Review of proposed National Health Priority Area asthma indicators and data sources

Australian Centre for Asthma Monitoring

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Executive summary

This document provides a background to defining and measuring National Health Priority Area (NHPA) indicators for asthma. The issues surrounding the selection, operational definition and measurement of indicators for asthma are presented. The report incorporates the views of stakeholders who were consulted in the development process through workshops around Australia. The material contained in this document was the starting point for work leading to the publication *Asthma in Australia 2003* and also makes recommendations for items that are suitable for inclusion in the *National Health Data Dictionary* (NHDD).

The indicators ACAM is recommending for monitoring are listed in Table S.1. The table includes indicators that have been developed in draft form and are ready to be submitted for inclusion in the NHDD, as well as those that are not recommended for inclusion at this stage, but will be submitted later for inclusion in the NHDD following further development of the indicator or data source to a stage where a firm recommendation can be made. In some cases the proposed indicators can be measured but are not recommended for inclusion in the NHDD in their current form.

The starting point for the recommendations reported here was the list of indicators proposed in the report of a workshop conducted in August 2000 by the Australian Institute of Health and Welfare (AIHW 2000). Some of the items listed in Table S.1 are those that were proposed in that report. Others are newly proposed indicators. The latter fall into three categories: new supplementary indicators to indicators proposed in 2000; replacement for indicators proposed in 2000; and entirely new indicators covering important areas not encompassed by the indicator set proposed in the AIHW report (AIHW 2000).

Table S.1: NHPA asthma indicators proposed by ACAM, 2003

Indicator	Type of indicator	Development complete		Submit to NHDD	Comments
		Operational definition	Data source identified		
HEALTH STATUS AND OUTCOMES					
Prevalence of asthma					
Prevalence of ever having doctor-diagnosed asthma	Supplementary	Yes	Yes	✓	
Prevalence of current asthma	Standalone	Yes	Partial	✓	State CATI surveys but not National Health Survey.
Prevalence of recent wheeze	**NEW**[(a)] supplementary (prevalence)	Yes	No		Need to identify nation-wide data source.
Prevalence of airway hyperresponsiveness	**NEW** supplementary (prevalence)	No	No		
Human function and wellbeing					
Impact of asthma on quality of life	**NEW** composite	No	No		Components of this composite measure are being addressed in a separate document.
Index of asthma control	**NEW** composite	No	No		
Deaths					
Death rate for asthma, ages 5–34 years	Stand alone	Yes	Yes	✓	
Death rate for asthma, all ages	**NEW** supplementary	Yes	Yes	✓	
DETERMINANTS OF HEALTH					
Environmental factors					
Prevalence of smoking in the household where children with asthma reside	Stand alone indicator	Yes	No		
Prevalence of occupational asthma	Stand alone indicator	No	No		Requires further assessment to consider feasibility and validity of this indicator.
Health behaviours					
Prevalence of smoking in people with asthma	Stand alone indicator	Yes	No		
Community capacity					
Proportion of schools using the Asthma Friendly Schools Program	Program-focused indicator	Yes	Yes		
HEALTH SYSTEM PERFORMANCE					
Rate of hospital separations for asthma	Stand alone indicator	Yes	Yes	✓	
Number of individuals with separations for asthma per 1,000 resident population per year	**NEW** supplementary (hospital utilisation)	Yes	No		Requires data linkage and only possible for use in two states.

(continued)

Table S.1 (continued): NHPA asthma indicators proposed by ACAM, 2003

Indicator	Type of indicator	Development complete		Submit to NHDD	Comments
		Operational definition	Data source identified		
HEALTH SYSTEM PERFORMANCE					
Hospital re-admissions for asthma	Stand alone	Yes	No		
Hospital patient days for asthma	**NEW** Supplementary	Yes	Yes	✓	
Rate of ED attendance for asthma	Stand alone	Yes	No		Data only available from some states.
Rate of asthma-related general practice encounters	Stand alone	Yes	Yes		Also recommended as component of cost and acute care indicators.
Rate of Asthma 3+ Visit Plan payments	**NEW** program-focused indicator	Yes	Yes		
Rate of healthcare visits for acute asthma exacerbations	**NEW** composite	Yes	No		Indicator will incorporate acute GP visits and ED attendances.
Proportion of people with asthma with an asthma action plan	Stand alone	Yes	No		
Proportion of people with asthma who use preventers regularly	**NEW** stand alone indicator	Yes	No		This indicator replaces existing proposed indicators on preventer use in people with asthma.
Proportion of people with asthma who have had recent spirometry	Stand alone	Yes	No		Requires further work to assess indicator validity.
Costs of asthma	**NEW** composite	No	No		Some existing proposed indicators would be incorporated into this index. Needs substantial development.

(a) This indicator was not included in the list of indicators proposed by the AIHW workshop in 2000.

The following indicators will not be further developed as they are not feasible to collect nationally, have been replaced by alternatives listed above, lack evidence for their usefulness and/or there was a consensus view that they were of low priority:

- prevalence rate for obesity and overweight in people with asthma
- prevalence rate for pre-existing occupationally aggravated asthma
- proportion of people with asthma who use a peak flow meter to monitor their asthma
- proportion of people with asthma who attend a health professional or carer at least six-monthly for review of their asthma action plan
- mean number of preventer prescriptions per person with asthma per year
- proportion of people with asthma for whom relievers are indicated and use relievers no less than 3 times per week
- the ratio of prescriptions of reliever to preventer medication among asthma patients
- proportion of people with asthma who experience 'morning dipping'.

