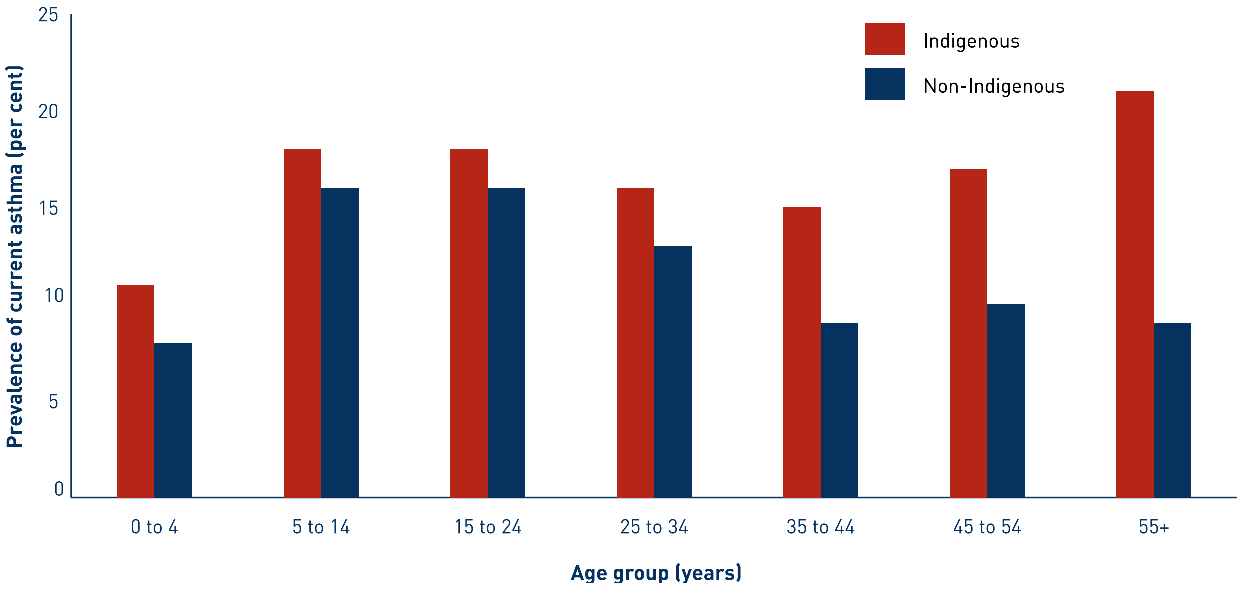
Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Ever diagnosed with asthma by a doctor and yes to 'do you still have asthma?'						
0 to 14 years	Australia 2001	18%			National Health Survey	ABS 2002c
Ever diagnosed with asthma by a doctor						
5 to 17 years	Tropical North, WA (n=90)	2000	14.7%	(8.5–24.2%)		Verheijden et al. 2002
5 to 17 years	Central Desert, WA (n=34)	1999	2.8%	(0.15–17%)		Verheijden et al. 2002
5 to 17 years	Northern WA (n=82)	1993	7.3%	(3.0–15.8%)		Bremner et al. 1998
Ever had asthma ('short wind')						
0 to 17 years	Remote communities, North Qld (n=1,650)	1999	15.8%	(14–17.6%)	ISAAC questionnaire	Valery et al. 2001
Wheeze in last 12 months						
5 to 17 years	Tropical North, WA (n=90)	2000	18.7%	(13.2–30.1%)		Verheijden et al. 2002
5 to 17 years	Central Desert, WA (n=34)	1999	8.8%	(2.3–24.8%)		Verheijden et al. 2002
0 to 17 years	Remote communities, North Qld (n=1,650)	1999	12.4%	(10.8–14%)	ISAAC questionnaire	Valery et al. 2001
7 to 12 years	Moree and Wagga Wagga, NSW (n=158)	1997	39.4%	(31.7–47.3%)	Prevalence in 1282 non-Aboriginal children in the same town was 39.3%	Downs et al. 2001b
5 to 17 years	Northern WA (n=82)	1993	19.5%	(11.9–30.0%)		Bremner et al. 1998
5 to 12 years	Remote communities in Qld, NT, SA (n=331)	1990–91	2.5%	(1.2–5.0%)		Veale et al. 1996
Wheeze in last 12 months plus AHR						
8 to 12 years	Remote communities in Qld, NT, SA (n=212)	1990–91	0.5%	(0.0–1.5%)		Veale et al. 1996

Table 2.4:
Prevalence of asthma in Aboriginal and Torres Strait Islander adults, Australia, 1990–2001

Age group	Place	Year conducted	Results	(95% CI)	Comments	Citation
Ever diagnosed with asthma by a doctor and yes to 'do you still have asthma?'						
All ages	Australia (n=3,700)	2001	17%		National Health Survey	ABS 2002c
Ever diagnosed with asthma by a doctor						
18 years and over	Tropical North, WA (n=119)	2000	13.6%	(6.5–18.8%)		Verheijden et al. 2002
18 years and over	Central Desert, WA (n=59)	1999	21.8%	(12.5–34.8%)		Verheijden et al. 2002
18 years and over	Northern WA (n=125)	1993	12%	(7.1–19.3%)		Bremner et al. 1998
Wheeze in last 12 months						
18 years and over	Tropical North, WA (n=119)	2000	31.5%	(23.5–40.8%)		Verheijden et al. 2002
18 years and over	Central Desert, WA (n=59)	1999	41.5%	(28.1–54%)		Verheijden et al. 2002
20 to 84 years	Remote communities in Qld, NT, SA (n=715)	1990–91	11.1%	(8.8–13.4%)		Veale et al. 1996
18 years and over	Northern WA (n=125)	1993	24.8%	(17.7–33.5%)		Bremner et al. 1998
Wheeze in last 12 months plus AHR						
20 to 84 years	Remote communities in Qld, NT, SA (n=715)	1990–91	3.3%	(1.9–4.6%)		Veale et al. 1996

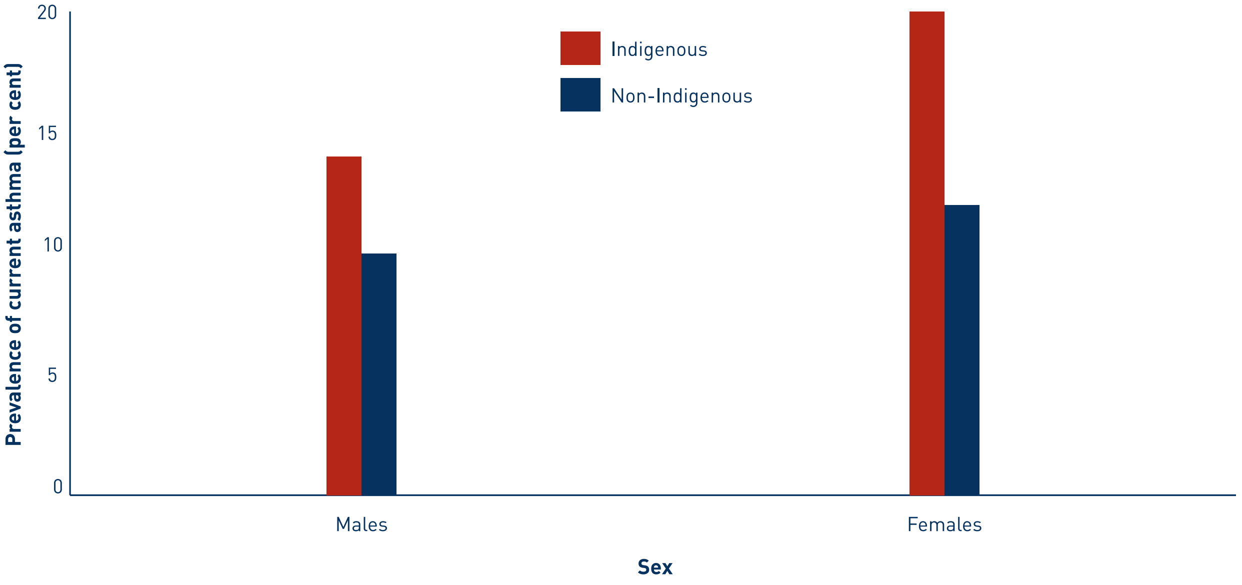
Within the limitations of the available data, it seems likely that the prevalence of asthma, or of asthma-like symptoms, is higher in Indigenous Australian adults than in non-Indigenous Australian adults. However, the data on asthma prevalence in children are too heterogeneous to allow any confident conclusions to be drawn.

Figure 2.7:
Prevalence of current asthma, by age group and Indigenous status, Australia, 2001



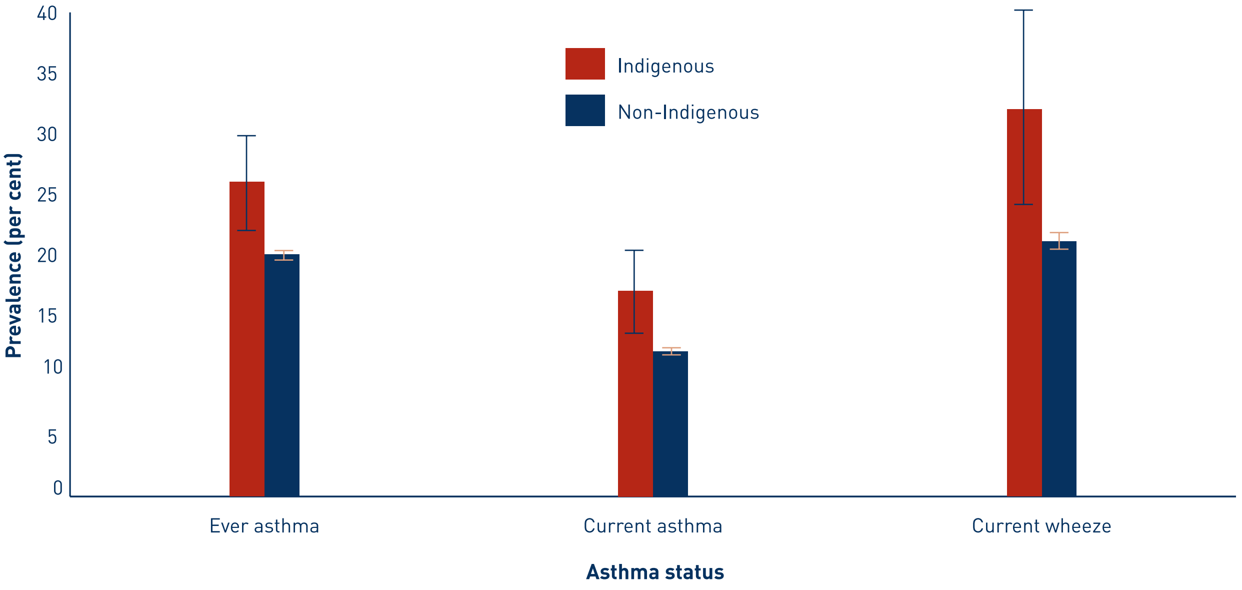
Source: ABS National Health Survey 2001.

Figure 2.8:
Prevalence of current asthma, by sex and Indigenous status, all ages, Australia, 2001



Source: ABS National Health Survey 2001.

Figure 2.9:
Prevalence of ever doctor diagnosed asthma, current asthma and current wheeze, by Indigenous status, Australia, 2001



Note: Current wheeze only asked in people aged 18 to 44 years. Ever asthma and current asthma estimates are for people of all ages.

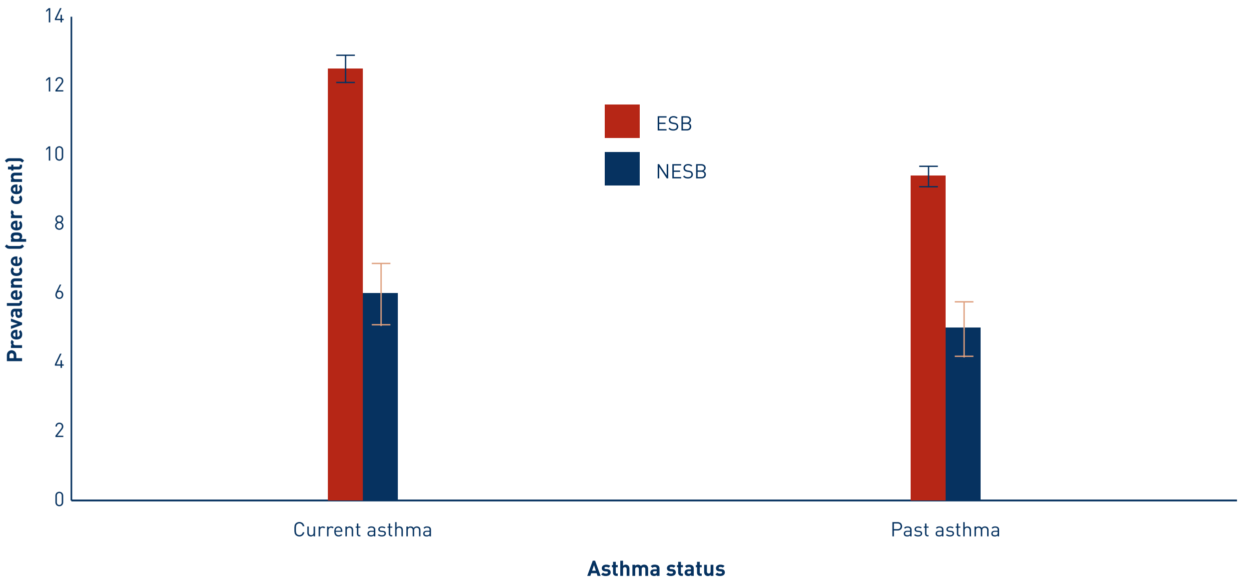
Source: ABS National Health Survey 2001.

Culturally and linguistically diverse background

Data from the National Health Survey 2001 demonstrated that the prevalence of asthma, both current and past, is lower in people from non-English-speaking backgrounds (Figure 2.10).

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

Figure 2.10:
Current and past asthma prevalence, by culturally and linguistically diverse background, Australia, 2001



Note: ESB: 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). NESB: Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001). Past asthma includes people ever diagnosed with asthma who had a negative response to 'do you still have asthma?'

Source: ABS National Health Survey 2001.

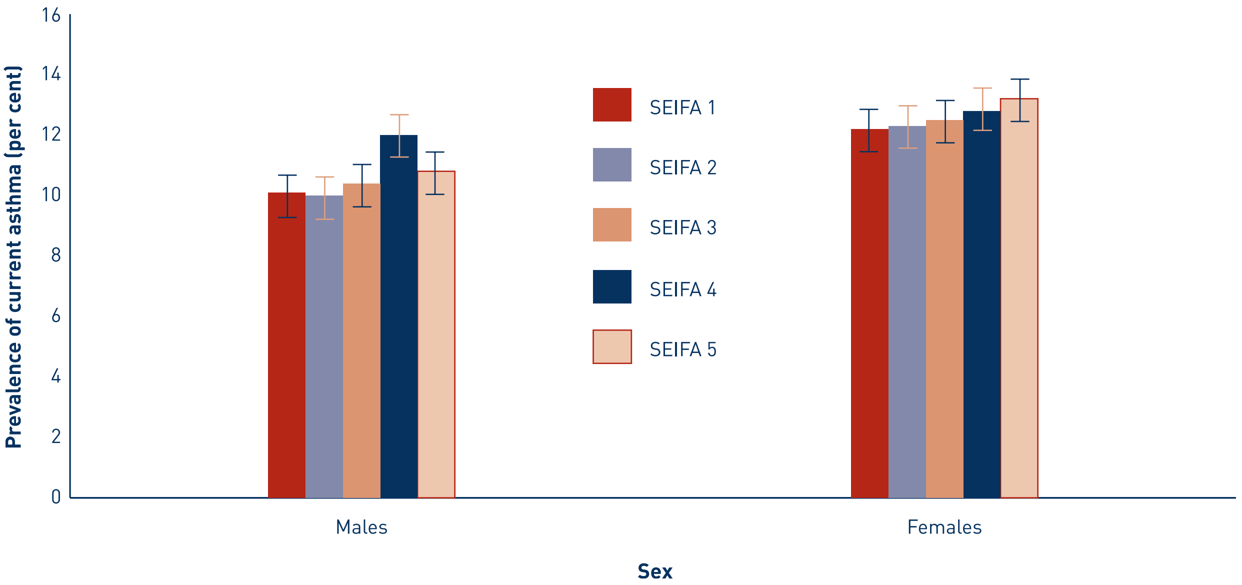
Socioeconomic disadvantage

In this report, the relation between levels of socioeconomic disadvantage and the presence of asthma was assessed using a locality-based index (SEIFA, see Appendix 1). The population was divided into five equal size groups (quintiles), ranging from the highest SEIFA group (least disadvantaged) to the lowest SEIFA group (most disadvantaged). Differences between SEIFA quintiles in prevalence rates for asthma were examined. Those living in the most socioeconomically disadvantaged localities did not have a substantially higher (or lower) prevalence of asthma compared with those in less disadvantaged areas (Figure 2.11).

Studies from the USA have reported a higher prevalence of asthma in children from lower income families (Miller 2000). Furthermore, the higher prevalence of asthma among African-American or Hispanic adults and children has been attributed to differences in socioeconomic status (Litonjua et al. 1999), although others have attributed these differences to living in an urban setting (Aligne et al. 2000). The prevalence of asthma has been shown to be higher among families eligible for subsidised school lunches, implying an association with socioeconomic disadvantage (Yawn et al. 2002).

The relationship between socioeconomic status and the prevalence of asthma has been more closely studied in children in recent years than in adults. However, there is some evidence that higher levels of education are associated with reduced risk of asthma in adults (Backer et al. 2002; Huovinen et al. 2001). Conversely, it has been reported in one recent study that there is no link between socioeconomic status and the prevalence of asthma (Morales Suarez-Varela et al. 1999), and in a review of earlier studies most showed little or no association with the prevalence of asthma (Rona 2000).

Figure 2.11:
Prevalence of current asthma, by sex and SEIFA quintile, Australia, 2001



Note: The population has been divided into 5 segments: SEIFA 1 represents the least disadvantaged socioeconomic quintile, and SEIFA 5 the most disadvantaged.

Source: ABS National Health Survey 2001.

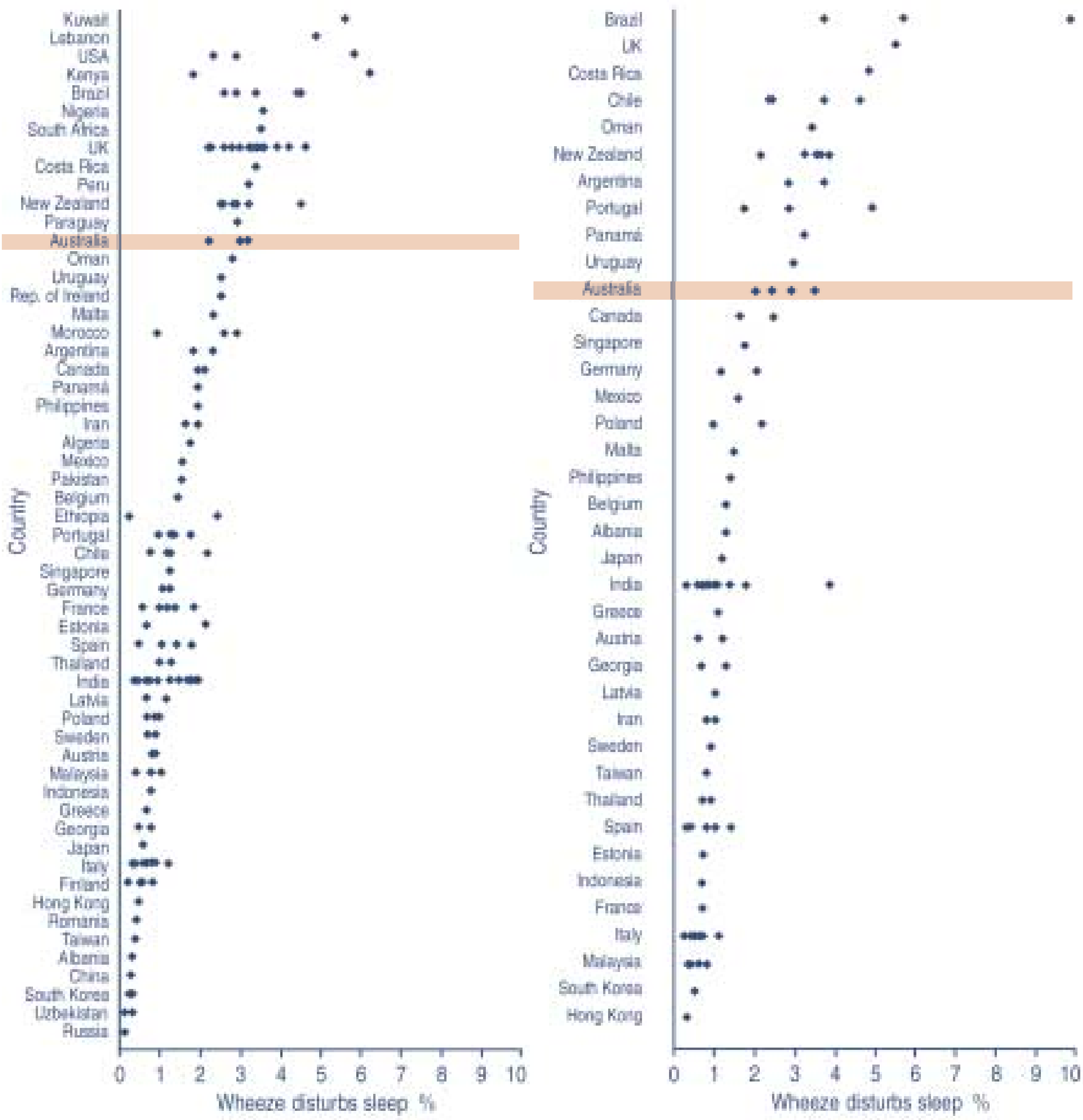
International comparisons

The difficulties described above in synthesising Australian data derived from 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.

Figure 2.12 shows the prevalence of reported wheeze disturbing sleep, a symptom of more severe asthma, among 6 to 7 year old children studied in 91 centres in 38 countries (total 257,800 children of this age) and among 13 to 14 year old children studied in 155 centres in 56 countries (total 463,800 children in this age group). Each dot represents one centre and the figure shows that the four Australian centres (Sydney, Melbourne, Adelaide and Perth) had a moderately high prevalence of this asthma-related symptom in both age groups of children, compared with other countries.

The European Community Respiratory Health Survey was conducted among adults aged 20 to 44 years in 35 centres in 16 countries, and included Australian data from Melbourne (Chinn et al. 1997). The survey included measurements of airway hyperresponsiveness as an indicator of the prevalence of asthma. For international comparative studies, this objective measure has the advantage of not being affected by language, fashion or other causes of spurious variation in the diagnostic label 'asthma' or the symptom label 'wheeze'. Data for Australia and New Zealand revealed a high rate of asthma among young adults compared with other, predominantly European, Western countries.

Figure 2.12:
World ranking for the percentage of children with sleep disturbed due to wheezing, (a) 13 to 14 year olds and (b) 6 to 7 year olds, 1991–95



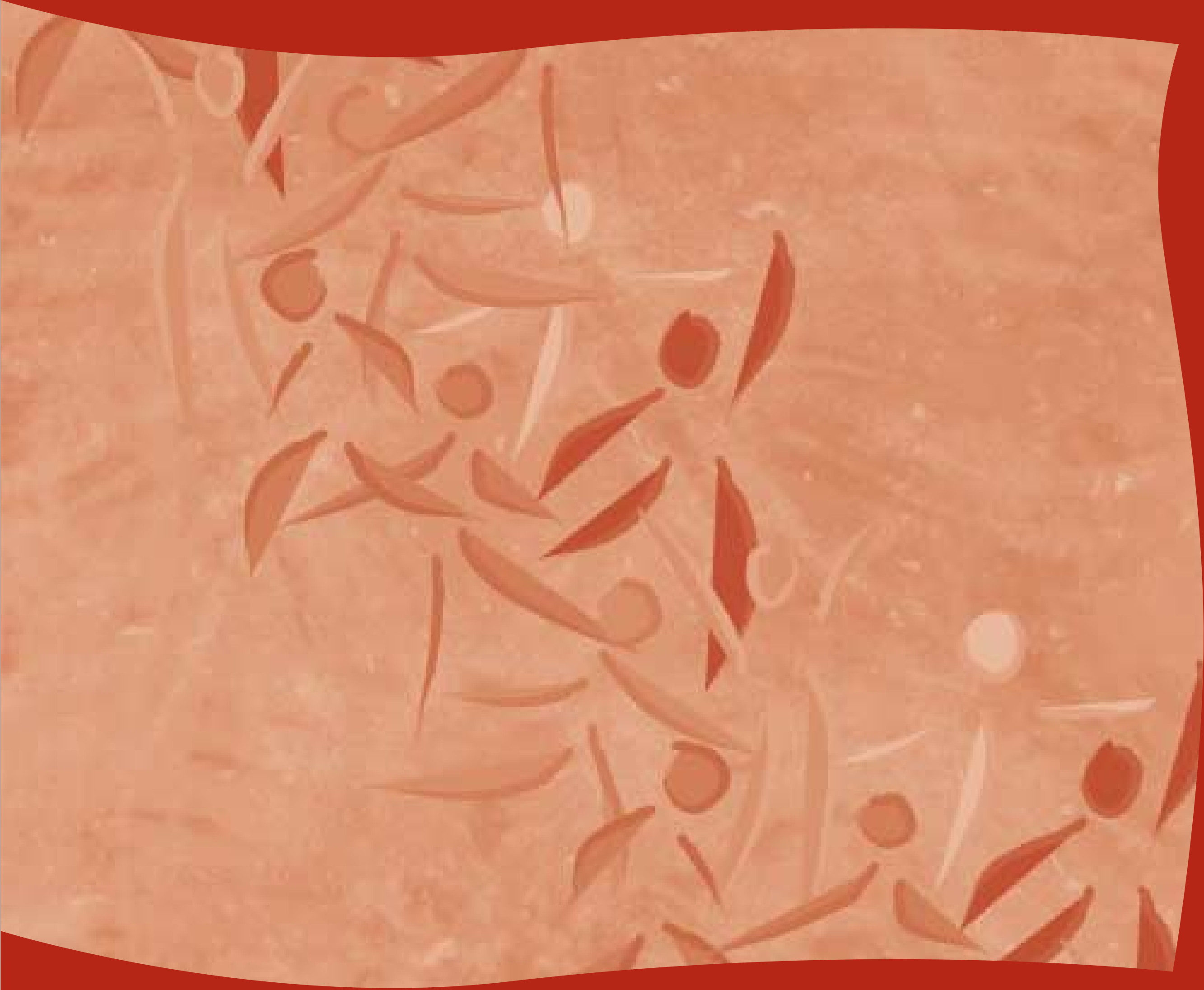
Note: Ranking is by the percentage who answered positively to the question: 'In the last 12 months, how often, on average, has your (child's) sleep been disturbed due to wheezing?' for participating countries in the ISAAC study. Each symbol represents the prevalence within one study centre.

Source: ISAAC 1998a—reproduced with permission.

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. A higher proportion report having experienced wheeze. International comparative studies have shown a high prevalence of asthma in Australia, compared with many other countries. During the 1980s and early 1990s the prevalence of asthma among children in Australia increased. However, there is little evidence of any increase in prevalence among adults during this period.

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 14 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 adults more commonly report asthma as a long-term condition than non-Indigenous Australian adults and this difference increases with increasing age. Persons of non-English-speaking backgrounds do not have a higher prevalence of asthma than other populations within the community.



Impact

3

3.1 Quality of life, severity and disability

Key points

- In a major Australian survey, people with asthma rated their health lower than people without asthma.
- Females with asthma rated their health lower than males with asthma.
- A greater proportion of people with asthma reported having days away from work or study over a 2 week period (11.4%) than people without asthma (7.9%).
- Of all people with asthma, 2.6% reported taking days away from work or study and 3.2% reported other days of reduced activity, which they attributed to asthma, in the 2 weeks preceding the 2001 National Health Survey.
- Approximately one-third to one-half of adults with asthma have moderate or severe disease.
- There is a higher prevalence of depression in people with asthma compared to people without asthma.

Introduction

Health-related quality of life (HRQOL) is a term often used to describe the impact of a chronic disease, such as asthma, on a person's health status and everyday functioning. This measure encompasses a range of dimensions that can be divided into the physical, psychological and social domains of health. The effect a certain condition has on each of these domains depends upon the severity and other features of the condition and also on each individual's perception of their health, which is based on their beliefs, experiences and expectations.

Measures of HRQOL that are generic, i.e. not disease-specific, are used in health surveys to assess the overall impact of a person's health status on their quality life. The Medical Outcomes Study Short Form 36 (SF-36) has been widely used for this purpose (McHorney et al. 1993, 1994). These data can be used to assess the quality of life of subgroups, such as those with asthma, relative to other members of the 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, for example, asthma.

Many of the generic quality of life questionnaires, including the SF-36, allow specific aspects of the impact of disease on quality of life to be separately assessed. However, a number of other specific indicators, relevant to the physical impact of disease and to its effect on social functioning or role performance, have been widely used in health surveys. These include reduced days of activity, restricted physical activity, reduced functioning ability, and days lost from work or school.

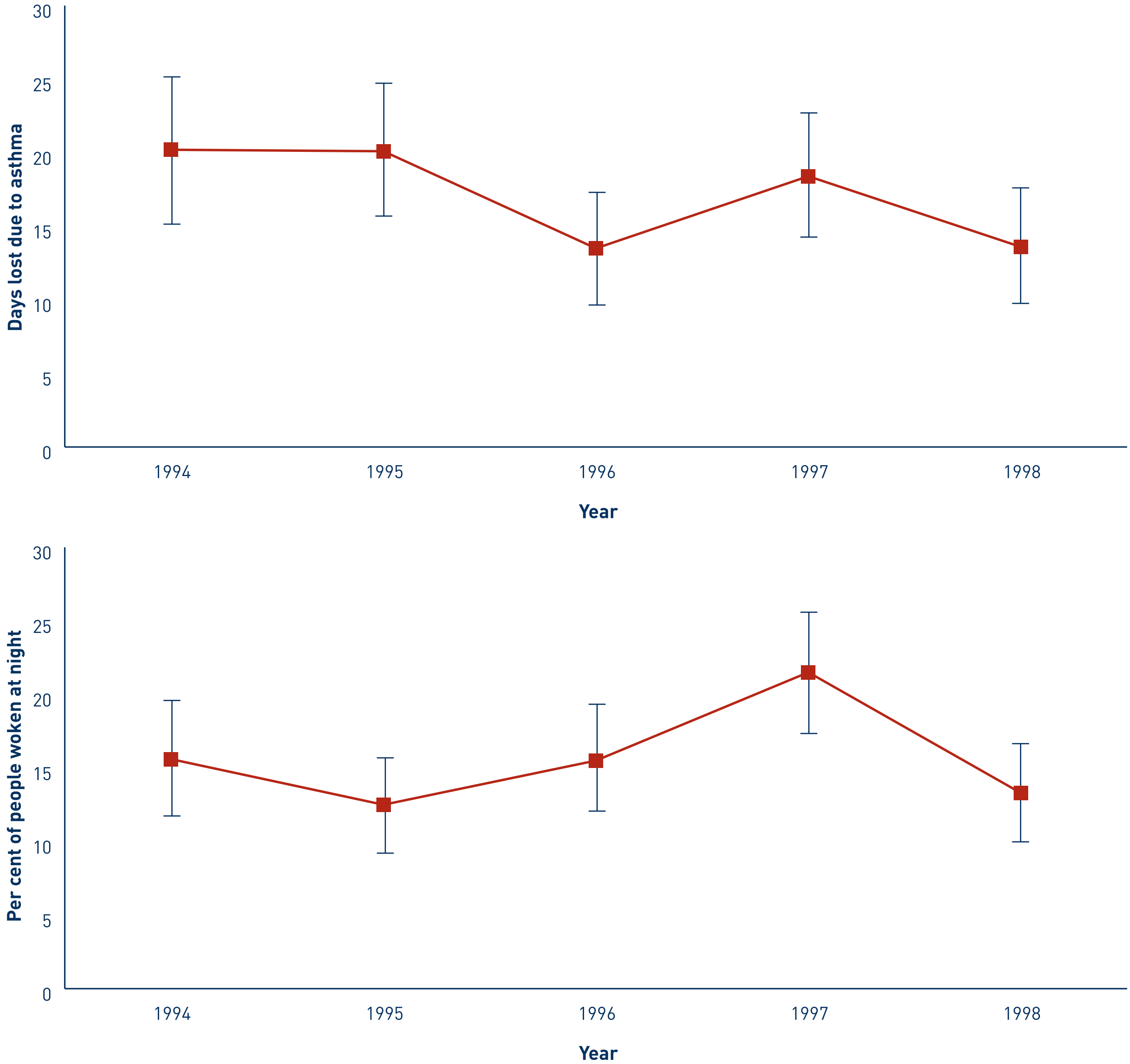
The concept of severity of asthma is widely used for varying purposes. While it reflects the magnitude of the effect of asthma on the individual, including the impact on quality of life, the term is also used to describe other features of asthma. Concepts of severity are context-specific: pathologists, physiologists, clinicians and patients all understand the term 'severity' in relation to asthma but all measure it in different ways. The importance of measuring disease severity from the standpoint of clinical care is that it often dictates the level of treatment required to control symptoms and prevent severe exacerbations. The National Asthma Council's recommendations for the assessment of asthma severity are described in this chapter.

Time trends in the quality of life of people with asthma

Limited data are available for Australia that are relevant to studying time trends in the impact of asthma on quality life.

Data from the South Australia Health Omnibus Survey show that there was a gradual decline in the number of days of work lost due to asthma from 1994 to 1998 (Figure 3.1). The proportion of people with asthma who had been woken at night by their asthma remained relatively constant over the same time period, apart from a peak in 1997. A small peak in the number of days lost due to asthma was also observed in 1997.

Figure 3.1:
Days lost due to asthma and percentage woken at night weekly or more frequently, age 15 years and over, South Australia, 1994–98

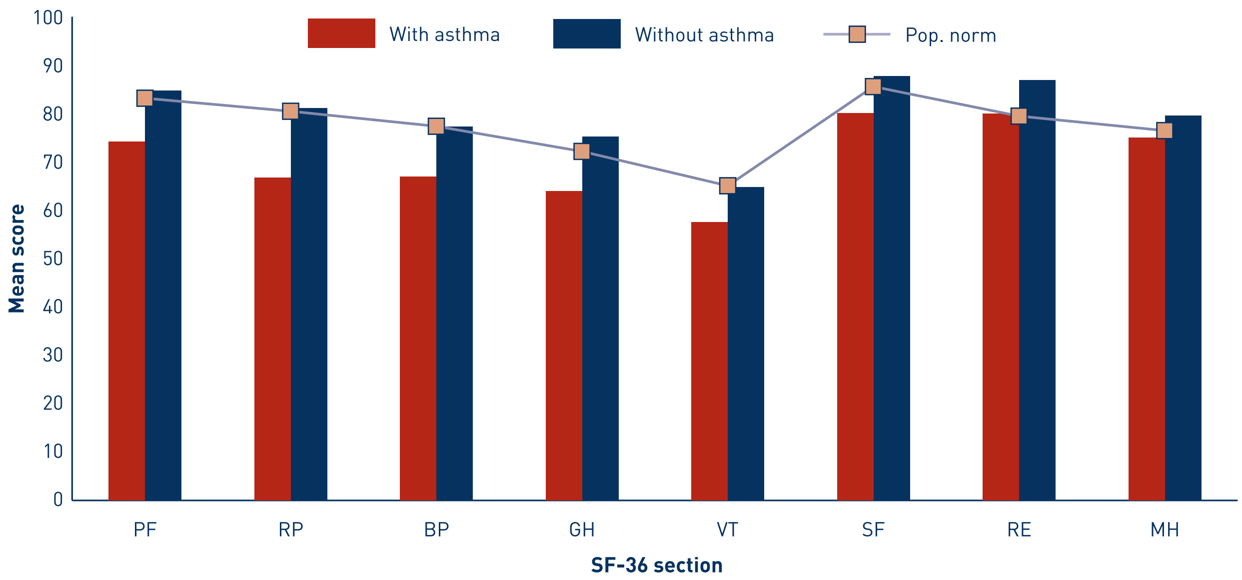


Source: Wilson et al. 2002.

Components of quality of life measures in people with asthma

In nearly all domains, the HRQOL of people with asthma is worse than that observed in people without the disease, although the impact on physical and social functioning, and on global measures such as self-assessed health, seems to be greater than the impact on psychological functioning. In a survey conducted in South Australia in 1998, people with asthma had significantly lower (worse) scores than people without asthma for all domains of the SF-36 (Figure 3.2). Average scores for people with asthma were also lower than the Australian population reference values for all domains of the SF-36 except the role: emotional and mental health domains (ABS 1997).

Figure 3.2:
SF-36 scores in people with and without asthma, age 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. Population norms are the 1995 mean unstandardised values for the Australian population. 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 $p=0.003$).

Sources: Wilson et al. 2002; ABS 1997.

The tables in the following sections summarise the available data describing aspects of quality of life measured in people with asthma. Where available, comparative data from the same survey in people without asthma are also provided.

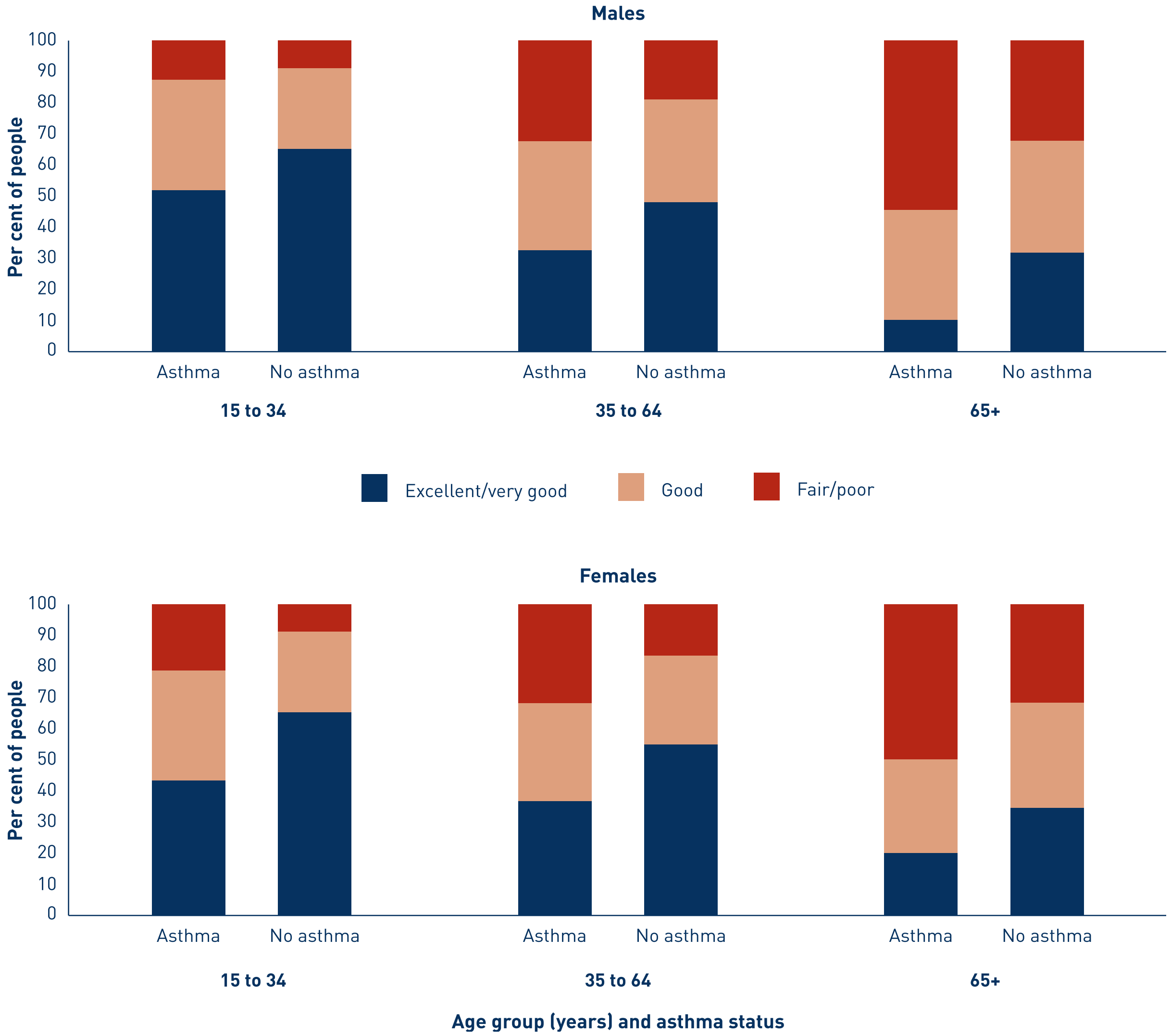
Quality of life profiles and self-assessed health

People with asthma have worse self-assessed health status than people without asthma (Table 3.1, Figure 3.3). This was true among all adult age groups and in both males and females. However, the disparity was greatest in the oldest age group and least among young males.

Table 3.1: Self-assessed health in adults with and without asthma, Australia, 1997–2001

Measure	Population/study	Response	Results (95% CI) With asthma	Results (95% CI) Without asthma	Comments
Self-assessed health	NHS 2001 15 years and over	Excellent/very good Good Fair/Poor	38.4% (36.3–40.4) 34.0% (32.0–36.1) 27.6% (25.6–29.6) (n=3,116)	53.4% (52.9–53.9) 29.8% (29.3–30.2) 16.9% (16.4–17.3) (n=26,863)	People ever diagnosed with asthma and positive response to 'do you still have asthma?'
Self-assessed health	NSW Health Survey 1997–98 16 years and over (Public Health Division 2001)	Excellent Very good Good Fair Poor	5.3% (4.6–6.0) 9.4% (8.7–10.1) 11.5% (10.6–12.3) 13.5% (12.3–14.7) 20.7% (17.9–23.4) (n=3,764)	19.78% (18.8–20.7) 36.46% (35.4–37.5) 28.46% (27.4–29.5) 11.82% (11.0–12.7) 3.0% (2.5–3.5) (n=31,261)	Ever diagnosed with asthma plus symptoms or treatment of asthma in last 12 months

Figure 3.3: Self-assessed health status in adults with and without current asthma, by age group and sex, Australia, 2001



Source: ABS National Health Survey 2001.

Physical

Adults with asthma have lower (worse) scores in the physical component of the SF-36 health questionnaire than people without asthma (Figure 3.2, Table 3.2).

Sleep disturbance due to asthma, which is an important contributor to poor quality of life in people with asthma (Goldney et al. 2003), occurred on 5 or more nights in the last month among 15.5% of respondents with asthma in the 1997–98 New South Wales Health Survey and 22.1% of respondents with asthma in Queensland in 2000.

Almost half of the children surveyed in the 2001 New South Wales Health Survey (48.2%) reported having disturbed sleep in the last month due to asthma. In 1991, 47.1% of children with asthma experienced sleeping difficulties weekly or more often. This was 13.1% higher than the proportion of children without asthma who experienced sleeping difficulties with the same frequency (Forero et al. 1996).