In some cases, new indicators to replace these have been proposed.

The report canvases the strengths and weaknesses of a range of data sources that will be used to measure asthma indicators. The main sources include:

- National Health Survey 2001
- State Computer Assisted Telephone Interview (CATI) surveys
- National Mortality Database
- National Hospital Morbidity Database (supplemented by state Health Department hospital databases)
- Bettering the Evaluation And Care of Health and Supplementary Analysis of Nominated Data general practice data
- Pharmacy Guild Survey
- IMS Health data
- Health Insurance Commission—Medical Benefits Scheme and Pharmaceutical Benefits Scheme data
- New South Wales and Victorian Emergency Department Collections.

This report will be reviewed and updated annually to reflect work on data development and subsequent amendments to the document. As they occur, amendments will be summarised on the ACAM reports web site so that users can easily identify updates and the date they have occurred. A full report of amendments will be detailed in an appendix to the document.

1 Introduction

1.1 What is asthma?

The definition of asthma that has substantial international (GINA 2002) and national (NAC 2002b) acceptance is given in Box 1.

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 increase in existing bronchial hyperresponsiveness to a variety of stimuli.'

Source: USA National Asthma Education and Prevention Program Expert Report (NAEPP 1997).

Asthma presents a range of symptoms and patterns of illness with impacts ranging from trivial to catastrophic. The implications of this heterogeneity for disease monitoring are discussed in Chapter 2 (Section 2.1).

1.2 Why monitor asthma?

Asthma in Australia is a major health, social and economic burden for the individual and the community (ACAM 2003). International comparative studies in adults (Burney et al. 1996) and children (Asher et al. 1998) reveal that Australia has one of the highest prevalence rates in the world. Whilst the death rate from asthma has declined over the last decade the prevalence remains high. Asthma is in the top five most common reasons for seeing a general practitioner (Britt et al. 2000) and is a major cause of hospitalisation, particularly in childhood. It is a common cause of absenteeism from school and also affects family, work and recreation.

Over the last 10 to 15 years there have been many advances in asthma care. These include improved understanding of the nature of the disease and how best to control it, as well as the development of community and professional education programs.

The large disease burden, accompanied by the availability of effective disease management strategies, highlights the considerable potential for additional health gains. In recognition of this potential, the Australian Government announced in 1999 that asthma was to be a National Health Priority Area (NHPA) and a range of initiatives have been put in place to capitalise on the potential for improving health outcomes in relation to asthma.

1.3 Australian System for Monitoring Asthma

As part of the NHPA initiative, the Australian Department of Health and Ageing has allocated funding for a range of national asthma initiatives. One such initiative is the establishment of the Australian System for Monitoring Asthma (ASMA).

The Australian Government has funded the Australian Institute of Health and Welfare (AIHW), in consultation with the National Asthma Council of Australia (2002a), to establish and manage ASMA. The system includes:

- The development of a draft set of 23 asthma indicators to monitor asthma. These have been developed by the AIHW in consultation with consumers and representatives from clinical, academic, statistical, policy, and prevention backgrounds. They cover the areas of prevalence; health care utilisation; co-morbidities; impact (quality of life, disability, disease severity and mortality); risk factors; and management practices.
- The Australian Centre for Asthma Monitoring (ACAM).

The operations of ASMA are overseen by a management committee, which also provides technical advice to the system. This committee comprises representatives from key government and non-government organisations, clinical specialists with expertise in asthma, experts in monitoring and surveillance, and other experts as required.

Objectives of ASMA

ASMA 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.

The specific objectives of ASMA are:

- to develop a systematic approach to surveillance of asthma across Australia;
- to monitor and report on disease levels, burden, and trends associated with asthma in the general population and specific population groups;
- to examine social, geographical and environmental differentials that may influence the development and burden associated with asthma;
- to identify potential for improved prevention and management strategies;
- to track the impact of health policy, and prevention and management strategies; and
- to develop and manage special projects and collaborations for the integration and enhancement of asthma-related information.

1.3.1 Australian Centre for Asthma Monitoring

The Australian Centre for Asthma Monitoring was established in February 2002 as a collaborating unit of the Australian Institute of Health and Welfare. ACAM is based at the Woolcock Institute of Medical Research (formerly the Institute of Respiratory Medicine), Sydney. The ASMA management committee supports the activities of ACAM and provides technical and specialist advice for monitoring activities undertaken by the Centre.

Role of ACAM

ACAM is currently developing a systematic approach to the surveillance of asthma using a national indicator set.

To facilitate the process, ACAM is:

- identifying and evaluating data sources;
- refining the draft indicator set and making recommendations for a final set of indicators;

- developing operational definitions for the final indicator set;
- analysing and developing a reporting system for these indicators; and
- identifying areas for data development, including overseeing the systematic development of national data sets that collect asthma data.

1.4 Indicators

Health indicators are measures of aspects of health and the health system that can be used to monitor the effectiveness and impact of the health system and of specific interventions to improve health and provide effective, accessible and quality health care.

1.4.1 Uses of health indicators

Health indicators summarise data that allow the regular reporting of disease levels, burden and trends and can be used to monitor changes over time. They are used to examine social, geographical and environmental differentials that may influence the development and burden associated with asthma. Indicators can identify problems that need action but are usually unable to identify the reasons for the change in the indicator. Health indicators can monitor and assist in the identification of potential prevention and management strategies. Finally, they can be used to track the impact of health policy, and prevention and management strategies and to monitor progress towards targets.