Table 3.2:
Physical component of quality of life, adults and children, Australia, 1993–2001

			Results (95% CI)		
Measure	Population/study	Response	With asthma	Without asthma	Comments
Adults					
SF-36 scale scores	SA Omnibus Survey 1998 15 years and over Metropolitan area (Wilson et al. 2002)	Physical functioning Role: physical Bodily pain General health Vitality	74.2 (71.0–77.4) 66.7 (60.9–72.5) 66.9 (62.9–71.0) 63.9 (60.5–67.3) 57.5 (54.2–60.8) (n=172)	84.7 (83.8–85.6) 81.1 (79.4–82.8) 77.3 (76.1–78.5) 75.2 (74.2–76.2) 64.8 (63.8–65.8) (n=1,539)	Scores shown are mean scores Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'
SF-36 scale scores	SA Omnibus Survey 1998 15 years and over Country area (Wilson et al. 2002)	Physical functioning Role: physical Bodily pain General health Vitality	72.2 (66.3–78.1) 59.7 (49.1–70.3) 68.3 (60.9–75.7) 62.2 (55.9–68.5) 54.0 (48.0–60.0) (n=52)	83.5 (82.2–84.8) 82.4 (80.0–84.8) 77.3 (75.5–79.1) 75.6 (74.2–77.0) 65.6 (64.2–67.0) (n=767)	Scores shown are mean scores Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'
How many nights in the last month has your sleep been disturbed by your asthma?	Qld Chronic Disease Survey 2000 18 years and over (Epidemiology Services Unit 2002)	No days 1–2 days 3–4 days 5–9 days 10–19 days 20+ days	52.3% (46.6–58.0) 16.2% (12.0–20.4) 9.3% (6.0–12.6) 7.0% (4.1–9.9) 7.2% (4.2–10.2) 7.9% (4.8–11.0) (n=291)		Ever diagnosed plus symptoms or treatment of asthma in last 12 months
Number of nights of sleep disturbed due to asthma in the last month	NSW Health Survey 1997–98 16 years and over (Public Health Division 2001)	No days 1–2 days 3–4 days 5–9 days 10–19 days 20+ days	61.7% (59.5–63.8) 15.0% (13.3–16.7) 7.8% (6.7–9.0) 6.2% (5.0–7.4) 5.2% (4.2–6.1) 4.1% (3.4–4.8) (n=3,764)		Ever diagnosed with asthma plus symptoms or treatment of asthma in last 12 months
Waken at night weekly or more frequently	SA Omnibus 1994–98 15 years and over (Wilson et al 2002)	1994 1995 1996 1997 1998	15.6% (11.6–20.7) 12.5% (9.2–16.9) 15.5% (11.8–20.1) 21.5% (17.3–26.3) 13.3% (9.9–17.7)		Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'
SF-36 scores	SA Omnibus 1995 15 years and over (Adams et al. 2001)	Physical Component Score (PCS)	46.2 (45.0 to 47.4)		Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'

(continued)

Table 3.2 (continued):
Physical component of quality of life, adults and children, Australia, 1993–2001

Measure	Population/study	Response	Results (95% CI) With asthma	Results (95% CI) Without asthma	Comments
Children					
Sleep disturbed in last month due to asthma	NSW Child Health Survey 2001 2 to 12 years (Centre for Epidemiology and Research 2002)	Disturbed sleep in last month as a result of asthma	48.2% Mean 2.9 nights Median 0 nights (n=1,243)		Ever diagnosed by doctor with asthma plus symptoms or treatment of asthma in the last 2 weeks
Sleep disturbance due to asthma	Melbourne, Sydney, Adelaide and Perth 1993–94 6 to 7 years (Robertson et al. 1998)	Never <1 night weekly >1 night weekly	43.7% (41.8–45.6) 43.9% (42.0–45.8) 11.2% (10.0–12.4) (n=2,686)		Children with history of wheeze or whistling in chest over the past 12 months
Sleep disturbance due to asthma	Melbourne, Sydney, Adelaide and Perth 1993–94 13 to 14 years (Robertson et al. 1998)	Never <1 night weekly >1 night weekly	58.4% (56.8–60.0) 30.5% (29.0–32.0) 9.8% (8.8–10.8) (n=3,607)		Children with history of wheeze or whistling in chest over the past 12 months
Symptoms disturbing sleep in last 12 months	Eastern Australia 1990 and 1993 5 to 12 year olds (Comino et al. 1996)	1993 1990	27.2% (25.4–29.0) (n=2,342) 30.5% (28.1–32.9) (n=1,382)		3 or more episodes of wheezing in last year or troublesome cough more than once a week during last 12 months or a diagnosis of asthma
Sleeping difficulties weekly or more often	Sydney 1991 11 to 15 year olds (Forero et al. 1996)	Sleeping difficulties weekly or more often	47.1% (43.6–50.6) (n=797)	34.0% (32.5–35.5) (n=3,751)	Wheeze, cough, or exercise-induced symptoms at least weekly or had taken medications for asthma in the last month

Psychological

People with asthma have marginally lower (worse) emotional scores in the SF-36 questionnaire than people without asthma, but there is very little difference in the score for the mental health component of the questionnaire (Table 3.3). More children with asthma report feeling low or depressed than children without asthma, although the difference is not statistically significant.

Recent evidence has shown that there is a higher prevalence of depression among people with asthma compared to people without asthma (Goldney et al. 2003). Furthermore, people with severe symptoms of asthma (shortness of breath, waking at night with asthma symptoms or morning symptoms) are more likely to suffer from major depression than those without severe symptoms.

Table 3.3:
Psychological component of quality of life, adults and children, Australia, 1991–98

Measure	Population/study	Response	Results (95% CI) With asthma	Results (95% CI) Without asthma	Comments
Adults					
PRIME-MD questionnaire	SA omnibus 1998 15 years and over (Goldney et al. 2003)	Major depression All depression	14.4% (10.4–18.4)* 22.1% (17.4–26.8)* (n=299)	5.7% (4.8–6.6) 16.7% (15.3–18.1) (n=2,711)	*There was a significantly higher rate of people with major depression (p=0.000) and all depression (p=0.03) among people with asthma compared to people without
SF-36 scale score	SA Omnibus 1998 15 years and over (Wilson et al. 2002)	*Metropolitan area:* Role: emotional Mental health *Country area:* Role: emotional Mental health	 79.9 (74.8–85.0) 75.0 (72.0–78.0) (n=172) 84.8 (75.4–94.2) 79.4 (74.0–84.8) (n=52)	 86.9 (85.5–88.3) 79.5 (78.7–80.3) (n=1,539) 91.3 (89.3–93.3) 82.7 (81.5–83.9) (n=767)	Scores shown are mean scores Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'

(continued)

Table 3.3 (continued):
Psychological component of quality of life, adults and children, Australia, 1991–98

Measure	Population/study	Response	Results (95% CI) With asthma	Results (95% CI) Without asthma	Comments
SF-36 scale score	SA Omnibus 1995 15 years and over (Adams et al. 2001)	Mental Component Score (MCS)	47.3 (46.1–48.4)		Scores shown are mean scores Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'
Children					
Feelings	Sydney 1991 11 to 15 year olds (Forero et al. 1996)	Proportion with a general feeling of unhappiness about life	16.0% (13.5–18.6)	12.5% (11.4–13.6)	Wheeze, cough, or exercise-induced symptoms at least weekly or had taken medications for asthma in the last month
		Proportion feeling low/depressed	42.4% (39.0–45.8)	30.4% (28.9–31.9)	
			(n=797)	(n=3,751)	

Social

Asthma accounts for a large proportion of days lost from work or study (Table 3.4). Among children aged 2 to 12 years with asthma, 58% reported in 2001 that it limited their normal activity in the previous year, resulting in an average of 9.3 days of reduced activity in 2001.

Table 3.4:
Social component of quality of life, adults and children, Australia, 1990–2001

Measure	Population/study	Response	Results (95% CI) With asthma	Results (95% CI) Without asthma	Comments
Adults					
Type of action taken for asthma in last 2 weeks	NHS 2001	Had days away from work/school	2.6%		People ever diagnosed with asthma and positive response to 'do you still have asthma?'
		Had other days of reduced activity (other than days off work/school)	3.2%		
			(n=3,116)		
Type of action taken in last 2 weeks (not specific for asthma)	NHS 2001	Had days away from work/study	11.4%	7.9%	People ever diagnosed with asthma and positive response to 'do you still have asthma?'
		Had other days of reduced activity	17.5%	10.0%	
			(n=3,116)	(n=26,863)	
In the last 12 months did your asthma interfere with your ability to work/study/ manage your day-to-day activities?	Qld Chronic Disease Survey 2000 18 years and over (Epidemiology Services Unit 2002)	Yes	36.7% (33.4–40.1) (n=795)		Ever diagnosed plus symptoms or treatment of asthma in last 12 months If yes for this question they were asked the question below.
In the last 12 months did your asthma interfere with your ability to work/study/ manage your day-to-day activities?	Qld Chronic Disease Survey 2000 18 years and over (Epidemiology Services Unit 2002)	A little bit Moderate Quite a lot Extremely	23% (18.2–27.8) 32% (26.6–37.4) 28.5% (23.3–33.7) 16.5% (12.2–20.8) (n=291)		Ever diagnosed plus symptoms or treatment of asthma in last 12 months and yes to previous question.
In the last 12 months did your asthma interfere with your ability to work/study/ manage your day-to-day activities?	NSW Health Survey 1997–98 16 years and over	None A little bit Moderately Quite a lot Extremely	67.5% (65.5–69.5) 10.1% (8.8–11.5) 10.8% (9.4–12.1) 7.7% (6.6–8.8) 3.9% (3.1–4.7) (n=3,764)		Ever diagnosed by a doctor with asthma and treatment or symptoms of asthma in the last 12 months

(continued)

Table 3.4 (continued):
Social component of quality of life, adults and children, Australia, 1990–2001

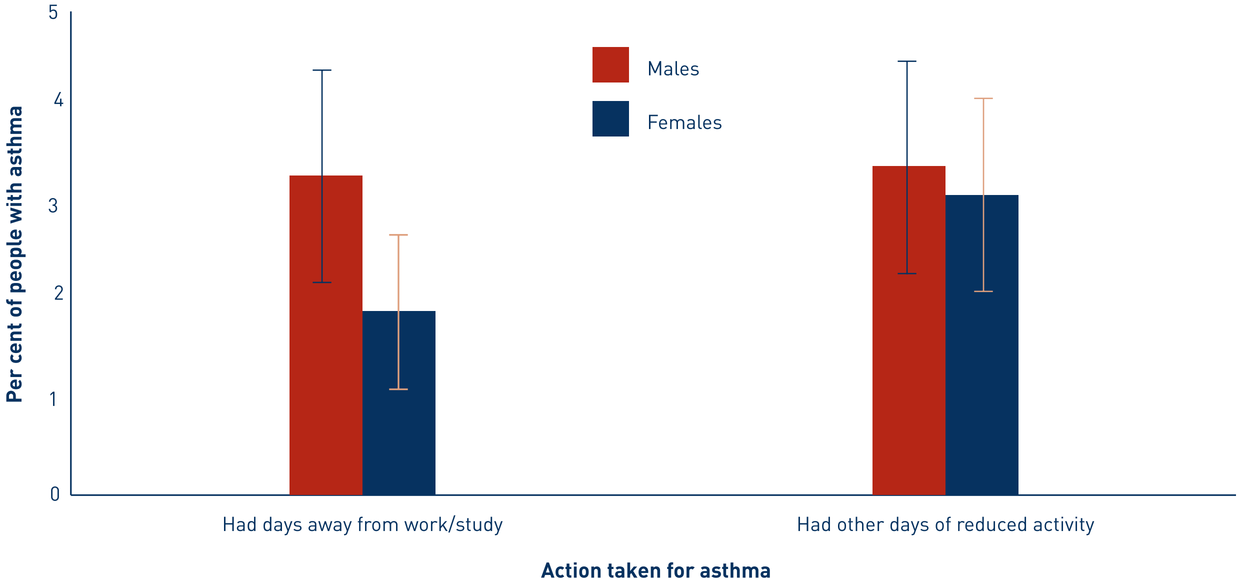
Measure	Population/study	Response	Results (95% CI) With asthma	Results (95% CI) Without asthma	Comments
On how many days in the last 12 months has your asthma made you so unwell that you could not work/study/ manage day-to-day activities?	Qld Chronic Disease Survey 2000 18 years and over (Epidemiology Services Unit 2002)	No days 1–2 days 3–4 days 5–9 days 10–19 days 20+ days	23.4% (18.5–28.3) 12.0% (8.3–15.7) 10.3% (6.8–13.8) 17.5% (13.1–21.9) 10.7% (7.2–14.3) 26.1% (21.1–31.2) (n=291)		Ever diagnosed plus symptoms or treatment of asthma in last 12 months
How many days in the last 12 months did your asthma interfere with your ability to work/ study/manage your day-to-day activities?	NSW Health Survey 1997/98 16 years and over	None 1–2 days 3–4 days 5–9 days 10–19 days 20+ days	79.9% (78.2–81.6) 5.6% (4.5–6.6) 3.8% (2.9–4.6) 3.9% (3.1–4.6) 3.0% (2.2–3.7) 3.9% (3.2–4.7) (n=3,764)		Ever diagnosed by a doctor with asthma and treatment or symptoms of asthma in the last 12 months
Days lost due to asthma	SA Omnibus Survey 1994–98 (Wilson et al. 2002)	1994 1995 1996 1997 1998	20.2 (15.6–25.7) 20.1 (15.9–25.0) 13.5 (10.0–17.8) 18.4 (14.5–23.1) 13.6 (10.1–18.0)		Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'
Lost days from work/ school/home duties in last 12 months	SA Omnibus 1995 (Adams et al. 2001)	Proportion with days lost due to asthma	20.3% Median 5 days lost		
Days off work or school in the last 12 months	WA Health Survey 1995 15 years and over (pers. comm., A Daly)	Days off work school	39.1% Average of 5.2 days		Ever diagnosed by a doctor with asthma and treatment or symptoms of asthma in the last 12 months
Took day off work/ school	NHS 1995 All ages	Took day off work/school	11.9%	4.3%#	#persons without respiratory conditions
Had a day of reduced activity	NHS 1995 All ages	Had a day of reduced activity other than having a day off work/school	9.1%	3.9%#	#persons without respiratory conditions
SF-36 scale score	SA Omnibus Survey 1998 15 years and over (Wilson et al. 2002)	*Social functioning* Metropolitan Country	 80.1 (76.0–84.2) (n=172) 85.4 (77.9–92.9) (n=52)	 87.7 (86.7–88.7) (n=1,539) 90.3 (88.8–91.8) (n=767)	Scores shown are mean scores Ever told by a doctor that you have asthma plus yes to 'do you still have asthma?'
Children					
Limitations in core activities in past 12 months	NSW Child Health Survey 2001 2 to 12 years (Centre for Epidemiology and Research 2002)	Asthma limited the child's usual activities in the last 12 months	58.2% (55.5–60.9) Mean of 9.3 days Median 2 days (n=1,243)		Ever diagnosed by a doctor with asthma plus treatment or symptoms of asthma in the last 12 months
Missed school because of asthma in last 12 months	Eastern Australia 1990 and 1993 (Comino et al. 1996)	1993 1990	58.1% (56.1–60.1) (n=2,342) 59.3% (56.7–61.9) (n=1,382) (Median 7 days missed in 1990 and 1993)		3 or more episodes of wheezing in last year or troublesome cough more than once a week during last 12 months or a diagnosis of asthma
Missed more than 14 days of school because of asthma in last 12 months	Eastern Australia 1990 and 1993 (Comino et al. 1996)	1993 1990	6.4% (5.4–7.4) (n=2,342) 9.4% (7.9–10.9) (n=1,382)		3 or more episodes of wheezing in last year or troublesome cough more than once a week during last 12 months or a diagnosis of asthma

Among participants in the National Health Survey, more males (3.5%) than females (1.9%) reported taking days off work or study because of asthma in the previous 2 weeks (Figure 3.4). The higher rate in males may reflect greater workforce participation. There is no difference in the proportion of males and females with asthma who had other days of reduced activity due to their asthma.

The proportion of people with asthma who reported taking time off work or study in the previous 2 weeks because of any illness was 11.4% (Figure 3.5). This was higher than the rate among people without asthma, which was 7.9%. The proportion of people with asthma who actually attributed days off work or study to asthma was 2.6%.

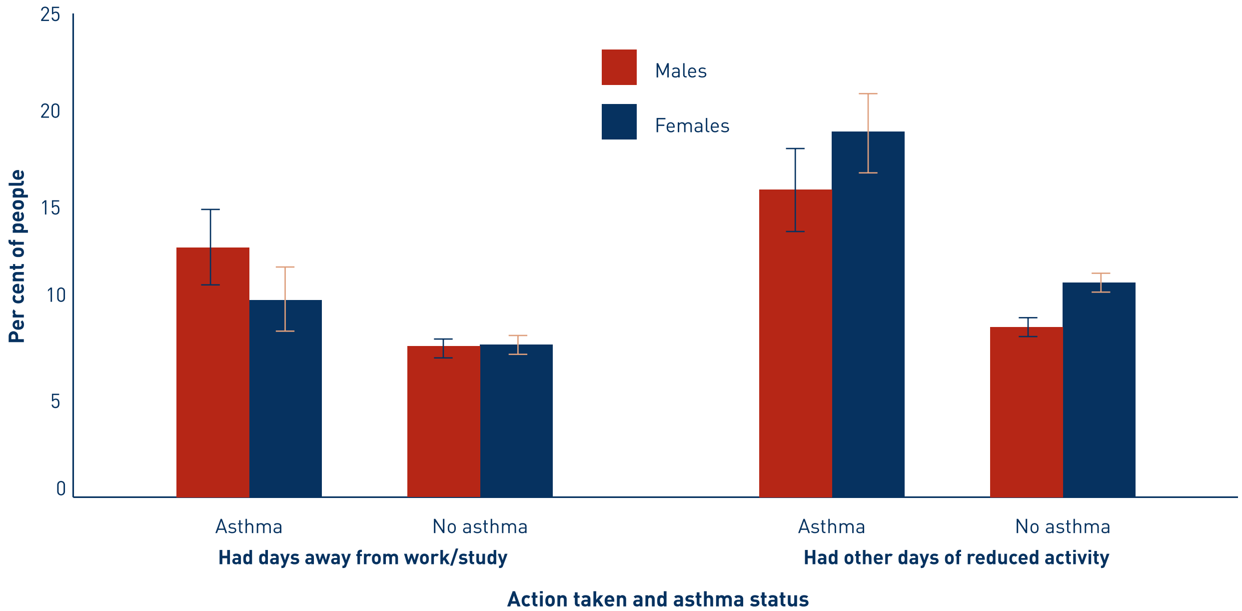
More people with asthma (17.5%) than people without asthma (10%) reported having other reduced activity days in the previous 2 weeks. Only 3.2% of people with asthma attributed other reduced activity days to asthma. These observations imply either that people with asthma under-estimate the impact of 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 3.4:
Action taken in last 2 weeks for asthma, by sex, all ages, Australia, 2001



Source: ABS National Health Survey 2001.

Figure 3.5:
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.

Assessment of the severity of asthma

The National Asthma Council (NAC 2002) recommends using eight indicators to classify asthma severity among adults. Using these guidelines, individuals are assigned to the most severe classification in which any feature occurs (Table 3.5).

Table 3.5:
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%

Note: The individual is assigned to the most severe grade in which any feature occurs.

Source: NAC 2002.

Children with asthma are grouped into three broad categories using the NAC guidelines:

- Infrequent episodic asthma—isolated episodes of asthma which can last from 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.

Data from the supplementary (SAND) asthma module of the BEACH general practice survey (see Appendix 1) were used to estimate the distribution of asthma severity of patients attending GPs using the above classifications (AIHW GPSCU 2000, 2001). The proportion of adult patients with asthma who were classified as having severe asthma decreased between 1999 and 2001 (Table 3.6). Most children and adults attending GPs were assessed as having infrequent episodic asthma and mild or very mild asthma, respectively.

Table 3.6:
Assessment of asthma severity according to the SAND asthma module, adults and children, 1999 and 2001

	1999	2001
Adults (≥18 years)		
Severe	7.9%	5.5%
Moderate	27.7%	24.5%
Mild	27.3%	Mild + very mild 70%
Very mild	32.9%	
Children (<18 years)		
Persistent	4.9%	5.1%
Frequent episodic	21.0%	20.3%
Infrequent episodic	68.5%	74.6%
Time period	30/3/99 to 7/6/99	28/11/00 to 15/01/01
Sample	4,285 encounters from 213 GPs: 630 patients with asthma	5,495 encounters from 95 GPs: 661 patients with asthma

Sources: AIHW GPSCU 2000, 2001.

In the 1997 NSW Health Survey, 54% of people with asthma were classified as having moderate to severe asthma, requiring regular preventer use (Marks et al. 2000). These were people who met one or more of the following criteria, which were adapted for survey use from the NAC criteria:

- 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 3.6) 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.

Summary

The impact of asthma on how people assess their overall health status can be measured. 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 severity of asthma in the general community. It is likely that between one-third and a half of patients with asthma in the general population have moderate or severe asthma, as defined by the NAC. As yet, there are few data which allow assessment of time trends in the impact of asthma on the quality of life.

3.2 Mortality

Key points

- There was an increase in the number of deaths from asthma during the 1980s. Since 1989 there has been a decline in the number of deaths from asthma.
- The risk of dying from asthma increases with age. The majority of deaths occur in people aged 65 years and over.
- People who live in rural and remote areas or in more disadvantaged areas are more likely to die from asthma than people in cities and large towns or in less disadvantaged areas. These differences are similar to those seen for deaths due to other causes.
- People with asthma who were born overseas and do not speak English as a first language have a higher risk of death from asthma.
- Older people with asthma have an increased risk of dying from asthma during winter.

Introduction

Death due to asthma is uncommon. The 422 deaths for which the underlying cause was asthma in 2001 represent only 0.3% of all deaths in that year (ABS 2002a). Nevertheless, it is important to monitor trends in asthma-related mortality as these rare events may be an indicator of changes in the incidence, prevalence (Mannino et al. 1998), severity (Jalaludin et al. 1999) and/or treatment (Suissa et al. 1994) of asthma.

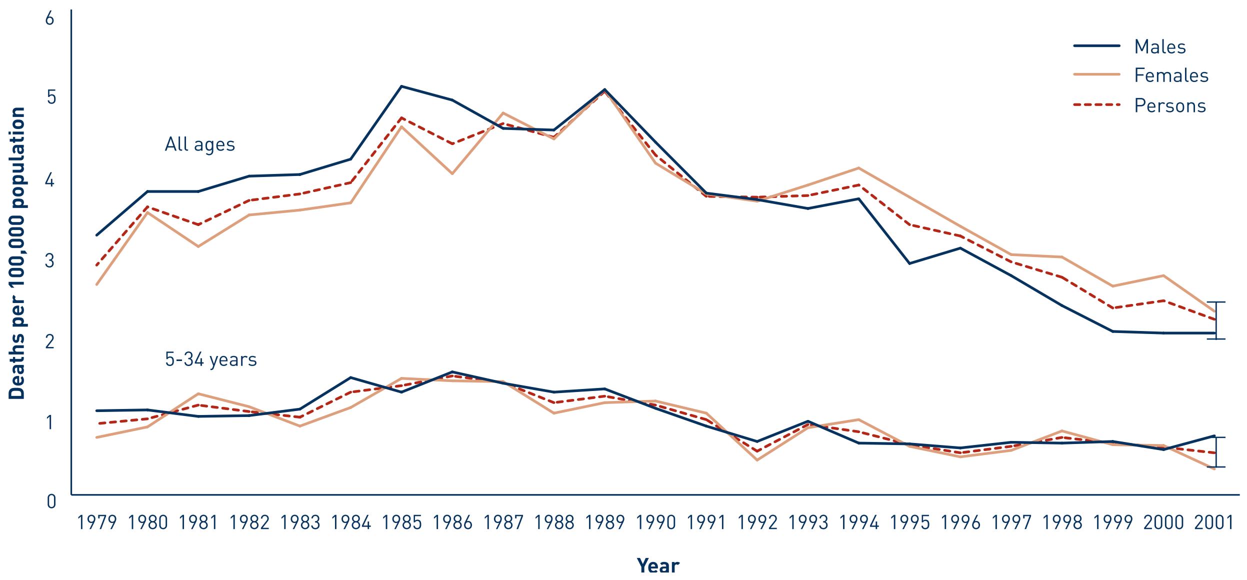
Interpreting differences and trends in asthma mortality is complicated by a variable overlap with other lung diseases, particularly chronic obstructive pulmonary disease (COPD) (Guite & Burney 1996; Smythe et al. 1996). This is a problem in older people in whom the attribution of death to asthma is less 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 the underlying cause of death is most reliable (Sears et al. 1986). However, as most deaths due to asthma actually occur in the elderly, it is also important to monitor older age groups (ABS 1999a).

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.

Time trends in asthma deaths

There was a rise in deaths directly attributed to asthma during the early to mid-1980s, reaching a peak in 1989 with 736 deaths, with a subsequent steady decline (Figure 3.6). This trend is confirmed, although less marked, among the subgroup of 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 in 1986. After 1992, death 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 years subgroup.

Figure 3.6:
Death rates for asthma, all ages and age 5 to 34 years, by sex, Australia, 1979–2001



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1 for details. 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 the following conversion: ages 5–34 years, no conversion; 35–64 years, converted by a factor of 0.84; 65+ years, converted by a factor of 0.68. Vertical error bars show 95% confidence interval for persons in 2001.

Source: AIHW National Mortality Database.

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). The observed reduction in death rates may be due to a fall in the prevalence of the disease, either due to reduced incidence or increased remissions, or a reduction in case-fatality rate among those who have the disease. Evidence about recent trends in the prevalence of asthma (see Chapter 2) is limited. However, it seems likely that at least part, if not all, of the reduction in deaths is due to a reduced case-fatality rate.

We cannot definitely attribute this improvement to any specific cause. Nationwide programs to improve management and education, including the introduction of guidelines for the management of asthma, may have contributed to this successful outcome. However, other changes in treatment practices or environmental changes affecting the severity of asthma and/or the severity of exacerbations of asthma may also have contributed.

These relatively recent trends may be viewed in the context of long-term trends (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. However, in the 5 to 34 years age group, asthma death rates were low in the early 20th century. There have been substantial fluctuations over time, most notably a marked increase during the mid-1960s. The increase between 1979 and the late 1980s came after a decreasing trend in this age group from a peak in 1966 to a low in the late 1970s.

Differentials in asthma mortality

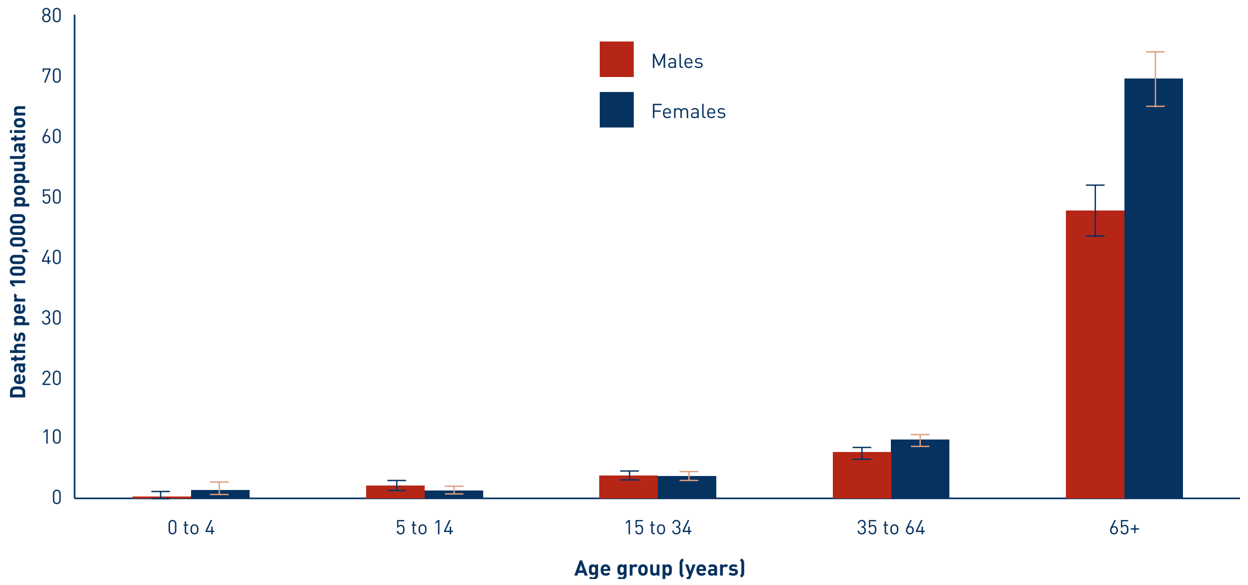
Factors affecting asthma mortality fall into four categories—underlying disease severity (Jalaludin et al. 1999), factors relating to management and care (Abramson et al. 2001), health behaviours and compliance (Sturdy et al. 2002), and psychological and socioeconomic factors (Castro et al. 2001; Sturdy et al. 2002). Information on many of these characteristics is not available from routinely collected data. However, examining differences across groups may help to identify opportunities for prevention.

Age and sex

Asthma mortality increases substantially with age in both males and females (Figure 3.7). This follows the broader age trend in all-cause deaths (Dunn et al. 2002). Sixty-one per cent of all deaths attributed to asthma between 1997 and 2001 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.

The gender differential occurs predominantly in the age group in which misclassification between COPD and asthma is most problematic. Hence, the extent to which this differential is due to gender differences in diagnosis and labelling, as opposed to actual differences in asthma mortality risk, remains unknown.

Figure 3.7:
Death rates for asthma, by age group and sex, Australia, 1997–2001



Note: Age-specific death rates for aggregated data from 1997 to 2001. Asthma classified according to ICD-10 codes J45 & J46.

Source: AIHW National Mortality Database.

States and territories

Figure 3.8 shows the death rates for asthma by jurisdiction for the period 1997 to 2001. Although there is a suggestion of variation between jurisdictions, the small numbers of deaths in the states and territories with smaller populations mean that the differences have to be interpreted with caution.

Figure 3.8:
Death rates for asthma, by state and territory, Australia, 1997–2001

Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1 for details. Death rates for aggregated data from 1997 to 2001. Persons, all ages. Asthma classified according to ICD-10 codes J45 & J46. Horizontal line represents Australian death rate for asthma (2.48 per 100,000 population). Estimates for ACT and NT excluded as they are too small to produce reliable estimates.

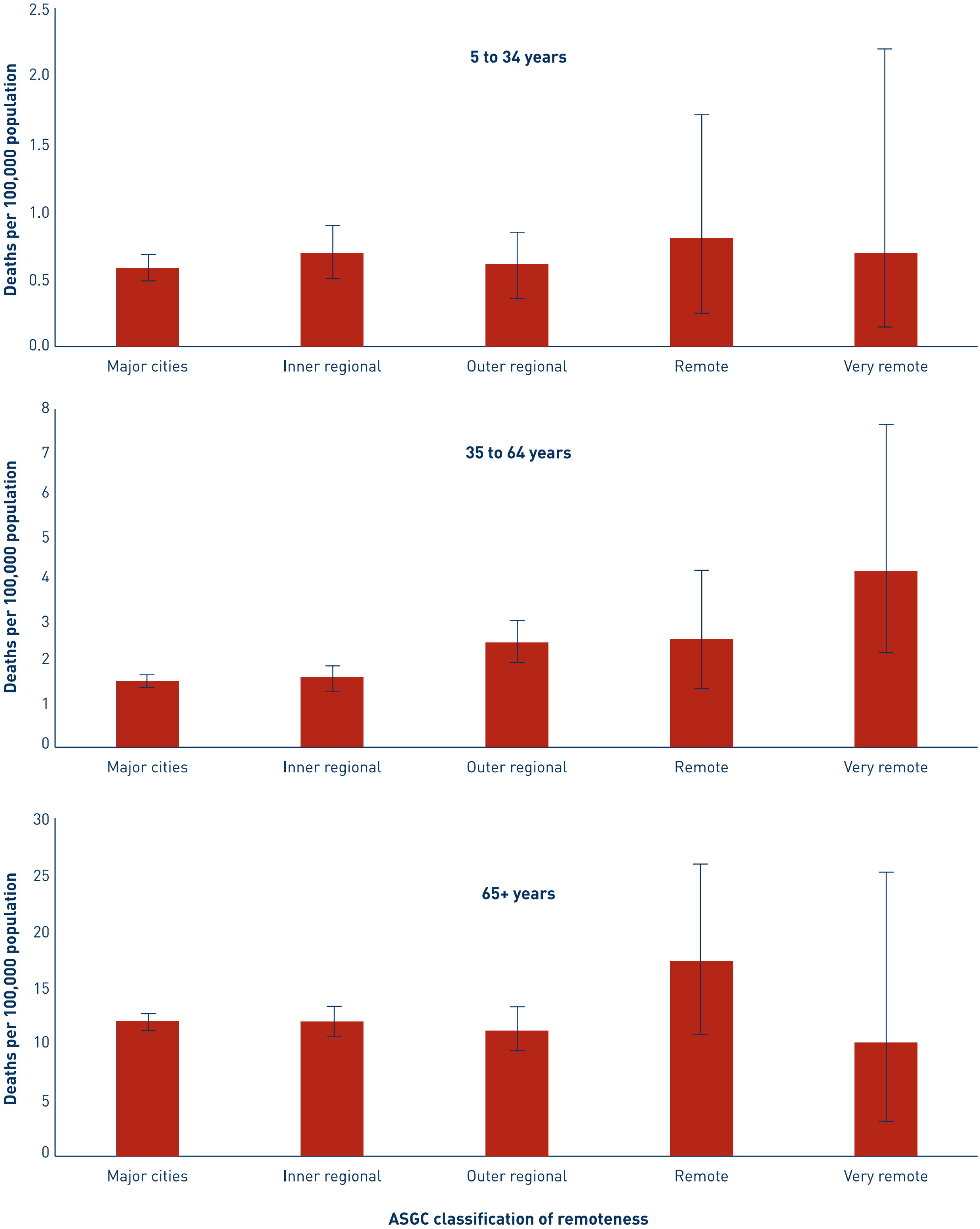
Source: AIHW National Mortality Database.

Urban, rural and remote areas

Death rates for asthma were higher in outer regional and remote areas than in major cities among persons aged 35 to 64 years ($p<0.007$, Figure 3.9). In this age group, the death rate due to asthma among persons living in remote and very remote areas was 2.07 times higher than the rate among persons living in major cities (95% confidence interval 1.4 to 3.0 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 A1.3 for method of analysis.) These findings are consistent with observations on regional variation in all-cause death 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 from 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 3.9:
Death rates for asthma, by ASGC classification of remoteness, age 5 years and over, Australia, 1997–2001



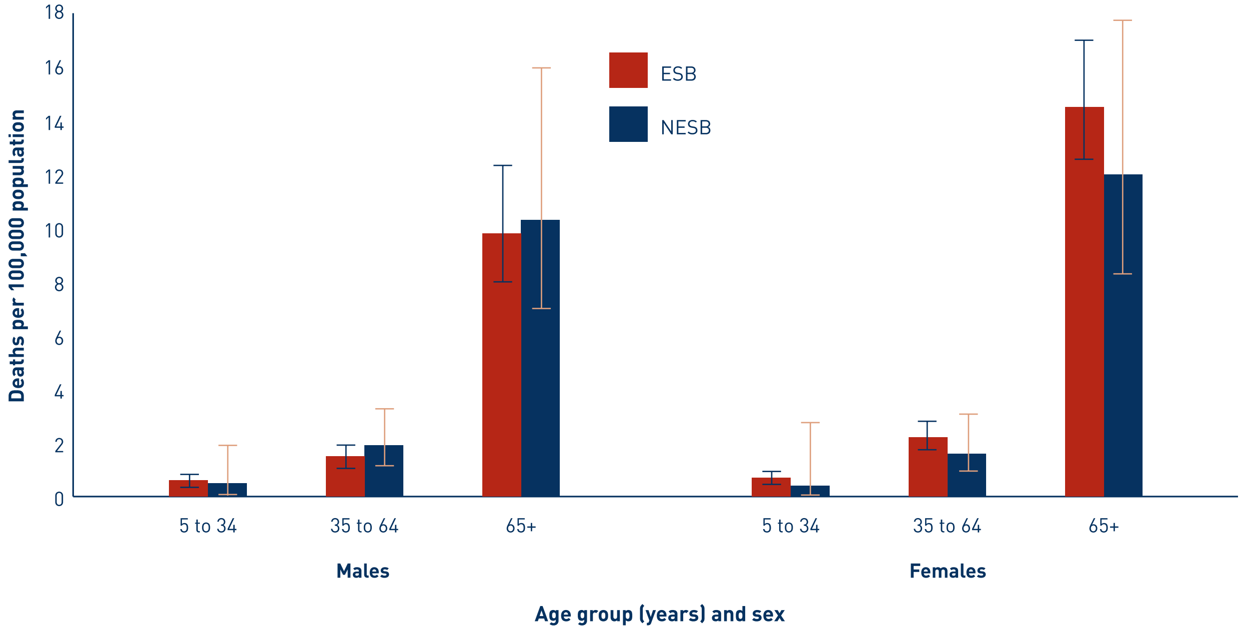
Note: Death rates for aggregated data from 1997 to 2001. Asthma classified according to ICD-10 codes J45 & J46.

Source: AIHW National Mortality Database.

Culturally and linguistically diverse background

There were no significant differences between people of non-English-speaking backgrounds and those of English-speaking backgrounds in the death rates for asthma (Figure 3.10). This contrasts with data on the prevalence of asthma, which is higher in persons of English-speaking background than in those of non-English-speaking backgrounds (Figure 2.10) and is also higher in children born in Australia compared with those who were born overseas (Leung et al. 1994; Peat et al. 1992). The overall case-fatality rates for asthma, estimated on the basis of the prevalence data from the National Health Survey 2001, are 46 per 100,000 people with asthma of non-English-speaking backgrounds and 19 per 100,000 people with asthma of English-speaking background. The higher case-fatality rate among people from a non-English-speaking background is evident across all ages (Figure 3.11). This suggests that persons with asthma who are of non-English-speaking background have an increased risk of death due to the disease compared with people from an English-speaking background. This requires further investigation, in the first instance to establish whether these differences in risk are real or, alternatively, are attributable to extraneous factors.

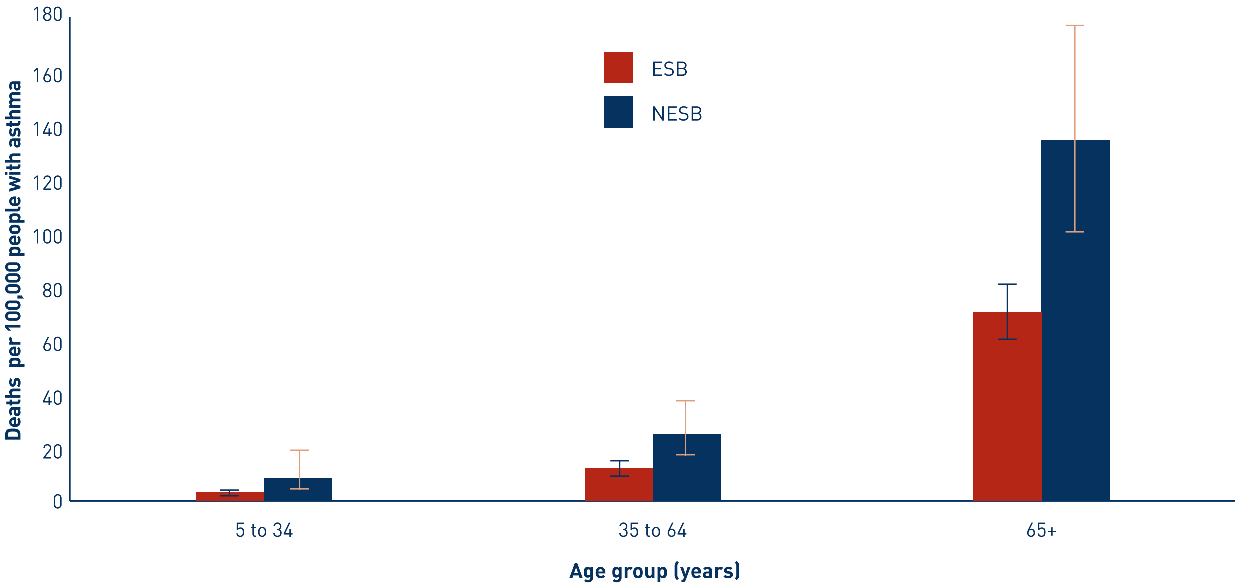
Figure 3.10:
Death rates for asthma, by sex and culturally and linguistically diverse background, age 5 years and over, Australia, 1997–2000



Note: Death rates for aggregated data from 1997 to 2000. Asthma classified according to ICD-10 codes J45 & J46. ESB—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). NESB—Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001).

Source: AIHW National Mortality Database.

Figure 3.11:
Death rates for asthma, per 100,000 people with asthma, by culturally and linguistically diverse background, age 5 years and over, Australia, 1997–2000



Note: Death rates for aggregated data from 1997 to 2000. Asthma classified according to ICD-10 codes J45 & J46. ESB—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). NESB—Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001).

Source: AIHW National Mortality Database.

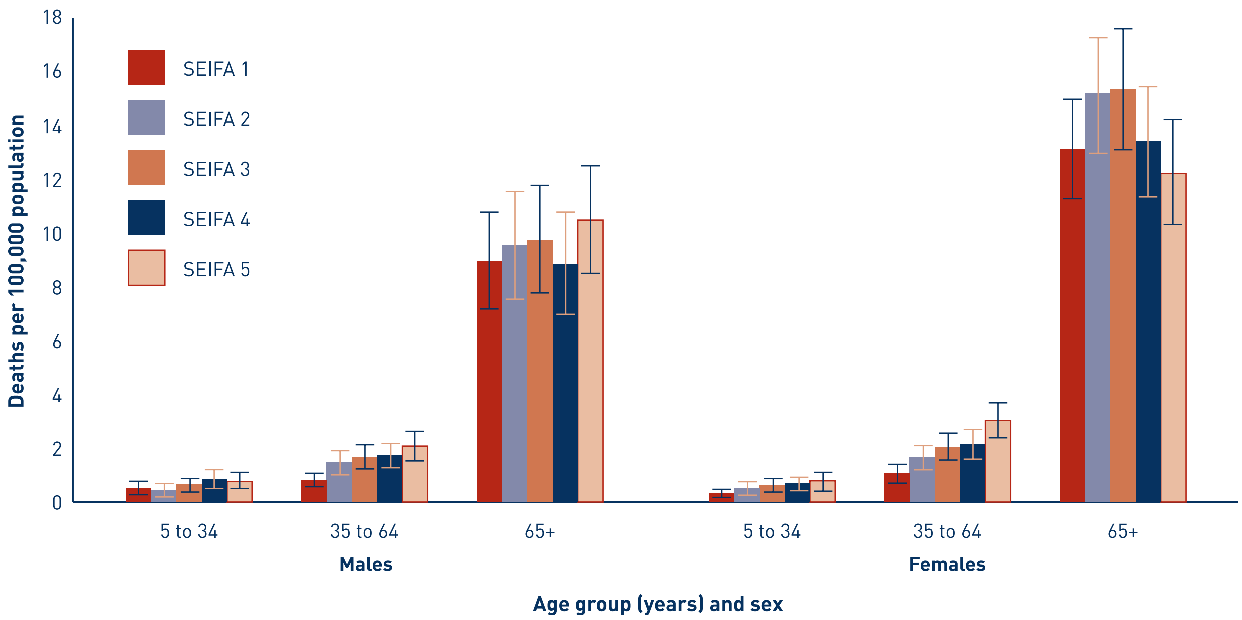
Socioeconomic disadvantage

Socioeconomic status reflects a complex interplay of factors such as ethnicity, education, income, occupation and geographic location. Studies of socioeconomic differentials 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).

There is 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 but not among persons aged 65 years and over (Figure 3.12). This trend is strongest in the 35 to 64 years age group, in which the death rate due to asthma in the two most disadvantaged quintiles was 2.3 times higher than the death rate in the least disadvantaged quintile (95% CI 1.59 to 3.41 times in males, 1.68 to 3.21 times in females). This association was independent of related variation in the degree of remoteness.

Figure 3.12:
Death rates for asthma, by SEIFA quintile and sex, age 5 years and over, Australia, 1997–2001



Note: Death rates for aggregated data from 1997 to 2001. Asthma classified according to ICD-10 codes J45 & J46. The population has been divided into 5 segments: SEIFA 1 represents the least disadvantaged socioeconomic quintile, and SEIFA 5 the most disadvantaged.

Source: AIHW National Mortality Database.

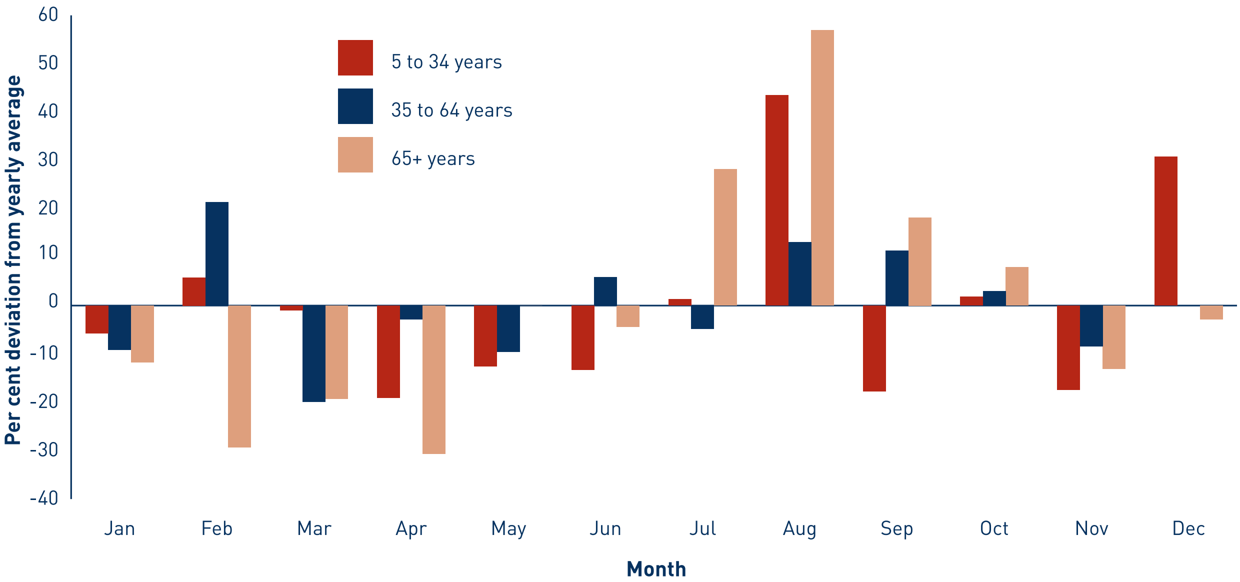
Seasonal variation in mortality risk

Previous studies have shown that seasonal variation in risk of death due to asthma itself 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 3.13) reflect 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 is no winter predominance in the pattern of asthma mortality among those aged 5 to 34 years and 35 to 64 year olds. There is 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 peaks 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 3.13:
Average monthly deviation from average number of deaths attributed to asthma, by age group, Australia, 1979–2001



Note: Asthma classified according to ICD-9 code 493, 1979 to 1996 and ICD-10 codes J45 & J46, 1997 to 2001. 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 22 year period.