In this report, health indicators are most often presented as rates per unit of population per unit of time, for example, the rate of deaths due to asthma per 100,000 population per year. They are also presented as proportions or ratios where the numerator is included in the denominator (e.g. proportion of people with asthma with a written asthma action plan), absolute numbers (e.g. number of individuals with separations for asthma) and average numbers (e.g. average number of sick days due to asthma).

1.4.2 Attributes of an indicator

Five important attributes of health indicators are:

1 *Feasibility.* If the indicator is to be selected, then it must be able to be measured using methods that are feasible and resource efficient in the desired setting.

2 *Reliability.* As indicators are used to compare disease burden or health system performance between population groups and/or over time, it is important that the indicators are measured in a way that has the same meaning in all these settings.

3 *Validity.* The indicator should be measured in a way that clearly reflects the intent of the indicator. In most cases, it will not be possible to assess the criterion validity of the measurement tool. However, at a minimum, the indicator should have face validity, as assessed by consensus among stakeholders in the field. Ideally, some evidence of concurrent or discriminant validity would support the value of the chosen indicator.

4 *Responsiveness to change*. The indicator should be responsive to changes over time due to management and prevention activities, or changes in disease prevalence and severity (Streiner & Norman 2001).

5 *Interpretability.* The information obtained from an indicator should not be neutral or ambiguous. To be useful it should be able to identify situations on a scale from most

unfavourable to most favourable, or be able to demonstrate an improvement or deterioration over time (Peron & Strohmenger 1985). In other words, where change in an indicator in a particular direction cannot be unambiguously interpreted as either adverse or favourable, that indicator will be of little value.

1.5 Operational definitions

An operational definition of an indicator is a quantifiable description of the indicator: what to measure and the steps to follow to measure it consistently. It defines how an indicator is to be translated into measurement and allows others to measure the same concept or variable reliably and validly. Any change in the operational definition will usually produce a change in the value of the indicator. The operational definition should be structured to optimise the desired attributes of indicators that are described above.

It may be necessary to use more than one operational definition for an indicator, as each operational definition is likely to be incomplete, only partially capturing the intent behind the indicator. This is not necessarily a disadvantage. There may be advantages in both aggregated and separate analysis of data classified according to the different definitions (Price 2000). Where several alternative definitions of an indicator yield consistent results, this strengthens the conclusions about that indicator. However, where the alternative definitions reveal disparate trends, careful interpretation of these differences is required.

Some operational definitions produce data quite easily and nearly anyone can use them. Others are complex and data sources are either not available or require complicated development in order to produce data to measure the indicator as defined by the operational definition.

1.6 The report

1.6.1 Objectives of the report

This report is a working document of the Australian Centre for Asthma Monitoring. Its purposes are as follows:

- to provide a background to the Centre's tasks in defining and measuring indicators for asthma;
- to summarise the issues surrounding the selection, operational definition and measurement of indicators for asthma and to provide a focus for further discussion on these issues;
- to justify recommendations to measure, or not to measure, indicators in the initial proposed list of indicators;
- where necessary, to propose and justify new indicators to adequately encompass the intent underlying the initial proposed set of indicators;
- to propose operational definitions and appropriate data sources for the indicators that are supported;
- to incorporate the views of stakeholders who were consulted in the development process conducted in workshops around Australia; to make recommendations for items which are suitable for inclusion in the *National Health Data Dictionary*.

1.6.2 Preparation of the report

The draft set of NHPA asthma indicators (AIHW 2000), developed by AIHW at a national workshop in August 2000 and subsequently modified by the National Asthma Reference Group, formed the starting point of this report. We have applied an indicator evaluation and review framework to further develop these indicators. A discussion paper, formulated around this framework, was circulated to stakeholders in each state. These individuals were invited to attend workshops held in Adelaide, Melbourne, Sydney, Canberra and Brisbane during July and August 2002. A teleconference was held with participants from Perth. The workshops were recorded and summaries of the discussion were reported back to the participants.

In parallel with this process, ACAM staff reviewed the published literature relevant to each of the proposed indicators.

This report represents the next stage in the development of the indicators and of the report on asthma in Australia. It has been prepared in the context of the views of key stakeholders and of the relevant published evidence. (See Appendix for a list of all contributors to the workshop, committee and the report.)

2 Issues around monitoring asthma indicators

2.1 Issues around defining asthma for monitoring

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

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 characteristic of asthma (i.e. reversible airflow obstruction and airway hyperresponsiveness) exist in a continuum: the distinction between asthma and non-asthma within this continuum is arbitrary.
- Asthma symptoms, lung function abnormalities, airway hyperresponsiveness and airway inflammation appear to be independent factors in the description of asthma, and therefore asthma cannot be described by any individual 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 at any particular point in time.
- It is rare in clinical practice or epidemiological studies to be able to make measurements of lung function in young children (and this is the age at which most incident cases occur 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, and in the elderly, where chronic obstructive pulmonary disease (COPD) causes similar symptoms and overlapping physiological abnormalities (Kennedy et al. 1990; Peat et al. 1987b).

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 or atopic) asthma found acceptance in the International Classification of Diseases. However, the demonstration that patients with intrinsic asthma shared many of the pathological features observed in extrinsic asthmatics has led to a waning in the use of this distinction.