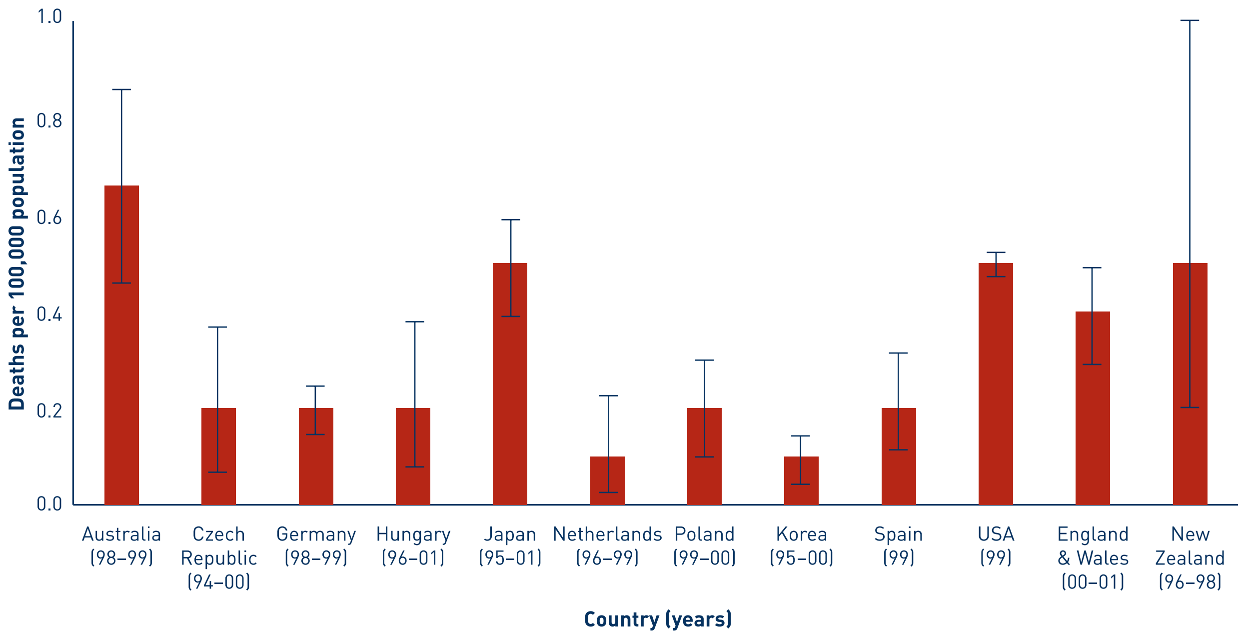
Source: AIHW National Mortality Database.

International comparisons

The validity of international comparisons in disease-specific mortality rates depends upon the reliability of the attribution of death to asthma. As noted above, although most deaths due to asthma occur in the elderly, it is in this age group that the attribution of death to asthma, as opposed to another cause, is most unreliable. As the diagnosis of asthma as the cause of death is most reliable in the age range 5 to 34 years, this age band is conventionally used for international comparisons.

Figure 3.14 shows standardised mortality rates for people aged 5 to 34 years for countries reporting to the WHO Information System in ICD-10 format. In addition, rates for England & Wales and New Zealand are shown using data obtained independently. The rates represent the average of between 1 and 7 years' data for each country. The Australian rate is based on 1998 and 1999 data included in the WHO database. The figure demonstrates that Australia has a relatively high mortality rate from asthma.

Figure 3.14:
Death rates for asthma, age 5 to 34 years, international comparison



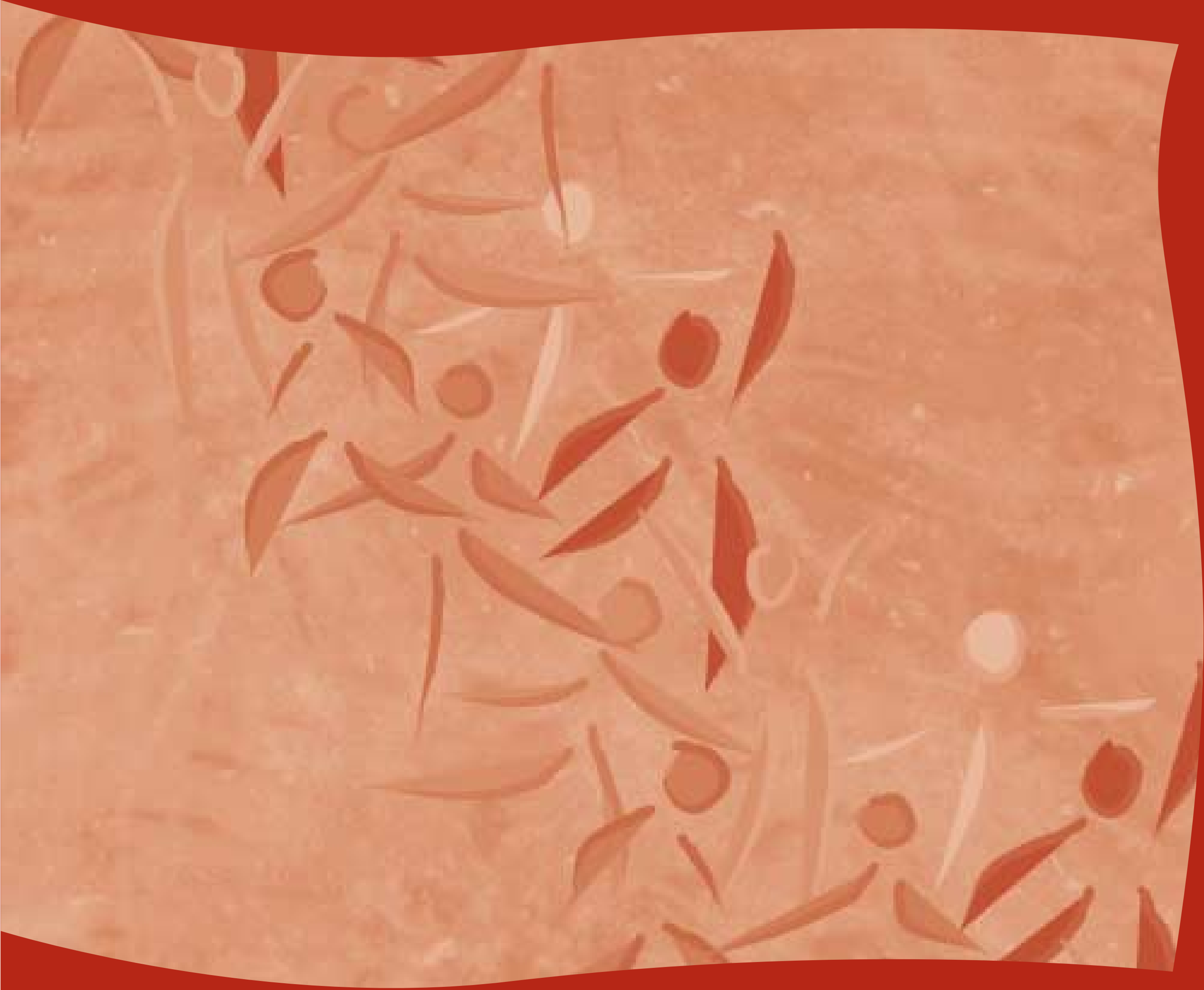
Note: Data are for countries reporting to the World Health Organisation Information System (WHOIS) in ICD-10 format. Data are the average over one or more years during the period 1994 to 2001 (years coverage for each country shown in brackets). Only those countries with >90% coverage and more than 30 deaths reported overall are included. Rates are age and sex standardised to the world population (median variant estimate for the year 2000). Data for England and Wales and New Zealand were sourced separately (see below).

Sources

1. For all countries shown except England & Wales and New Zealand data were obtained from World Health Organisation 2003.
2. Population division of the Department of Economics and Social Affairs of the United States Secretariat 2001, 2002.
3. Data for England & Wales were obtained from Office of National Statistics 2001, 2002, 2003. The 2000 data were classified by ICD-9 and the 2001 data were classified by ICD-10. Data were obtained for 10-year age groups.
4. Data for New Zealand were obtained from New Zealand Health Information System 1999, 2000, 2001. Data were classified by ICD-9.

Summary

Australian death rates due to asthma have been steadily falling for more than a decade. However, the risk remains high compared with other nations. Death rates for asthma increase markedly with age and, generally speaking, people living in remote areas and those living in socioeconomically disadvantaged areas have higher death rates. However, these trends mirror similar trends observed for all-cause mortality. Among people aged 65 years and over, mortality is 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 is an increased risk of death due to asthma during winter in older people but no such pattern is observed among children and young adults.



4 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; Stewart & Huang 2003). 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, no reliable data for this indicator are available in Australia at the present time (Baker et al. 2003).

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

4.1 Smoking in people with asthma

Key points

- The 2001 National Health Survey found that the proportion of smokers among people with asthma was higher than the proportion of smokers among people without asthma.
- The highest proportion of current smokers among people with asthma was in the 18 to 34 years age group and the proportion decreased as age increased.
- 40.5% of males aged 18 to 24 years with asthma were current smokers, compared to 31.0% of females with asthma in the same age group.
- The proportion of smokers increased as socioeconomic disadvantage increased.
- Young males, aged 18 to 34 years, living in the most disadvantaged areas were the most likely to smoke. In this group there were more male smokers with asthma (68.3%) than without asthma (42.1%).

Introduction

The adverse effects of active and passive smoking are well known. 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 to non-smokers with asthma.

In this chapter, we report data on smoking status from the 2001 National Health Survey. Data are for people who reported that they have had asthma diagnosed by a doctor and still have it.

Overall, 25.9% of people with asthma were current smokers (27.4% of males and 24.9% of females). This rate was higher than that observed in people without asthma: 24.1% (27.6% of males and 20.6% of females).

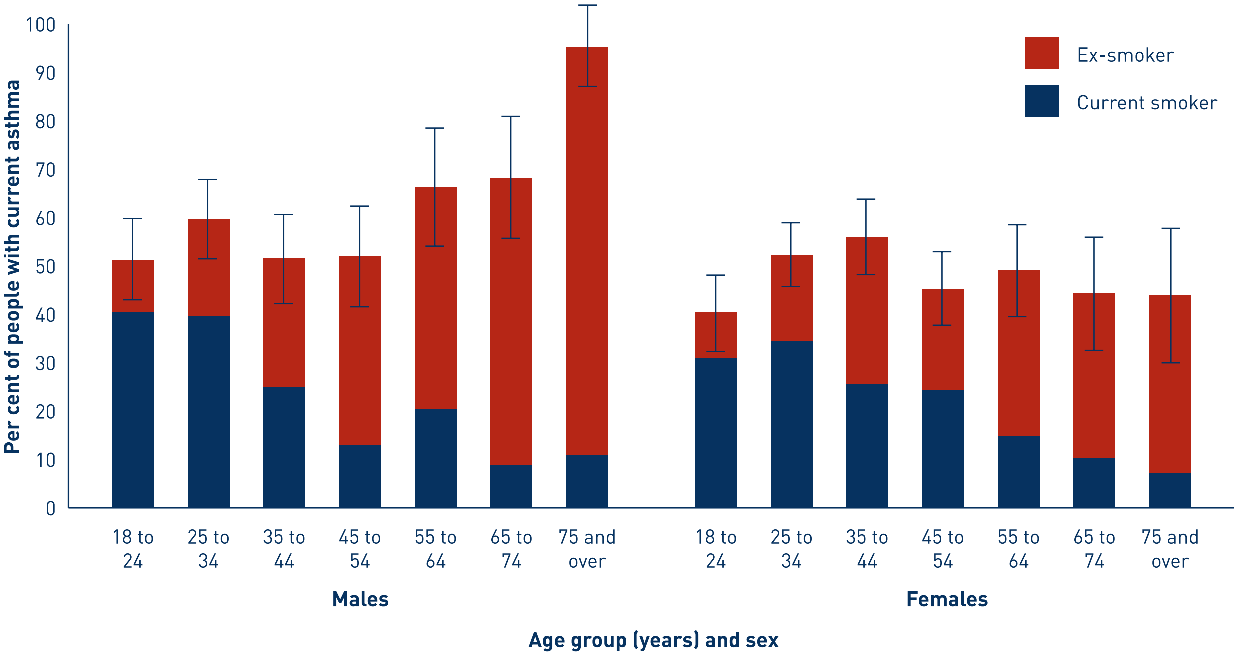
This observation raises the possibility that some people with chronic obstructive pulmonary disease (COPD), which is strongly related to smoking, have been wrongly classified as having asthma. Smoking is the major cause of emphysema and other, related diseases that underlie COPD. The symptoms and signs of COPD are similar to those of asthma and misclassification between COPD and asthma is a major problem in both clinical and epidemiological practice. It is possible that the apparent high rates of smoking among people with asthma are in part attributable to the inclusion of people with COPD.

Differentials in asthma and smoking

Age and sex

The proportion of people with asthma who were current smokers in 2001 decreased markedly with age (Figure 4.1). The highest proportion of smokers among people with asthma was in the male 18 to 24 year age group. In this group, 40.5% of males were current smokers, compared to 31.0% of females. More females than males with asthma reported never having smoked. This was most pronounced in the 75 years and over age group where 55.7% of females compared to 4.7% of males with asthma had never smoked. In the older age groups there was also a greater percentage of male ex-smokers. This again raises the possibility that a substantial proportion of these older men actually had smoking-related lung disease, that is COPD, rather than asthma.

Figure 4.1:
Smoking status among people with current asthma, by age group and sex, Australia, 2001

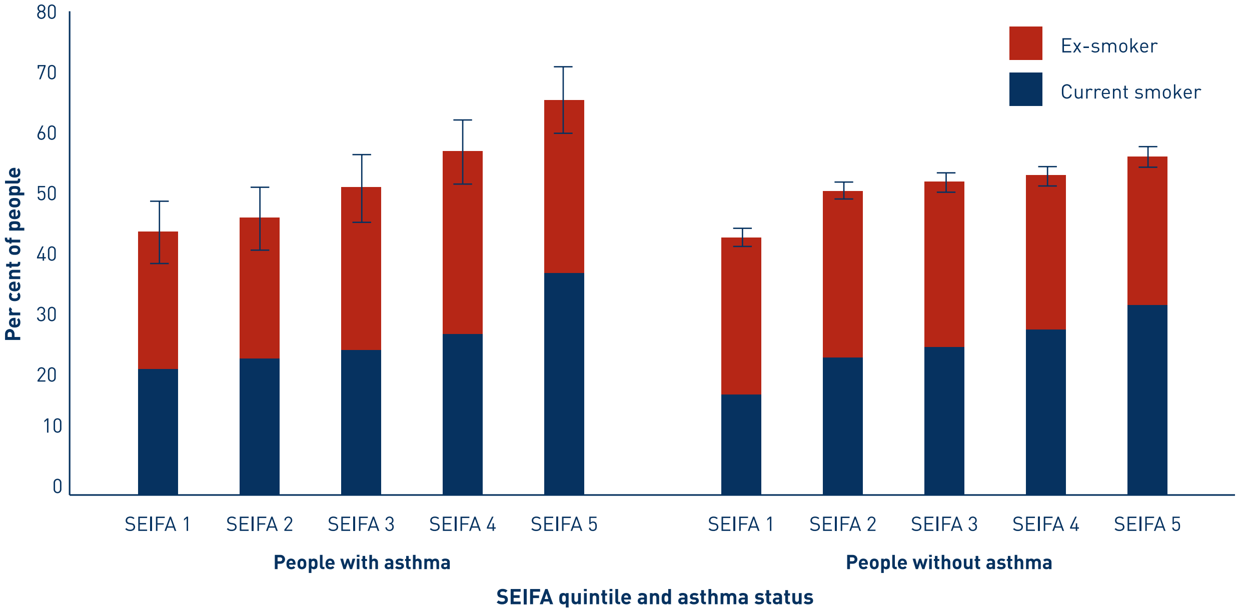


Source: ABS National Health Survey 2001.

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 4.2). This differential was more marked than that observed in the people without asthma and, hence, the prevalence of smoking among people with asthma in the most disadvantaged group (36.7%) was higher than that observed for people without asthma (31.4%).

Figure 4.2:
Current smokers and ex-smokers in people with and without asthma, by SEIFA quintile, Australia, 2001

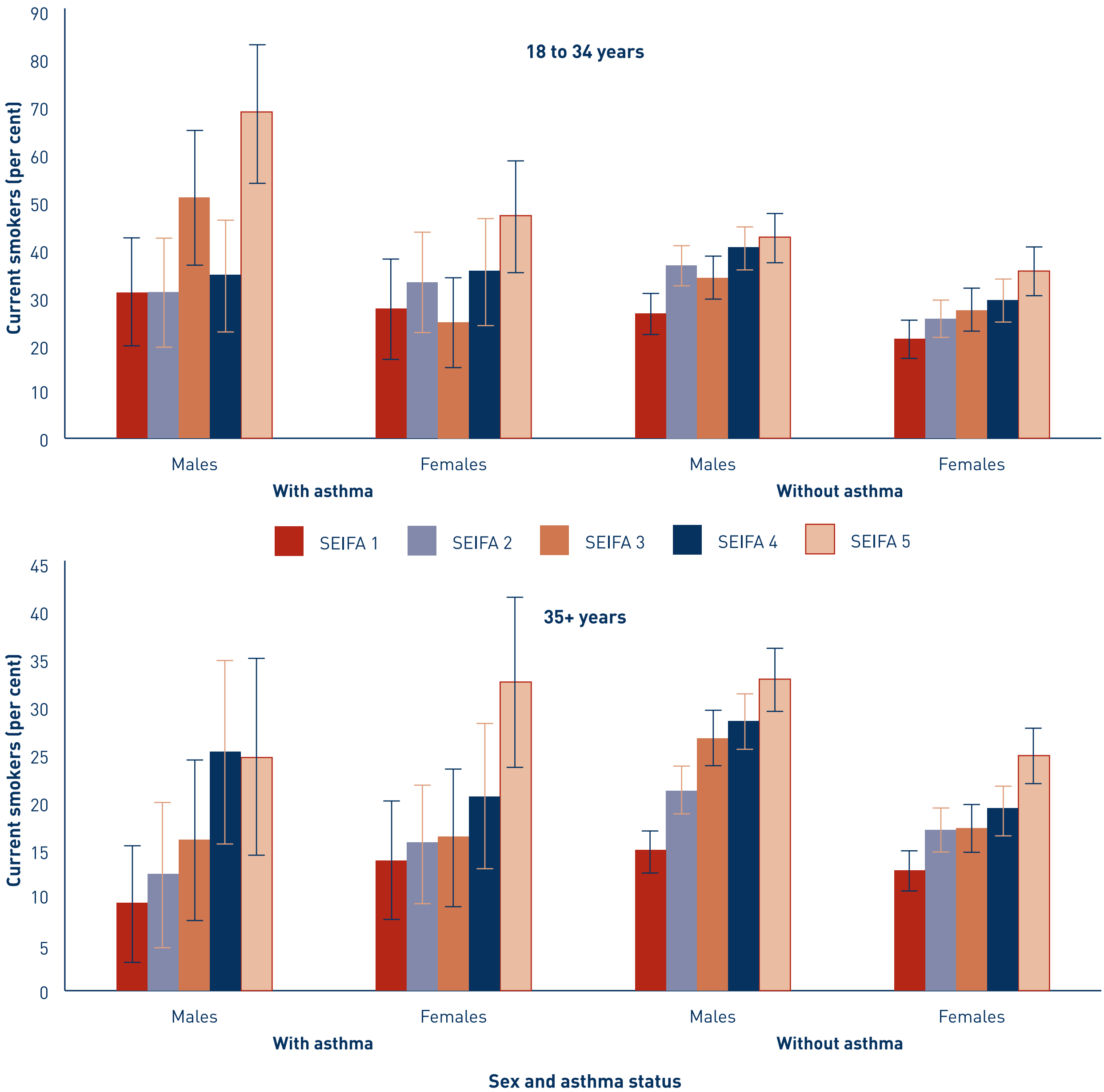


Note: SEIFA 1 represents the least disadvantaged socioeconomic quintile and SEIFA 5 the most disadvantaged.

Source: ABS National Health Survey 2001.

The trend for an increasing proportion of smokers with increasing socioeconomic disadvantage was most pronounced in the young males with asthma (aged 18 to 34 years) and the older females with asthma (aged 35 years and above). A total of 30.5% of young males with asthma in the least socioeconomically disadvantaged group reported being a current smoker compared to 68.3% of those with the greatest socioeconomic disadvantage. This latter proportion was much higher than the proportion of young male smokers without the condition for the same socioeconomic group (42.1%). The proportion of older female smokers with asthma (aged 35 years and over) increased markedly with increasing socioeconomic disadvantage, from 13.6% of females in the least disadvantaged group to 32.3% of females in the most disadvantaged group (Figure 4.3).

Figure 4.3:
Proportion of current smokers in people with and without asthma, by SEIFA, age group and sex, Australia, 2001



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

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.

4.2 Passive smoke exposure in children with asthma

Key points

- The 2001 National health Survey found that among children with asthma, 41.9% of boys and 38.9% of girls reported living with one or more regular smokers.
- More boys with asthma (41.9%) than boys without asthma (36.7%) had one or more regular smokers in their household.
- Children with asthma from areas of greater relative socioeconomic disadvantage were more likely to be living with a regular smoker.
- More children with asthma (60.1%) than without asthma (49.1%) who were living in areas of greater relative socioeconomic disadvantage had one or more regular smokers in their household.

Introduction

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 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 care utilisation is increased in children exposed to ETS. It has been reported that children exposed to ETS are more likely to attend Emergency Departments with asthma (Evans et al. 1987) and that 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).

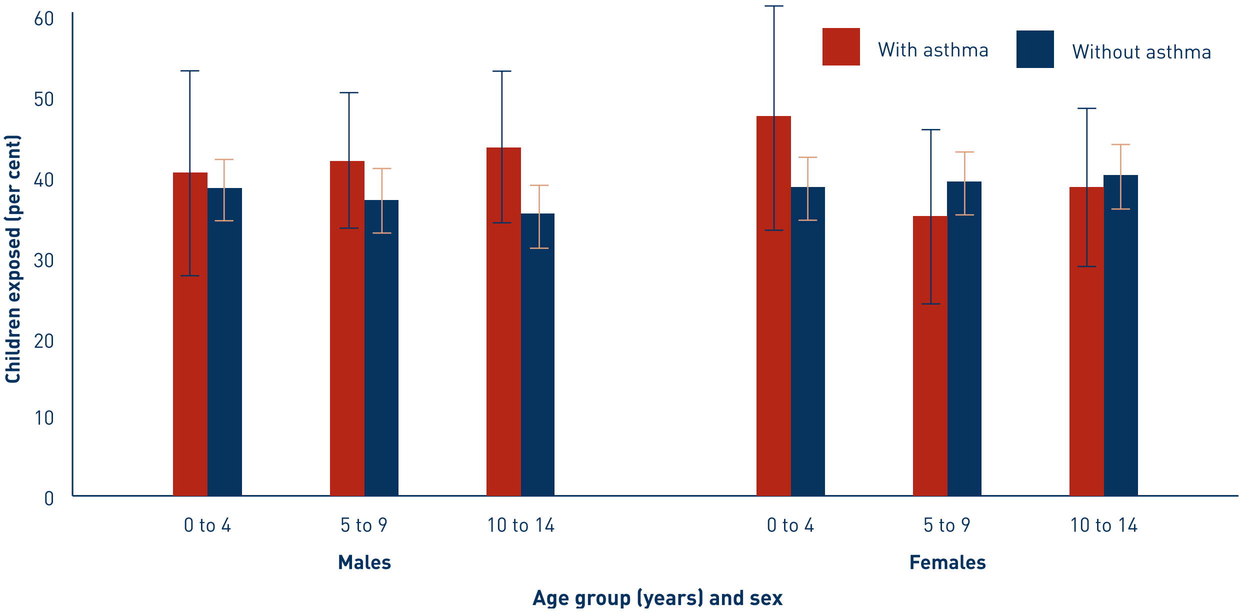
The main data source for the results presented in this chapter is the Australian Bureau of Statistics' 2001 National Health Survey.

Differentials in children exposed to passive smoke

Age and sex

Approximately 40% of children with asthma reported having one or more regular smokers in their household and were potentially exposed to cigarette smoke in their home (Figure 4.4). The proportion of girls with asthma aged 0 to 4 years living with one or more regular smokers was as high as 47%. There was a higher proportion of boys with asthma (41.9%) than boys without asthma (36.7%) residing with one or more cigarette smokers. There was very little difference in the total proportion of girls with asthma (38.9%) and girls without asthma (39.0%) who had one or more cigarette smokers in their household.

Figure 4.4:
Children with and without current asthma with one or more cigarette smokers in the household, by age group and sex, Australia, 2001

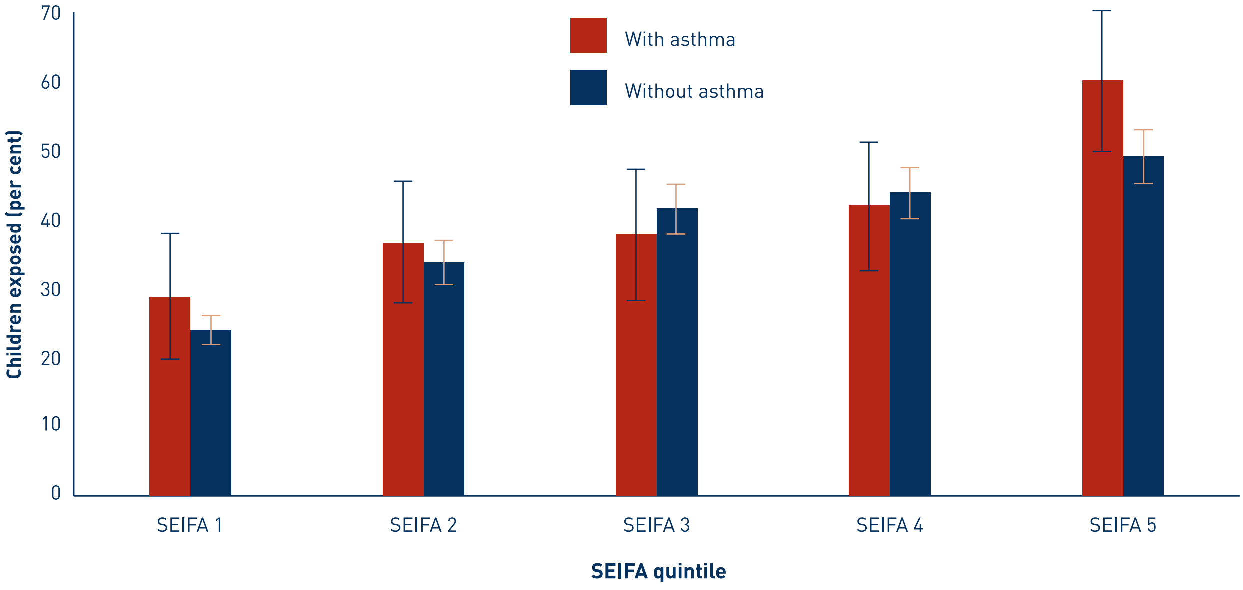


Source: ABS National Health Survey 2001.

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 areas of less socioeconomic disadvantage (Figure 4.5). This difference was significantly different when the two SEIFA quintiles representing the least disadvantaged areas were compared to the most disadvantaged area. Within the area of most socioeconomic disadvantage, a higher proportion of children with asthma (60.1%) than without asthma (49.1%) reported living with one or more cigarette smokers.

Figure 4.5:
Children with and without current asthma with one or more cigarette smokers in the household, by SEIFA quintile, age 0 to 14 years, Australia, 2001

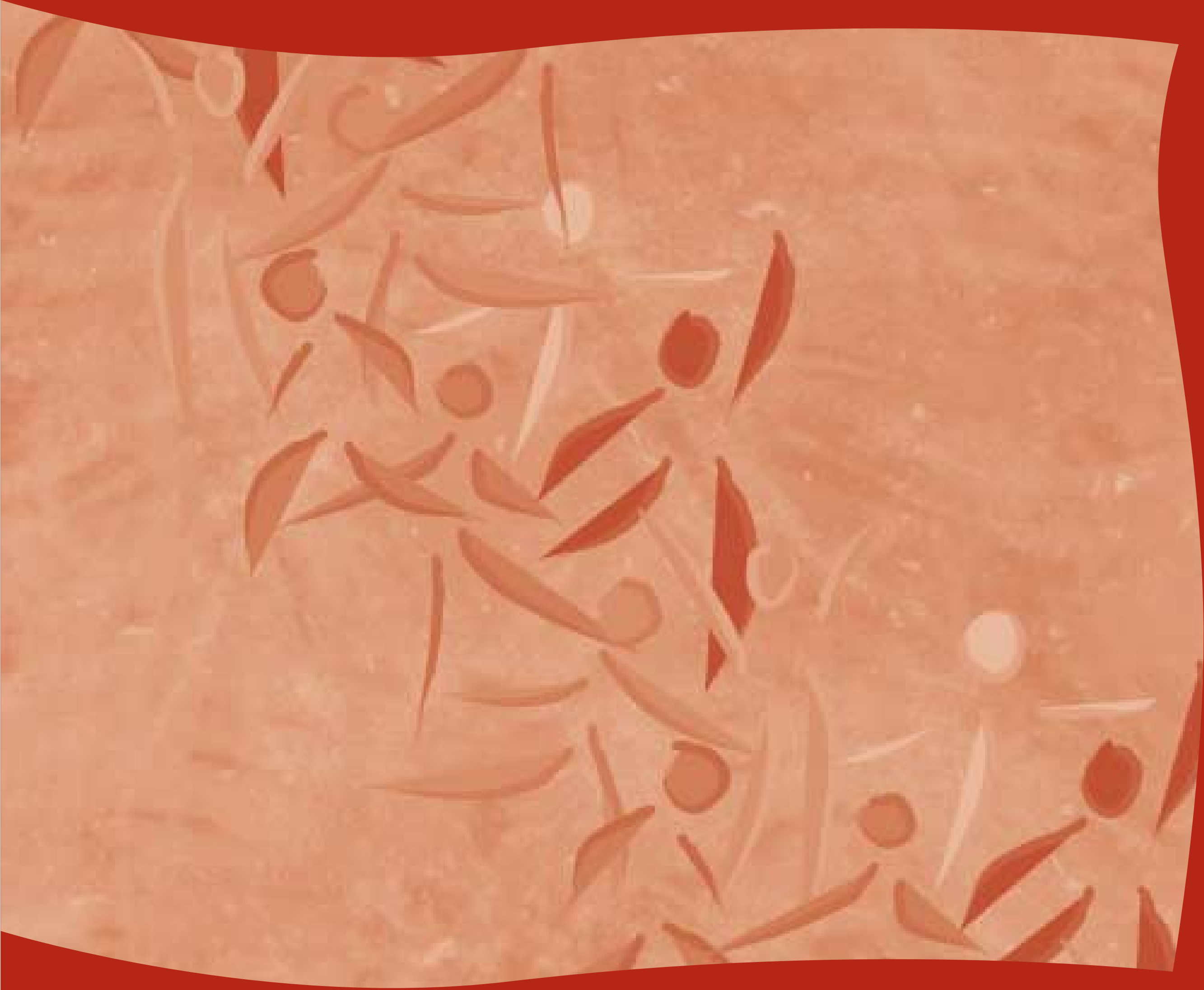


Note: SEIFA 1 represents the least disadvantaged socioeconomic quintile and SEIFA 5 the most disadvantaged.

Source: ABS National Health Survey 2001.

Summary

A high proportion of children with asthma report living with one or more regular smokers. More boys than girls with asthma aged 0 to 14 years reside with at least one regular smoker. Children with current asthma from areas of greater socioeconomic disadvantage are the most likely to be residing with a smoker.



5 Management and care

5.1 Asthma-related general practice encounters

Key points

- During the period 1998–99 to 2001–02, the average rate of general practice encounters at which asthma was managed was 16 per 100 population per year. This represents 3.0% of all general practice encounters over that period.
- Boys aged 0 to 4 years had the highest rate of asthma-related general practice encounters.
- The rate of general practice encounters for asthma has declined over the last 4 years, particularly in children aged 0 to 4 years.
- Seasonal fluctuations in the annual rate of asthma-related general practice encounters are consistent with the seasonal fluctuations in hospitalisations and Emergency Department attendance rates for asthma.

Introduction

General practitioners (GPs) provide the cornerstone for the management of asthma in the community, diagnosing, maintaining and managing acute care for most people with asthma. It is important to monitor the utilisation of general practice encounters related to asthma in order to better understand the impact of asthma on community resources and the level of accessibility to general practice asthma care. Variations in resource utilisation and accessibility across different groups and geographical areas 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 a severe exacerbation or increased symptom frequency (including diagnosis); a review during or following an acute episode; or a visit for maintenance activities such as writing prescriptions. The GP may initiate an opportunistic review when the patient visits for another condition or the patient or GP may schedule a structured planned review.

With the introduction of a number of strategies to improve asthma management in general practice, there is 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. Currently, there is no data source available that can provide information, separately, on the rate of acute and review asthma-related general practice encounters.

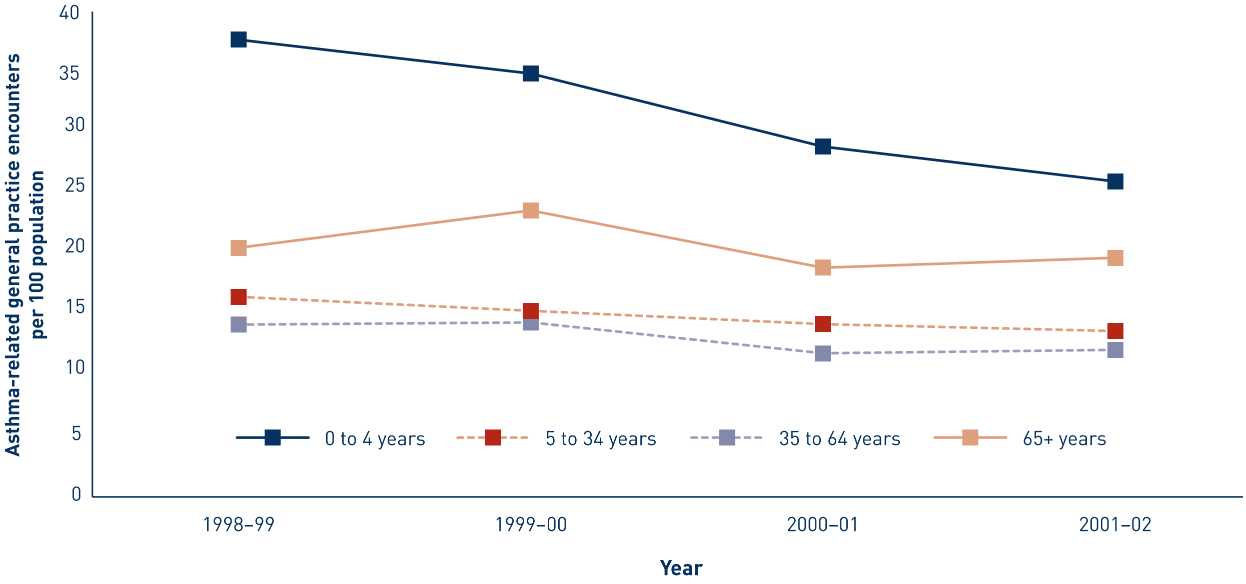
This chapter presents information on all asthma-related general practice encounters as a population-based rate. These estimates are based on the Bettering the Evaluation and Care of Health (BEACH) data (AIHW GPSCU 2002) which report the proportion of a random sample of all general practice encounters in which asthma is reported as being managed. The chapter also reports data on structured general practice review visits for asthma that comply with the Asthma 3+ Visit Plan Practitioner Incentive Program (PIP). These data are derived from Health Insurance Commission data.

Time trends in asthma-related general practice encounters

During the period 1998–99 to 2001–02, the average rate of general practice encounters at which asthma was managed was 16 per 100 population per year. This represents 3.0% of all general practice encounters over that period.

The rate of asthma-related general practice encounters was stable at around 17 per 100 population per year between 1998–99 and 1999–2000, dropping to below 15 encounters per 100 population in 2000–01 and levelling off in 2001–02 (Figure 5.1). The rates for all age groups declined during this period. However, the most notable decrease was in the 0 to 4 years age group, in which the rates were highest overall. In this youngest age group the rate of asthma-related general practice encounters fell by 30% between 1998–99 and 2001–02.

Figure 5.1:
Asthma-related general practice encounters, per 100 population, by age group, Australia, 1998–2002



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

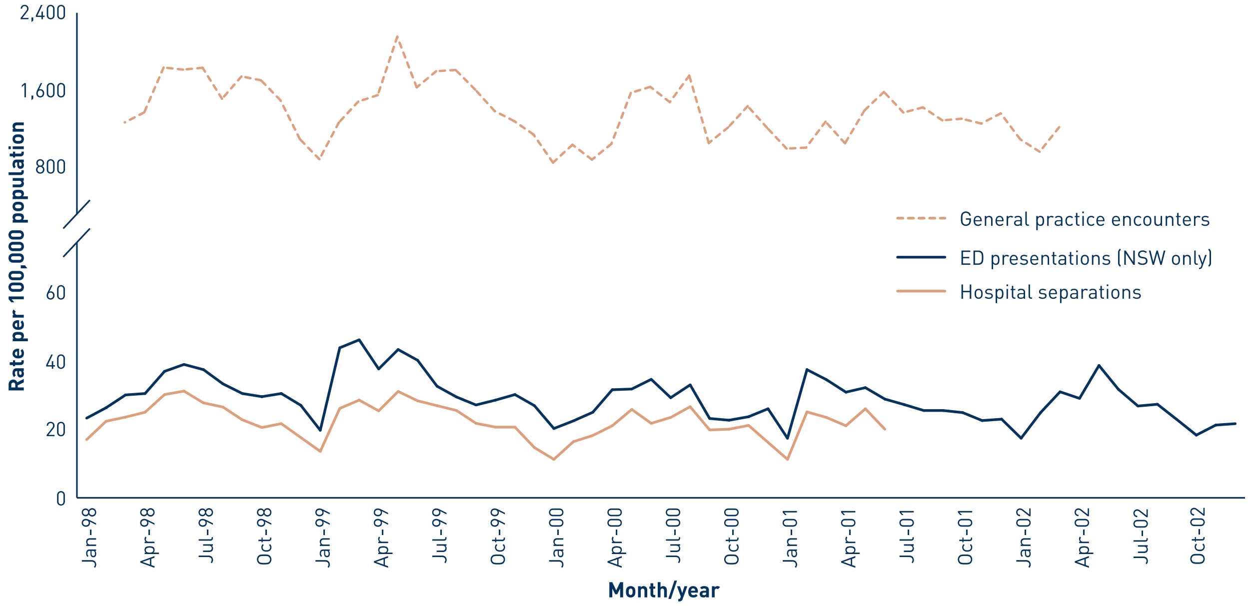
Source: BEACH Survey of General Practice.

Longer term time trend data are not available for Australia. Recently published 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).

Seasonal variation and time trends in asthma-related health care encounters

The relative rate of asthma-related encounters with general practitioners is higher from late autumn to late spring and drops substantially during December and January. This seasonal variation in asthma-related general practice visits is consistent with time trends in hospital separations and Emergency Department visits for asthma (Figure 5.2), implying that the variation in general practice encounters is mainly related to variation in the rate of asthma exacerbations.

Figure 5.2:
Asthma-related health care encounters, per 100,000 population, Australia and New South Wales, 1998-2002



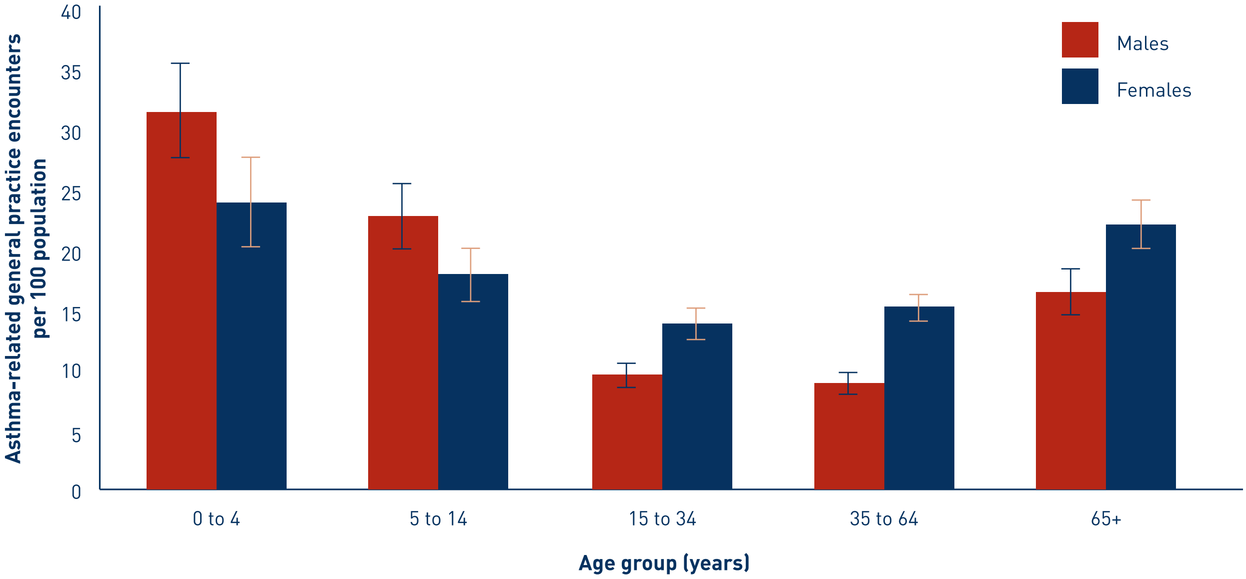
Sources: BEACH Survey of General Practice; AIHW National Hospital Morbidity Database; NSW Health Department Emergency Department Data Collection (EDDC) (HOIST) Centre for Epidemiology and Research, NSW Department of Health.

Differentials in asthma-related general practice encounters

Age and sex

Among children, boys are more likely than girls to have an asthma-related general practice encounter. This trend is reversed after the age of 15, with females having more asthma-related general practice encounters (Figure 5.3). In 2000–02, males aged 0 to 4 years had the highest rate (31.2 per 100 population) followed by females 0 to 4 years (23.7 per 100 population) and 65 years and over (21.9 per 100 population), while males aged 15 to 34 years and 35 to 64 years had the lowest rates.

Figure 5.3:
Average annual asthma-related general practice encounters, per 100 population, by age group and sex, Australia, July 2000 to June 2002



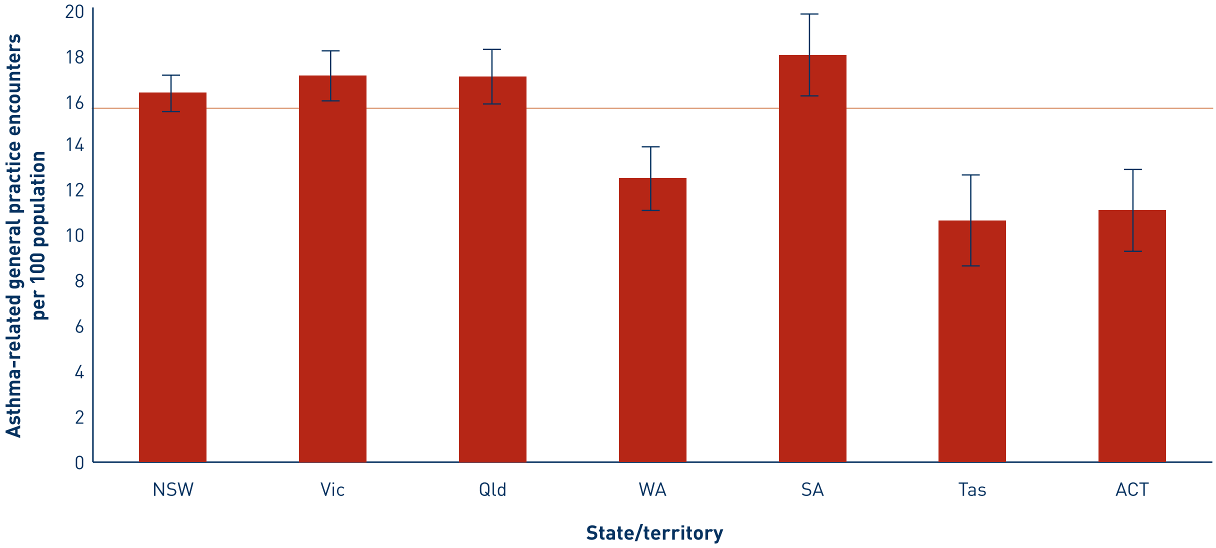
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008.

Sources: BEACH Survey of General Practice; HIC health statistics.