Most existing guidelines classify people with asthma as having intermittent or persistent asthma (NAC 2002b; NAEPP 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 periodicity 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 led to the elucidation of 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 nocturnal symptoms, the frequency of need for bronchodilator, and the level and variability of lung function (NAC 2002b; 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 (e.g. 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.

This complexity that underlies the entity commonly known as 'asthma' poses major problems in identifying a single surveillance definition for the disease. It is for this reason that we have proposed several alternative definitions, which we propose to monitor simultaneously.

2.2 Proposed asthma indicators

Table 2.1 presents the set of draft NHPA asthma indicators developed by the AIHW in consultation with consumers and representatives from clinical, academic, statistical, policy, and prevention backgrounds at a workshop conducted in August 2000 (AIHW 2000). They cover the areas of prevalence; health care utilisation; co-morbidities; impact (quality of life, disability, disease severity and mortality); risk factors; and management practices.

These indicators provide the starting point for the analysis presented in Chapter 3.

Table 2.1: NHPA asthma indicators proposed by AIHW in 2000

Disease prevalence	
1	Prevalence rate for asthma
Co-morbidity	
2	Prevalence rate for obesity and overweight in people with asthma
Primary care, emergency department attendance and hospital separation	
3	Rate of asthma-related GP visits
4	Re-admission rate, within one month, for asthma
5	Rate of asthma-related emergency attendance
6	Hospital separation rate for asthma
Quality of life	
7	Average number of sick days due to asthma per year
8	Proportion of persons who perceive their asthma as a limitation on their physical activity, social role and emotional wellbeing
Mortality	
9	Death rate for asthma among persons aged 5–34 years
Risk factors	
10	Prevalence rate for smoking among persons with asthma
11	Prevalence rate for smoking within the household where children with asthma reside
12	Prevalence rate for asthma initiated (caused) by occupational exposure
13	Prevalence rate for pre-existing occupationally aggravated asthma
Management	
14	Proportion of people with asthma who have a recent, written asthma action plan, developed in consultation with their GP
15	Proportion of people with asthma who use a peak flow meter to monitor their asthma
Health maintenance	
16	Proportion of people with asthma who attend a health professional or carer at least 6-monthly for review of their asthma action plan
17	Proportion of people with asthma who have had spirometry measurements in the last 6 months
18(a)	Mean number of preventer prescriptions per person with asthma per year
18(b)	Proportion of people with asthma for whom relievers are indicated and use relievers no less than 3 times per week
18(c)	The ratio of prescriptions of reliever to preventer medication among asthma patients
Education	
19	Proportion of schools (primary and secondary), child care centres, pre-schools and hospitals using nationally-accredited asthma education programs
Severity	
20(a)	Proportion of people with asthma who have been woken at night due to their asthma
20(b)	Proportion of people with asthma who experience ‘morning dipping’
Disability	
21	Proportion of people with asthma who are restricted in their performance of core activities

Source: AIHW 2000.

2.3 Framework for indicator review

We have adopted a systematic approach to the further development of these indicators based on an existing framework (Bartlett & Moore 2001) developed to evaluate health indicators in New South Wales (Tables 2.2 and 2.3). In the first instance we have reviewed the proposed indicators from 2000, as listed in Table 2.1. The framework for describing, assessing and making recommendations about these indicators is described in Table 2.2 and the results of that review are presented in Chapter 3.

Based on the recommendations arising from this review, a new set of indicators has been proposed incorporating many of the initial proposed set, in their original or a modified format, together with additional indicators identified as a result of consultations or further analysis. For each of these indicators we have proposed a draft operational definition and described a range of attributes, including those listed in Chapter 1.4. This framework is presented in Table 2.3. This description and analysis is presented in Chapter 4.

Table 2.2: Framework for indicator description, assessment and recommendation

Proposed indicator
Indicator as described in current indicator list.
Intent of indicator
Describes the potential purposes for which the indicator was developed.
Includes a description of target population and setting.
Feasibility/value assessment
Assessment of the proposed indicator worth and whether it is consistent with the intent.
Examines the feasibility, including the complexity of the indicator and data availability. Considers options for various indicator definitions and alternative data sources.
May include recommending modification to a more complex indicator, or simplifying a complex indicator to address multiple target populations, settings or interventions.
Indicator recommendation
A statement clearly stating whether the indicator is recommended for monitoring, for further data development, or not recommended as a core indicator.
The recommendation should include details of the scope for monitoring the indicator (e.g. national, state, local level), the frequency of collection, and recommendations for further development, if any, including the reasons for further development and actions to be taken (e.g. examine new indicator, improve data availability, discontinue indicator, develop new indicator).

Table 2.3: Framework for developing operational definition and assessment of quality of indicator