States and territories

South Australia, Victoria, Queensland and New South Wales had higher than the national average rates of asthma-related general practice encounters per 100 population between 1997 and 2002 (Figure 5.4). Rates in Western Australia, Tasmania and the Australian Capital Territory were lower than the national average.

Figure 5.4:
Average annual asthma-related general practice encounters, per 100 population, by state and territory, Australia, July 1997 to June 2002



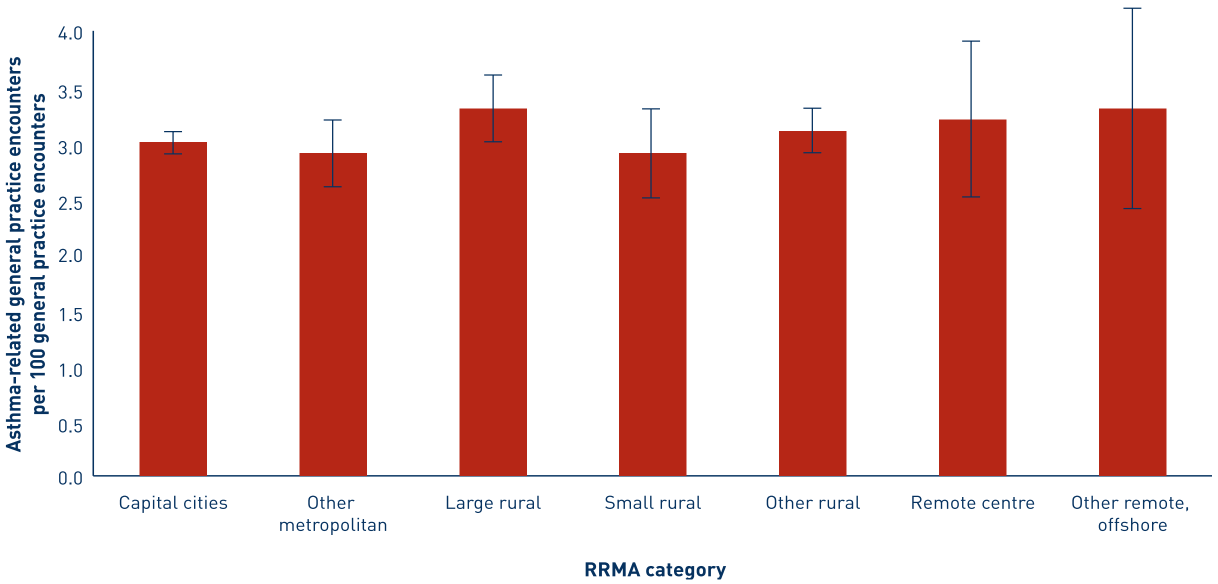
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. Horizontal line represents the national rate of general practice encounters where asthma was managed (16 per 100 population). Data for NT not reported due to small numbers.

Sources: BEACH Survey of General Practice; HIC health statistics.

Urban, rural and remote areas

The rates for asthma-related general practice encounters did not differ across metropolitan and rural regions in Australia between 1998 and 2002 (Figure 5.5).

Figure 5.5:
Average annual asthma-related general practice encounters, per 100 general practice encounters, by RRMA classification, Australia, July 1998 to June 2002



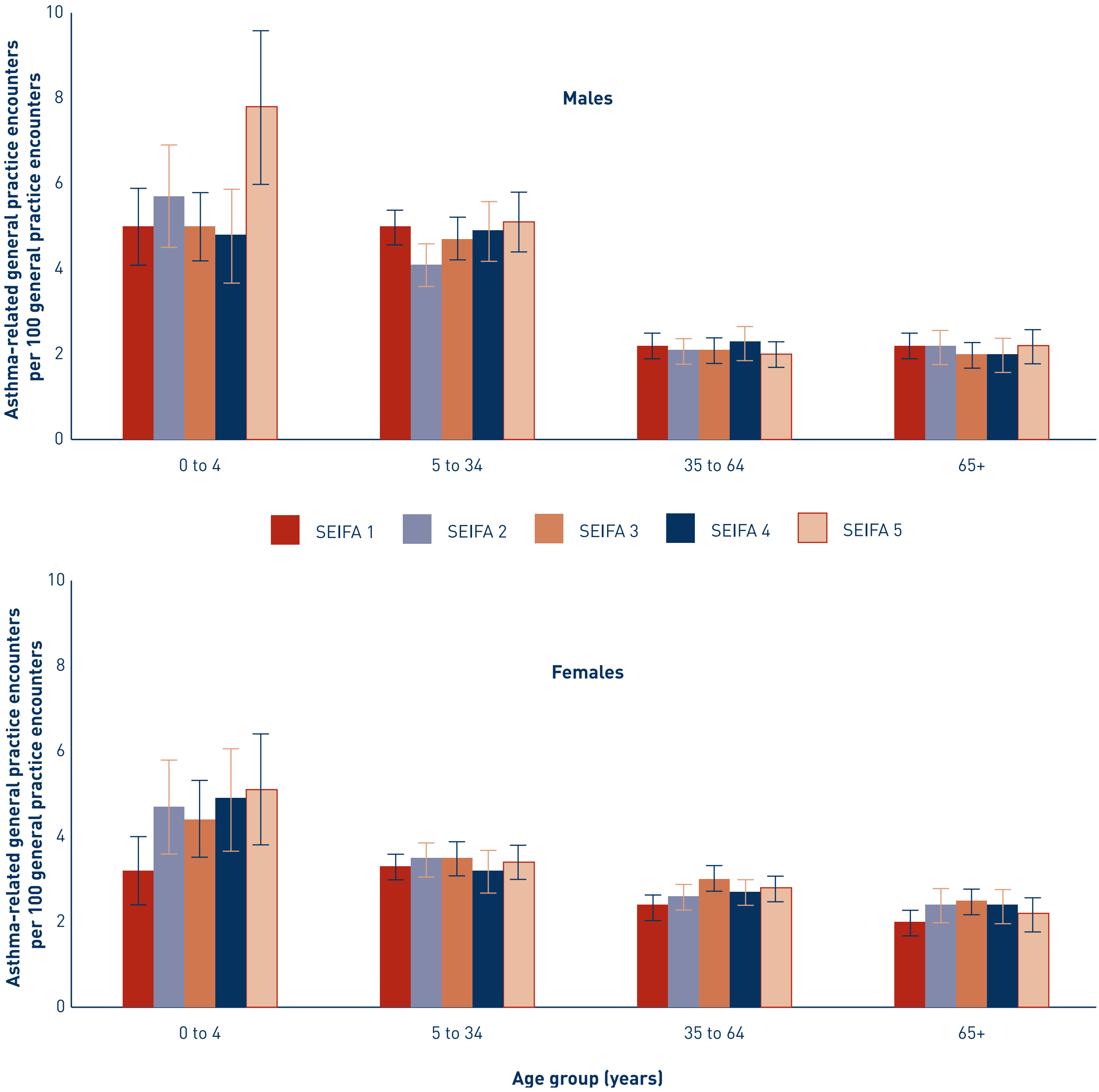
Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008.

Source: BEACH Survey of General Practice.

Socioeconomic disadvantage

Previous studies in Australia and overseas have shown that socioeconomically disadvantaged persons have higher rates of overall general practice consultations than those less disadvantaged (Charles et al. 2003; McNiece & Majeed 1999; Saxena et al. 1999). Saxena et al. (1999) showed that children (0 to 15 years) from more disadvantaged groups have higher rates of general practice visits (up to 23% higher), poorer health and lower rates of preventive general practice visits. Recent Australian data from BEACH show only limited variation attributable to the socioeconomic disadvantage (Figure 5.6). Among boys aged 0 to 4 years, the most disadvantaged group had higher rates of general practice encounters for asthma and among females of all ages, but particularly in the youngest age group, the least disadvantaged group have the lowest rate of general practice attendances for asthma.

Figure 5.6:
Average annual asthma-related general practice encounters, per 100 general practice encounters, by sex, age group and SEIFA quintile, Australia, July 1997 to June 2002



Note: Asthma classified according to ICPC-2 PLUS codes: R96001–R96005, R96007, R96008. SEIFA 1 represents the least disadvantaged socioeconomic quintile and SEIFA 5 the most disadvantaged.

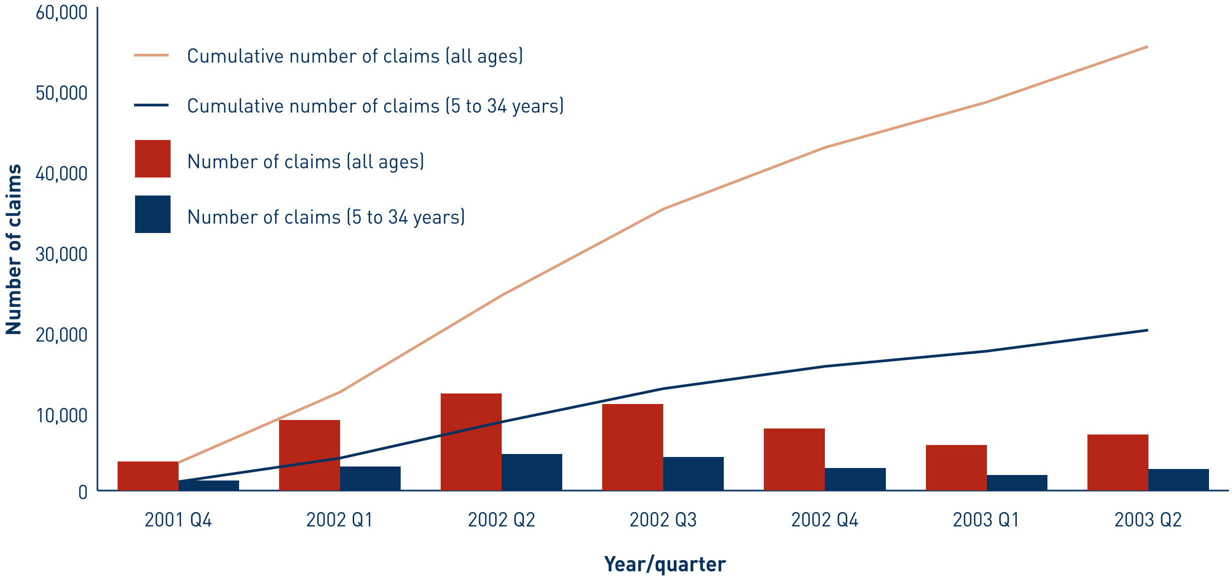
Source: BEACH Survey of General Practice.

Monitoring structured asthma review visits in general practice

The Asthma 3+ Visit Plan Practitioner Incentive Program (PIP) is an incentive scheme funded by the Commonwealth Government. It is based on strong evidence that self-management education for people with asthma combined with written asthma action plans, self-monitoring and regular medical review improve patient outcomes (Gibson et al. 2003). The program aims to promote improved asthma control and outcomes by encouraging a systematic approach to the diagnosis and assessment of asthma. It is directed 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 June 2003 over 55,000 Asthma 3+ Plan Visits had been completed and claimed (Figure 5.7). The claims for payments under the scheme peaked in April to June 2002.

Figure 5.7:
Number of structured general practice asthma review visits, all ages and age 5 to 34 years, Australia, October 2001 to June 2003



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

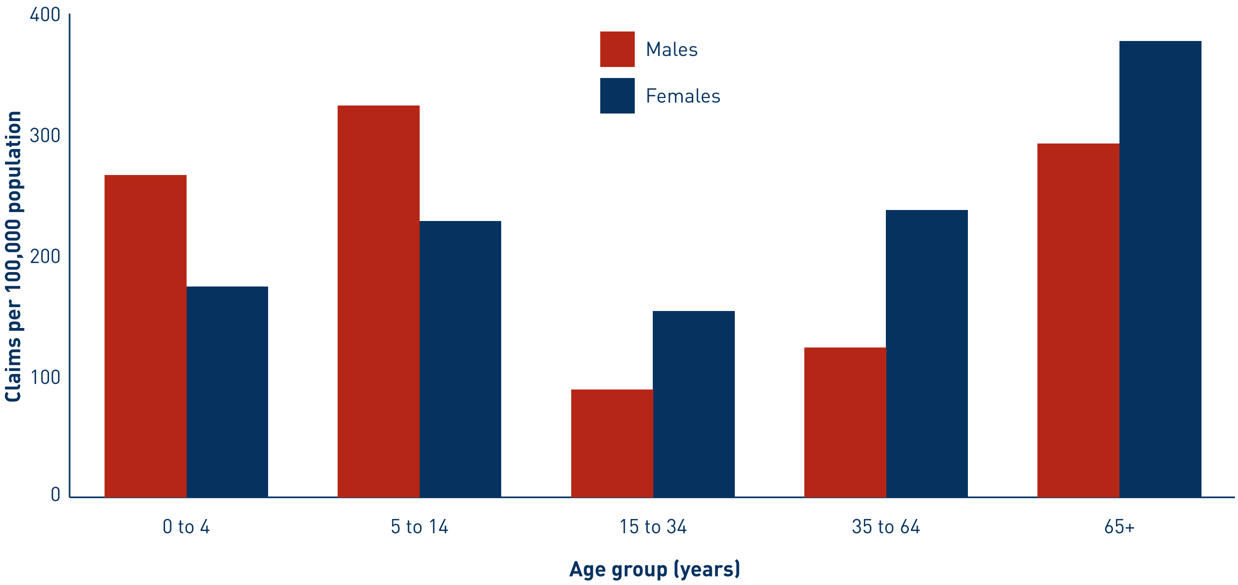
Source: MBS statistics.

Differentials in structured asthma review visits in general practice

Age and sex

Among children aged less than 15 years, Asthma 3+ Visit Plan PIP claims were higher for males than females in 2002 (Figure 5.8), consistent with the higher prevalence of asthma in males in this age group. The reverse was evident among persons aged 15 years and over. The claim rate was highest in females aged 65 years and over and males aged 5 to 14 years. These age and gender patterns were similar to those observed for general practice consultations for asthma (Figure 5.3), except that the rate of Asthma 3+ Visit Plan claims among persons aged 65 years and over was relatively higher and the rate of claims for persons aged less than five years was relatively lower.

Figure 5.8:
Structured general practice asthma review visits, per 100,000 population, by age group and sex, Australia, 2002



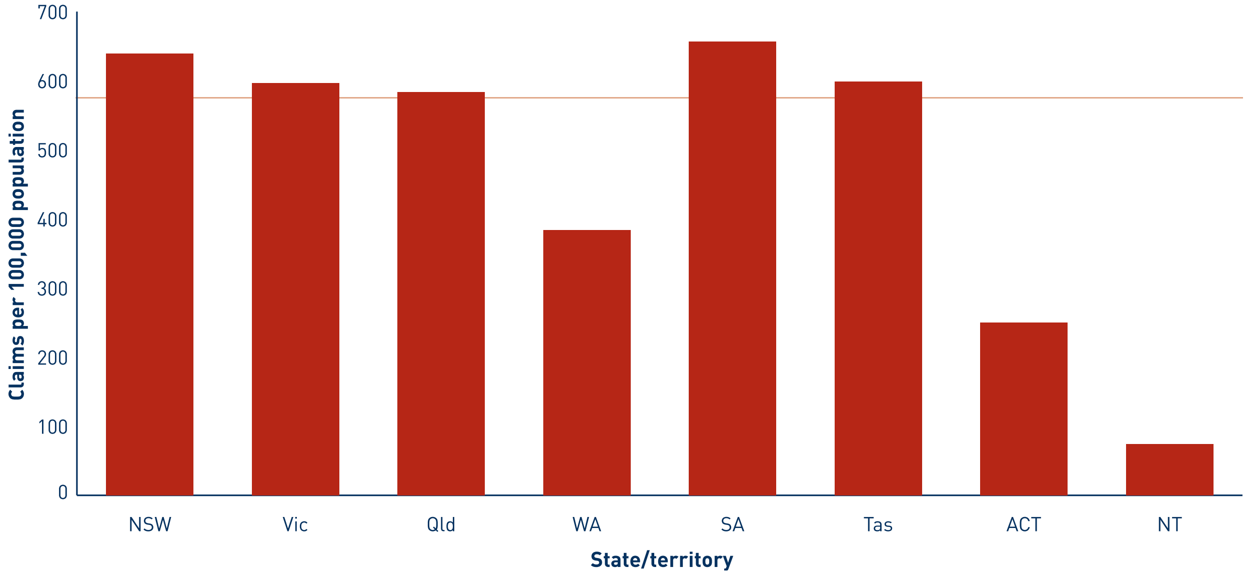
Note: Claims are for asthma review visit classified codes 2546, 2547, 2552, 2553, 2558, 2559, 2664, 2666, 2668, 2673, 2675 & 2677.

Source: MBS statistics.

States and territories

During 2002, the rate of Asthma 3+ Visit Plan usage was highest in South Australia and New South Wales. In Western Australia, Australian Capital Territory and Northern Territory, the rate was substantially lower than the national average (Figure 5.9).

Figure 5.9:
Structured general practice asthma review visits, per 100,000 population, by state and territory, Australia, 2002



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 structured general practice asthma review visit claims (581 per 100,000 population).

Source: MBS statistics.

Summary

The highest rate of asthma-related general practice encounters is seen in boys aged 0 to 4 years and the lowest rate is among males aged 15 to 64 years. The age and gender distribution of claims for the Asthma 3+ Visit Plan follow a similar pattern, except that there are relatively more claims for people aged 65 years and over.

5.2 Asthma action plans

Key points

- Written instructions on how to recognise when asthma is getting worse, and what action to take when it does, can help many people control their asthma and stay out of hospital. These instructions are known as asthma action plans.
- Most people with asthma do not have asthma action plans. 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 asthma action plans has actually decreased during the period 1995 to 2001 (at least in South Australia, the only state where this has been monitored).
- Young adults, adult men, and persons living in outer regional and remote areas and in less well-off areas are least likely to have a written asthma action plan.

Introduction

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, including the need for hospitalisation, urgent GP visits, and additional medication, as well as lung function (Gibson et al. 2002). It has also been shown that written AAPs reduce 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.

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. An AAP:

1. must be written;
2. must be individually prescribed and not a generic example;
3. must contain information to allow the user to recognise the onset of an exacerbation; and
4. must 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, many have not specifically established whether it contains the other essential components.

Trends in the possession of asthma action plans

The data from the South Australia Omnibus surveys show that, between 1992 and 1995, there was a rise in the proportion of adults with asthma who reported having AAPs (Table 5.1, Figure 5.10). 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 do not suggest any substantial trend to increasing rates of possession of AAPs in those states.

Table 5.1:
Possession of asthma action plans: adults with current asthma, Australia, 1990–2001

Age group	Place	Year	Results	95% CI	Comments	Citation
Possession of a written asthma management plan from GP						
All ages	Australia	2001	17.0%	15.6–18.5%	National Health Survey	
18 years and over	Queensland (n=795)	2000	21.1%	18.3–23.9%	Qld Chronic Disease Survey	Epidemiology Services Unit 2002
16 years and over	All NSW (n=1,897)	1998	34.6%	31.7–37.5%	NSW Health Survey	Public Health Division 2001
16 years and over	All NSW (n=1,867)	1997	35.6%	32.6–38.6%	NSW Health Survey*	Public Health Division 2001
Possession of written instructions from GP on how to treat asthma						
15 years and over	All WA (n=513)	1995	33–34%	29.3–37.6%	WA Health Survey	Pers. comm. A Daly
Possession of a written action plan						
Parents aged less than 50 years	Eastern Australia (n=1,482)	1998	25.6%	23.4–27.8%	NAC study	Gibson et al. 2000
Parents aged less than 50 years	Eastern Australia (n=1,005)	1993	19.9%	17.5–22.5%	NAC study	Comino et al. 1996
Parents aged less than 50 years	Eastern Australia (n=926)	1990	14.0%	11.9–16.5%	NAC study	Comino et al. 1996
Possession of an asthma management plan from question: 'Do you have an asthma management plan? If yes, is this asthma management plan written down for you completely or in part or did you receive verbal instructions?'						
15 years and over	All SA (n=344)	1995	46% (9% written 3% partly written 34% verbal)	40.6–51.4%	SA Omnibus	Beilby et al. 1997
Possession of an asthma action plan						
15 years and over	All SA (n=388)	2001	22.2%	18.1–26.3%	SA Omnibus	Wilson et al. 2003
15 years and over	All SA (n=369)	2000	25.1%	20.7–29.5%	SA Omnibus	Wilson et al. 2003
15 years and over	All SA (n=355)	1999	24.1%	19.7–28.6%	SA Omnibus	Wilson et al. 2003
15 years and over	All SA (n=346)	1998	29.2%	24.3–34.6%	SA Omnibus	Wilson et al. 2002

(continued)

Table 5.1 (continued):
Possession of asthma action plans: adults with current asthma, Australia, 1990–2001

Age group	Place	Year	Results	95% CI	Comments	Citation
15 years and over	All SA (n=368)	1997	31.6%	26.7–36.9%	SA Omnibus	Wilson et al. 2002
15 years and over	All SA (n=349)	1996	33.4%	28.3–38.9%	SA Omnibus	Wilson et al. 2002
15 years and over	All SA (n=344)	1995	42.3%	36.8–48.0%	SA Omnibus	Wilson et al. 2002
15 years and over	All SA (n=286)	1994	32.8%	27.2–38.9%	SA Omnibus	Wilson et al. 2002
15 years and over	All SA (n=300)	1993	15.5%	11.4–19.9%	SA Omnibus	Adams et al. 1997
15 years and over	All SA (n=280)	1992	21.9%	17.2–26.7%	SA Omnibus	Adams et al. 1997

*In a separate analysis of a subgroup of this survey population aged 16 to 55 years, 34.7% of those with current asthma had a written AAP (n=1,372). It was also reported that 43.1% of people with more severe asthma (people with any one or more of the following: sleep disturbed by asthma 3 to 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 GP for an attack of asthma 3 or more times in the last 12 months) possessed a written AAP (Marks et al. 2000).

Notes

1. Only people with current asthma were asked about the possession of AAPs.
2. The definitions for current asthma were: NSW, Queensland Chronic Disease Survey and WA Health Surveys: Doctor diagnosis of asthma plus treatment or symptoms of asthma in the last 12 months; NAC study: Parents of primary school children with a self-reported diagnosis of asthma; 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 asthma?'
3. 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'.

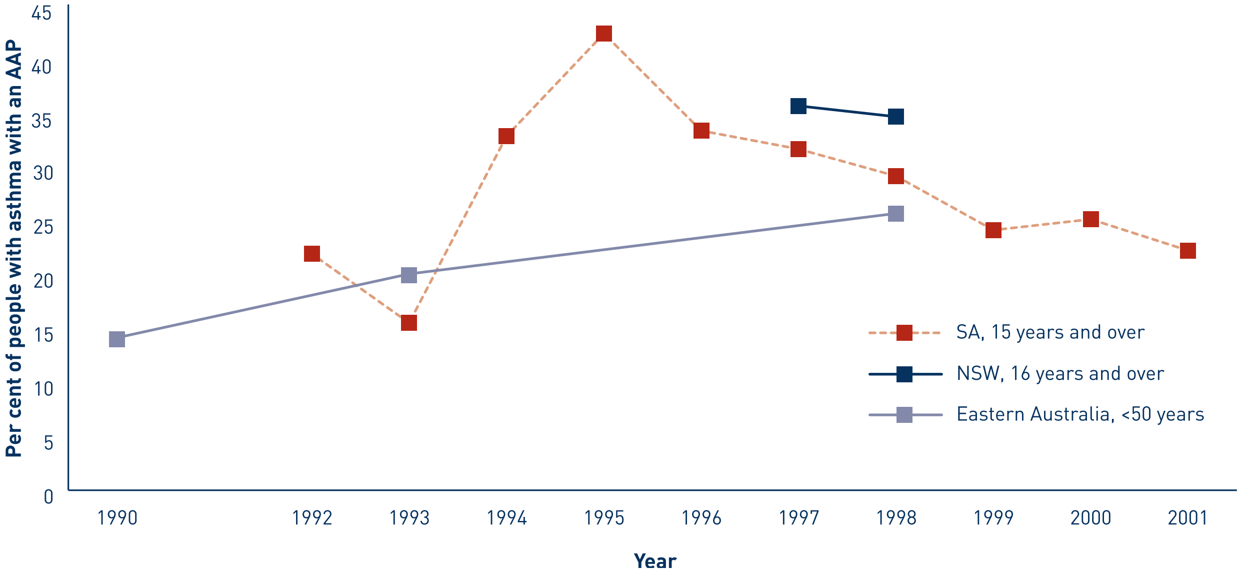
Table 5.2:
Possession of asthma action plans: children with current asthma, Australia, 1990–2001

Age group	Place	Year	Results	95% CI	Comments	Citation
Possession of a written asthma management plan from GP						
2 to 12 years	All NSW (n=1,296)	2001	43.6%	40.1–47.2%	NSW Child Health Survey	Centre for Epidemiology and Research 2002
0 to 9 years	Australia	2001	28.5%	23.6–33.5%	National Health Survey	
Possession of a written plan which tells you how to look after your (child's) asthma						
6 to 7 years	Sydney, Melbourne, Adelaide and Perth (n=2,686)	1993	26.5%	24.9–28.2%	ISAAC study	Robertson et al. 1998
13 to 14 years	Sydney, Melbourne, Adelaide and Perth (n=3,607)	1993	15.8%	14.6–17.0%	ISAAC study	Robertson et al. 1998
Possession of an action plan						
5 to 12 years	Eastern Australia (n=2,342)	1993	21.7%	20.0–23.4%	NAC study	Comino et al. 1996
5 to 12 years	Eastern Australia (n=1,382)	1990	16.7%	14.8–18.8%	NAC study	Comino et al. 1996

Notes

1. Only children with current asthma were asked about the possession of AAPs.
2. The definitions for current asthma were: NSW Child Health Survey: Doctor diagnosed asthma plus treatment or symptoms of asthma in the last 12 months; ISAAC: Children with current wheeze (history of wheeze or whistling in the chest over the past 12 months); NAC study: Primary school children who had 'probable asthma' (three or more episodes of wheeze in the last year, or a troublesome night cough more than once a week during the past 12 months or a diagnosis of asthma); National Health Survey: Yes to the question 'have you ever been diagnosed by a doctor with asthma?' and yes to 'do you still have asthma?'
3. 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'.

Figure 5.10:
Changes over time in the proportion of people with asthma who report possession of a (written) asthma action plan, Australia, 1990–2001



Note: The figure includes only those data from Table 5.1 which form a series of two or more observations, separated by a year or more, in the same population using the same question.

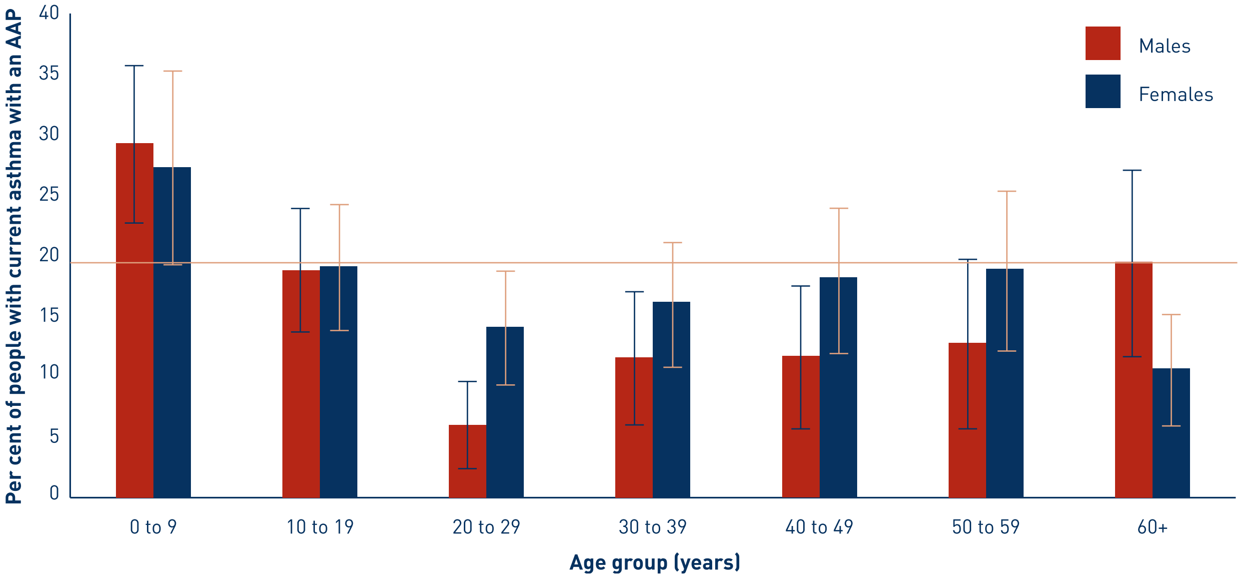
Sources: Comino et al. 1996; Gibson et al. 2000; Public Health Division 2001; Wilson et al. 2002, 2003.

Differentials in the possession of 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 5.11). In the adult age range, females are more likely than males to report having a written AAP, except in the elderly. Males aged 20 to 29 years had a very low rate of possession of written AAPs (6.0%).

Figure 5.11:
Proportion of people with current asthma with a written AAP, by age group and sex, Australia, 2001



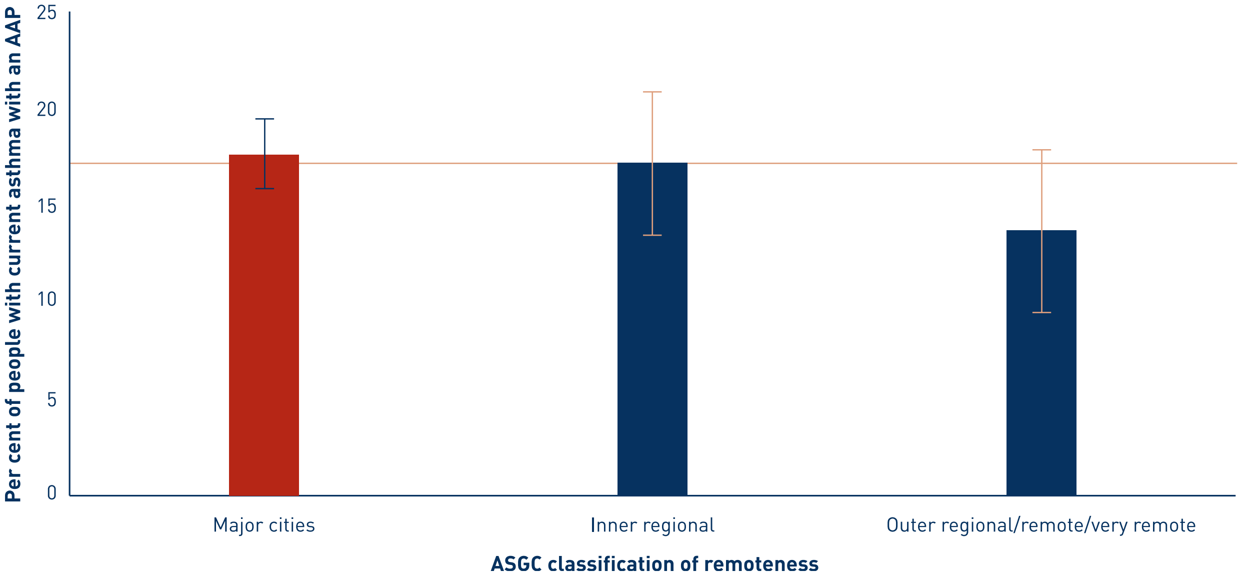
Note: Horizontal line represents the proportion of people of all ages with a written AAP (17.0%).

Source: ABS National Health Survey 2001.

Urban, rural and remote areas

There is no significant difference in the rate of ownership of a written AAP among people with asthma living in major cities, or in regional and remote areas (Figure 5.12).

Figure 5.12:
Possession of a written AAP in people with current asthma, by ASGC classification of remoteness, Australia, 2001



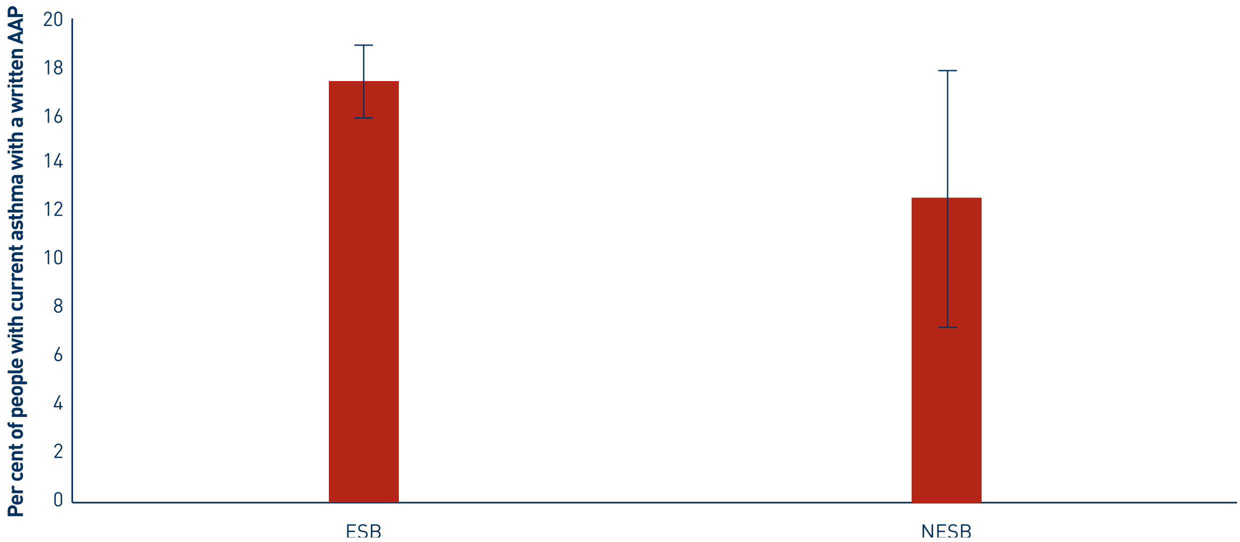
Note: Horizontal line represents possession of AAPs in Australia (17.0%).

Source: ABS National Health Survey 2001.

Culturally and linguistically diverse background

Fewer people from non-English-speaking backgrounds possessed a written asthma action plan (Figure 5.13).

Figure 5.13:
Possession of a written AAP in people with current asthma, by culturally and linguistically diverse background, all ages, Australia, 2001



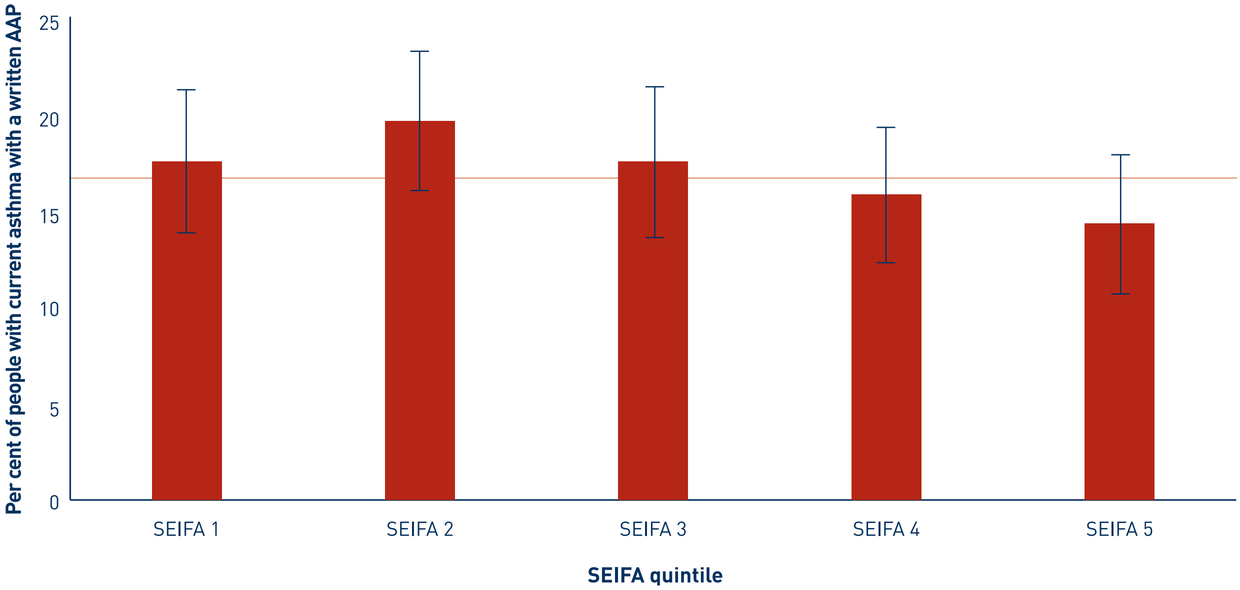
Note: ESB—English-speaking background includes anyone born in Australia, New Zealand, United Kingdom, Ireland, United States of America, Canada or South Africa (DIMIA English Proficiency Group 1). NESB—Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001).

Source: ABS National Health Survey 2001.

Socioeconomic disadvantage

While there was a slight downward trend in the possession of an AAP with increasing socioeconomic disadvantage, the differences were not statistically significant (Figure 5.14).

Figure 5.14:
Possession of a written AAP in people with current asthma, by SEIFA quintile, all ages, Australia, 2001



Note: Horizontal line represents possession of AAPs in Australia (17.0%). SEIFA 1 represents the least disadvantaged socioeconomic quintile and SEIFA 5 the most disadvantaged.

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 probably not been sustained. Young adults, adult men, and persons living in outer regional and remote areas and in socioeconomically disadvantaged areas are least likely to have a written asthma action plan.

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

5.3 Medication use

Key points

- The most common type of asthma medcation used in all age groups is reliever medication (short-acting beta agonists).
- Most reliever medication is given by puffers (metered dose inhalers) but a large amount (approximately one-quarter) is supplied for use in nebulisers.
- Although inhaled corticosteroids are the second most commonly used asthma drug, there is evidence that not all people who should use them are doing so.
- Inhaled corticosteroids, commonly known as preventer medications, are used more often by older people with asthma than by younger people.

Introduction

Drug therapy is the mainstay of asthma management, and is directed at improving control and lung function and preventing exacerbations without unwanted side effects. The drugs used to treat asthma can be broadly grouped into reliever (including short-acting beta agonists and anticholinergics), symptom controller (long-acting beta agonists), preventer (inhaled corticosteroids and cromones) and combination medications. Preventer medications, mainly inhaled corticosteroids, are the recommended treatment for moderate and severe asthma (NAC 2002). However, all these drugs can also be used in the management of other respiratory conditions, including chronic obstructive pulmonary disease (COPD).

There is evidence that people with poorly controlled asthma who rely on short-acting reliever medication are more likely to have exacerbations of asthma requiring Emergency Department attendance or admission to hospital, while treatment with inhaled corticosteroids reduces the likelihood of hospitalisation (Anis et al. 2001; Gerdtham et al. 1996; Kuo & Craig 2001; Nestor et al. 1998; Suissa et al. 2002). Monitoring the appropriate use of medications for asthma will provide an opportunity to assess the quality of asthma care.

Information on the sale of medications in the community and on the purchase of medications through various sources is available, but it cannot be linked to the reason for medication use or to the characteristics of the purchaser. Surveys are the best source of information about actual use of medication.

This chapter presents information on trends in wholesale supply of respiratory medication to pharmacies and hospitals, based on data collected by IMS Health, and the prescription and purchase of respiratory medication using the Pharmaceutical Benefits Scheme (PBS) and the Pharmacy Guild Surveys (PGS). The ABS National Health Survey and the NSW Health Survey provide insight into the use of medication in people with asthma and its appropriateness.

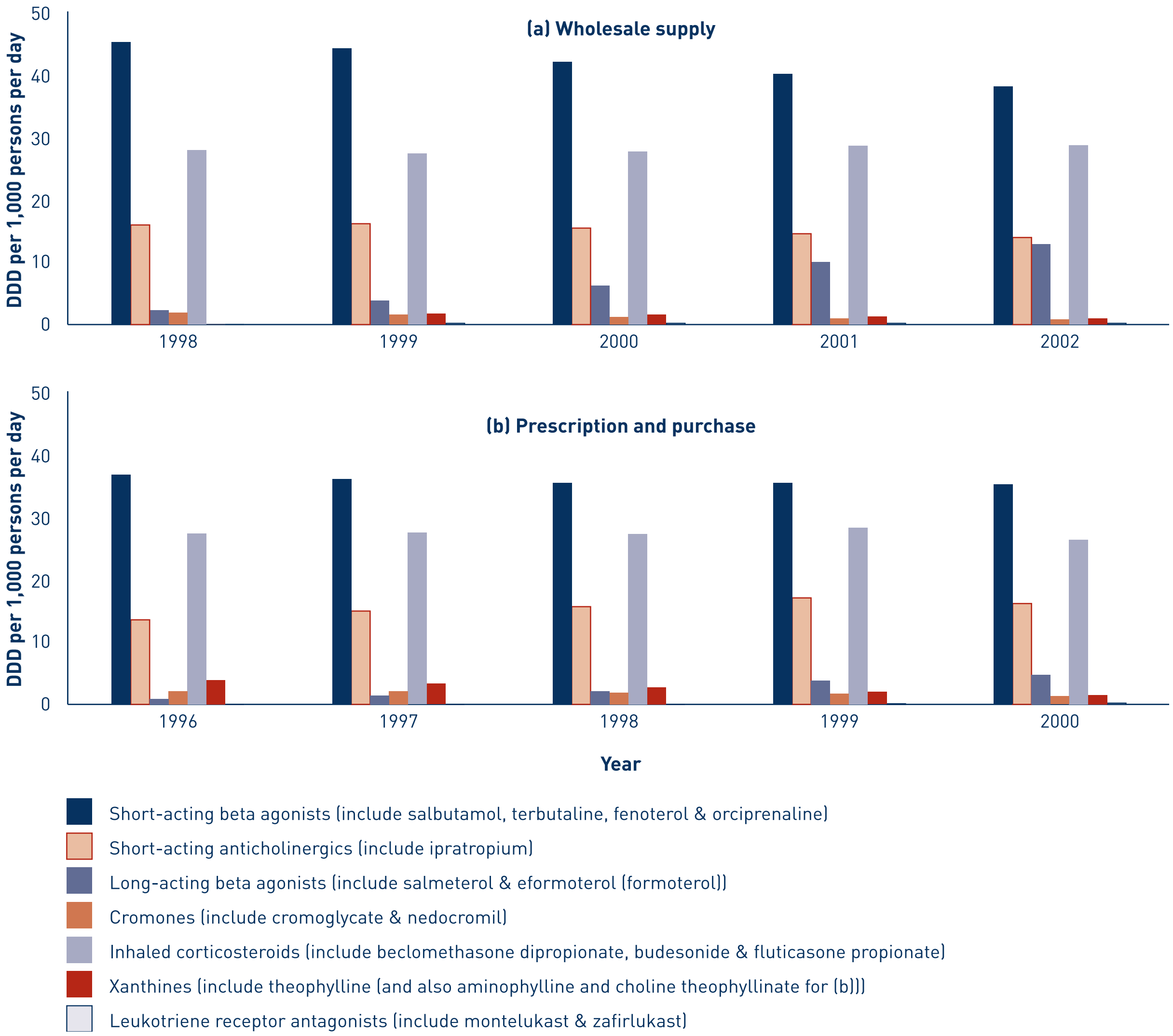
Trends in medication supply for respiratory conditions

Classes of medications

Wholesale distribution data for the medications used for treating asthma and related breathing disorders in Australia (Figure 5.15a) show that short-acting beta agonists, mainly salbutamol and terbutaline, remain the most commonly used class of medications among this group. Over the last 5 years, wholesale supply of short-acting beta agonists has declined slightly, while supply of inhaled corticosteroids has increased slightly. Over the same period, the wholesale supply of long-acting beta agonists (only salmeterol was distributed during the period encompassed by this graph) increased rapidly. Supply of ipratropium bromide (a short-acting anticholinergic medication) remained stable at a relatively high level and supply of cromones (cromoglycate and nedocromil) and theophylline were low and decreased during this period.

These same trends and differentials between classes of respiratory medications are observed in dispensing of medications by community pharmacies during the period 1996 to 2000 (Figure 5.15b), although the decreasing trend in short-acting beta agonist is less evident and there is no consistent trend in inhaled corticosteroid dispensing over this period.