DRAFT operational definition for the indicator
A statement clearly defining the indicator, data needed for the indicator and, where appropriate, the numerator and denominator.
Quality of the indicator
Validity of the indicator: the extent to which the indicator accurately and correctly measures the concepts under consideration. Content or face validity will be considered as well as criterion (positive predictive value, sensitivity and specificity), and construct validity if relevant information is available. Reliability of the indicator: the extent to which the indicator is internally consistent, and is reproducible over time (test/retest stability) under the same circumstances. Responsiveness of the indicator and the ability to identify changes over time due to management and prevention activities, or changes in disease prevalence and severity. For further information about these concepts see Glossary at the end of this report.
Quality of data
Assessment of: • the completeness and coverage of data recording • the representativeness • the accuracy and reliability with which data is recorded.
Data analysis
Discussion of the appropriate level to which data can be disaggregated. The number of events related to a particular indicator will dictate the level of disaggregation at which an indicator can be monitored. For example, death from asthma in the age group 5–34 years is a relatively rare event, and, as such, the numbers will be too small to allow disaggregation beyond the level of jurisdictions. Therefore, it would be inappropriate to use this indicator to monitor the effectiveness of an intervention at a local level. Conversely, hospital separations for asthma, particularly in children, are relatively common. Interventions to improve management may be readily reflected in hospital statistics at the local level.
Timeliness
Assessment of: • the time from service event, identification of health status or data collection, to information availability • reasonableness of time delay.
Interpretation
Discussion of: • issues relevant to the interpretation of the findings of the indicator • for example, relation to service provision or to risk factor modification.
Interventions that may affect the indicator
Outline of which interventions (current or proposed) may affect the indicator.
Cost and policy implications
Discussion of any resource and policy implications for reporting the indicator.

2.4 Classification of asthma indicators

2.4.1 Intent of asthma indicators

In order to establish valid operational definitions for the indicators, it was necessary to establish the purpose or intent underlying each indicator. To facilitate this process ACAM examined current frameworks for measuring health, and factors that impact on health, and disease management.

A review of Australian and overseas documents on asthma examined the goals for prevention and management to identify key population and strategic goals for the monitoring of asthma and more specific objectives that could be related to individual indicator intent. This review considered the National Asthma Council's mission statement (NAC 2002a), the original goals identified for the proposed indicators (AIHW 2000) and the current goals of other asthma surveillance and monitoring initiatives (Pearson et al. 1999). Table 2.4 describes the objectives for monitoring asthma within the population and strategic goals for asthma prevention and management.

Table 2.4: Goals and objectives for the monitoring of asthma

POPULATION GOALS	STRATEGIC GOALS			
	Clinical	**Educational**	**Organisational**	**Public health**
	To obtain optimal asthma control	**To achieve best practice in asthma self-management and clinical management**	**To use resources effectively and efficiently for asthma care**	**To prevent the onset of asthma and of exacerbations**
Reduce risk of developing asthma			To monitor exposure to and impact of environmental and other risk factors for asthma	
Reduce burden of asthma for the individual	To evaluate population health interventions to prevent the onset and exacerbations of asthma			
	To evaluate health care/clinical interventions for the management of asthma and exacerbations			
	To monitor regular symptoms and the frequency and severity of asthma exacerbations			
	To monitor return to normal function after an exacerbation of asthma			
	To monitor the impact[(a)] and costs of asthma for the individual			
	To monitor adverse events related to asthma			
Reduce burden of asthma for the community	To monitor the impact[(b)] and costs of asthma for the community			
	To monitor the provision of a safe environment for people with asthma			
	To develop structures to support effective and accessible asthma care			

(a) Impact of asthma for the individual encompasses quality of life, reduced activity days and disability, severity and mortality.

(b) Impact of asthma for the community encompasses sick days and health care utilisation.

2.4.2 Structure and classification of asthma indicators

Indicators in this report are classified according to the National Health Performance Indicator Framework (NHPC 2002) into the following main categories:

- Health status and outcomes (includes indicators of health conditions, human function, life expectancy and wellbeing, and mortality).
- Determinants of health (includes indicators related to environmental factors and health behaviours, socioeconomic factors, person-related factors and community capacity) .
- Health system performance (includes indicators of effectiveness, appropriateness, efficiency, responsiveness, accessibility, safety, continuity, capability and sustainability).

Each individual asthma indicator is also classified as being generic or program-focused. Generic indicators are those which can be used across populations to monitor overall changes in health status, outcomes and system performance in the longer term. Program-focused indicators are used to assess the process and outcomes of current asthma initiatives and may, therefore, be in place only for the duration of the program. An example from this report is the 'rate of structured general practice asthma review visits', which monitors the number of Asthma 3+ Visit Plan Practitioner Incentive Program payments.

There are three subtypes of indicators:

1 *Stand alone*—Indicators that by themselves provide adequate information for effective monitoring. For example, the indicator 'death rate for asthma 5–34 years' can be interpreted in isolation to provide sufficient information about this serious impact of asthma and the effects of interventions to reduce death rates.

2 *Supplementary*—Indicators that provide additional information to stand alone indicators. The asthma indicator 'prevalence of airway hyperresponsiveness' provides supplementary information about the prevalence of asthma by adding confidence to the observation that prevalence (and, hence, the trend in prevalence over time) has been consistently measured.

3 *Composite*—Indicators that are created by combining two or more stand alone or supplementary indicators. For example, 'rate of healthcare visits for acute asthma exacerbations' includes acute general practice visits and Emergency Department attendances.

3 Assessment of and recommendations for asthma indicators developed by AIHW in 2000

This chapter describes the application of the indicator assessment process presented in Table 2.2 to the asthma indicators proposed by the AIHW in 2000 (AIHW 2000) (Table 2.1). The number of each indicator, as listed in Table 2.1, is shown in parentheses. A consensus statement arising from the discussions held with stakeholders is included and the assessment ends with a recommendation about the status of these asthma indicators being made:

- recommended for monitoring
- not recommended for monitoring
- recommended for further development
- proposed for monitoring and inclusion in the *National Health Data Dictionary*.

3.1 Prevalence rate for asthma (1)

3.1.1 Intent of indicator

- To evaluate population health interventions to prevent the onset of asthma**.**
- To monitor exposure to and the impact of environmental and other risk factors for asthma.
- To monitor the impact and costs of asthma for the community.

Target population: Children and adults of all ages in the Australian population.

3.1.2 Feasibility/value assessment

Asthma prevalence is a complex indicator that has been measured using a wide range of subjective and objective criteria, in clinical and population-based settings.

Measuring asthma

The first two intents of this indicator imply that incidence, rather than prevalence, will be measured. However, the often ill-defined nature of the incident event and its remote past occurrence for most adults, both mean that there are major problems in measuring the timing of the onset, and hence the incidence, of this disease. Furthermore, there may be incomplete recollection of childhood symptoms among adults and this may influence the attribution of adult-onset symptoms to relapse, as opposed to incidence, of asthma. There are situations in which cohort studies do enable incidence to be measured with confidence: in particular, cohorts of infants recruited at birth (Gissler et al. 1999) and disease-free cohorts recruited in an occupational setting (Archambault et al. 2001; Fuortes et al. 1997). However, on the basis of the general limitations in the interpretation of measures of incidence of asthma at a population level, prevalence is measured for the purposes of asthma monitoring, and information about changes in incidence will need to be inferred from these cross-sectional prevalence estimates.

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

The following elements have been widely used, alone or in combination, in studies measuring the prevalence of asthma:

Self-reported measures:

- **Doctor diagnosis of asthma**—self or parent-reported (Robertson et al. 1991; Ruffin et al. 2001).
- **Symptoms**—wheeze (Asher et al. 1995; Grant et al. 1999; Robertson et al. 1991), shortness of breath (particularly at night) (Burney et al. 1996; Woods et al. 2001), cough at night (Grant et al. 1999), wheezing with exercise (Grant et al. 1999; Jones 1994; Ponsonby et al. 1996).

  Compared with measures based on a reported doctor diagnosis, symptom-based measures are less subject to variation in diagnostic fashion and, hence, may be more reliable (Cuijpers et al. 1994). However, the validity of symptoms alone as a basis for measuring the prevalence of asthma is questionable, particularly in the young (Gerald et al. 2002; Grant et al. 1999; Kaur et al. 1998) and the elderly (Ryu & Scanlon 2001), where a number of competing diagnoses (virus-associated wheeze, bronchiolitis, cardiac failure and COPD) have similar predominant symptoms.
- **Treatment for asthma** (Burney et al. 1996). Treatment interferes with the measurement of asthma prevalence as it may abolish symptoms and airway hyperresponsiveness. Therefore, people effectively treated may not be counted in the prevalent population unless treatment forms part of the definition.

Prevalence measures are usually reported as either 'ever asthma', representing cumulative incidence, and/or 'recent/current asthma', representing period prevalence. For the latter, various periods have been used but 'in the last 12 months' is the most commonly applied period.

Objective measures:

- **Airway hyperresponsiveness, as measured by bronchial provocation challenge tests, or bronchodilator reversibility, as measured by response to inhaled beta agonist aerosol** (Kim et al. 1997; Toelle et al. 1992). The measurement of airway hyperresponsiveness (AHR) can be performed on a population scale (Peat et al. 1995). It provides information that is distinct from that provided by measures of symptoms and diagnoses. Among people with wheeze, the presence of AHR identifies a sub-population with greater morbidity than individuals without AHR (Toelle et al. 1992; Toelle et al. 1997). Unlike reported diagnoses and symptoms, the finding of AHR is independent of diagnostic or labeling fashion. Changes, over time, in the prevalence of AHR represent the most solid evidence of true changes in the prevalence of asthma (Peat et al. 1994).
- **Peak flow variability** (Parameswaran et al. 1999). Portable peak expiratory flow meters are used in clinical practice for serial home monitoring to assist in the assessment of management of patients with asthma. However, there are practical limitations that apply to the use of serial peak flow monitoring for population surveillance. It requires monitoring over a (variable) period of time and the quality of data may be poor in the absence of supervision. This may be a particular problem in a general population sample.

- **Spirometry**. Measurement of spirometric function, and the response to bronchodilator, is used in clinical practice in the diagnosis of asthma in individuals who present with airflow obstruction. However, this measurement lacks sensitivity for the diagnosis of asthma in a general population setting since most people with asthma have near normal lung function most of the time.

Asthma presents in a number of patterns, which have been classified according to the time course, periodicity, and severity of the manifestations and the treatment status of the subject. Monitoring the prevalence of 'asthma' may obscure important variation in the prevalence of one or more of these patterns of asthma. These have been discussed in Section 2.1.

Composite measures of 'current' asthma

In order to overcome some of the limitations of symptoms alone and asthma diagnosis alone as indices for asthma prevalence, a range of composite measures were considered. The following four possible composite measures were evaluated:

(1) Ever had diagnosed asthma AND still have asthma

Advantages:

- This definition has been used in the South Australian and Victorian Health Surveys, and the 2001 National Health Survey uses a similar definition, except that the second question is 'do you still *get* asthma?' It is derived from the American Thoracic Society/Division of Lung Disease 1978 (ATD/DLD 78) respiratory diseases questionnaire definition of asthma (Ferris 1978).

Disadvantages:

- Sensitivity and specificity may be affected by variations in diagnostic fashion since 'diagnosed asthma' forms part of the definition (Cuijpers et al. 1994).
- The time period implied by the question 'do you still have asthma?' or 'do you still get asthma' is not defined and the interpretation of this aspect of the question may vary substantially between subjects.