Figure 5.15:
(a) Respiratory medications supplied by wholesalers and manufacturers, 1998–2002; and
(b) Respiratory medications dispensed by community pharmacies, 1996–2000; by defined daily dose (DDD) per 1,000 persons per day, Australia



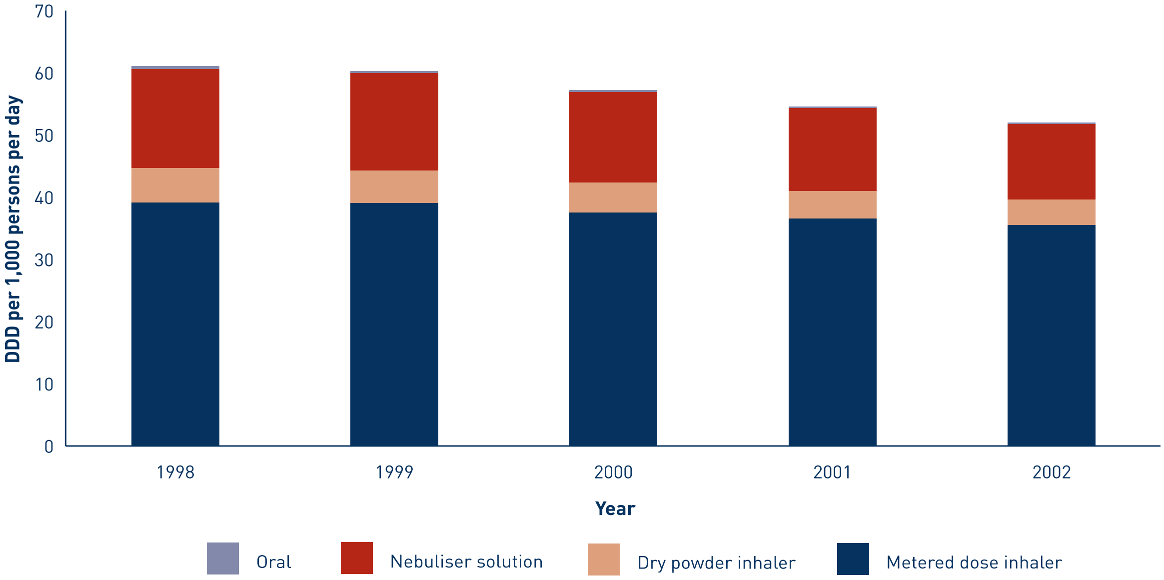
Note: Respiratory medications classified according to ATC.

Sources: (a) IMS Health, courtesy of GlaxoSmithKline Australia; (b) Pharmaceutical Benefits Scheme (PBS) and Pharmacy Guild Survey (PGS) aggregated by the Commonwealth Department of Health and Ageing.

Route of administration of bronchodilators

Nearly all short-acting beta agonist and anticholinergic bronchodilator medication was administered by inhalation (as opposed to oral tablets or syrups) between 1998 and 2002 (Figure 5.16). 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 slightly in 2001–2002.

Figure 5.16:
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, 1998–2002

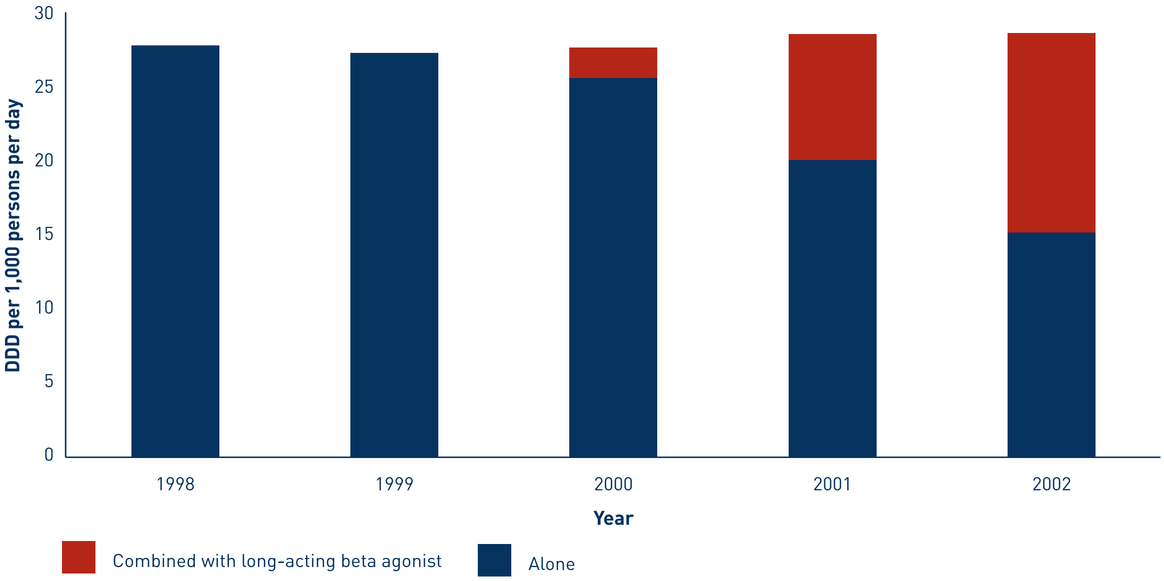


Source: IMS Health, courtesy of GlaxoSmithKline Australia.

Combined medications

Inhalation devices that combined long-acting beta agonists and corticosteroids in the same unit were introduced into the Australian market in 2000. Over the next 3 years, the proportion of all inhaled corticosteroids that were supplied by wholesalers in combination with long-acting beta agonists increased to nearly 50% (Figure 5.17).

Figure 5.17:
Inhaled corticosteroids supplied by wholesalers separately or as part of combined therapy, by defined daily dose (DDD) per 1,000 persons per day, Australia, 1998–2002

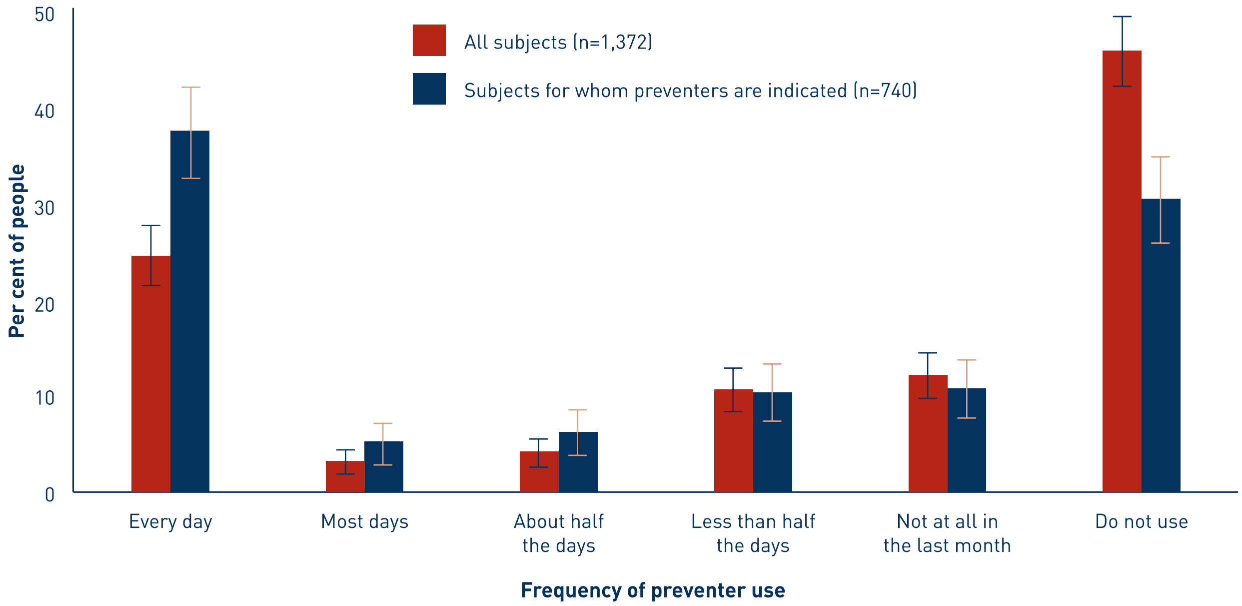


Source: IMS Health, courtesy of GlaxoSmithKline Australia.

Appropriate use of asthma medications

There is strong evidence that inhaled corticosteroids are effective in controlling the symptoms of asthma and in preventing complications (Rowe et al. 2000). However, survey data suggest that many people who could clearly benefit from using inhaled corticosteroids are not using them, or are not using them regularly as intended. A population survey of people with asthma in New South Wales has shown that 55% of people with asthma and 70% of people with asthma in whom preventers are indicated, based on Asthma Management Handbook criteria (Marks et al. 2000; NAC 2002), were using preventers. However, only around half of those people were using them regularly (Figure 5.18).

Figure 5.18:
Frequency of preventer use in people with asthma, age 16 to 54 years, New South Wales, 1997



Note: Those people with asthma for whom preventers are indicated include people with any one or more of the following: sleep disturbed 3 to 4 nights or more in the last month; use reliever medication half the days or more in the last month; had asthma interfere with their normal activities to a moderate or greater extent in the last month; visited a GP for an attack of asthma three or more times in the last 12 months.

Source: Marks et al. 2000. Copyright 2000 The Medical Journal of Australia—reproduced with permission.

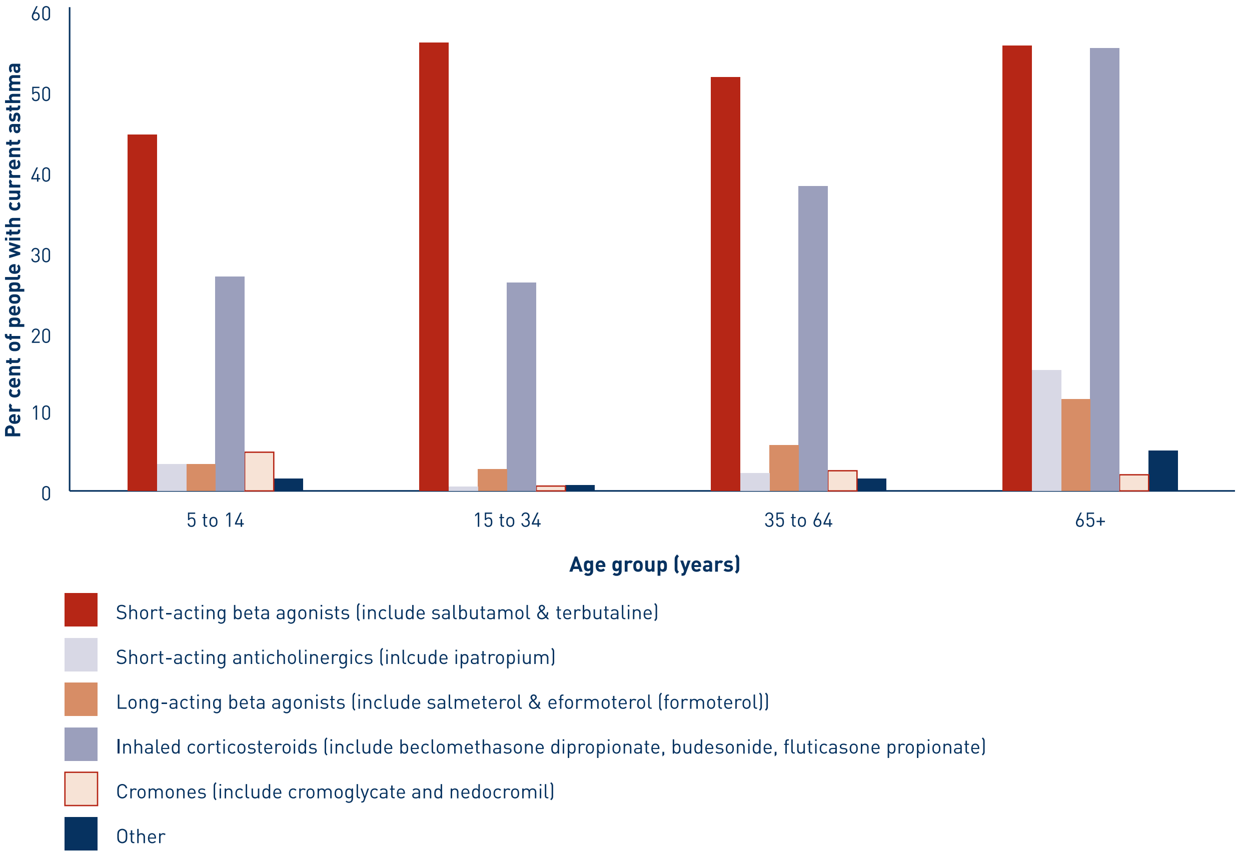
Differentials in the use of asthma medication

Age and sex

Data from people with asthma identified in the National Health Survey show that, in all age groups, short-acting beta agonists (relievers) are the most commonly used medications for asthma (Figure 5.19). This usage data is consistent with the wholesale supply and dispensing data shown previously. Inhaled corticosteroid use increases with increasing age, as does the use of short-acting anticholinergics 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.

More than twice as many people aged 15 to 34 years with asthma use short-acting beta agonists compared to inhaled corticosteroids. This almost certainly indicates a need to improve the uptake of inhaled corticosteroids in young adults with asthma.

Figure 5.19:
Use of asthma medication in people with current asthma, by age group and type of medication, Australia, 2001

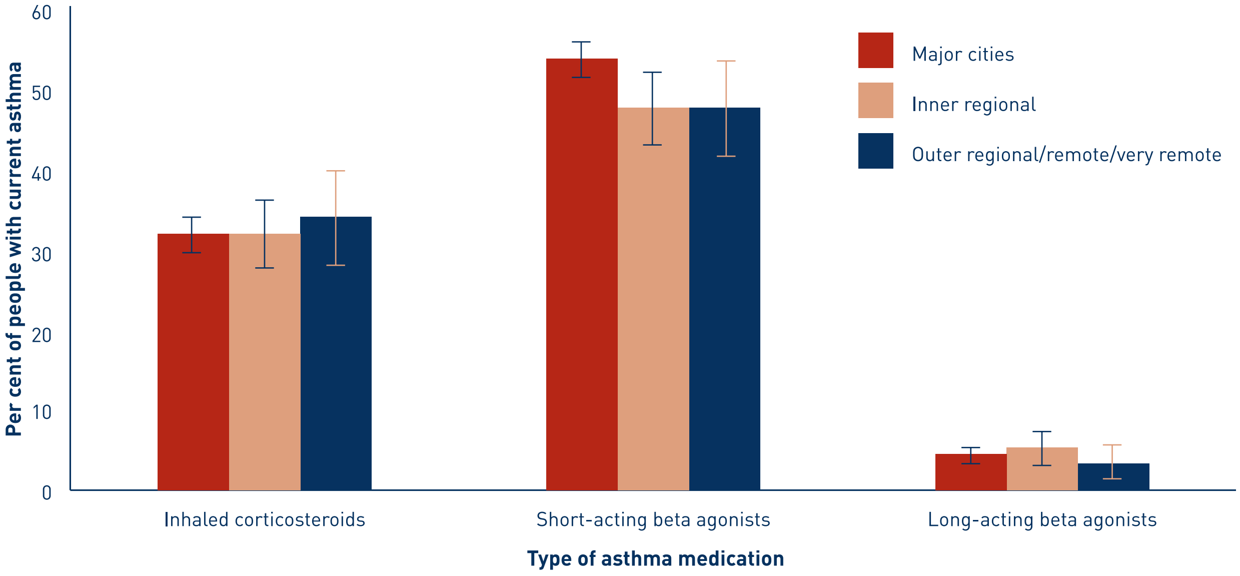


Source: ABS National Health Survey 2001.

Urban, rural and remote areas

The prevalence of use of inhaled corticosteroids and long-acting beta agonists among people with asthma does not differ between urban, regional and remote communities (Figure 5.20). In 2001, a higher proportion of people in major cities reported using short-acting beta agonists compared to other regional and remote areas.

Figure 5.20:
Use of asthma medication in people with asthma, by ASGC classification of remoteness, Australia, 2001



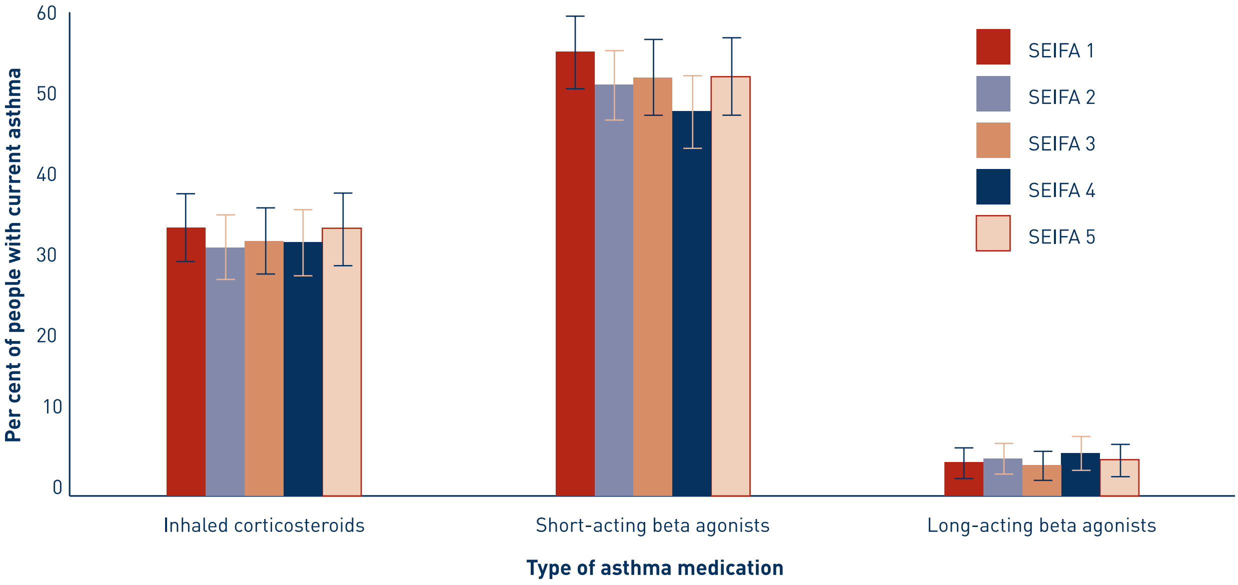
Note: Short-acting beta agonists include salbutamol and terbutaline; long-acting beta agonists include salmeterol and eformoterol (formoterol); inhaled corticosteroids include beclomethasone (dipropionate), budesonide, fluticasone.

Source: ABS National Health Survey 2001.

Socioeconomic disadvantage

There was little variation in reported use of inhaled corticosteroids or short- and long-acting beta agonists across socioeconomic groups in 2001 (Figure 5.21).

Figure 5.21:
Use of asthma medication in people with current asthma, by SEIFA quintile, Australia, 2001



Note: Inhaled corticosteroids include beclomethasone (dipropionate), budesonide, fluticasone; short-acting beta agonists include salbutamol and terbutaline; long-acting beta agonists include salmeterol and eformoterol (formoterol). SEIFA 1 represents the least disadvantaged socioeconomic quintile and SEIFA 5 the most disadvantaged.

Source: ABS National Health Survey 2001.

Summary

Data on wholesale supply, dispensing and use of inhaled corticosteroids confirm that inhaled short-acting beta agonist and inhaled corticosteroids remain the most commonly used medications among people with asthma. However, over the last 2 years, the combination of inhaled corticosteroids with long-acting beta agonists has become increasingly popular.

There is cause for concern about the continuing under-use of inhaled corticosteroid medication among people with asthma who could potentially benefit from it. Younger persons seem to be particularly at risk. However, under-use of this class of medications does not appear to be related to socioeconomic disadvantage or living in a more remote location.

5.4 Spirometry

Key points

- Spirometry is a breathing test used to help diagnose and monitor asthma and other lung diseases.
- During the 1990s, there was little apparent change in the use of spirometry.
- There is a lot of variation between the states in the number of claims for performing spirometry. The reasons for this variation are not known.

Introduction

Measurement of spirometric 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 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, changes in spirometric function have 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.

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

Data source

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. These data, which are available from the Health Insurance Commission (HIC), only include those services that qualified for a Medicare benefit—that is, services that were performed by a registered provider and for which a claim was processed by the HIC. The data do not include services provided by public hospital doctors to public patients or services qualifying for a benefit under the Department of Veterans' Affairs National Treatment Account.

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).

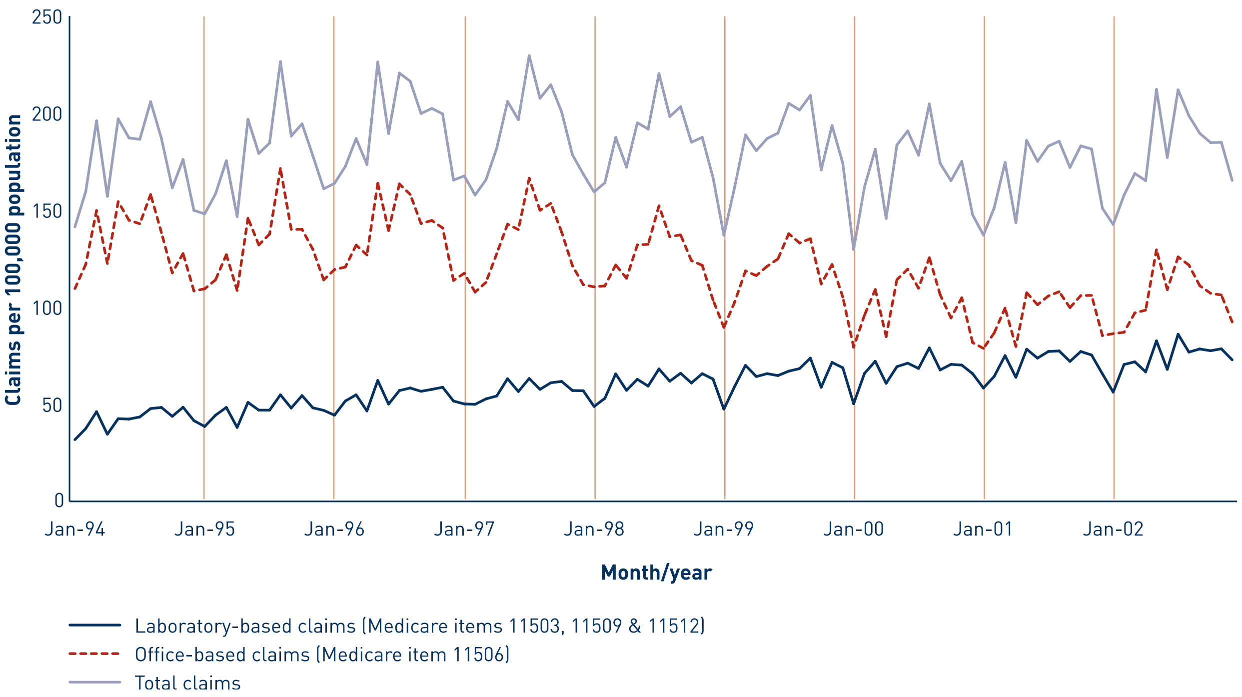
Spirometry is not solely used for diagnosis and assessment of asthma. It may be used in the assessment of a range of other lung diseases, most commonly chronic obstructive pulmonary disease (COPD), and also in normal people to exclude disease. There are no reliable data directly linking asthma status with the performance of the spirometry. The HIC data do not contain any information on the condition for which the test was performed. In order to provide a more valid indicator of 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.

The other limitation of the HIC data is that, in the form that it is available, it provides 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. (See Appendix 1 for a further discussion on this data source.)

Trends in spirometry use

Overall, the total number of claims for the performance of lung function tests, which included spirometry, remained stable during the period 1994 to 2002 (Figure 5.22). However, during this period there was a gradual change from claims for office-based spirometry (that is, tests performed in the doctor's examination room) to claims for lung function laboratory-based tests. Among the 5 to 34 years age group, in whom we believe most spirometry would be performed for the assessment of asthma, the performance of office-based spirometry declined steadily during the period 1996 to 2001, with a small reversal of this trend in 2002 (Figure 5.23). 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 5.22:
Claims for the performance of spirometry and complex lung function tests which included spirometry, all ages, Australia, 1994–2002

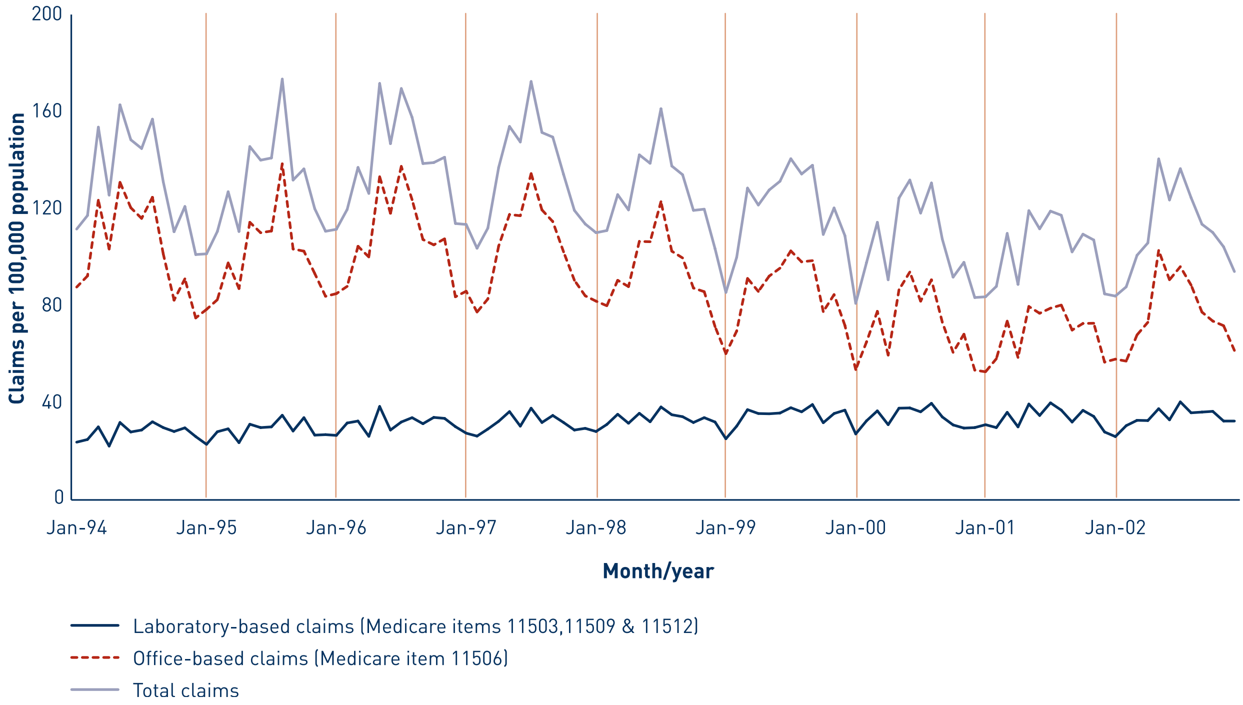


Source: HIC health statistics.

There was evidence of marked seasonal fluctuations in the use of office-based spirometry for all ages (Figure 5.22) and also for people aged 5 to 34 years (Figure 5.23). 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 age children (Sheppeard et al. 2001).

Figure 5.23:

Claims for the performance of spirometry and complex lung function tests which included spirometry, age 5 to 34 years, Australia, 1994–2002



Source: HIC health statistics.

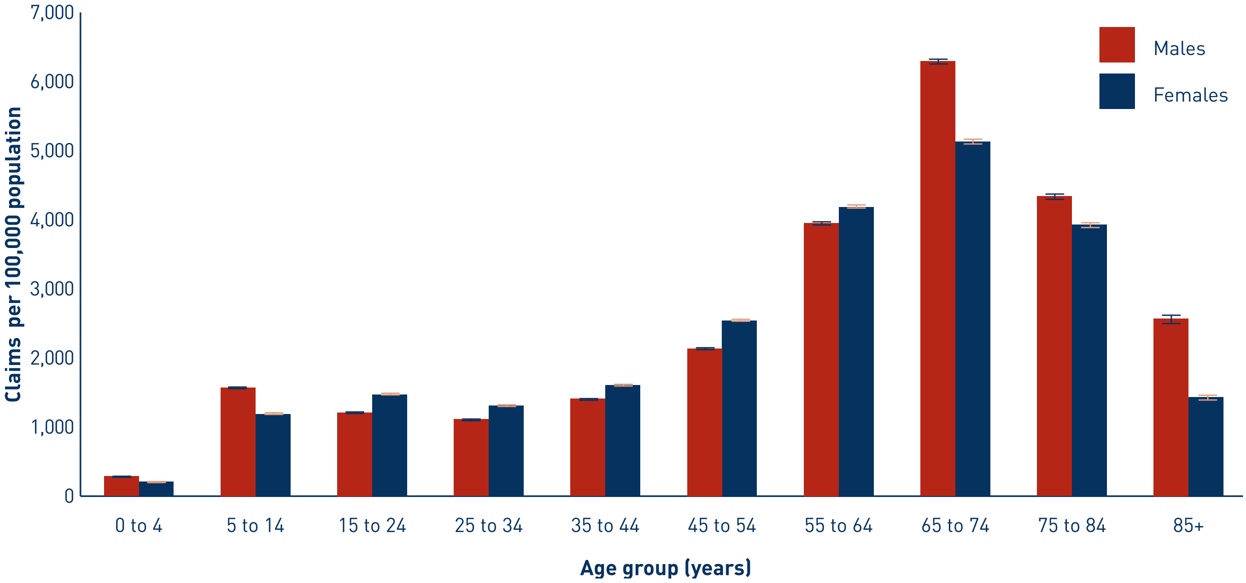
There was a small rise in claims for office-based spirometry from 2000 in those aged 5 to 34 years, for whom the claims are more likely to reflect those for asthma management or assessment. The increase, which arrests the previous downward trend, coincides with the introduction of the Asthma 3+ Visit Plan.

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 5.24). 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 2002b).

Figure 5.24:
Claims for the performance of spirometry and complex lung function tests which included spirometry, per 100,000 population, by age group and sex, Australia, 1999–2001



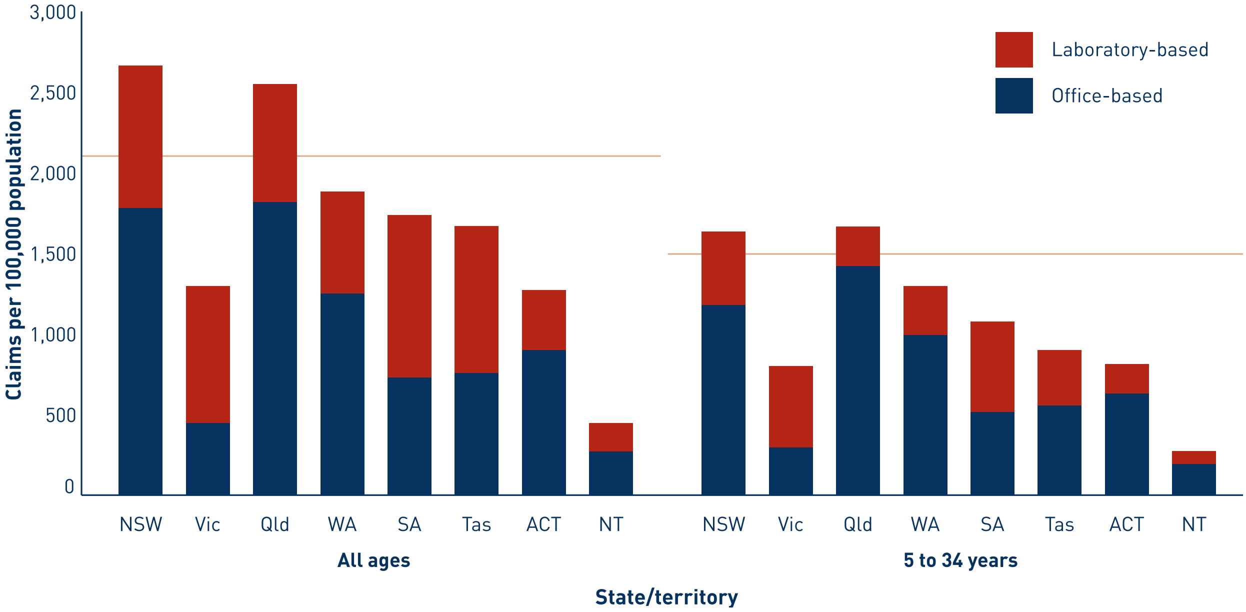
Note: Data are aggregated from 1999, 2000 and 2001 from claims for Medicare Item Numbers 11503, 11506, 11509 and 11512. Population is the Australian population as estimated by the ABS for the relevant years.

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 1999 and 2001, with higher rates in New South Wales and Queensland and lower rates in Victoria than average (Figure 5.25). This variation is not offset by claims for laboratory-based spirometry and is largely unexplained. A similar pattern is reflected in the data for 5 to 34 year olds, except that the proportion of laboratory-based testing is 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.

Figure 5.25:
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, 1999–2001



Note: Data are aggregated from 1999, 2000 and 2001. Laboratory-based claims include claims for Medicare item numbers 11503, 11509 and 11512. Office-based claims comprise claims for Medicare item number 11506 only. Horizontal line represents total number of claims for Australia. Population is the Australian population as estimated by the ABS for the relevant years.

Sources: HIC health statistics; Australian Bureau of 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. There is unexplained variation among the states in the rate of claims for this procedure.

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.

5.5 Attendance at hospital Emergency Departments

Key points

- Children aged 0 to 4 years are the most likely age group to attend an Emergency Department for asthma.
- Boys are more likely to attend an Emergency Department for asthma than girls. This is reversed in adulthood when females attend more than males.
- People aged 65 years and over and children aged 0 to 4 years are most likely to be admitted to hospital following attendance at an Emergency Department.

Introduction

People with asthma may attend an Emergency Department (ED) when they experience an exacerbation or flare-up of their disease. The more severe the episode, the more likely it is that they will attend the ED. Hence, rates of ED attendance for asthma are often considered to reflect the level of severe or poorly controlled asthma in the community (Farber et al. 1998; Vollmer et al. 2002; Wakefield et al. 1997) and may also be a useful indicator of the effects of interventions to reduce the frequency and severity of asthma exacerbations (Harish et al. 2001; Sin & Man 2002).

However, attendance at an ED is only one of a range of alternatives available for managing less severe flare-ups of asthma. Hence, variation in ED attendance 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 attendances for asthma are attributable to exacerbations of asthma. There is some evidence to show that people may use EDs as a regular source of primary care. Use of EDs in this manner may be associated with a number of factors, including demographic and social characteristics, and availability of alternative sources of care (Ford et al. 2001; Halfon et al. 1996; Hanania et al. 1997).

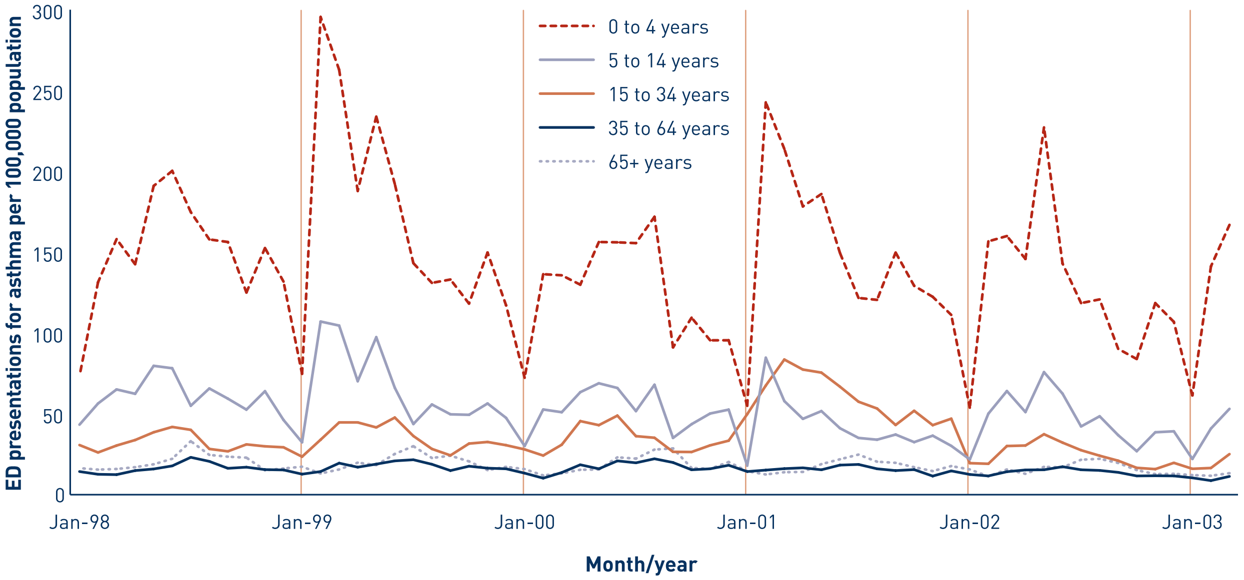
Currently, only New South Wales and Victoria collect ED attendance data with a diagnosis attached to each record. In these states coverage is not complete and only a proportion of hospital Emergency Departments collect attendance data for their respective reporting systems. This should be kept in mind when interpreting these results, as all estimated rates will be an underestimate of the true attendance rates.

Data for this chapter have been sourced from the New South Wales Emergency Department Data Collection, which represents around two-thirds of total ED attendances in New South Wales. Most of these EDs are located in urban hospitals and larger rural hospitals, with EDs in more remote areas under-represented. It should also be noted that diagnoses attached to this data set are provisional and are not coded by a professional coder. Inconsistencies in coding may limit the ability to identify all presentations for asthma.

Time trends in Emergency Department attendances for asthma

Both the timing and the size of peaks in rates of ED attendance vary with age (Figure 5.26). Among children under the age of 15 years, several very large peaks in ED admissions occurred, most notably in February 1999 and February 2001 (but not in that month in 1998 or 2000) and in May 2002. Lesser increases occurred during autumn and early winter. A smaller peak can also be seen around December. Among young adults (age 15 to 34 years) there is a rise in ED attendance rates in autumn and early winter and another, smaller, peak in spring.

Figure 5.26:
Emergency Department presentations for asthma, per 100,000 population, by month and age group, New South Wales, January 1998 to March 2003



Note: As the coverage of the ED database is less than 100% this rate will be an under-estimate of the true ED attendance rate.

Source: NSW Health Department Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health.

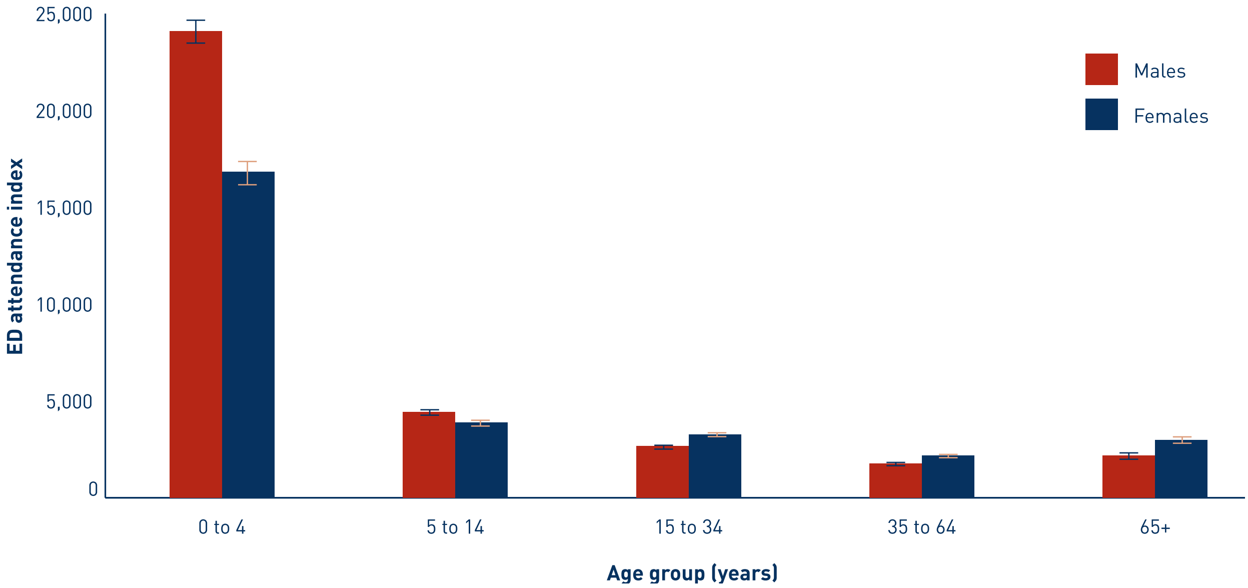
Among persons aged 65 years and over, and to a lesser extent those aged 35 to 64 years, the fluctuations in ED attendance rates are less marked. The peak in attendances for these middle-aged and older adults is in the middle of winter (July), corresponding to the peak in respiratory tract infections.

Differentials in Emergency Department attendance for asthma

Age and sex

The rate of attendance at an ED for asthma, expressed as index relative to the estimated number of people with asthma, is much higher among children aged 0 to 4 years than in all other age groups (Figure 5.27). This differential is also observed when the attendance rate is expressed as a population-based rate (Figure 5.26). Males have a higher ED attendance index than females during childhood and the gender difference is reversed in adult life. However, the differences between males and females are small except for the substantial excess of males in the youngest age group.

Figure 5.27:
Emergency Department presentations for asthma, per 100,000 people with asthma, by age group and sex, New South Wales, 1998–2002



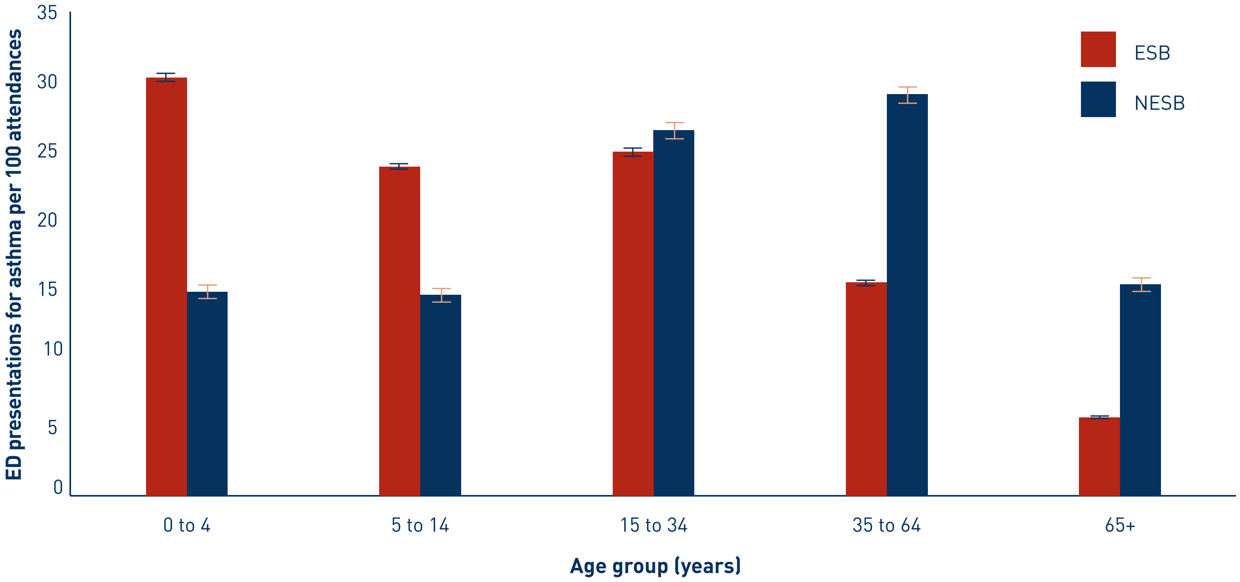
Note: ED attendance index calculated as ratio of number of ED attendances in NSW to estimated number of people with asthma in NSW, by age group and sex (multiplied by 100,000). As the coverage of the ED database is less than 100%, this rate will be an under-estimate of the true ED attendance rate among people with asthma.

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

Culturally and linguistically diverse background

Among children under the age of 15 years, the proportion of all ED attendances that were for asthma is higher among people from English-speaking backgrounds than for those from non-English-speaking backgrounds (Figure 5.28). However, after the age of 15 years this trend is reversed, with a higher proportion of all ED attendances being for asthma among people from a non-English-speaking background. In the younger age groups, this differential reflects the lower prevalence of asthma among people born overseas (Leung et al. 1994; Peat et al. 1992). However, the reverse differential among adults is more difficult to explain. It is known that the prevalence of asthma increases among migrant populations with the duration of residence (Leung et al. 1994). However, the extent of the excess ED attendance rates in non-English-speaking communities probably does reflect differences in the rates of exacerbations and/or differences in pattern of health care use.

Figure 5.28:
Emergency Department presentations for asthma, per 100 attendances, by culturally and linguistically diverse background and age group, New South Wales, 1998–2002



Note: ESB—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). NESB—Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001). Data are aggregated for the years 1998–2002.

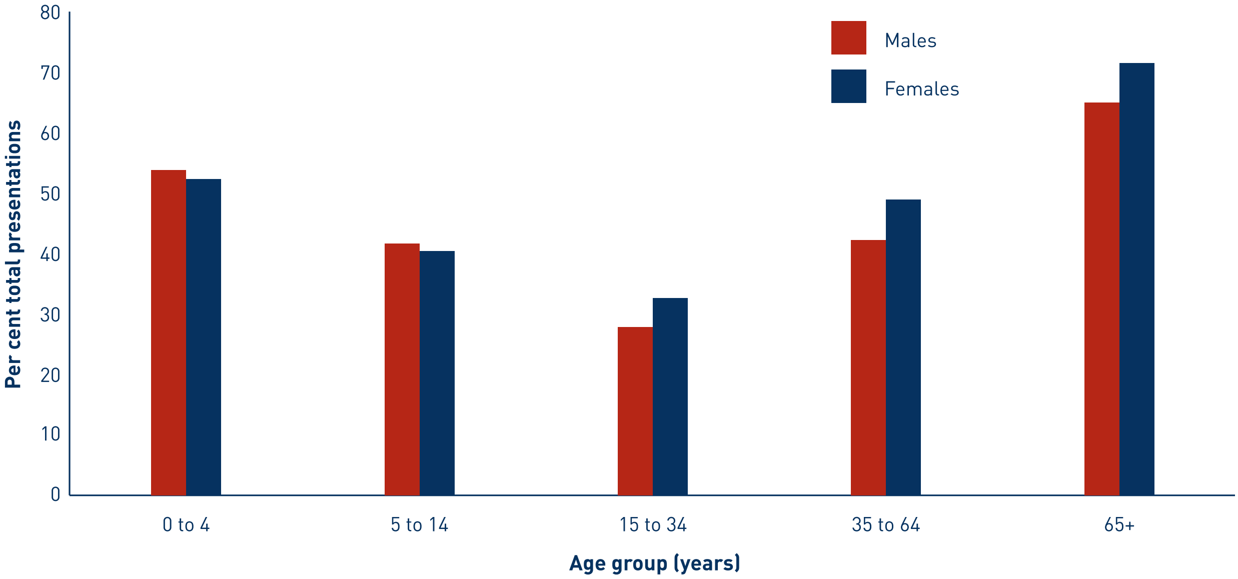
Source: NSW Health Department Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health.

Outcome of Emergency Department attendance for asthma

Among people attending an ED for asthma, those who are subsequently admitted to hospital during the same visit have more severe exacerbations or respond less well to emergency management, than those who are discharged home from the ED. Other factors influencing admission to hospital include the availability of care at home, self-management confidence and competence of the patient or carer, and remoteness from urgent medical care facilities.

The highest proportion of admissions during 1998 to 2002 occurred in the elderly, followed by the youngest age group (Figure 5.29). The lowest proportion of ED attendances resulting in admission to hospital occurred in persons aged 15 to 34 years. There was no important difference between males and females in the likelihood of being admitted to hospital from an ED.

Figure 5.29:
Emergency Department attendances resulting in admission to hospital, by age group and sex, New South Wales, 1998–2002



Note: Data aggregated from 1998–2002. As the coverage of the ED database is less than 100% this rate will be an under-estimate of the true ED attendance rate among people with asthma.

Source: NSW Health Department Emergency Department Data Collection (EDDC) (HOIST), Centre for Epidemiology and Research, NSW Department of Health.

Summary

There are marked seasonal variations in rates of attendance at EDs for asthma, most notably in children under the age of 15 years. Peak attendance in children is in late summer, whereas for adults it is late autumn and winter. Among children with asthma, boys attend EDs more often than girls. However, after the age of 15 years females attend slightly more often than males. A similar pattern is seen in people from non-English-speaking backgrounds, in that children under 15 years are less likely to present at an ED, but this is reversed among adults.

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

5.6 Hospitalisations

Key points

- Children, particularly, those aged less than 5 years, have higher rates of hospitalisation for asthma than adults.
- The rate of hospitalisation for asthma among children has decreased since 1993. However, there has been little change in the hospitalisation rate among adults over the same period.
- Among people aged 65 years and over, rates of hospital admission 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 than girls, in keeping with the higher prevalence of asthma in boys. However, this trend is reversed after the age of 15 years where more females than males are admitted to hospital for asthma.
- Among people aged 35 years and over, rates of hospital admission for asthma are higher in people living in more remote areas.
- Indigenous Australians have higher rates of hospitalisation for asthma in all age groups except children aged 5 to 14 years, where the rates are very similar.
- Rates of hospital admission for asthma are higher among people living in areas that are comparatively more disadvantaged socioeconomically.

Introduction

Asthma represents one of the most common reasons for admission to hospital in childhood. Hospitalisation for asthma occurs as a consequence of disease exacerbations. Hospitalisation is required when the exacerbation is severely disabling or life-threatening. Factors that affect the likelihood that this will occur include the underlying severity of the disease, the effectiveness of (including adherence to) disease controlling ('preventer') medications, the nature and severity of the exacerbation trigger, and the timeliness and effectiveness of specific treatment for the exacerbation. Hence, 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 also affect hospital usage.

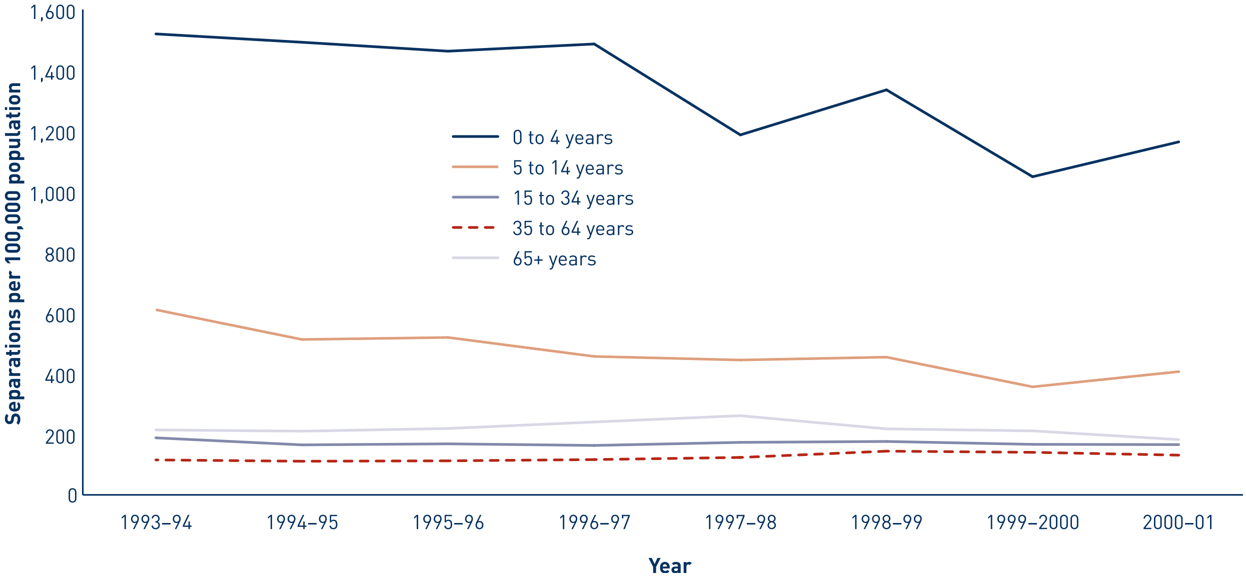
The data for this chapter have been taken from the AIHW National Hospital Morbidity Database (NHMD) for the period 1993–94 to 2000–01. All states and territories in Australia collect data on hospital separations and provide them to the AIHW for inclusion in the NHMD. The data are for financial year periods.

In 2000–01, hospital separations with a principal diagnosis of asthma accounted for 48,812 or 0.8% of all separations. In children aged 1 to 14 years, 6.2% of separations were for asthma. Over half of all separations for asthma (51%) occurred in children aged 1 to 14 years.

Trends in hospital use

There has been an overall reduction in the rate of hospital separations for asthma among children, especially those aged 0 to 4 years, since 1993. Much of the decline has occurred in the years since 1996. The hospitalisation rate in people aged 15 years and over has remained largely unchanged over this time (Figure 5.30). The majority of these admissions are overnight stays or same day separations. The trends in hospital separation rates are unchanged by the exclusion of same day separations (i.e. people who are discharged on the same day as they are admitted). (Data not shown.)

Figure 5.30:
Hospital separations for asthma, per 100,000 population, Australia, 1993–2001

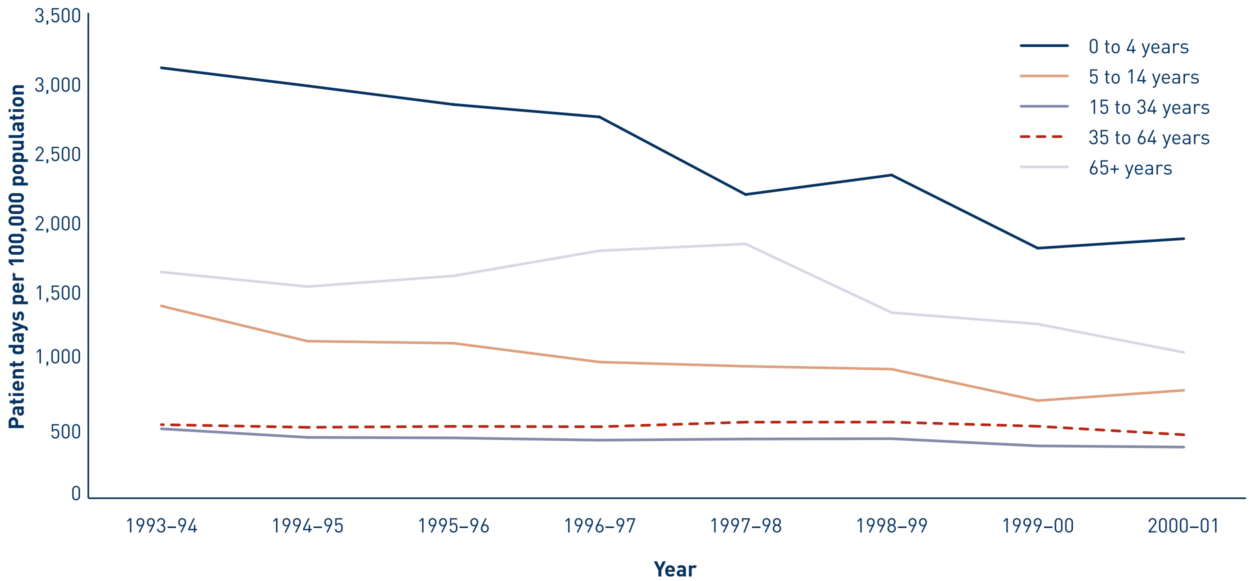


Note: Age standardised to the Australian population as at 30 June 2001. Asthma classified according to ICD-9-CM code 493 and ICD-10-AM codes J45 & J46. Hospital separations coded to ICD-9-CM (1993–97) were converted to ICD-10-AM using the following conversion: ages 5 to 34 years, no conversion; 35 to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

Source: AIHW National Hospital Morbidity Database.

The number of patient days (i.e. the total length of stay for people with asthma) has followed similar trends over time, with a decline in rates, mainly among children. The decline in patient days is greater than the decline in separations, indicating a reduction in average length of stay. In contrast to the separations data, persons aged 65 years and over have a high rate of patient days for asthma, relative to other age groups (Figure 5.31). This reflects the longer duration of individual hospital stays for asthma in this age group.

Figure 5.31:
Hospital patient days for asthma, per 100,000 population, Australia, 1993–2001



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 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, converted by a factor of 0.53. Hospital separations of more than 120 days duration were excluded from this analysis. This accounted for 0.015% of all patient days.

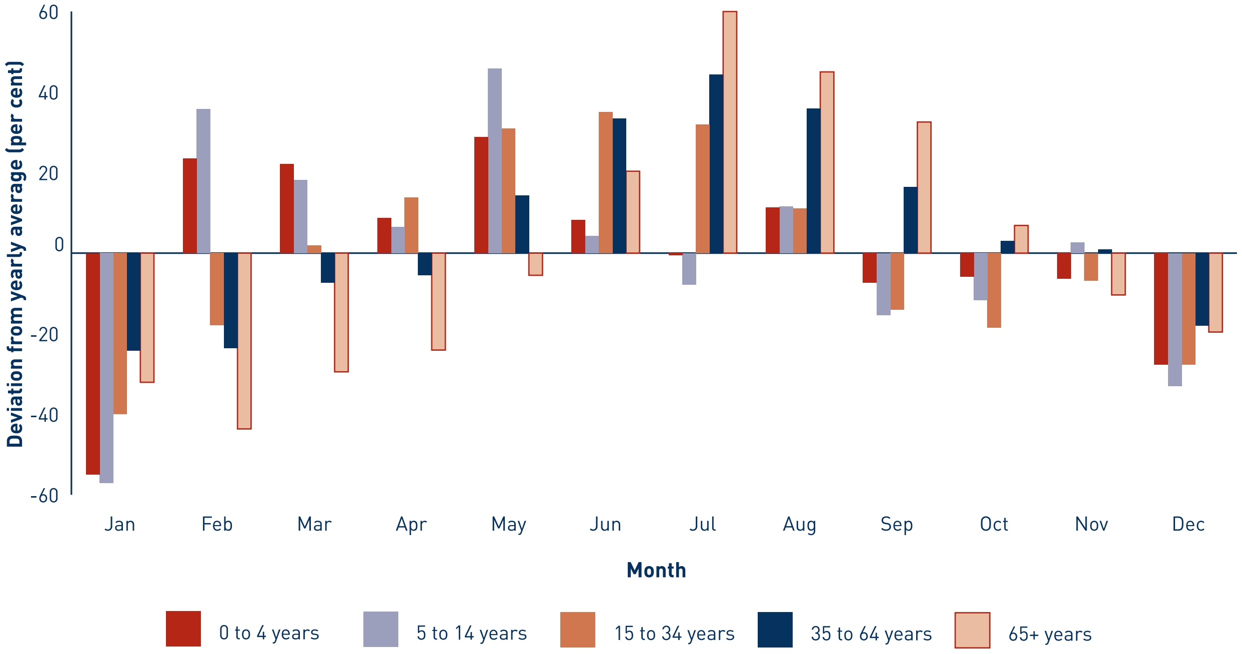
Source: AIHW National Hospital Morbidity Database.

Seasonal variation in hospital separations 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 5.32) reflect a similar pattern, with highest admission rates over winter in adults, most notably in people aged 65 years and over and, to a lesser extent, in people aged 35 to 64 years. This seasonal pattern may reflect the impact of the winter rise in respiratory tract infections.

Figure 5.32:
Average monthly deviation from average number of hospital separations attributed to asthma, by age group, Australia, 1998–2000



Source: AIHW National Hospital Morbidity Database.

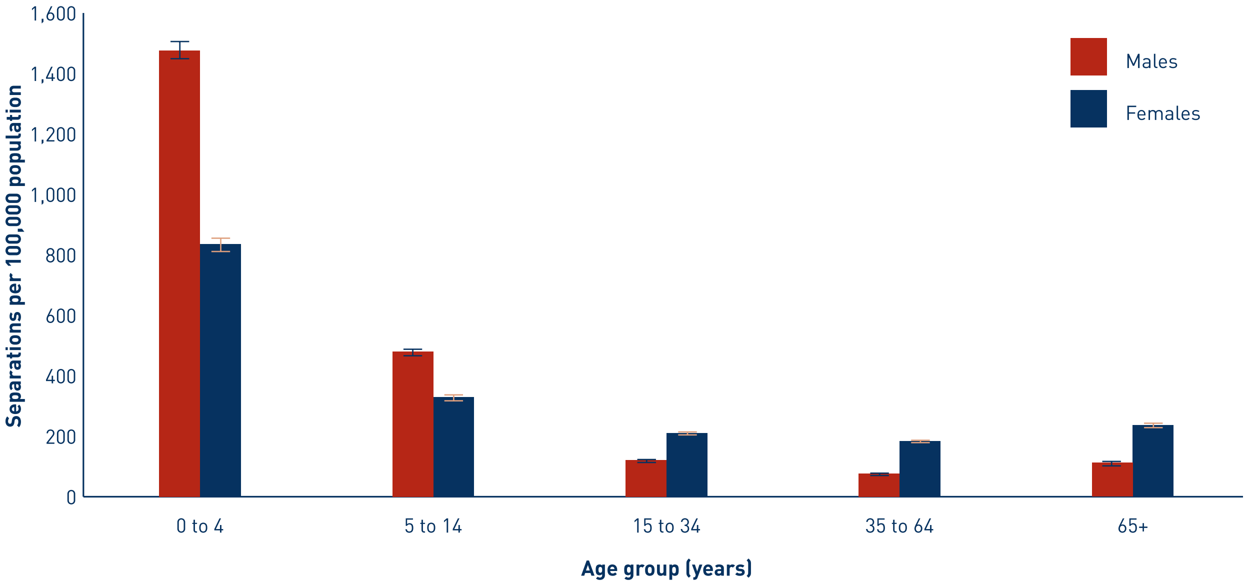
Differentials in hospital separations for asthma

Age and sex

Children aged 0 to 4 years had the highest rate of hospital separations for asthma in the 2000–01 financial year, and the rate among boys in this age group was almost twice that of girls (Figure 5.33). Boys aged 5 to 14 years also had a higher rate of hospital separations for asthma than girls. This pattern was reversed after the age of 15 years, with females having a higher rate than males.

The age and gender pattern observed for asthma hospitalisations differs from the 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 2002a). 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 5.33:
Hospital separations for asthma, per 100,000 population, by age group and sex, Australia, 2000–01

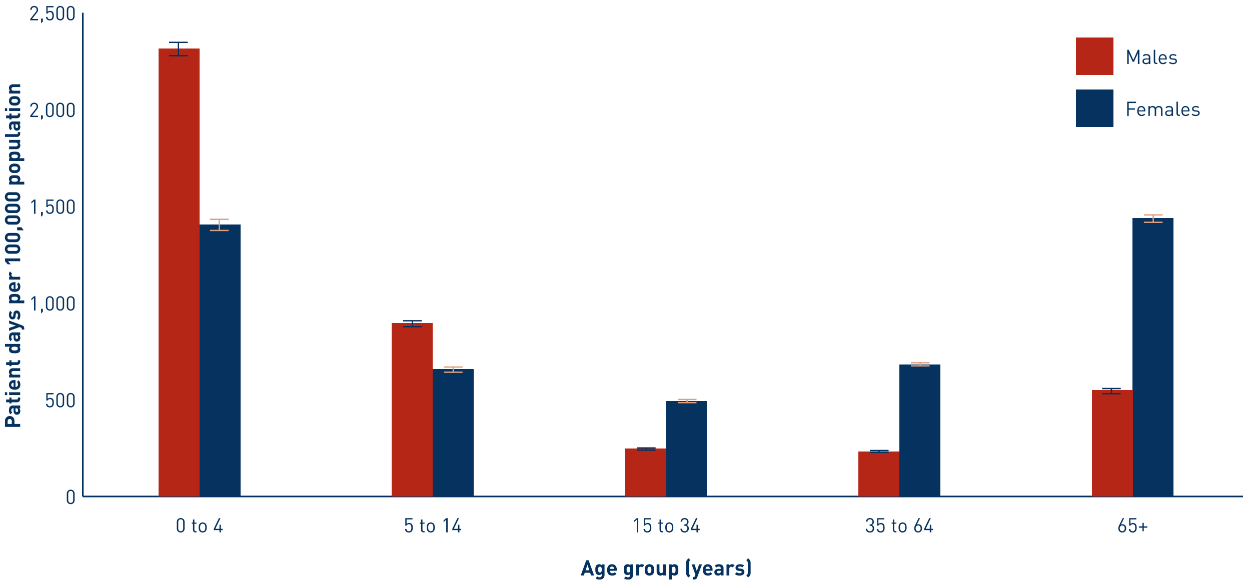


Note: Asthma classified according to ICD-10-AM codes J45 & J46.

Source: AIHW National Hospital Morbidity Database.

Similar age and gender trends are observed when examining total patient days for asthma, except that the magnitude of the gender difference among adults is greater than observed for separations, reflecting a longer average length of stay among females (Figure 5.34).

Figure 5.34:
Hospital patient days for asthma, per 100,000 population, by age group and sex, Australia, 2000–01



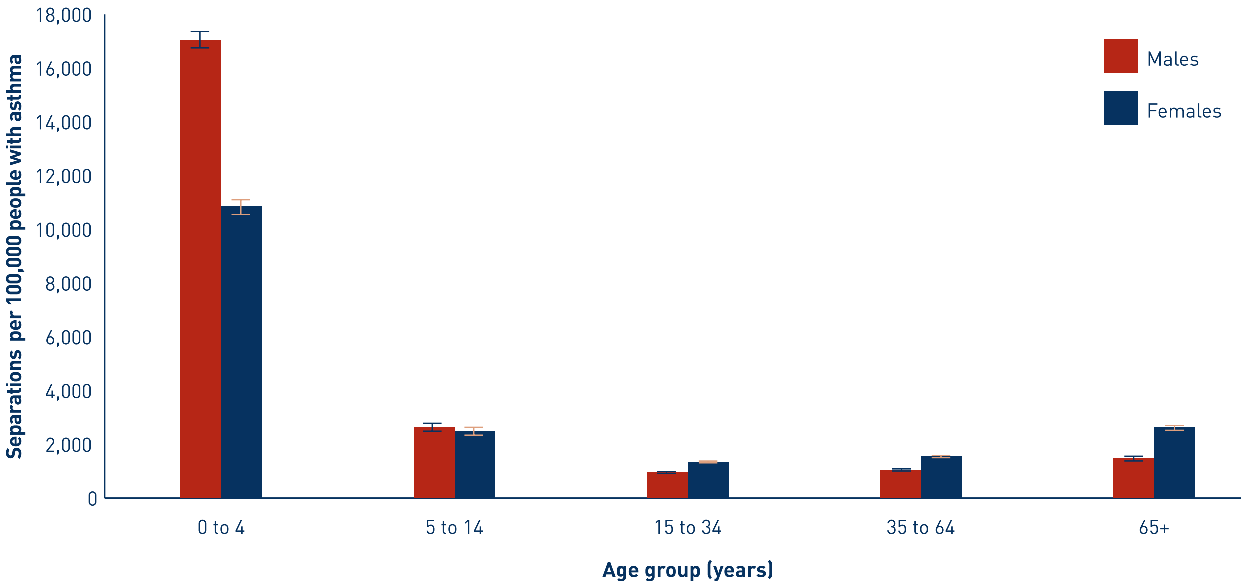
Note: Asthma classified according to ICD-10-AM codes J45 & J46. Hospital separations of more than 120 days duration were excluded from this analysis. This accounted for 0.015% of all patient days.

Source: AIHW National Hospital Morbidity Database.

The gender differences in hospitalisation rates are partially explained by differences in disease prevalence. In Figures 5.35 and 5.36, the hospitalisation rate for asthma by age and gender have been expressed per 100,000 people with current asthma, as estimated by the National Health Survey 2001. Young boys aged 0 to 4 years with asthma are more likely to be hospitalised than young girls with asthma but the difference between boys and girls aged 5 to 14 years with asthma is minimal (Figure 5.35). Gender differences in separation rates in other age groups are relatively minor, except among the elderly where the females with asthma are more likely to be hospitalised than males.

The age differential in hospitalisation rates is not explained by differences in prevalence. The case-based hospitalisation rates are much higher for children, especially those aged 0 to 4 years, than for adults. The longer average length of stay among older age groups and among adult females with asthma is reflected in the relatively higher rates of patient days among these groups (Figure 5.36).

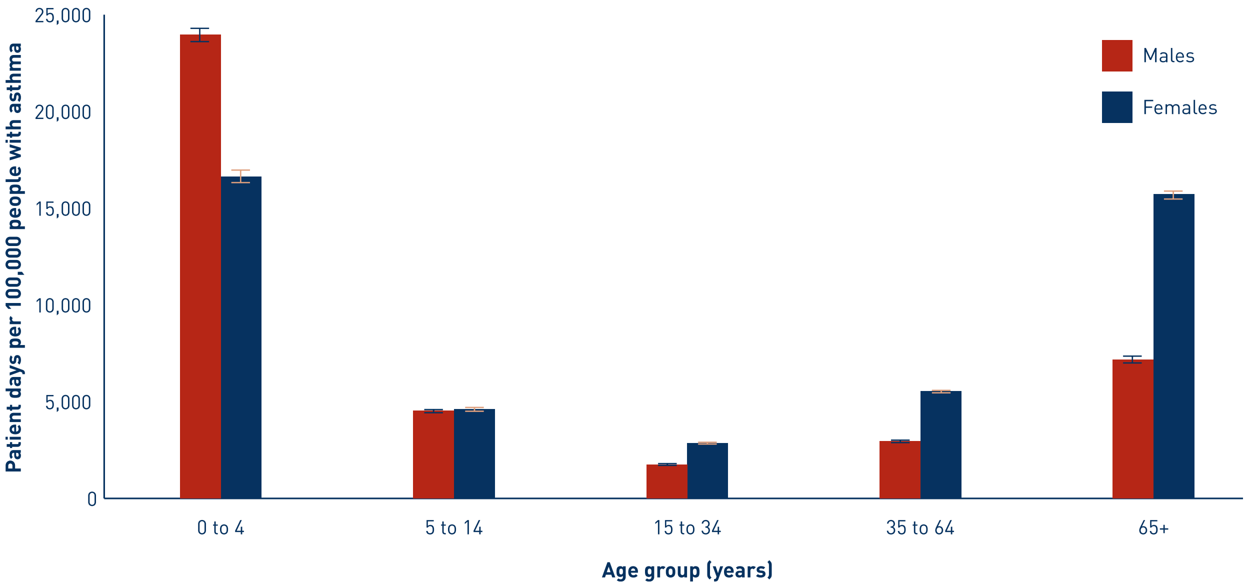
Figure 5.35:
Hospital separations for asthma, per 100,000 people with asthma, by age group and sex, Australia, 2000–01



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

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

Figure 5.36:
Hospital patient days for asthma, per 100,000 people with asthma, by age group and sex, Australia, 2000–01



Note: 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 0.015% of all patient days.

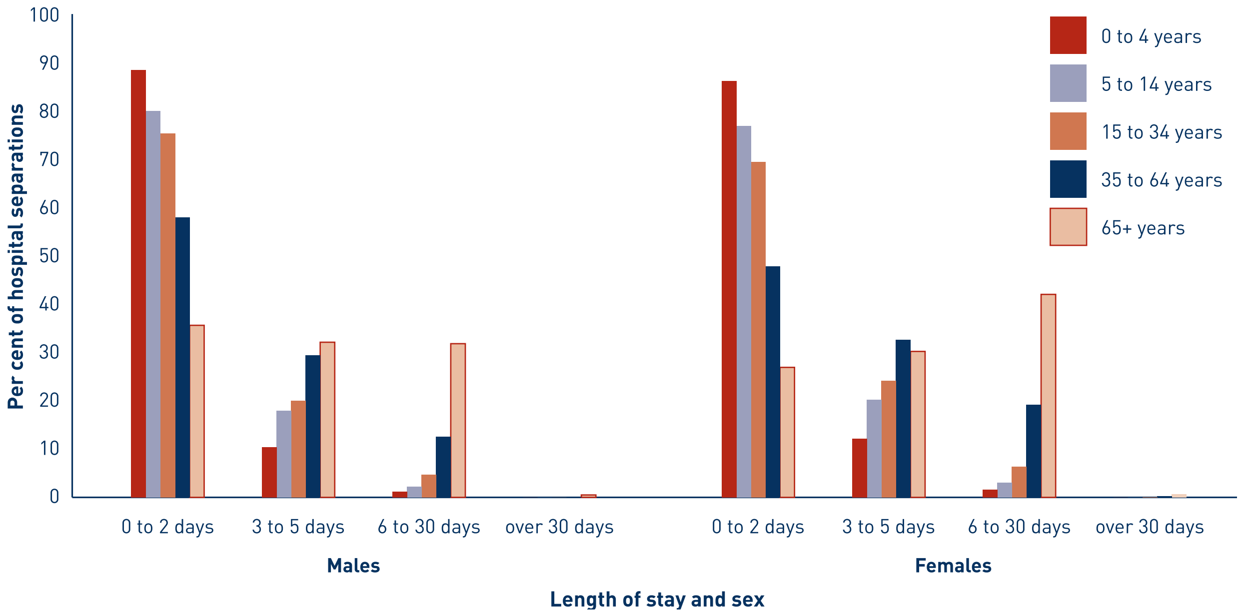
Source: AIHW National Hospital Morbidity Database.

Average length of stay for people hospitalised with asthma increases with increasing age (Figure 5.37, Table 5.3). The great majority of asthma admissions during 2000–01 in 0 to 14 year olds were for 2 days or less. After the age of 5 years, females had a slightly longer length of stay than males.

Table 5.3:
Hospital separations for asthma, median length of stay, Australia, 2000–01

	Median length of stay (days)	
Age group (years)	Males	Females
0 to 4	1	1
5 to 14	1	2
15 to 34	1	2
35 to 64	2	3
65+	4	5

Figure 5.37:
Relative frequency of length of stay for asthma, by age group and sex, Australia, 2000–01



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

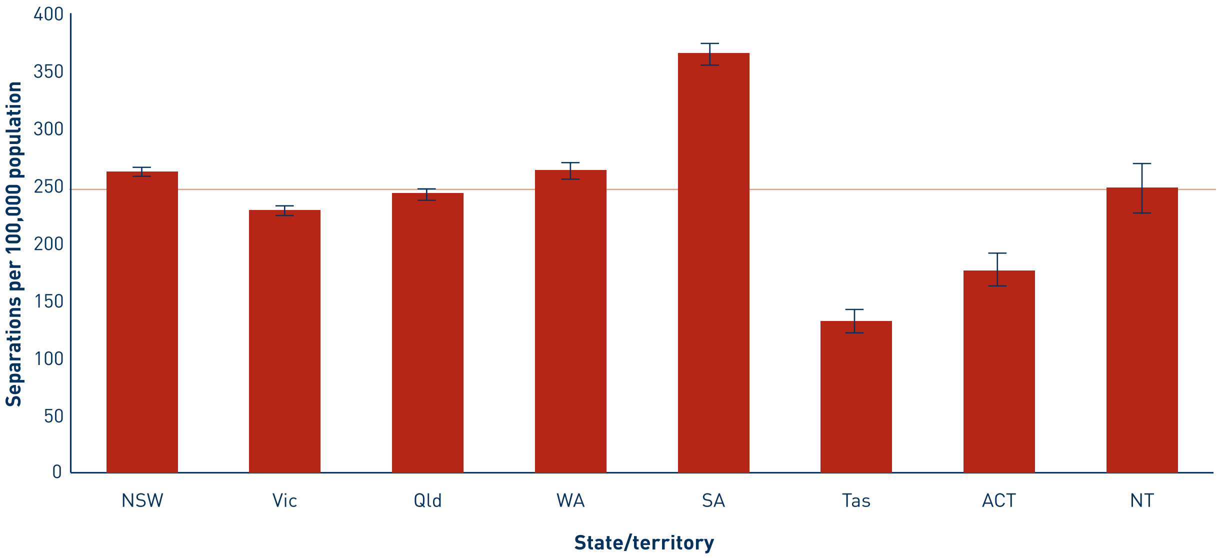
Source: AIHW National Hospital Morbidity Database.

States and territories

The hospital separation rates for asthma in 2000–01 were lower than the national average in Victoria, Tasmania and the Australian Capital Territory and were higher than average in South Australia (Figure 5.38). After correcting for variation in the prevalence of asthma, by expressing the hospital separation rate as an asthma case-based rate, similar differences between jurisdictions were observed except that, in addition, New South Wales and Western Australia had rates that were above the national average (Figure 5.39).

More detailed analysis, by age groups, reveals that 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 5.40).

Figure 5.38:
Hospital separations for asthma, per 100,000 population, by state and territory, Australia, 2000–01



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1 for details. Asthma classified according to ICD-10-AM codes J45 & J46. Horizontal line represents the national hospital separation rate for asthma for 2000–01.

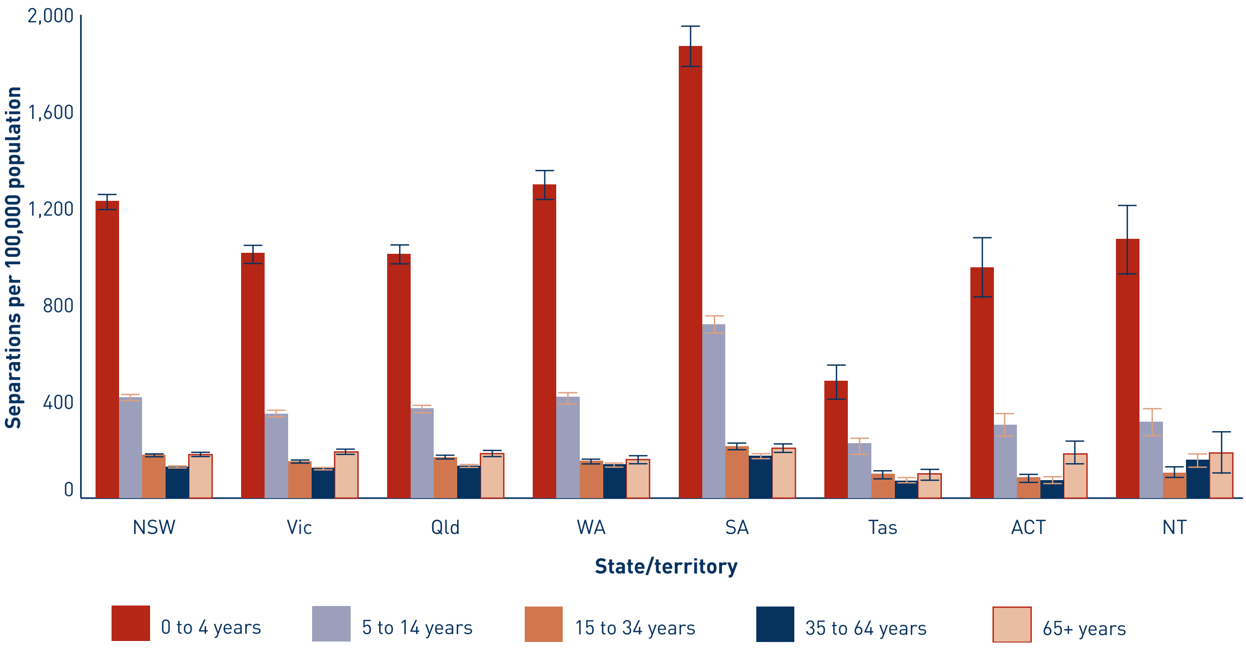
Source: AIHW National Hospital Morbidity Database.

Figure 5.39:
Hospital separations for asthma, per 100,000 people with asthma, by state and territory, Australia, 2000–01

Note: Asthma classified according to ICD-10-AM codes J45 & J46. See Appendix 1 for details. Rate for the NT is not shown, as asthma prevalence data are not available. Horizontal line represents the national hospital separation rate for asthma for 2000–01.

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

Figure 5.40:
Hospital separations for asthma, per 100,000 population, by age group and state and territory, Australia, 2000–01



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

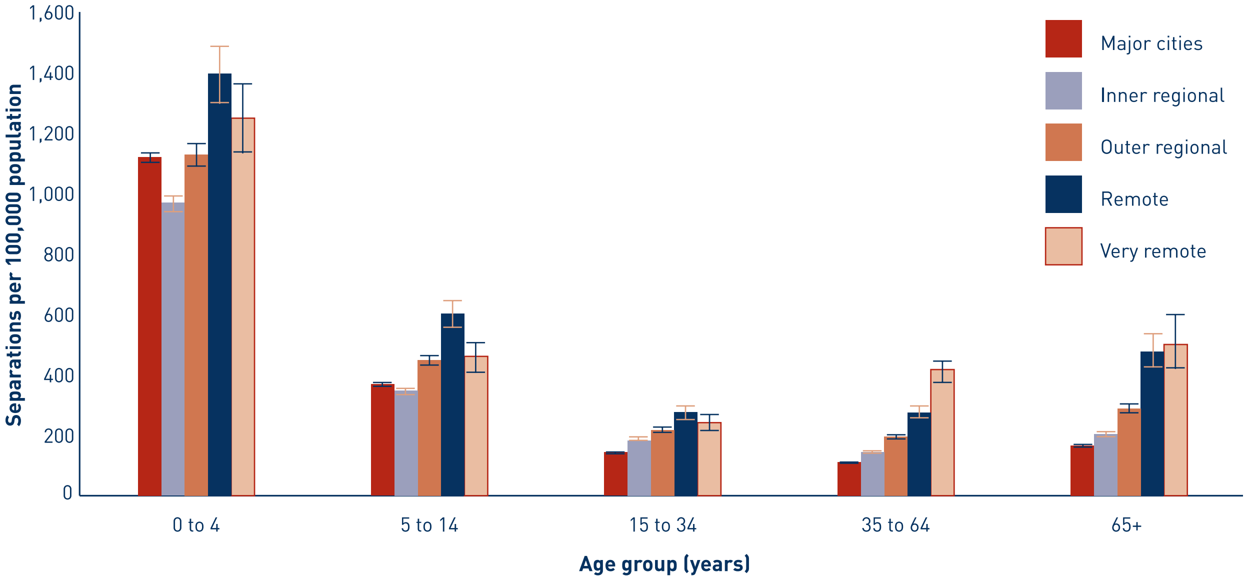
Source: AIHW, National Hospital Morbidity Database.

Urban, rural and remote areas

Hospital separation rates for asthma increase with increasing remoteness from major cities ($p<0.001$, Figure 5.41). This trend is independent of related variation in socioeconomic disadvantage (SEIFA) and is steeper with increasing age. In 2000–01, the difference in hospital separation rates between people living in major cites and those living in remote and very remote areas was 7%, 32%, 70%, 160% and 220%, in the age groups 0 to 4, 5 to 14, 15 to 34, 35 to 64 and 65 years and over, respectively. Among children, those living in inner regional areas had lower admission rates than those living in major cities (15% lower among 0 to 4 year olds and 6% lower among 5 to 14 year olds). This pattern is not seen in adults.

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 5.41:
Hospital separations for asthma, per 100,000 population, by ASGC classification of remoteness, Australia, 2000–01



Source: AIHW National Hospital Morbidity Database.

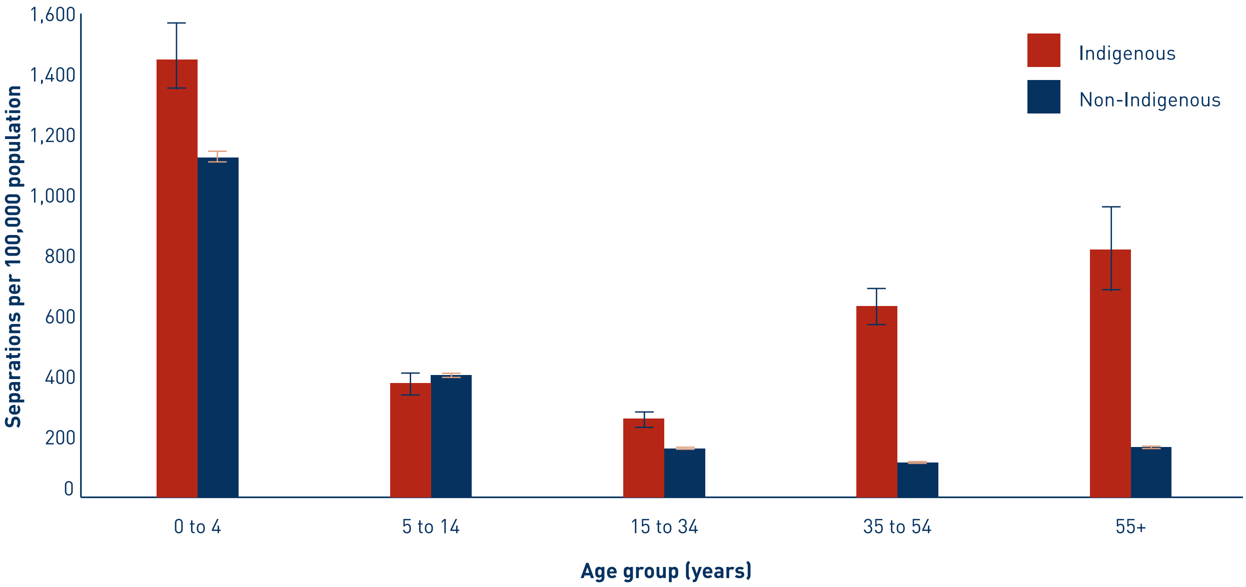
Aboriginal and Torres Strait Islander Australians

Hospital separation rates for asthma are higher for Indigenous Australians than for non-Indigenous Australians across all age groups, with the exception of children aged 5–14 years (Figure 5.42). The disparity is most noticeable in children aged 0 to 4 years and females aged over 35 years (data not shown). Data for patient days reflected a similar pattern, with the exception that Indigenous children aged 5 to 14 years had a marginally higher rate of patient days than non-Indigenous children (data not shown).

Among Indigenous Australians, during childhood (0 to 14 years), hospital separations for asthma are consistently higher in males; however, after the age of 15 years this is reversed and females demonstrate higher hospital separation rates across all ages (data not shown). This gender differential, which changes with age, is consistent with observations in the general population for a range of variables including asthma prevalence and hospital separations for asthma.

This pattern of hospital utilisation is consistent with hospital separations for all causes. In 1999–00, Indigenous Australians in every age group (and for both sexes) were more likely to be hospitalised than non-Indigenous Australians, and the smallest difference in hospital separation rates was in the age group 5 to 14 years (ABS & AIHW 2002).

Figure 5.42:
Hospital separations for asthma, per 100,000 population, by Indigenous status, Australia, 2000–01



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

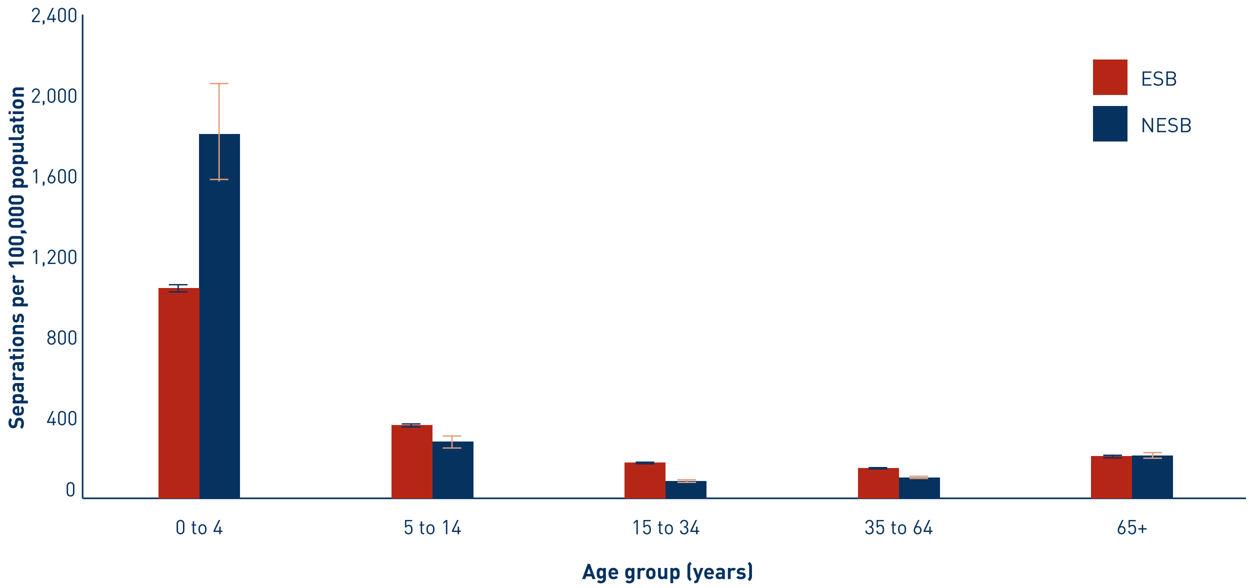
Source: National Hospital Morbidity Database.

Culturally and linguistically diverse background

Young children (aged 0 to 4 years) from non-English-speaking backgrounds are more likely to be hospitalised with asthma than children from an English-speaking background (Figure 5.43). This pattern is also observed in hospital patient days for asthma (Figure 5.44). In this age group, the prevalence of asthma is lower and overall rates of hospitalisation are lower in persons born overseas (Moon et al. 1998). The explanation for higher hospitalisation rates for asthma in this group is not clear.

Among persons aged 5 years and over, the rates of hospitalisation and patient days for asthma are higher in people from English-speaking backgrounds, consistent with the differences in prevalence.

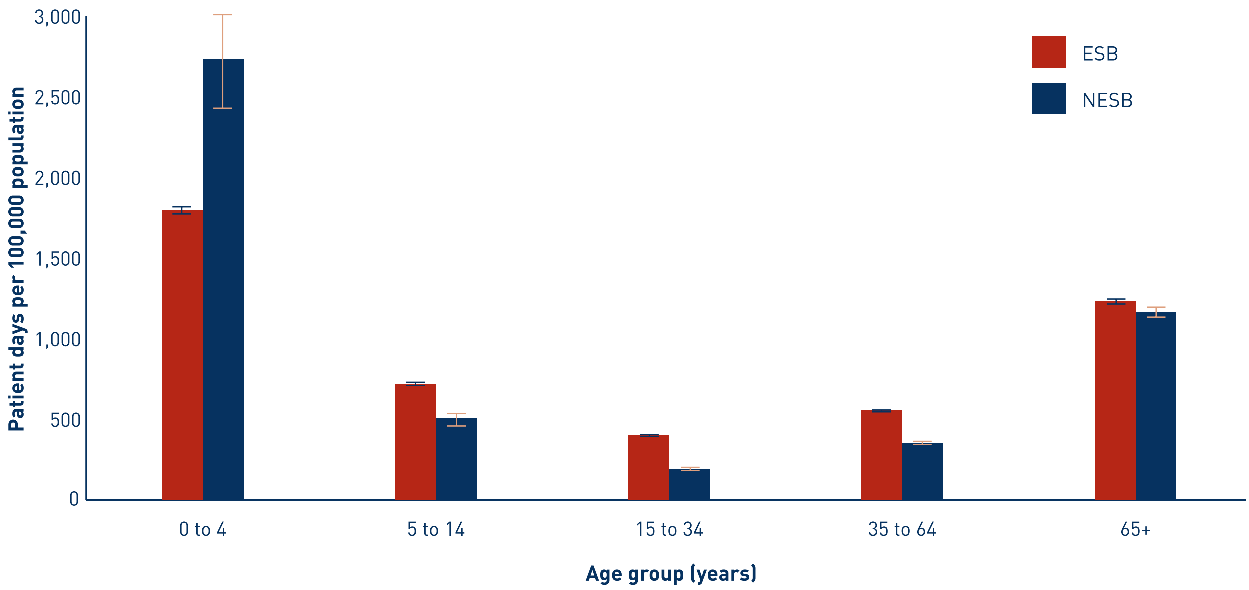
Figure 5.43:
Hospital separations for asthma, per 100,000 population, by age group and culturally and linguistically diverse background, Australia, 1999–00



Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1 for details. Asthma classified according to ICD-10-AM codes J45 & J46. ESB—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). NESB—Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001).