Data for this indicator are currently available from the 2001 National Health Survey (NHS) and some state health survey data collections (South Australia, Western Australia, and the Northern Territory).

(2) Waking at night with shortness of breath OR attack of asthma in last 12 months OR treatment for asthma in the last 12 months

Advantages:

- This definition has been used in surveys based on the European Community Respiratory Health Survey (ECRHS) (Burney et al. 1996) screening questionnaire to identify subjects with possible asthma for further objective testing.
- Definition does not include wheeze and hence may be more specific, tending to exclude subjects with non-asthma wheezing syndromes.

Disadvantages:

- The questionnaire was designed as a screening tool rather than for surveillance purposes.
- The ECRHS was conducted in 20–44 year olds. The question on nocturnal breathlessness may be less specific in older age groups where cardiac disease overlaps to a greater extent.
- The use of the word 'attack' may be ambiguous.

Data for some components of this indicator may be available from the 2001 National Health Survey and some state health survey data collections. Data for this indicator would be available for Melbourne from the ECRHS survey conducted in 1996.

(3) Episode or attack of asthma in the last 12 months

Advantages:

- This is the definition used in the USA for asthma surveillance by the Council of State and Territorial Epidemiologists (CSTE 1998).

Disadvantages:

- This definition excludes people with mild asthma, those who are well controlled on treatment, and those who do not recognise that they have had an asthma 'attack' (even if they actually have persistent or regular symptoms).
- The terms 'episode' and 'attack' are ambiguous and open to individual interpretation.

(4) Ever been diagnosed with asthma AND asthma symptoms (including wheeze, shortness of breath, chest tightness) in last 12 months OR current treatment for asthma

Advantages:

- Reasonably inclusive (i.e. sensitive) (Jenkins et al. 1996).
- The requirement for current symptoms of asthma or treatment, as well as a diagnosis of asthma enhances specificity and has face validity. Inclusion of treatment allows subjects successfully treated and, therefore, asymptomatic to be included.
- Historical data from state health surveys in New South Wales and Queensland are already available using this definition/criterion, so this is a measure for which comparisons can be made.

Disadvantages:

- Sensitivity and specificity may be affected by variations in diagnostic fashion (since 'diagnosed asthma' forms part of the definition).

This indicator was originally proposed as including only wheeze in the last 12 months. However, this may limit the sensitivity and other symptoms including chest tightness and shortness of breath could be included without much loss of specificity (Burney et al. 1989a).

Results of consultation with stakeholders

Several criteria were identified by workshop participants as important considerations for any prevalence definition:

- reliability of the measure;
- ability to compare with data that have been collected previously in Australia;
- should be measurable with self-reported data;
- the ability to distinguish between different types of asthma, to differentiate between the severity and patterns of asthma **(**e.g. frequent episodic compared to persistent);
- ability to make international comparisons.

3.1.3 Indicator recommendation

There was a widely held view that no single measure could be regarded as an unambiguous index of the prevalence of asthma. Therefore, it has been decided to recommend four different indicators of asthma prevalence, each capable of being measured across the age spectrum, reflecting the diverging presentations of the illness. When uniform trends are apparent across all four prevalence indicators, this will add confidence to the conclusion that apparent trend is validly measured. Where the indicators present diverging trends, explanations for this divergence should be explored but it is unlikely that confident conclusions will be able to be drawn.

The four prevalence indicators proposed for measurement are:

1 Prevalence of ever having doctor-diagnosed asthma—proposed for monitoring and inclusion in the *National Health Data Dictionary*.

2 Prevalence of current asthma—proposed for monitoring and inclusion in the *National Health Data Dictionary*.

3 Prevalence of recent wheeze—recommended for further development.

4 Prevalence of airway hyperresponsiveness—recommended for further development.

In addition to these indicators, it is acknowledged that a framework for describing the prevalence of various patterns of asthma needs to be developed. An introduction to the complexity of this problem has been provided in Section 2.1.

3.2 Prevalence rate for obesity and overweight in people with asthma (2)

3.2.1 Intent of indicator

- To monitor exposure to and the impact of environmental and other risk factors for asthma.

Target population: People of all ages with asthma.

3.2.2 Feasibility/value assessment

Recent cross-sectional evidence has shown an association between obesity and some features of asthma, especially asthma symptoms and/or diagnosis, in both children and adults (Epstein et al. 2000; Figueroa-Munoz et al. 2001; Gennuso et al. 1998; Schachter et al. 2001; von Mutius et al. 2001). Most studies have not demonstrated an association with airway hyperresponsiveness or other objective measures of asthma. Most association studies have been cross-sectional although there is some evidence from cohort studies that show a higher incidence of diagnosed asthma (Beckett et al. 2001; Camargo et al. 1999) or asthma symptoms (Castro-Rodriguez et al. 2001) in people who have gained weight. It is plausible that obesity may be associated with increased work of breathing and reduced activity levels and that these changes could be responsible for the respiratory symptoms, leading to a diagnosis of asthma in the absence of any alteration in airway biology. Studies have shown, however, that people with asthma are not less active (Chen et al. 2001b) and that weight gain is independent of a reduction in physical activity (Beckett et al. 2001). In summary, while there is some evidence linking obesity to the aetiology of asthma, overall the status of the evidence is inconclusive.