Source: AIHW National Hospital Morbidity Database.

Figure 5.44:
Hospital patient days for asthma, per 100,000 population, by age group and culturally and linguistically diverse background, Australia, 1999–00



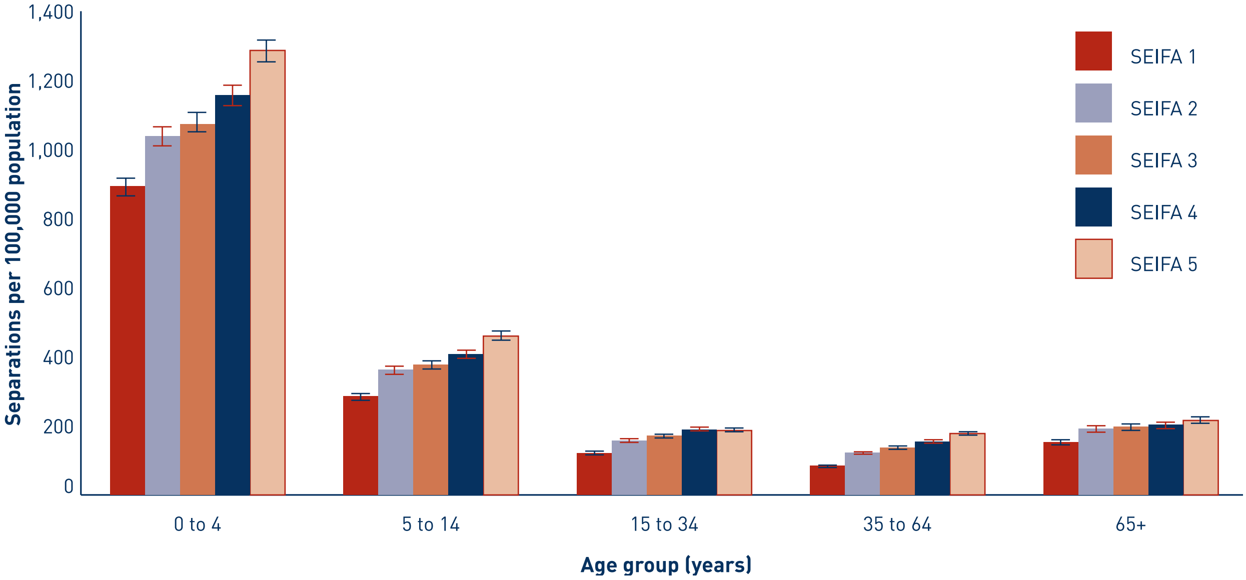
Note: Age standardised to the Australian population as at 30 June 2001. See Appendix 1 for details. Asthma classified according to ICD-10-AM codes J45 & J46. Hospital separations of more than 120 days duration were excluded from this analysis. This accounted for 0.015% of all patient days. ESB—English-speaking background includes anyone born in Australia, New Zealand, United Kingdom, Ireland, United States of America, Canada or South Africa (DIMIA English Proficiency Group 1). NESB—Non-English-speaking background includes people born everywhere else (equivalent to DIMIA English Proficiency Groups 2 to 4) (DIMIA 2001).

Source: AIHW National Hospital Morbidity Database.

Socioeconomic disadvantage

Rates of hospitalisation for asthma are higher for people living in more socioeconomically disadvantaged localities than for those living in less disadvantaged localities ($p<0.0001$, Figure 5.45). 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 living in locations in the least socioeconomically disadvantaged quintile and those living in locations in the two most disadvantaged quintiles was 41%, 49%, 45%, 64% and 15%, in the age groups 0 to 4, 5 to 14, 15 to 34, 35 to 64 and 65 years and over, respectively.

Figure 5.45:
Hospital separations for asthma, per 100,000 population, by age group and SEIFA quintile, Australia, 2000–01



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

Source: AIHW National Hospital Morbidity Database.

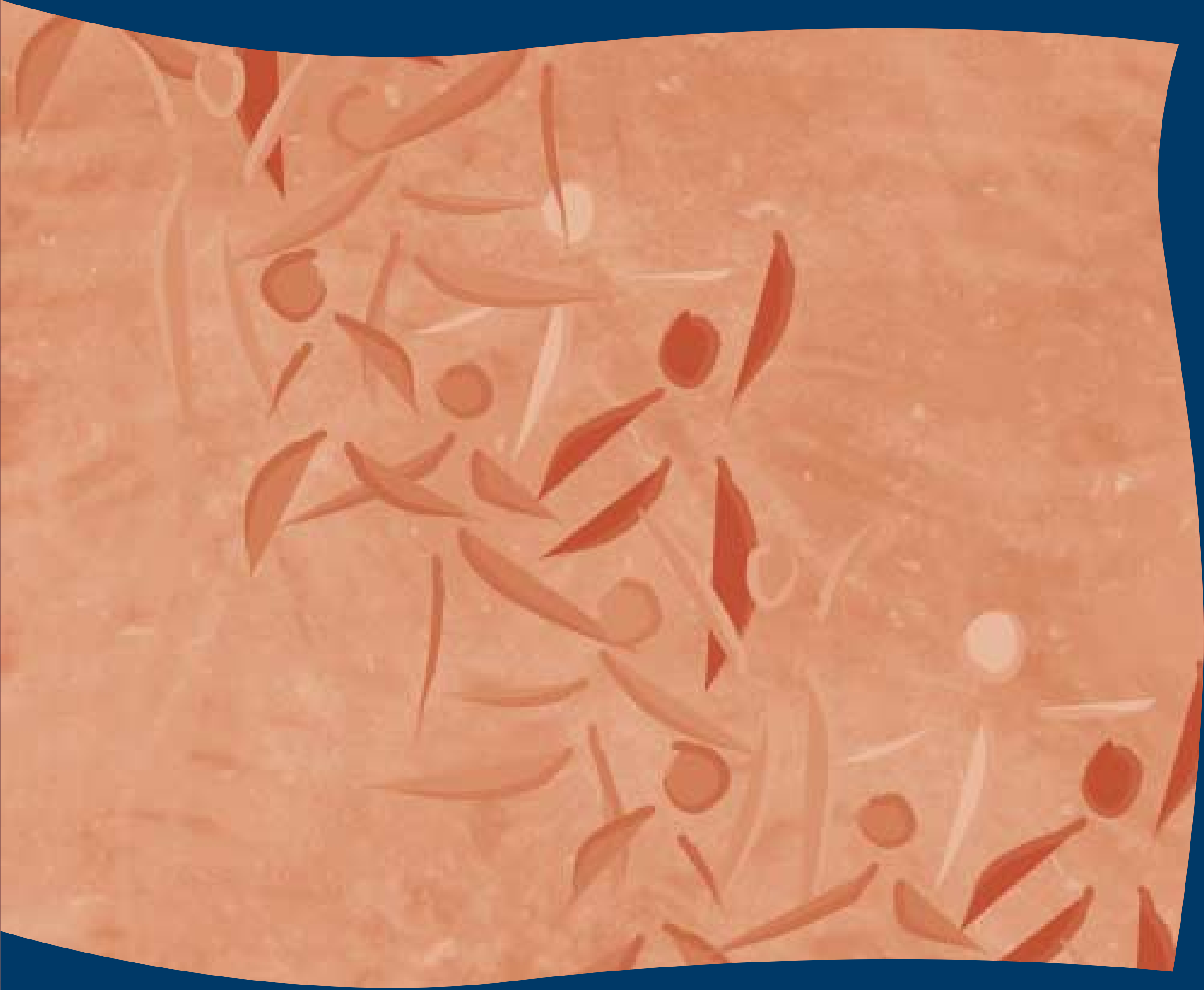
Summary

Since 1993, both hospital separations and hospital patient days for asthma have been declining, especially in children. However, children still have high rates of hospitalisation for asthma compared with adults.

Indigenous people, 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 than girls, in keeping with the higher prevalence of asthma in boys. However, after the age of 15 years, hospitalisation for asthma is greater in females than males.

Hospitalisation for asthma demonstrates noticeable seasonal variation by age. There is an increased risk of hospitalisation for asthma during winter in older people, particularly those over 65 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.



Appendix 1

A1.1 Data sources

National Mortality Database

This dataset is held at the Australian Institute of Health and Welfare. 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.

In 1997, automated coding was introduced into Australia by the ABS (see discussion on comparability factors in Section A1.2), which allows for the identification of multiple cause of death. However, throughout this report, death data relate only to the single underlying cause of death reported on each certificate.

Issues around the enumeration of deaths

As the registration of deaths is a legal requirement in Australia, this data set is considered nearly complete, although there has been no formal validation of completeness. The ABS advises that Aboriginal and Torres Strait Islander Australians are under-enumerated in some states.

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 45 years and under 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, also 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.

National Hospital Morbidity Database

Also held at the Australian Institute of Health and Welfare, this dataset contains information, on episodes of care for patients admitted to hospital, including demographic, procedural and length of stay information. Data are supplied to the AIHW by state and territory health authorities. The database contains information for each episode of care. Whilst the dataset contains details of principal and additional diagnoses, in this report data relate to the principal diagnosis only, unless otherwise stated.

Issues in the enumeration of hospital separations

As with mortality, 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 limited validation of the coding of diagnoses during hospital admissions, but the available evidence suggests that diagnostic coding of asthma is reasonably accurate (Krueger et al. 2001; Osborne et al. 1992), and that a diagnosis of asthma is most accurate in younger ages, but this accuracy decreases with age (Osborne et al. 1992).

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.

In this report, data from the 2001 survey were used. The 2001 survey collected information from 26,900 people between February and November of that year (ABS 2002b). The estimate of the prevalence of current asthma is derived from two questions asked in the survey, as described under 'asthma prevalence definitions' (Table A1.3). Some data collected in the two preceding surveys (1989 and 1995) are also cited in this report. However, the questions used to estimate the prevalence of asthma in those surveys were different from the questions used in the 2001 survey.

Table A1.1:
Asthma questions from the 2001 National Health Survey used in this report

Question	Response category	Use
Have you ever been told by a doctor or a nurse that you have asthma?	Yes No Don't know	Used throughout this report to define current asthma status 'Current asthma' derived from yes responses to 'ever had asthma' and 'do you still get asthma'
Do you still get asthma?	Yes No Don't know	
Do you have a written asthma action plan?	Yes No Never heard of one Don't know	Section 5.2 Asthma action plans
Have you taken any medication for asthma in the last 2 weeks?	Yes No Don't know	Section 5.3 Medication use
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?	Admitted to hospital as an inpatient Visited outpatient clinic Visited casualty/emergency Visited day clinic Consulted doctor (general practitioner or specialist) Consulted other health practitioner Had days(s) away from work/school Had other days of reduced activity Taken vitamins/mineral supplements Used natural/herbal medicines	Section 3.1 Quality of life, severity and disability (days away from work/ school; other days of reduced activity)

Note: Other questions used from the National Health Survey covered general health status, smoking, passive smoke exposure and demographic variables.

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

The BEACH Program is based on data collected using a continuous survey of general practice activity in Australia, which began in 1998–99. It is run by 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 modified, classic synchronised sampling procedure is used to select a random sample of GPs from the HIC Medicare data (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 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 and the data items/questions do not vary. The bottom section collects data for the SAND collection.

BEACH data

The BEACH collection includes information about each encounter (date and type of consultation, up to three reasons for the encounter, up to four diagnoses/problems managed, Medicare/Veterans' Affairs item number), the patient (date of birth, age, sex, postcode of residence, health care card status, non-English-speaking background, whether the patient identifies as Aboriginal and/or Torres Strait Islander), 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) and GP characteristics (age, sex, years working in general practice, number of sessions worked per week, postcode of main practice, etc)(Britt et al. 2001).

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 can ask questions on topics of their choice and have access to the detailed reports. At each encounter, the GP is requested to ask patients specific questions at the bottom of the recording form for the SAND collection. Using this method, 10 to 20 SAND topics are covered annually.

Medical Benefits Schedule statistics

The Health Insurance Commission (HIC) provides statistics on the claims made to the Medical Benefits Schedule (MBS). These include items claimed by general practitioners, doctors and specialists in the community. The principal items that were used in this report are spirometry (item numbers 11503, 11506, 11509 and 11512) and the GP Asthma 3+ Visit Plan Practitioner Incentive Program (PIP, item numbers 2546–2559, 2664–2677). The Asthma 3+ Visit Plan is an incentive scheme funded by the Commonwealth Government since 2001–02. The scheme encourages a structured approach to diagnosis, assessment, and management of patients with moderate and severe asthma in general practice (DoHA 2002).

Online interactive data reports for these MBS items were accessed at: <http://www.hic.gov.au/statistics/dyn_mbs/forms/mbs_tab4.shtml> and collated by time period, state and age and sex (where available).

Issues in the enumeration of spirometry and Asthma 3+ Visit Plan PIP in MBS data

There is no published information on the quality of MBS statistics. They are based on claims for remuneration made by medical practitioners and claims for reimbursement by patients for Medicare-eligible services. Services that are not eligible for Medicare funding are not included in these data. For example, the data do not include episodes of care that occurred in hospital settings, thus underestimating total episodes of care.

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. The MBS information on spirometry does not enable the reason for spirometry to be ascertained. The available data include all spirometry ordered for any reason (including for asthma, bronchitis, COPD and in people without respiratory disease).

IMS Health pharmaceutical data

Data on sales of pharmaceutical products into the Australian market, collected by IMS Health Australia, were provided to us courtesy of GlaxoSmithKline Australia P/L. These data include the monthly aggregate number of packs (sale units) distributed for each product relevant to the treatment of asthma for the period March 1998 to December 2002. Data reflect sales from major manufacturers and wholesalers operating in Australia. 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). The DDD is defined as 'the assumed average maintenance dose per day for a drug used for its main indication in adults'. DDD is used internationally as a unit of measurement for drug utilisation studies. Each medication pack or sale unit was converted to a number of DDDs per unit and the aggregate monthly totals were converted to aggregate monthly DDDs. The individual medications were then grouped into categories (Table A1.2) and DDDs were summed within categories for each calendar year and expressed as monthly averages for that year.

Table A1.2: Classification of asthma medications

Category	Medications included
Short-acting beta agonists	Salbutamol Terbutaline Orciprenaline Fenoterol
Short-acting anticholinergics	Ipratropium
Long-acting beta agonists	Salmeterol (e)Formoterol
Cromones	Cromoglycate Nedocromil
Inhaled corticosteroids	Beclomethasone Budesonide Fluticasone
Xanthines	Theophylline
Leukotriene receptor antagonists	Montelukast Zafirlukast

The delivery devices associated with each medication were classified as: metered dose inhalers; dry powder inhalers; nebuliser solutions; or oral medications.

Parenteral forms were excluded. The quantities of short-acting beta agonist and ipratropium medications sold in each of these delivery forms were calculated in DDD units.

Finally, the proportion of inhaled corticosteroids that were distributed in combination with a long-acting beta agonist was calculated for each calendar year. Only the salmeterol/fluticasone combination was available during the period covered by these data.

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 subsidy threshold, equivalent data are not available through the Pharmaceutical Benefits Scheme.

The main limitation of the data is that there is no information on the characteristics of the purchasers or consumers. As these drugs are commonly used for 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 utilisation of drugs cannot be assessed using these data.

Emergency Department collections

Emergency Department (ED) attendance for asthma has been determined using data from the New South Wales Emergency Department Data Collection (EDDC). This is one of only two ED data collections in Australia. An ED attendance index was calculated for various subgroups of the population as the number of attendances per year per 100,000 persons with asthma in that subgroup.

The data collection in New South Wales involves 50 of the 150 EDs in that state. Larger, tertiary hospitals are more likely to be included as well as the larger rural hospitals. Metropolitan Sydney has good coverage, but this is reduced in rural and remote areas, with only a selection of hospitals participating. This incomplete coverage means that the ED attendance index represents an underestimate of the true attendance rate among people with asthma. In particular, attendances at EDs in rural and remote areas are substantially underestimated.

Population data

This report has used population data sourced from the AIHW, which, in turn, are sourced from the ABS Demography section and are updated as revised/new estimates become available. All population estimates currently produced by the ABS are based on a usual residence concept, that is where people usually reside, and are referred to as estimated resident populations (ERPs).

ERPs 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.

ERPs are then updated each year from the census date using indicators of population change such as births, deaths and net migration.

A1.2 Classifications used in this report

Asthma prevalence definitions

A number of definitions for asthma have been applied in the various surveys cited in this report. These have been used either to estimate prevalence as a stand-alone measure, or to identify denominator populations, where this is appropriate. Table A1.3 lists the definitions that have been used in the surveys most commonly cited within this report.

Table A1.3: Asthma definitions used in Australian surveys

State/survey	Ever asthma	Current asthma
Australia		
National Health Survey	Have you ever been told by a doctor or a nurse that you have asthma?	Positive response to both the questions: Have you ever been told by a doctor or a nurse that you have asthma? Do you still have asthma?
New South Wales		
NSW Health Survey	Have you ever been told by a doctor that you have asthma?	Ever doctor diagnosed asthma plus treatment for asthma or symptoms of asthma in the last 12 months
NSW Child Health Survey	Have you ever been told by a doctor that you have asthma?	Ever doctor diagnosed asthma plus treatment for asthma or symptoms of asthma in the last 12 months
Victoria		
Victorian Population Health Survey	Have you ever been told by a doctor that you have asthma?	Positive response to both the questions: Have you ever been told by a doctor that you have asthma? Do you still have asthma?
ECRHS	Have you ever been told by a doctor that you have asthma?	Ever told by a doctor that you have asthma plus wheeze in the past 12 months
Queensland		
Qld State Health Survey	Have you ever been told by a doctor that you have asthma?	Ever doctor diagnosed plus symptoms or treatment of asthma in last 12 months
Chronic Disease Survey	Have you ever been told by a doctor that you have asthma?	Ever doctor diagnosed plus symptoms or treatment of asthma in last 12 months
Western Australia		
WA Health Survey	Have you ever been told by a doctor that you have asthma?	Positive response to both the questions: Have you ever been told by a doctor that you have asthma? Do you still have asthma?
South Australia		
Omnibus Survey	Have you ever been told by a doctor that you have asthma?	Positive response to both the questions: Have you ever been told by a doctor that you have asthma? Do you still have asthma?

Cause of death and hospital diagnosis codes

The classification of asthma as the underlying cause of death was based on the International Classification of Diseases 9th Revision (ICD-9) for deaths from 1979 to 1997, and the 10th Revision (ICD-10) for deaths from 1998 onwards. Comparability factors were applied to data classified under ICD-9 to make it comparable to ICD-10 (see below) enabling ICD-10 rates to be reported.

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 hospital separations coded under ICD-9 to enable comparison with ICD-10 (see below) enabling ICD-10 rates to be reported.

Table A1.4: Disease codes

Classification	Codes used	Description
ICD-9 Code 493	493.0	Extrinsic asthma
	493.1	Intrinsic asthma
	493.2	Chronic obstructive asthma
	493.9	Asthma, unspecified
ICD-10 Codes J45 & J46	J45.0	Predominantly allergic asthma
	J45.1	Non-allergic asthma
	J45.8	Mixed asthma
	J45.9	Asthma, unspecified
	J46.0	Status asthmaticus

Comparability factors

In the last 5 years there have been two major changes in classification of causes of death, and mortality coding practice (McKenzie et al. 2002). In 1997 Automated Coding Software (ACS) was introduced into Australia. This software allows for coding of multiple causes of death, as well as standardisation in interpretation and coding of causes of death. However, the introduction of automated coding was also associated with a change in the interpretation of coding rules, which has implications for the classification of some causes of death.

The second major change was the introduction of International Classification of Diseases version 10 (ICD-10) from version 9. The introduction of ICD-10 was associated with changes to, and clarification of, coding rules relating to the selection of underlying causes of death. This has had an impact on the classification of asthma as the cause of death (ABS 2002a). Where both COPD and asthma appear on the death certification, it is more likely under ICD-10 rules, than it was under ICD-9 rules, that COPD, rather than asthma, will be coded as the underlying cause of death. This has resulted in an apparent reduction in reporting of asthma as the underlying cause of death. Since COPD is more common in persons aged over 40 years, this change has its greatest impact in this age group.

All registered deaths during 1997 and 1998 were coded in both ICD-9 and ICD-10 using the automated coding system. Therefore, only one change to mortality coding is evident in time series data, with data up to 1996 manually coded using ICD-9, and data from 1997 onwards coded using automated ICD-10 (ABS 2002a). Comparability factors, which quantify the extent of change attributable to the new coding system and enable rates derived data coded in ICD-9 to be converted to rates that are consistent with ICD-10-derived data, were calculated using dual coded data (McKenzie et al. 2002). For asthma, this comparability factor was calculated as the ratio of number of deaths from the dual coded sample that were classified as J45 or J46 (asthma in ICD-10) divided by the number of deaths from the sample that were classified as 493.x (asthma in ICD-9). The ABS calculated a comparability factor of 0.75 for asthma overall (ABS 2002a). ACAM investigated the effect of age and determined the comparability factors shown in Table A1.5. These factors have been applied to ICD-9 data to make them comparable with ICD-10 for analyses of asthma deaths presented in this report.

Table A1.5: Comparability factors for asthma mortality

Age group	Conversion factor
< 35 years	1.0 (i.e. no conversion)
35 to 64 years	0.84
65+ years	0.68

Similar analyses have been undertaken with a smaller sample of hospitalisation data for asthma. Table A1.6 shows the age-group specific comparability factors calculated for converting ICD-9-CM to ICD-10-AM.

Table A1.6: 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	0.53

Medicare Benefits Schedule

The MBS item numbers used to select data for this report are shown in Table A1.7.

Table A1.7: MBS codes used in the report

MBS code	Description
Codes used in Chapter 5 Section 5.4 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
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
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
Codes used in Chapter 5 Section 5.1 Asthma-related general practice encounters	
General practitioner attendance associated with PIP incentive payments	
Subgroup 3: completion of the Asthma 3+ Visit Plan	
2546	Level 'b' Professional attendance involving taking a selective history, examination of the patient with the implementation of a management plan in relation to one or more problems, or a professional attendance of less than 20 minutes duration involving components of a service to which item 36, 37, 38, 40, 43, 44, 47, 48, 50 or 51 applies; and which completes the requirements of the Asthma 3+ Visit Plan Surgery consultation (professional attendance at consulting rooms)
2547	Out of surgery consultation (professional attendance at a place other than consulting rooms)
2552	Level 'c' Professional attendance involving taking a detailed history, an examination of multiple systems, arranging any necessary investigations and implementing a management plan in relation to one or more problems and lasting at least 20 minutes, or a professional attendance of less than 40 minutes duration involving components of a service to which item 44, 47, 48, 50 or 51 applies; and which completes the requirements of the Asthma 3+ Visit Plan Surgery consultation (professional attendance at consulting rooms)
2553	Out of surgery consultation (professional attendance at a place other than consulting rooms)
2558	Level 'd' Professional attendance involving taking an exhaustive history, a comprehensive examination of multiple systems, arranging any necessary investigations and implementing a management plan in relation to one or more complex problems and lasting at least 40 minutes duration for implementation of a management plan and which completes the requirements of the Asthma 3+ Visit Plan Surgery consultation (professional attendance at consulting rooms)
2559	Out of surgery consultation (professional attendance at a place other than consulting rooms)
2664	Surgery consultation (professional attendance at consulting rooms) Standard consultation of more than 5 minutes duration but not more than 25 minutes duration and which completes the requirements of the Asthma 3+ Visit Plan
2666	Surgery consultation (professional attendance at consulting rooms) Long consultation of more than 25 minutes duration but not more than 45 minutes duration and which completes the requirements of the Asthma 3+ Visit Plan
2668	Surgery consultation (professional attendance at consulting rooms) Prolonged consultation of more than 45 minutes duration and which completes the requirements of the Asthma 3+ Visit Plan
2673	Out of surgery consultation (professional attendance at a place other than consulting rooms) Standard consultation of more than 5 minutes duration but not more than 25 minutes duration and which completes the requirements of the Asthma 3+ Visit Plan
2675	Out of surgery consultation (professional attendance at a place other than consulting rooms) Long consultation of more than 25 minutes duration but not more than 45 minutes duration and which completes the requirements of the Asthma 3+ Visit Plan
2677	Out of surgery consultation (professional attendance at a place other than consulting rooms) Prolonged consultation of more than 45 minutes duration and which completes the requirements of the Asthma 3+ Visit Plan

International classification of primary care

Information on diagnosis and problem managed during GP encounters, obtained from the BEACH dataset, was classified according to the International Classification of Primary Care—2nd edition (ICPC-2) (Britt et al. 2001). For further information, see the Classification Committee of the World Organization of Family Doctors (WICC 1997). To classify 'asthma' from BEACH data we 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

Population groups

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 they can be addressed. However, it is also important to ensure an acceptable level of reliability and validity of the data that are used for this purpose. This applies to assignation of Indigenous status as much as it does to all other aspects of the data.

Data for Aboriginal and Torres Strait Islander 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.

Despite the use of a standard definition for identification of Indigenous Australians since 1981, there have been substantial increases in the Indigenous Australian population between census collections that cannot be fully explained by natural increase (Ross 1999). This has generated uncertainty about interpretation of the standard question and how responses may change over time and subsequently led to difficulty estimating and projecting the Indigenous Australian population. The implication of changes over time in the designation of Aboriginal and Torres Strait Islander status is that time trends using Aboriginal and Torres Strait Islander status in all data collections may not be valid and should be treated with extreme caution.

Deficiencies in health data for Indigenous Australians also exist in the National Mortality Collection and the National Hospital Morbidity Dataset (NHMDS). In 2000–01 all states and territories adopted a standard definition for use in the NHMDS. However, data are still only considered acceptable in South Australia and Northern Territory, and for the years prior to 1998–99 any use of the identifier for Indigenous Australians should be undertaken with caution. Similarly, in the National Mortality Collection from 1990 onwards only data from South Australia, Western Australia and 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 health status in Indigenous Australians. The validity and reliability of other general population surveys (including the state CATI surveys) is less certain and it is preferable not to use them to draw conclusions about Aboriginal and Torres Strait Islander health status. BEACH data do not provide reliable estimates for the Aboriginal and Torres Strait Islander population. Finally, there is no reliable identification of Aboriginal and Torres Strait Islander status on the HIC database at this point in time.

In summary, 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 therefore 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 is also applicable to a large number of Aboriginal and Torres Strait Islander Australians.

Non-English-speaking 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 1999b). As such, it is necessary to describe the health status of people from different backgrounds. The term 'non-English-speaking background' (NESB) 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 (ESB) 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 (NESB) 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.

Socioeconomic disadvantage

The SEIFA Index of Relative Socioeconomic Disadvantage (IRSD) is one of five indexes developed by the ABS to measure different characteristics of socioeconomic aspects associated with geographic locations (ABS 1998b), 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 IRSD 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 (least disadvantaged)	≥1064.4
2nd Quintile	1008.1–<1064.4
3rd Quintile	973.1–<1008.1
4th Quintile	940.5–<973.1
5th Quintile (most disadvantaged)	<940.5
NSW average	**1006**

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 least disadvantaged households and quintile five (SEIFA 5) includes the most disadvantaged 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.

Urban, rural and remote areas

Accessibility to health and education services plays an important role in the successful treatment and management of asthma. Urban, rural and remote areas are identified in this report using the Australian Standard Geographical Classification, which is based on the Accessibility/Remoteness Index of Australia (ARIA). ARIA was developed in 1998 for the Commonwealth Department of Health and Aged Care by the National Key Centre for Social Applications of Geographical Information Systems (GISCA) at the University of Adelaide.

ARIA 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 2001.)

Table A1.9: ABS classes of remoteness by ASGC and their definitions

ASGC remoteness 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 range 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.

A1.3 Analysis methods

Rates

Rates are used to compare the incidence of an event or prevalence of a condition between different populations. This ensures that the absolute number of events (e.g. deaths) is related to the size of the population producing the events. For rare events, rates per 100,000 persons have been cited. For less rare events or conditions, other bases (e.g. per 100 persons or percentage) have been used.

Population-based rates

Crude event rates

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

Age- and sex-specific rates

Age- and sex-specific rates have been used in order to take into account the age- and sex- specific variation in rates. Rates have been calculated using the following formula:

n/population x 100,000

where n=number of events, and population is the mid-year population for the relevant year, for the age group and/or sex.

Age-standardised rates

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

The standard population was the Australian population as at 30 June 2001 in all analyses except the international comparison of mortality data, in which the world standard population in 2000 was used (details provided in the relevant chapter). Where trend data are presented by age group, larger age groups (e.g. 5–14, 15–34, 35–64, 65 plus) are age standardised to the corresponding age group of the Australian population as at 30 June 2001.

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

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

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

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. Where the data source includes an estimate of this denominator, rates based on that denominator are used. Where no such data are available, asthma prevalence estimates for the relevant population from the ABS National Health Survey 2001 are used.

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.

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 reflect or 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.

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.

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. This method could not be applied to the rates derived from the ABS National Health Survey 2001. For these analyses, 95% confidence intervals around rates and proportions were estimated by interpolation from a range of estimate- and sample-specific relative standard error values supplied by the ABS.

Multivariate methods

Multivariate regression methods were used to assess the independent effects of age, gender, socioeconomic disadvantage (SEIFA quintile) and remoteness (ASGC classification) on mortality and hospitalisation rates. A logistic model was constructed in which the independent effects of these characteristics on event rates were estimated. Results were expressed as adjusted (independent) odds ratios, with 95% confidence intervals.

Clustered analysis of BEACH Survey of General Practice data

Estimating the rate of asthma-related general practice encounters

The number of general practice encounters where asthma was managed (i.e. asthma-related general practice encounters) per 100 encounters was estimated by analysing the BEACH data using the SURVEYMEANS® Procedure in SAS software version 8.1 (SAS Institute Inc. © 1999–2001). This procedure takes account of the cluster sampling used in BEACH and incorporates post-stratification weights to account for differences in age and service activity between the GP sample and the general practice population.

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

where

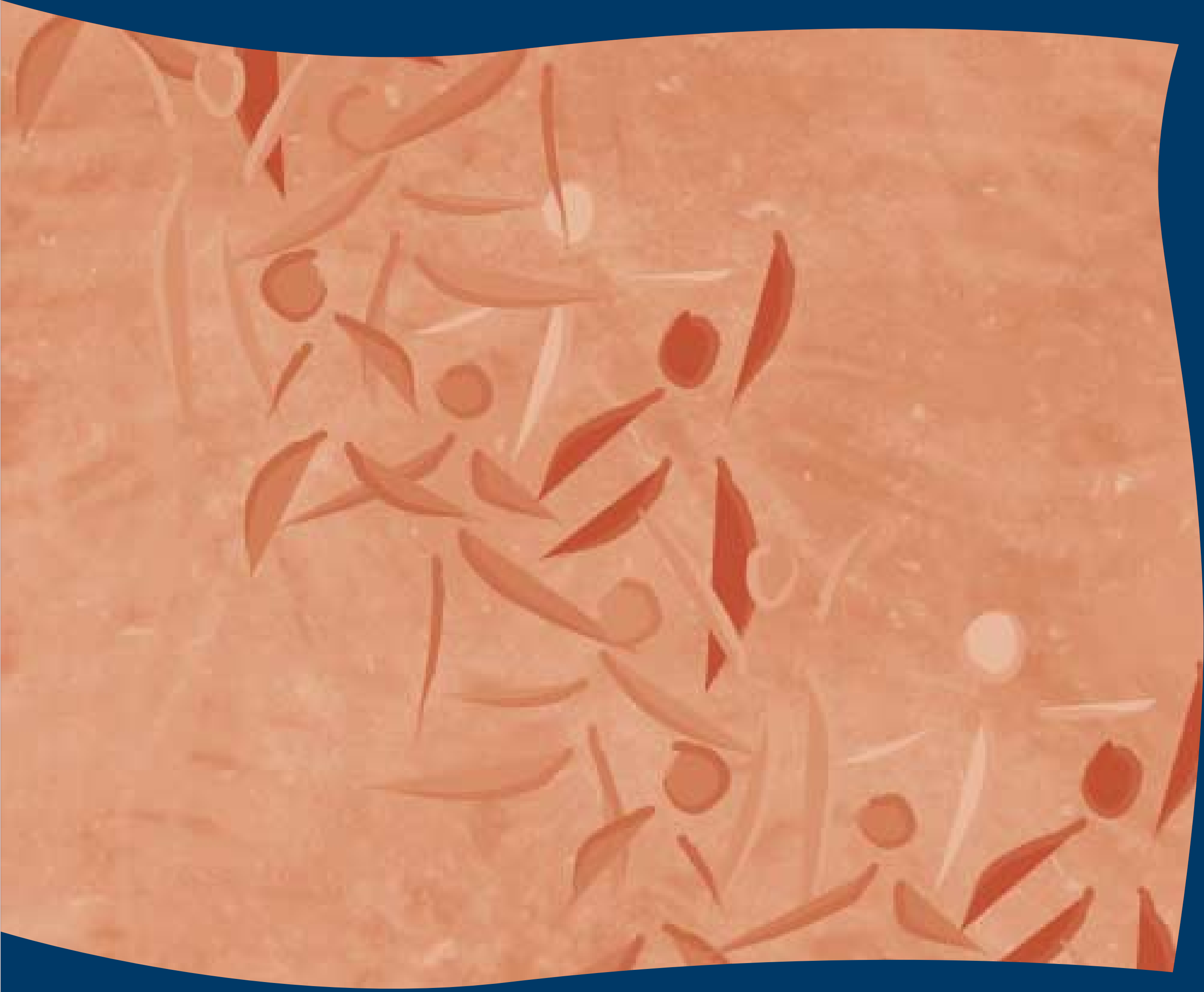
ARGPEs = number of asthma-related general practice encounters per 100 encounters and is based on analysis of BEACH data;

population = the end of year population for the relevant year, for the age group and/or sex; and

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

Calculation of defined daily dose

The defined daily dose per 1,000 population per day (DDD/1,000/day) is used in this report to compare community drug consumption over time and across drug groups where information about actual drug consumption for asthma is not available. The information in this report is based on published data from the Department of Health and Ageing (DHAC 1999; DoHA 2003) using information provided by the HIC Pharmaceutical Benefits Scheme (PBS and RPBS) and an annual survey of pharmacies (Pharmacy Guild Survey).



Appendix 2: Statistical tables

Table A2.1:
Cumulative incidence of doctor diagnosed asthma, by age group and sex, Australia, 2001

Sex/age group	Estimated 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+	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+	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**

Table A2.2:
Current prevalence of asthma, by age group and sex, Australia, 2001

Sex/age group	Estimated people with current asthma	Estimated total people	Per cent of people with current 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+	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**

(continued)

Table A2.2 (continued):
Current prevalence of asthma, by age group and sex, Australia, 2001

Sex/age group	Estimated people with current asthma	Estimated total people	Per cent of people with current asthma	95% confidence interval
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+	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 have asthma?'

Table A2.3:
Rate of hospital separations for asthma, per 100,000 population, Australia, 1993–2001

	Males				Females			
Age group/ year	Hospital admissions	Population	Rate per 100,000	95% confidence intervals	Hospital admissions	Population	Rate per 100,000	95% confidence intervals
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
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
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

(continued)

Table A2.3 (continued):
Rate of hospital separations for asthma, per 100,000 population, Australia, 1993–2001

	Males				Females			
Age group/ year	Hospital admissions	Population	Rate per 100,000	95% confidence intervals	Hospital admissions	Population	Rate per 100,000	95% confidence intervals
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
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
65+ years								
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

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.

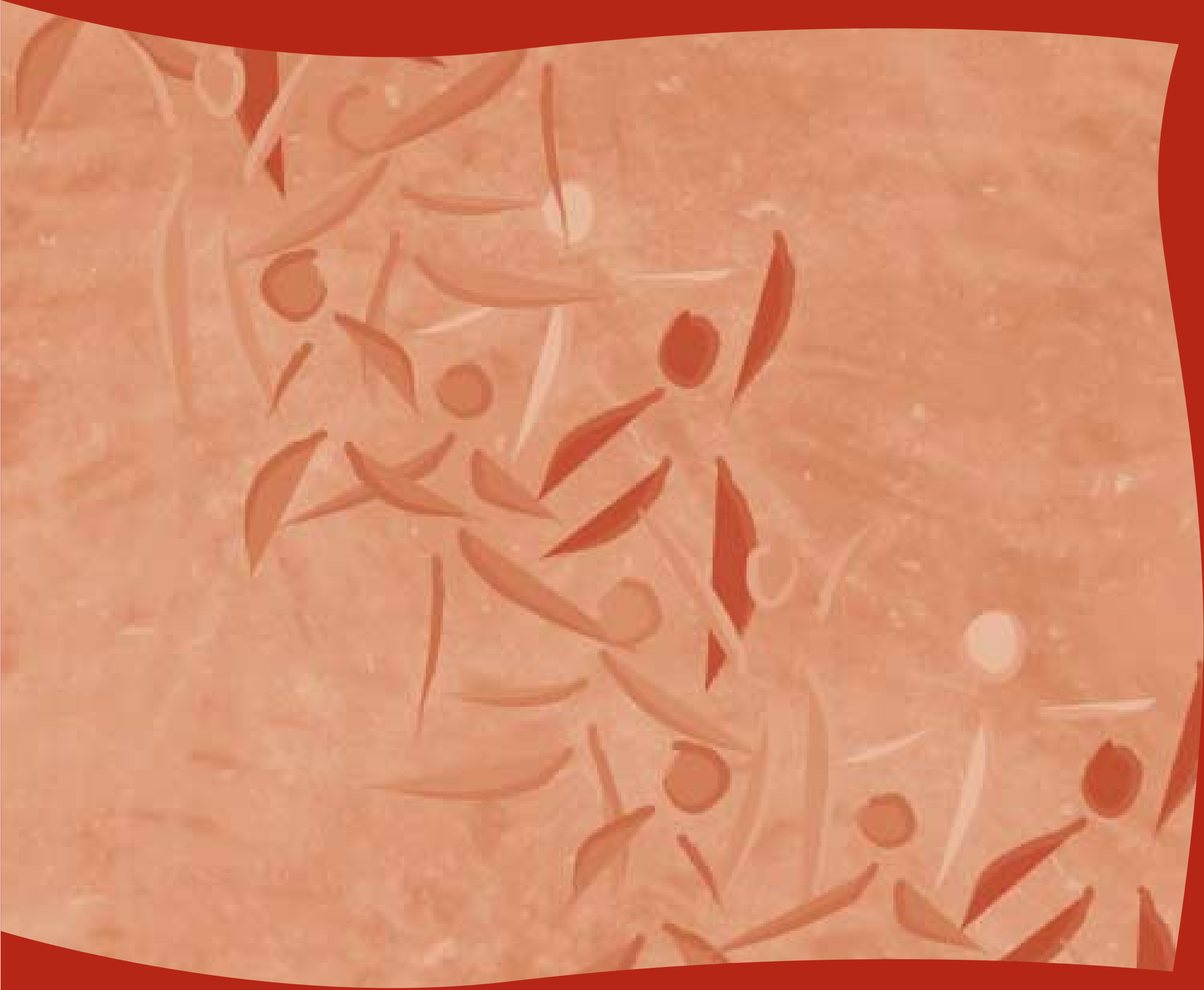
Table A2.4:
Age-standardised mortality rates for asthma, per 100,000 population, Australia, 1979–2001

	Males				Females			
Age group/ year	Deaths due to asthma	Population	Rate per 100,000	95% confidence interval	Deaths due to asthma	Population	Rate per 100,000	95% confidence interval
5 to 34 years								
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	1.0	6 .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

(continued)

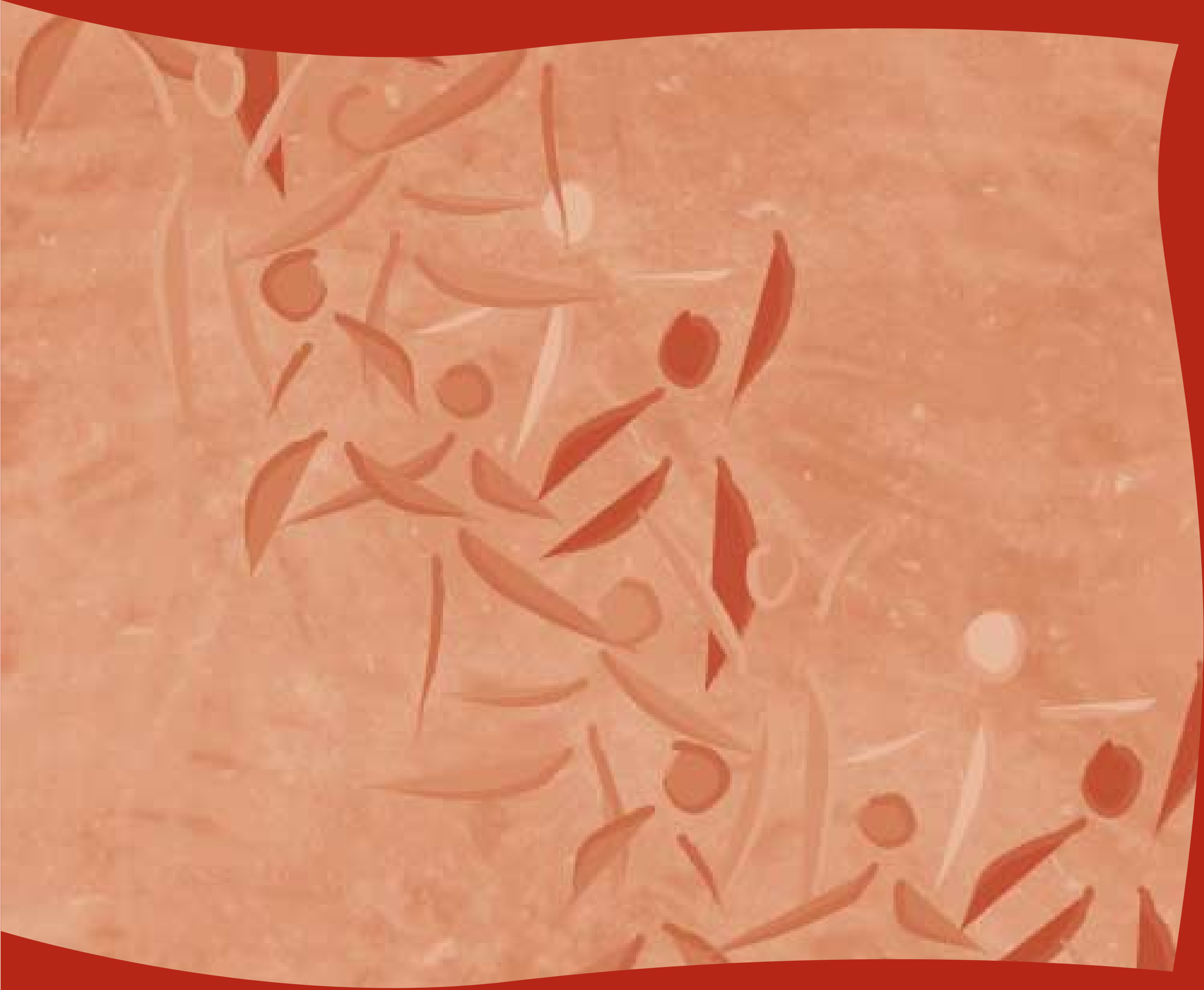
Table A2.4 (continued):
Age-standardised mortality rates for asthma, per 100,000 population, Australia, 1979–2001

	Males				Females			
Age group/ year	Deaths due to asthma	Population	Rate per 100,000	95% confidence interval	Deaths due to asthma	Population	Rate per 100,000	95% confidence interval
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
All ages								
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



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
DDD	Defined daily dose
DIMIA	Department of Immigration & Multicultural & Indigenous Affairs (Commonwealth)
DoHA	Department of Health and Ageing (Commonwealth)
ECRHS	European Community Respiratory Health Survey
ED	Emergency Department
EDDC	Emergency Department Data Collection (NSW Health Department)
ERP	Estimated resident population
ESB	English-speaking background
ETS	Environmental tobacco smoke
GINA	Global Initiative for Asthma
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-AM	International 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 Allergy in Children
MBS	Medical Benefits Schedule
NAC	National Asthma Council
NAEPP	National Asthma Education and Prevention Program
NARG	National Asthma Reference Group
NESB	Non-English-speaking background
NHDD	National Health Data Dictionary
NHPA	National Health Priority Area
NHS	National Health Survey
NSW	New South Wales
NT	Northern Territory
PBS	Pharmaceutical Benefits Scheme
Qld	Queensland
RRMA	Rural, remote and metropolitan areas classification
SA	South Australia
SAND	Supplementary Analysis of Nominated Data
SEIFA	Socioeconomic Index for Areas
SERCIS	Social, Environmental and Risk Context Information System
SF-36	Medical Outcomes Study Short Form 36
SLA	Statistical local area
Tas	Tasmania
Vic	Victoria
WA	Western Australia
WHO	World Health Organisation



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, an admission rate is the same as a separation rate.

Age-specific rate: A rate for a specific age group. The numerator and denominator relate to the same age group. See Appendix 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 (usually increasing) 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).

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. (GINA 2002; NAC 2002; National Asthma Education and Prevention Program 1997).

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 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 Commonwealth Government aimed at people with moderate to severe asthma. The Plan entails three visits to the GP in which asthma is assessed, an individualised asthma management plan is developed and reviewed, and the patient receives appropriate education about asthma.

BEACH Survey of General Practice: 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*.

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.

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.

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 Organisation'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.

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.

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.

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.

Risk factor: See *Health risk factor*.

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 to measure general health and wellbeing.

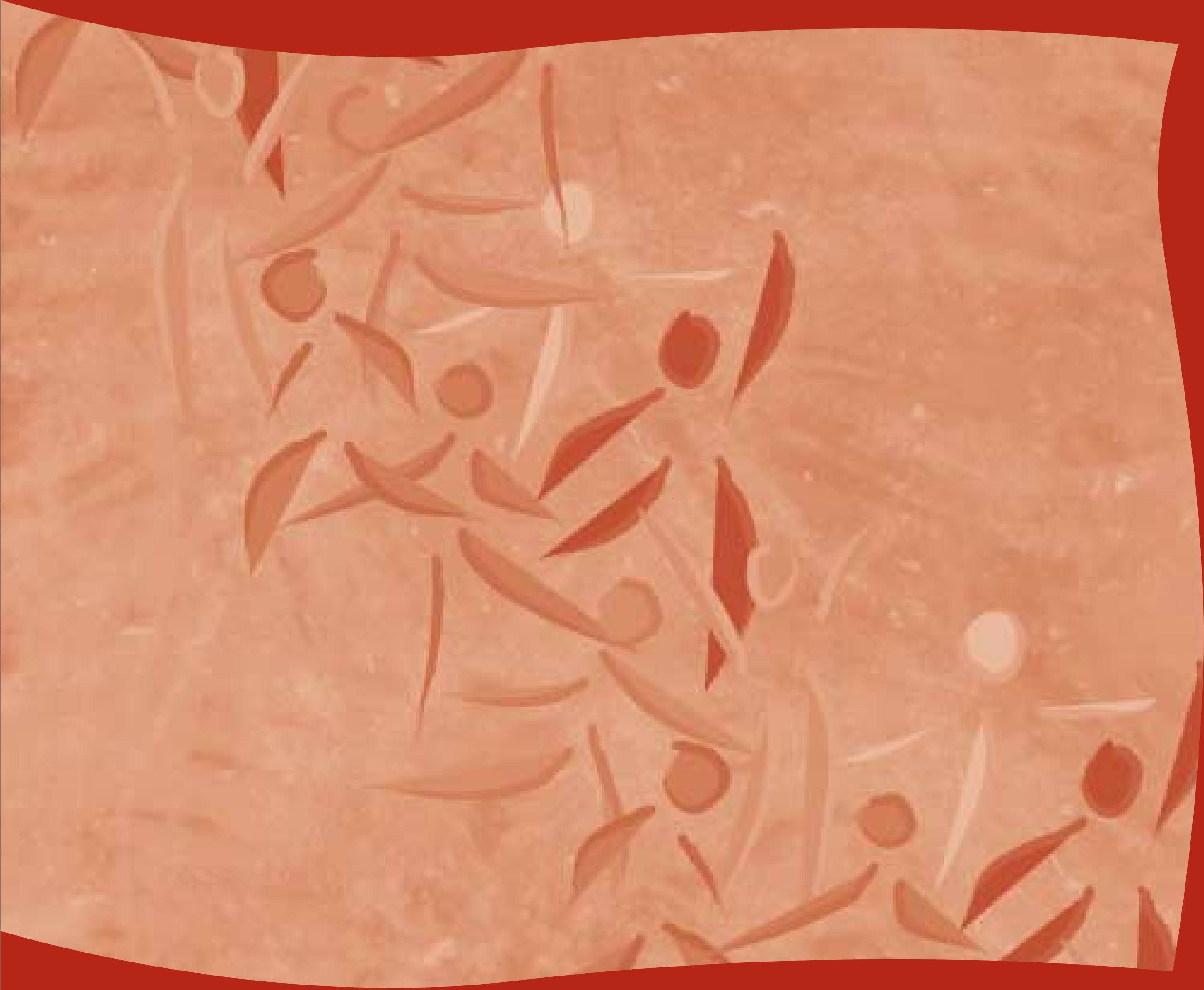
Six Step Asthma Management Plan: Consensus-based guidelines for the management of asthma. The six steps are: 1) Assess asthma severity; 2) Achieve best lung function; 3) Maintain best lung function: identify and avoid trigger factors; 4) Maintain best lung function: optimise medication program; 5) Develop an action plan; and 6) Educate and review regularly.

Spirometer/spirometry: A spirometer is a device used to measure timed expired and inspired volumes, and from these calculate how effectively and how quickly the lungs can be emptied and filled. 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.

Underlying cause of death: The main disease that initiated the train of events leading directly to death; distinct from the 'associated causes of death', which are diseases, conditions or injuries that contributed to the death directly or indirectly.

Wheeze: Breathing difficulty accompanied by an audible whistling sound.



References

Abramson M, Kutin J & Bowes G 1992. The prevalence of asthma in Victorian adults. Australian & New Zealand Journal of Medicine 22:358–63.

Abramson M, Kutin J, Czarny D & Walters EH 1996. The prevalence of asthma and respiratory symptoms among young adults: is it increasing in Australia? Journal of Asthma 33(3):189–96.

Abramson MJ, Bailey MJ, Couper FJ, Driver JS, Drummer OH, Forbes AB, et al. 2001. Are asthma medications and management related to deaths from asthma? American Journal of Respiratory and Critical Care Medicine 163:12–18.

ABS (Australian Bureau of Statistics) 1997. National health survey Australia, 1995: SF-36 population norms. ABD Cat. No. 4399.0 Canberra: ABS.

ABS (Australian Bureau of Statistics) 1998a. Asthma and other respiratory conditions, Australia, 1995. ABS Cat. No. 4373.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) 1998b. Information paper: 1996 census of population and housing: Socioeconomic indexes for areas. ABS Cat. No. 2309.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) 1999a. Causes of death: Australia 1998. ABS Cat. No. 3303.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) 1999b. Standards for social, labour and demographic variables. Cultural diversity variables. Country of birth of father. Viewed 12 March 2003, <http://www.abs.gov.au/ausstats/abs@.nsf/0/974145038229B390CA25697E0018FE69?Open>.

ABS (Australian Bureau of Statistics) 2001. ABS views on remoteness. ABS Cat. No. 1244.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) 2002a. Causes of death: Australia 2001. ABS Cat. No. 3303.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) 2002b. 2001 National health survey: summary of results. ABS Cat. No. 4364.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) 2002c. National health survey: Aboriginal and Torres Strait Islander results, Australia. ABS Cat. No. 4715.0. Canberra: ABS.

ABS (Australian Bureau of Statistics) & AIHW (Australian Institute of Health and Welfare) 2002. Hospital statistics: Aboriginal and Torres Strait Islander Australians 1999–2000. Occasional Paper. ABS Cat. No. 4711.0. AIHW Cat. No. IHW 9. Canberra: ABS & AIHW.

Abulhosn RS, Morray BH, Llewellyn CE & Redding GJ 1997. Passive smoke exposure impairs recovery after hospitalization for acute asthma. Archives of Pediatrics & Adolescent Medicine 151(2):135–9.

Adams R, Ruffin R, Wakefield M, Campbell D & Smith B 1997. Asthma prevalence, morbidity and management practices in South Australia, 1992–1995. Australian & New Zealand Journal of Medicine 27:672–9.

Adams R, Wakefield M, Wilson D, Parsons J, Campbell D, Smith B, et al. 2001. Quality of life in asthma: a comparison of community and hospital asthma patients. Journal of Asthma 38(3):205–14.

Adams RJ, Smith BJ & Ruffin RE 2000. Factors associated with hospital admissions and repeat emergency department visits for adults with asthma. Thorax 55:566–73.

AIHW (Australian Institute of Health and Welfare) 2000. National Health Priority Area indicators for monitoring asthma. Report of a consultation workshop. Canberra: AIHW. Unpublished.

AIHW (Australian Institute of Health and Welfare) 2002a. Australian hospital statistics 2000–2001. AIHW Cat. No. HSE 20. Canberra: AIHW (Health Services Series No. 19).

AIHW (Australian Institute of Health and Welfare) 2002b. Chronic diseases and associated risk factors in Australia, 2001. Canberra: AIHW.

AIHW GP Statistics and Classification Unit 2000. SAND Abstract No. 3 from the BEACH program: asthma. Sydney: GPSCU University of Sydney.

AIHW GP Statistics and Classification Unit 2001. SAND Abstract No. 22 from the BEACH program: asthma-prevalence, severity and management. Sydney: GPSCU University of Sydney.

AIHW GP Statistics and Classification Unit 2002. Bettering the evaluation and care of health. Viewed 11 May 2003, <http://www.fmrc.org.au/beach.htm>.

AIHW: De Looper M 2002. Seasonality of death. Bulletin No. 3. AIHW Cat. No. AUS 29. Canberra: Australian Institute of Health and Welfare.

Aligne C, Auinger P, Byrd R & Weitzman M 2000. Risk factors for pediatric asthma. American Journal of Respiratory & Critical Care Medicine 2000:873–7.

American Thoracic Society 1993. Guidelines for the evaluation of impairment/disability in patients with asthma. American Review of Respiratory Disease 147:1056–61.

Anis AH, Lynd LD, Wang X-H, King G, Spinelli JJ, Fitzgerald M, et al. 2001. Double trouble: impact of inappropriate use of asthma medication on the use of health care resources. Canadian Medical Association Journal 164(5):625–31.

Anon. 1972. Beclomethasone dipropionate aerosol in asthma. Lancet 2:1239–40.

Backer V, Nepper-Christensen S, Ulrik C, von Linstow M & Porsbjerg C 2002. Factors associated with asthma in young Danish adults. Annals of Allergy, Asthma & Immunology 89:148–54.

Baker DF, Marks GB, Poulos LM & Williamson M 2003. A technical review and documentation of proposed NHPA asthma indicators and data sources. AIHW Asthma Series. Canberra: AIHW. Unpublished.

Bauman A, Antic R & Rubinfeld A 1993. Could it be asthma?: the impact of a mass media campaign aimed at raising awareness about asthma in Australia. Health Education Research 8(4):581–7.

Beilby JJ, Wakefield MA & Ruffin RE 1997. Reported use of asthma management plans in South Australia. Medical Journal of Australia 166:298–301.

Boston Consulting Group 1992. Report on the cost of asthma in Australia. Victoria: National Asthma Campaign.

Boulet L, Cartier A, Thomson NC, Roberts RS, Dolovich J & Hargreave FE 1983. Asthma and increases in nonallergic bronchial responsiveness from seasonal pollen exposure. Journal of Allergy & Clinical Immunology 71(4):399–406.

Bremner PB, de Klerk NH, Ryan GF, James AL, Musk M, Murray C, et al. 1998. Respiratory symptoms and lung function in Aborigines from Tropical Western Australia. American Journal of Respiratory & Critical Care Medicine 158:1724–9.

Britt H, Miller G, Knox S, Charles J, Valenti L, Henderson J, et al. 2001. General practice activity in Australia, 2000–2001. Canberra: AIHW (General Practice Series No. 8).

Burney P, Chinn S, Jarvis D, Luczynska C & Lai E 1996. Variations in the prevalence of respiratory symptoms, self-reported asthma attacks, and use of asthma medication in the European Community Respiratory Health Survey (ECRHS). European Respiratory Journal—Supplement 9:687–95.

Burney P 2002. The changing prevalence of asthma? Thorax 57(Suppl II):ii36–9.

Castro M, Schechtman KB, Halstead J & Bloomberg G 2001. Risk factors for asthma morbidity and mortality in a large metropolitan city. Journal of Asthma 38(8):625–35.

Centre for Epidemiology and Research (NSW Department of Health) 2002. New South Wales child health survey 2001. NSW Public Health Bulletin 13(S–3):34–6.

Chalmers GW, MacLeod KJ, Thomson L, Little SA, McSharry C & Thomson NC 2001. Smoking and airway inflammation in patients with mild asthma. Chest 120(6):1917–22.

Chalmers GW, Macleod KJ, Little SA, Thomson LJ, McSharry CP & Thomson NC 2002. Influence of cigarette smoking on inhaled corticosteroid treatment in mild asthma. Thorax 57(3):226–30.

Charles J, Valenti L & Britt H 2003. GP visits by healthcare card holders. A secondary analysis of data from Bettering the Evaluation and Care of Health (BEACH), a national study of general practice activity in Australia. Australian Family Physician 32(1–2):85–8, 94.

Chilmonczyk BA, Salmun LM, Megathlin KN, Neveux LM, Palomaki GE, Knight GJ, et al. 1993. Association between exposure to environmental tobacco smoke and exacerbations of asthma in children. New England Journal of Medicine 328(23):1665–9.

Chinn S, Burney P, Jarvis D & Luczynska C on behalf of the European Community Respiratory Health Survey (ECRHS) 1997. Variation in bronchial responsiveness in the European Community Respiratory Health Survey (ECRHS). European Respiratory Journal 10(11):2495–501.

Christakis DA, Mell L, Koepsell TD, Zimmerman FJ & Connell FA 2001. Association of lower continuity of care with greater risk of emergency department use and hospitalization in children. Pediatrics 103:524–9.

Comino E, Mitchell C, Bauman A, Henry R, Robertson C, Abramson M, et al. 1996. Asthma management in eastern Australia, 1990 and 1993. Medical Journal of Australia 164:403–6.

Comino EJ, Bauman A, Mitchell CA, Ruffin RE, Antic R, Zimmerman PV, et al. 1997. The Australian national asthma campaign: effects of public education activities based on mass media. American Journal of Preventive Medicine 13(4):251–6.

Coughlan J, Wilson A & Gibson PG 1999. Evidence based review of the Australian 6 step asthma management plan. Sydney: NSW Health Department.

Daley A, Saunders D & Roberts L 2001. 2000 Collaborative health and wellbeing survey: an overview. Perth: Western Australia Department of Health.

Daley A & Roberts L 2002. 2001 Child health survey: an overview. Perth: Western Australia Department of Health.

Department of Human Services (Centre for Population Studies in Epidemiology) 2002. North west Adelaide health study: brief reports number: 2002–07. Viewed 7 March 2003, <http://www.health.sa.gov.au/pehs/cpse/sercis-publications.html>.

D'Espaignet E, Measey M & Dal Grande E 2002. Northern Territory health and wellbeing survey, non-Indigenous population, December 2000. Darwin: Department of Health and Community Services.

DHAC (Commonwealth Department of Health and Aged Care) 1999. Australian statistics in medicines 1998. Canberra: Commonwealth of Australia.

DIMIA (Commonwealth Department of Immigration & Multicultural & Indigenous Affairs) 2001. English proficiency 1996 Census. Statistical Report No. 30. Canberra: Department of Immigration and Multicultural Affairs.

DoHA (Commonwealth Department of Health and Ageing) 2002. GP asthma initiative. Viewed 19 March 2003, <http://www.health.gov.au/pq/asthma/3plus.htm>.

DoHA (Commonwealth Department of Health and Ageing) 2003. The Asthma 3+ Visit Plan. Viewed 12 May 2003, <http://www.health.gov.au/pq/asthma/3visitpln.htm>.

DoHA (Commonwealth Department of Health and Ageing): Li et al. 2002. National health priorities and quality: asthma. Viewed 14 July 2003, <http://www.health.gov.au/pq/asthma/index.htm>.

DoHA (Commonwealth Department of Health and Ageing): Li et al. 2003. Australian statistics in medicines 1999–2000. Canberra: Commonwealth of Australia. ISBN 0 642 82184 4.

Downs SH, Marks GB, Sporik R, Belousova EG, Car NG & Peat JK 2001a. Continued increase in the prevalence of asthma and atopy. Archives of Disease in Childhood. 84(1):20–3.

Downs SH, Marks GB, Belousova EG & Peat JK 2001b. Asthma and hayfever in Aboriginal and non-Aboriginal children living in non-remote rural towns. Medical Journal of Australia 175(1):10–13.

Dunn C, Sadkowsky K & Jelfs P 2002. Trends in deaths: Australian data, 1987–1998 with updates to 2000. Mortality Surveillance Series No. 3. Cat. No. PHE 40. Canberra: AIHW.

Epidemiology Services Unit (Health Information Centre) 2002. 2000 Chronic disease surveys: asthma (Results from preliminary report. Final results to be published late 2003). Brisbane: Queensland Health.

Evans D, Levison MJ, Feldman CH, Clark NM, Wasilewski Y & Levin B 1987. The impact of passive smoking on emergency room visits of urban children with asthma. American Review of Respiratory Disease 135:567–72.

Faniran AO, Peat JK & Woolcock AJ 1999. Prevalence of atopy, asthma symptoms and diagnosis, and the management of asthma: comparison of an affluent and a non-affluent country. Thorax 54(7):606–10.

Farber HJ, Johnson C & Beckerman RC 1998. Young inner-city children visiting the emergency room (ER) for asthma: risk factors and chronic care behaviors. Journal of Asthma 35(7):547–52.

Fielder H, Lyons RA, Heaven M, Morgan H, Govier P & Hooper M 1999. Effect of environmental tobacco smoke on peak flow variability. Archives of Disease in Childhood 80(3):253–6.

Fleiss J 1981. Statistical methods for rates and proportions (2nd edn). John Wiley & Sons, New York.

Fleming DM, Cross KW, Sunderland R & Ross AM 2000. Comparison of the seasonal patterns of asthma identified in general practitioner episodes, hospital admissions and deaths. Thorax 55:662–5.

Ford JG, Meyer IH, Sternfels P, Findley SE, McLean DE, Fagan JK, et al. 2001. Patterns and predictors of asthma-related emergency department use in Harlem. Chest 120(4):1129–35.

Forero R, Bauman A, Young L, Booth M & Nutbeam D 1996. Asthma, health behaviours, social adjustment, and psychosomatic symptoms in adolescence. Journal of Asthma 33(3):157–64.

Frischer T, Kuhr J, Meinert R, Karmaus W & Urbanek R 1993. Influence of maternal smoking on variability of peak expiratory flow rate in school children. Chest 104(4):1133–7.

Gerdtham UG, Hertzman P, Jonsson B & Boman G 1996. Impact of inhaled corticosteroids on acute asthma hospitalization in Sweden 1978 to 1991. Medical Care 34(12):1188–98.

Gergen P, Mitchell H & Lynn H 2002. Understanding the seasonal pattern of childhood asthma: results from the national cooperative inner-city asthma study (NCICAS). Journal of Pediatrics 141:631–6.

Gibson PG, Mitchell CA, Bauman A, Henry RL, Comino E, Robertson C, et al. 2000. Asthma morbidity and management among adults in Australia, 1998. Respirology 5:(Suppl):A27.

Gibson PG, Coughlan J, Wilson AJ, Abramson M, Bauman A, Hensley MJ, et al. 2002. Self-management education and regular practitioner review for adults with asthma (Cochrane Review). In: The Cochrane Library, Issue 2. Oxford:Update Software.

Gibson PG, Powell H, Coughlan J, Wilson AJ, Abramson M, Haywood P, et al. 2003. Self-management education and regular practitioner review for adults with asthma [update of Cochrane Database Syst Rev. 2000;(2): CD001117; PMID: 10796600]. Cochrane Database of Systematic Reviews. (1):CD001117.

Gill T, Taylor A, Williams M & Starr G 2001. Physical activity in South Australian adults. Viewed 7 March 2003, <http://www.dhs.sa.gov.au/pehs/cpse/sercis-publications.html>.

GINA 2002. Global Strategy for asthma management and prevention. Viewed 6 May 2003, <www.ginasthma.com>.

Glasgow NJ, Ponsonby A-L, Yates RE, McDonald T & Attewell R 2001. Asthma screening as part of a routine school health assessment in the Australian Capital Territory. Medical Journal of Australia 174:384–8.

Goldney RD, Ruffin R, Fisher LJ & Wilson DH 2003. Asthma symptoms associated with depression and lower quality of life: a population survey. Medical Journal of Australia 178:437–41.

Grant E, Daugherty S, Moy J, Nelson S, Piorowski J & Weiss K 1999. Prevalence and burden of illness for asthma and related symptoms among kindergarteners in Chicago public schools. Annals of Allergy, Asthma & Immunology 83(2):113–20.

Grant E, Lyttle C & Weiss K 2000. The relation of socioeconomic factors and racial/ethnic differences in US asthma mortality. American Journal of Public Health 90(12):1923–5.

Griffiths C, Sturdy P, Naish J, Omar R, Dolan S & Feder F 1997. Hospital admission for asthma in East London: associations with characteristics of local general practises, prescribing, and population. British Medical Journal 314(482):1–10.

Guite HF & Burney PGJ 1996. Accuracy of recording of deaths from asthma in the UK: the false negative rate. Thorax 51(9):924–8.

Gurkan F, Ece A, Haspolat K, Derman O & Bosnak M 2000. Predictors for multiple hospital admissions in children with asthma. Canadian Respiratory Journal 7(2):163–6.

Haahtela T, Jarvinen M, Kava T, Kiveranta K, Koskinen S, Lehtonen K, et al. 1991. Comparison of a beta 2-agonist, terbutaline, with an inhaled corticosteroid, budesonide, in newly detected asthma. New England Journal of Medicine 325:388–92.

Haby MM, Peat JK, Marks GB, Woolcock AJ & Leeder SR 2001. Asthma in preschool children: prevalence and risk factors. Thorax 56:589–95.

Halfon N, Newacheck PW, Wood DL & St Peter RF 1996. Routine emergency department use for sick care by children in the United States. American Academy of Pediatrics 98(1):28–34.

Hanania NA, David-Wang A, Kesten S & Chapman KR 1997. Factors associated with emergency department dependence of patients with asthma. Chest 111(2):290–5.

Harish Z, Bregante AC, Morgan C, Fann CSJ, Callaghan CM, Witt MA, et al. 2001. A comprehensive inner-city asthma program reduces hospital and emergency room utilization. Annals of Allergy, Asthma & Immunology 86:185–9.

Harju T, Tuuponen T, Keistinen T & Kivela S 1998. Seasonal variations in hospital treatment periods and deaths among adult asthmatics. European Respiratory Journal 12:1362–5.

Health and Wellbeing Outcomes Unit 1999. First results of the healthy communities survey 1998. Hobart: Tasmanian Department of Health and Human Services.

Health Department of Western Australia 1996. The 1995 Western Australian health survey: overview, WA health survey 1995. Report Number 1. Perth: Health Department of Western Australia.

Health Insurance Commission 2002. Medicare Benefits Schedule (MBS) group statistics reports. Viewed 7 April 2003, <http://www.hic.gov.au/statistics/dyn_mbs/forms/mbsgtab4.shtml>.

Health Targets and Implementation Committee 1988. Health for all Australians. Report to the Australian Health Ministers' Advisory Council and the Australian Health Ministers' Conference. Canberra: AGPS.

Homer CJ, Szilagyi P, Rodewald L, Bloom SR, Greenspan P, Yazdgerdi S, et al. 1996. Does quality of care affect rates of hospitalization for childhood asthma? Pediatrics 98(1):18–23.

Hunt LW, Silverstein MD, Reed CE, O'Connell EJ, O'Fallon WM & Yunginger JW 1993. Accuracy of the death certificate in a population-based study of asthmatic patients. Journal of the American Medical Association 269(15):1994–5.

Huovinen E, Kaprio J, Laitinen LA & Koskenvuo M 2001. Social predictors of adult asthma: a co-twin case control study. Thorax 56:234–236.

ISAAC 1995. International study of asthma and allergies in childhood (ISAAC): rationale and methods. European Respiratory Journal 8:483–491.

ISAAC 1998a. Worldwide variations in the prevalence of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). European Respiratory Journal 12:315–335.

ISAAC 1998b. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. [comment]. Lancet 351(9111):1225–32.

Jalaludin B, Chey T, Holmwood M, Chipps J, Hanson R, Corbett S, et al. 1998. Admission rates as an indicator of the prevalence of severe asthma in the community. Australian & New Zealand Journal of Public Health 22(2):214–19.

Jalaludin B, Smith M, Chey T, Orr N, Smith W & Leeder S 1999. Risk factors for asthma deaths: a population-based, case-control study. Australian & New Zealand Journal of Public Health 23(6):595–600.

Johnston S, Pattemore P, Sanderson G, Smith S, Lampe F & Josephs L 1995. Community study of the role of viral infections in exacerbations of asthma in 9–11 year old children. British Medical Journal 310(6989):1225–8.

Jones AP 1994. Asymptomatic bronchial hyperreactivity and the development of asthma and other respiratory tract illnesses in children. Thorax 49:757–61.

Jones AP & Bentham G 1997. Health service accessibility and deaths from asthma in 401 local authority districts in England and Wales, 1988–92. Thorax 52:218–22.

Jones AP, Bentham G, Harrison BDW, Jarvis D, Badminton RM & Wareham NJ 1998. Accessibility and health service utilization for asthma in Norfolk, England. Journal of Public Health Medicine 20(3):312–17.

Jones AP, Bentham G & Horwell C 1999. Health service accessibility and deaths from asthma. International Journal of Epidemiology 28:101–5.

Jorgensen IM, Bulow S, Jensen VB, Dahm TL, Prahl P & Juel K 2000. Asthma mortality in Danish children and young adults, 1973–1994: epidemiology and validity of death certificates. European Respiratory Journal 15:844–8.

Kennedy S, Burrows B, Vedal S, Enarson D & Chan-Yeung M 1990. Methacholine responsiveness among working populations. Relationship to smoking and airway caliber. American Review of Respiratory Disease 142:1377–83.

Kim YY, Cho SH, Kim WK, Park JK, Song SH, Kim YK, et al. 1997. Prevalence of childhood asthma based on questionnaires and methacholine bronchial provocation test in Korea. Clinical Experimental Allergy 27:761–8.

Kimbell-Dunn M, Pearce N & Beasley R 2000. Seasonal variation in asthma hospitalizations and death rates in New Zealand. Respirology 5:241–6.

Krueger KP, Armstrong EP & Langley PC 2001. The accuracy of asthma and respiratory disease diagnostic codes in a managed care medical claims database. Disease Management 4(4):155–61.

Kuo A & Craig TJ 2001. A retrospective study of risk factors for repeated admissions for asthma in a rural/suburban university hospital. Journal of the American Osteopathic Association 101(5 Suppl):S14–17; quiz S517–18.

Lange P, Parner J, Vestbo J, Schnohr P & Jensen G 1998. A 15-year follow-up study of ventilatory function in adults with asthma. New England Journal of Medicine 339(17):1194–200.

Leung R, Carlin JB, Burdon JGW & Czarny D 1994. Asthma, allergy and atopy in Asian immigrants in Melbourne. Medical Journal of Australia 161(3 October):418–25.

Litonjua A, Carey V, Weiss S & Gold D 1999. Race, socioeconomic factors, and area of residence are associated with asthma prevalence. Pediatric Pulmonology 28:394–401.

Mannino DM, Homa D, Pertowski C, Ashizawa A, Nixon L & Johnson C 1998. Surveillance for asthma: United States, 1960–1995. Morbidity & Mortality Weekly Report. CDC Surveillance Summaries 47(1):1–27.

Marks GB & Burney P 1997. Diseases of the respiratory system. In: Charlton J & Murphy M (eds). The health of adult Britain. London: The Stationery Office, 93–113.

Marks GB, Jalaludin BB, Williamson M, Atkin NL & Bauman A 2000. Use of 'preventer' medications and written asthma management plans among adults with asthma in New South Wales. Medical Journal of Australia 173(8):407–10.

Martinez F, Stern D, Wright A, Taussig L & Halonen M 1998. Differential immune responses to acute lower respiratory illness in early life and subsequent development of persistent wheezing and asthma. Journal of Allergy & Clinical Immunology 102:915–20.

Martinez FD, Cline M & Burrows B 1992. Increased incidence of asthma in children of smoking mothers. Pediatrics 89:21–6.

McHorney CA, Ware JE & Raczek AE 1993. The MOS 36-item short-form health survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental constructs. Medical Care 31:247–63.

McHorney CA, Ware JEJ, Lu JFR & Sherbourne CD 1994. The MOS 36-item short-form health survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. Medical Care 32:40–66.

McKenzie K, Tong S, Walker S & Sydkowsky K 2002. Evolution in classifying mortality statistics. Sydney: National Centre for Classification in Health.

McNiece R & Majeed A 1999. Socioeconomic differences in general practice consultation rates in patients aged 65 and over: prospective cohort study. British Medical Journal 319(7201):26–8.

Miller JE 2000. The effects of race/ethnicity and income on early childhood asthma prevalence and health care use. American Journal of Public Health 90(3):428–30.

Moon L, Rahman N & Bhatia K 1998. Australia's children: their health and wellbeing. AIHW Cat. No. PHE7. Canberra: AIHW.

Morales Suarez-Varela M, Gonzalez A & Martinez Selva M 1999. Socioeconomic risk factors in the prevalence of asthma and other atopic diseases in children 6 to 7 years old in Valencia, Spain. European Journal of Epidemiology 15:35–40.

Murray AB & Morrison BJ 1989. Passive smoking by asthmatics: its greater effect on boys than on girls and on older than on younger children. Pediatrics 84(3):451–9.

Murray AB & Morrison BJ 1993. The decrease in severity of asthma in children of parents who smoke since the parents have been exposing them to less cigarette smoke. Journal of Allergy & Clinical Immunology 91:102–10.

NAC (National Asthma Council) 1999. Asthma adherence: a guide for health professionals. Viewed 12 May 2003, <http://www.nationalasthma.org.au/publications/adherence/index.html>.

NAC (National Asthma Council) 2002. Asthma management handbook 2002. Melbourne: National Asthma Council Australia Ltd.

National Asthma Campaign 1994. National asthma strategy goals and targets. South Melbourne: National Asthma Campaign.

National Asthma Campaign 1996. National asthma strategy: strategies and implementation. South Melbourne: National Asthma Campaign.

National Asthma Campaign 1999. National asthma strategy implementation plan. South Melbourne: National Asthma Campaign.

National Asthma Education and Prevention Program 1997. Expert panel report 2: guidelines for the diagnosis and management of asthma. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. NIH Publication no. 97–4051.

Nestor A, Calhoun AC, Dickson M & Kalik CA 1998. Cross-sectional analysis of the relationship between national guideline recommended asthma drug therapy and emergency/hospital use within a managed care population. Annals of Allergy, Asthma and Immunology 81(4):327–30.

New Zealand Health Information System 1999. Mortality and demographic data 1996. Wellington: New Zealand Ministry of Health.

New Zealand Health Information System 2000. Mortality and demographic data 1997. Wellington: New Zealand Ministry of Health.

New Zealand Health Information System 2001. Mortality and demographic data 1998. Wellington: New Zealand Ministry of Health.

NHMRC (National Health and Medical Research Council) 1988. Asthma in Australia: strategies for reducing mortality and morbidity. Canberra: NHMRC, Commonwealth of Australia.

NHMRC (National Health and Medical Research Council) 1997. The health effects of passive smoking: a scientific information paper. Canberra: NHMRC, Commonwealth of Australia.

NSW Health Department 1997. Asthma and the environment: perspectives on the prevention of asthma. Sydney: NSW Health Department.

Oddoze C, Dubus JC, Badier M, Thirion X, Pauli AM, Pastor J, et al. 1999. Urinary cotinine and exposure to parental smoking in a population of children with asthma. Clinical Chemistry 45(4):505–9.

Oddy WH 2000. Breastfeeding and asthma in children: findings from a West Australian study. Breastfeeding Review 8(1):5–11.

Office of National Statistics 2001. Deaths, 2000 registrations: Death by age, sex and underlying cause. Viewed 29 April 2003, <www.ons.gov.uk/statbase>.

Office of National Statistics 2002. Deaths, 2001 registrations: Death by age, sex and underlying cause. Viewed 29 April 2003, <www.ons.gov.uk/statbase>.

Office of National Statistics 2003. Population: age and sex, 1971 onwards: Population trends 112. Viewed 29 April 2003, <www.ons.gov.uk/statbase>.

Osborne ML, Vollmer WM & Buist AS 1992. Diagnostic accuracy of asthma within a health maintenance organisation. Journal of Clinical Epidemiology 45(4):403–11.

Parameswaran K, Belda J & Sears MR 1999. Use of peak flow variability and methacholine responsiveness in predicting changes from pre-test diagnosis of asthma. European Respiratory Journal 14(6):1358–62.

Peat JK, Woolcock A & Cullen K 1987. Rate of decline of lung function in subjects with asthma. European Journal of Respiratory Disease 70:171–90.

Peat JK, Salome C & Woolcock AJ 1992. Factors associated with bronchial hyperresponsiveness in Australian adults and children. European Respiratory Journal 5:921–9.

Peat JK 1994. The rising trend in allergic illness: which environmental factors are important? Clinical & Experimental Allergy 24:797–800.

Peat JK, van den Berg RH, Green WF, Mellis CM, Leeder SR & Woolcock AJ 1994. Changing prevalence of asthma in Australian children. British Medical Bulletin 308(6944):1591–6.

Pedersen B, Dahl R, Karlstrom R, Peterson CG & Venge P 1996. Eosinophil and neutrophil activity in asthma in a one-year trial with inhaled budesonide. The impact of smoking. American Journal of Respiratory & Critical Care Medicine 153(5):1519–29.

Phelan P, Bishop J, Baxter K & Duckett S 1993. Hospitalisation of children under 15 years in Victoria. Australian Health Review 16(2):148–59.

Phelan P, Robertson C & Olinsky A 2002. The Melbourne asthma study: 1964–1999. Journal of Allergy & Clinical Immunology 109(2):189–94.

Pierce R & Irving L 1991. The national asthma campaign—a measurable public health exercise. Australian & New Zealand Journal of Medicine. 21:4–5.

Pilotto LS, Smith BJ, Nitschke M, Ruffin RE & Mitchell R 1999. Industry, air quality, cigarette smoke and rates of respiratory illness in Port Adelaide. Australian & New Zealand Journal of Public Health 23(6):657–60.

Ponsonby A, Couper D, Dwyer T, Carmichael A & Wood-Baker R 1996. Exercise induced bronchial hyperresponsiveness and parental ISAAC questionnaire responses. European Respiratory Journal 9:1356–62.

Ponsonby A-L, Couper D, Dwyer T, Carmichael A, Kemp A & Cochrane J 2000. The relation between infant indoor environment and subsequent asthma. Epidemiology 11:128–35.

Population division of the Department of Economics and Social Affairs of the United States Secretariat 2001. World urbanization prospects: The 2001 revision. Viewed 18 March 2003, <http://esa.un.org/unpp>.

Population division of the Department of Economics and Social Affairs of the United States Secretariat 2002. World population prospects: The 2002 revision. Viewed 18 March 2003, <http://esa.un.org/unpp>.

Powell CVE, Nolan TM, Carlin JB, Bennett CM & Johnson PDR 1999. Respiratory symptoms and duration of residence in immigrant teenagers living in Melbourne, Australia. Archives of Disease in Childhood 81(2):159–62.

Public Health Division 2001. Report on the 1997 and 1998 NSW health surveys. Sydney: NSW Health Department.

Rasmussen F, Taylor R, Flannery EM, Cowan JO, Greene JM, Herbison GP, et al. 2002. Risk factors for hospital admission for asthma from childhood to young adulthood: a longitudinal population study. Journal of Allergy & Clinical Immunology 110:220–7.

Reddel HK, Jenkins CR, Marks GB, Ware SI, Xuan W, Salome CM, et al. 2000. Optimal asthma control, starting with high doses of inhaled budesonide. European Respiratory Journal 16(2):226–35.

Robertson C, Heycock E, Bishop J, Nolan T, Olinsky A & Phelan P 1991. Prevalence of asthma in Melbourne schoolchildren: changes over 26 years. British Medical Journal 302:1116–18.

Robertson CF, Dalton MF, Peat JK, Haby MM, Bauman A, Kennedy JD, et al. 1998. Asthma and other atopic diseases in Australian children: Australian arm of the International Study of Asthma and Allergy in Childhood. Medical Journal of Australia 168(9):434–8.

Rona RJ 2000. Asthma and poverty. Thorax 55:239–44.

Rosi E, Ronchi M, Grazzini M, Duranti R & Scano G 1999. Sputum analysis, bronchial hyperresponsiveness, and airway function in asthma: results of a factor analysis. Journal of Allergy & Clinical Immunology 103(2 Pt 1):232–7.

Ross K 1999. Occasional paper: population issues, Indigenous Australians 1996. Cat. no. 4708.0. Canberra: ABS.

Rowe B, Spooner C, Ducharme FM, Brezlaff J & Bota G 2000. Corticosteroids for preventing relapse following acute exacerbations of asthma (Cochrane Review). In: The Cochrane Library Oxford:Update Software.

Ruffin R, Wilson D, Smith B, Southcott A & Adams R 2001. Prevalence, morbidity and management of adult asthma in South Australia. Immunology & Cell Biology 79:191–4.

Rural and Regional Health and Aged Care Services Division 2002. Victorian population health survey 2001 selected findings. Melbourne: Victorian Department of Human Services.

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Saxena S, Majeed A & Jones M 1999. Socioeconomic differences in childhood consultation rates in general practice in England and Wales: prospective cohort study. British Medical Journal 318:642–6.

Sears MR, Rea HH, De Boer G, Beaglehole R, Gillies AJD, Holst PE, et al. 1986. Accuracy of certification of deaths due to asthma. American Journal of Epidemiology 124(6):1004–11.

Sheppeard V, Corbett S & Morgan G 2001. A statewide 'outbreak' of asthma in NSW, February 1999. Public Health Bulletin 11:187–9.

Sidenius KE, Munich EP, Madsen F, Lange P, Viskum K & Soes-Petersen U 2000. Accuracy of recorded asthma deaths in Denmark in a 12 months period in 1994–95. Respiratory Medicine 94(4):373–7.

Sin DD & Man SF 2002. Low-dose inhaled corticosteroid therapy and risk of emergency department visits for asthma. Archives of Internal Medicine 162(14):1591–5.

Siroux V, Pin I, Oryszczyn MP, Le Moual N & Kauffmann F 2000. Relationships of active smoking to asthma and asthma severity in the EGEA study. Epidemiological study on the genetics and environment of asthma. European Respiratory Journal 15(3):470–7.

Slack-Smith LM, Read AW & Stanley FJ 2002. Experience of respiratory and allergic illness in children attending childcare. Child: Care, Health & Development 28:171–7.

Smythe ET, Wright SC, Evans AE, Sinnamon DG & MacMahon J 1996. Death from airways obstruction: accuracy of certification in Northern Ireland. Thorax 51(3):293–7.

Stafford RS, Ma J, Finkelstein SN, Haver K & Cockburn I 2003. National trends in asthma visits and asthma pharmacotherapy, 1978–2002. Journal of Allergy & Clinical Immunology 111(4):729–35.

Stewart A & Huang N 2003. Review of public health interventions for asthma. Melbourne: Victorian Department of Human Services (in press).

Strachan DP & Cook DG 1997. Parental smoking and lower respiratory illness in infancy and early childhood. Thorax 52:905–14.

Strachan DP & Cook DG 1998. Health effects of passive smoking—6: Parental smoking and childhood asthma: longitudinal and case-control studies. Thorax 53(3):204–12.

Sturdy PM, Victor CR, Anderson HR, Bland JM, Butland BK, Harrison BDW, et al. 2002. Psychological, social and health behaviour risk factors for deaths certified as asthma: a national case-control study. Thorax 57:1034–9.

Suissa S, Ernst P, Boivin JF, Horwitz RI, Habbick B, Cockroft D, et al. 1994. A cohort analysis of excess mortality in asthma and the use of inhaled beta-agonists. American Journal of Respiratory & Critical Care Medicine 149 (3 Pt 1):604–10.

Suissa S, Ernst P & Kezouh A 2002. Regular use of inhaled corticosteroids and the long term prevention of hospitalisation for asthma. Thorax 57(10):880–4.

Taylor A, Starr G, Williams M, Dal Grande E, Chittleborough C, Wilson D, et al. 1998. Physical activity of adults in South Australia—1998. Viewed 7 March 2003, <http://www.health.sa.gov.au/pehs/cpse/sercis-publications.html>.

Taylor R, Comino E & Bauman A 1997. Asthma mortality in Australia 1920–94: age, period, and cohort effects. Journal of Epidemiology & Community Health 51:408–11.

Toelle BG, Ng K, Belousova E, Xuan W, Salome CM, Peat JK, et al. 2003. Trends in the prevalence of asthma over 20 years in Belmont, NSW, Australia. American Journal of Respiratory & Critical Care Medicine 167(7):A470.

Tong S & Drake P 1999. Hospital admission and mortality differentials of asthma between urban and rural populations in New South Wales. Australian Journal of Rural Health 7(1):18–22.

Valery PC, Chang AB, Shibasaki S, Gibson O, Purdie DM, Shannon C, et al. 2001. High prevalence of asthma in five remote Indigenous communities in Australia. European Respiratory Journal 17(6):1089–96.

Veale A, Peat J, Tovey E, Salome C, Thompson J & Woolcock A 1996. Asthma and atopy in four rural Australian Aboriginal communities. Medical Journal of Australia 165:192–196.

Venables KM & Chan-Yeung M 1997. Occupational asthma. Lancet 349:1465–9.

Verheijden M, Ton A, James A, Wood M & Musk A 2002. Respiratory morbidity and lung function in two Aboriginal communities in Western Australia. Respirology 7:247–253.

Vollmer WM, Markson LE, O'Connor E, Frazier EA, Berger M & Buist AS 2002. Association of asthma control with health care utilization: a prospective evaluation. American Journal of Respiratory & Critical Care Medicine 165(2):195–9.

Wakefield M, Ruffin R, Campbell D, Roberts L & Wilson D 1995. Smoking-related beliefs and behaviour among adults with asthma in a representative population sample. Australian & New Zealand Journal of Medicine 25:12–17.

Wakefield M, Ruffin R, Campbell D, Staugas R, Beilby J & McCaul K 1997. A risk screening questionnaire for adult asthmatics to predict attendance at hospital emergency departments. Chest 112(6):1527–33.

Warner JO & Naspitz CK 1998. Third international pediatric consensus statement on the management of childhood asthma. Pediatric Pulmonology 25:1–17.

Weiss K 1990. Seasonal trends in US asthma hospitalisations and mortality. Journal of the American Medical Association 263:2323–8.

Whorlow K, Mitchell CA, Robertson CF, Bauman AE & Chey T 2003. Evaluation of the 2002 National Asthma Council NAC/GSK mass media and social marketing campaign to increase awareness of asthma management in Australia. American Journal of Respiratory & Critical Care Medicine 167(7):A37.

WICC (Classification Committee of the World Organization of Family Doctors) 1997. ICPC-2: international classification of primary care. Oxford University Press, Oxford.

Wilson D, Chittleborough C, Ruffin R & Tucker G 2002. Comparison of rural and urban health status: asthma in South Australia as an example. In: Wilkinson D & Blue I (eds). The new rural health. South Melbourne: Oxford University Press, 149–70.

Wilson DH, Adams RJ, Appleton SL, Hugo D, Wilkinson D, Hiller J, et al. 2003. Prevalence of asthma and asthma action plans in South Australia: population surveys from 1990 to 2001. Medical Journal of Australia 178(10):483–5.

Woods RK, Burton DL, Wharton C, McKenzie GH, Walters EH, Comino EJ, et al. 2000. Asthma is more prevalent in rural New South Wales than metropolitan Victoria, Australia. Respirology 5:257–63.

Woods RK, Walters H, Wharton C, Watson N & Abramson M 2001. The rising prevalence of asthma in young Melbourne adults is associated with improvement in treatment. Annals of Allergy, Asthma & Immunology 87:117–23.

Woolcock A, Rubinfeld AR, Seale JP, Landau LL, Antic R, Mitchell C, et al. 1989. Asthma management plan, 1989. Medical Journal of Australia 151:650–3.

World Health Organisation 2003. World Health Organisation Mortality Database. Viewed 18 March 2003, <http://www3.who.iny/whosis/menu.cfm?path=mort>.

Yawn B, Wollan P, Kurland M & Scanlon P 2002. A longitudinal study of the prevalence of asthma in a community population of school age children. Journal of Pediatrics 140:576–81.

Asthma is an important health problem in Australia. This report brings together data from a wide range of sources to describe the current status of asthma in Australia. It includes information on the number of people who have asthma, who receive various treatments for asthma, who have written asthma action plans, and who visit their GP, are hospitalised or die due to asthma.