Body mass index (BMI) is the most common method of calculating the degree of obesity and overweight. BMI is calculated as the weight (kg)/height $(m)^2$. Assessment of height and weight based on interview or questionnaire surveys is problematic. There is evidence that self-reported values for height and weight show poor agreement with measured values (Donath 2000; Flood et al. 2000; Paxton & Sculthorpe 1994).

3.2.3 Indicator recommendation

Indicator not recommended for monitoring.

At the present time there is no strong evidence demonstrating that co-morbidity due to obesity is a major priority in asthma prevention or management. In view of this, and the problems inherent in self-reported measures of obesity, it is recommended that this indicator is not included for monitoring.

3.3 Rate of asthma-related GP visits (3)

3.3.1 Intent of indicator

The **rate of asthma-related GP visits** was originally proposed as an indictor to assist in monitoring asthma management by 'monitoring primary care through GP-patient encounters for diagnosis and review of the condition' (AIHW 2000).

The primary intent of the indicator is:

- To evaluate health care/clinical interventions in primary care for the management of asthma during the stable phase and during mild to moderate exacerbations.

This indicator will also contribute to other monitoring objectives:

- To monitor the impact and costs of asthma for the community.
- To monitor the impact and costs of asthma for the individual.

Target population: People of all ages with asthma.

3.3.2 Feasibility/value assessment

This is one of the few indicators that provides information on asthma care in the community. Care provided during asthma-related general practice encounters may include:

- acute management of a severe exacerbation or increased symptom frequency (this may include diagnosis);
- review during or following an acute episode;
- maintenance activities such as writing a prescription;
- opportunistic review when the patient visits for another condition—the general practitioner (GP) may conduct peak flow or spirometry, take a history or consider options;
- formal planned asthma review.

Current interventions in primary care are aimed at increasing structured review of asthma and reducing visits for acute episodes or exacerbations of asthma, for example, the Practitioner

Incentive Program (PIP), Asthma 3+ Visit Plan, which supports planned review encounters by GPs, thus encouraging patients to seek regular planned care to reduce symptoms and prevent acute exacerbations. With such interventions, it is expected that the rate of asthma-related general practice encounters may initially rise (due to increased review visits), and later fall, if the intervention has the desired effect. Ideally it would be useful to have indicators that can measure the rate of visits for acute management of asthma symptoms and exacerbations and for structured review visits. Currently, the only data on the structured review visits is based on claims from the Asthma 3+ Visit Plan PIP.

Although the rate of general practice visits is an imprecise measure of the effects of such interventions, it currently may be the only measure available. This indicator also provides information on access to primary care services for asthma, especially when interpreted with data on rates of ED visits and hospitalisations. Information from the indicator will also enhance our understanding of the level of health resources used to provide asthma care in the community and costs for individuals.

Currently, there are four potential sources of information on general practice visits in Australia:

- Bettering the Evaluation and Care of Health (BEACH) general practice surveys. These surveys gather data from consecutive consultations undertaken by a rolling random sample of GPs on reasons for consultations, medications prescribed, referrals and other management activities.
- Medical Benefits Scheme data from the Health Insurance Commission (HIC), which collects information from Medicare claims about general practice visits. It contains no information about reason for visits except for certain specific claims like Asthma 3+ Visit Plan PIP.
- GP research databases, which are based on regional groupings of GPs who volunteer to collect information usually about general practice management of asthma and other chronic or acute conditions. The generalisability of these data may be limited due to the potential volunteer bias.
- Community or population-based surveys, in which respondents are asked about the number of GP visits for asthma they have had in a given time period. However, self-reported GP visits may be an over- or under-estimation of actual visits.

The following four possible indicator definitions were considered for an indicator to measure the rate of general practice visits:

1 **Asthma-related general practice encounters per 100 general practice encounters.** Data for the numerator and denominator of this indicator are currently available and reported annually through the BEACH survey of general practice (1999–ongoing). This information is reported annually. The indicator reflects the relative burden of asthma in general practice compared with other conditions and more obviously reflects asthma workload in general practice.

2 **Asthma-related general practice encounters per 100 population.** The numerator can be estimated by applying the proportion of asthma-related general practice encounters from BEACH data to the HIC Medical Benefits Scheme (MBS) data on number of claims for Medicare reimbursement for Professional Attendances Group A1 and A2. The denominator is the Australian population (based on Australian Bureau of Statistics Census population data). It can be used as a crude measure of changes due to interventions in the primary care of asthma, to reflect the burden of asthma in the community, and to provide some indication of access to primary care for people with asthma. However, the distinction among these different interpretations would be problematic.

3 **Asthma-related general practice encounters per 1,000 people with asthma.** Numerator data can be extrapolated from the BEACH survey of general practice by applying the proportion

of general practice encounters to the HIC Medical Benefits data on claims for Medicare reimbursement for Professional Attendances Group A1 and A2, while denominator data are based on estimates of the asthma prevalence rate from the ABS National Health Survey. The indicator will reflect changing patterns of GP service utilisation for people with asthma and may provide information about access to primary care services for asthma. Once again, the attribution of changes in this indicator to changes in need (demand) or changes in access would be problematic.

4 **Structured general practice review visits for asthma.** Numerator data can be extrapolated from the HIC Medical Benefits Scheme data for Professional Attendances Group A18 Subgroup 3, while denominator data are based on estimates of the asthma prevalence rate from the ABS National Health Survey. The indicator will reflect uptake of this initiative by GPs and improved management of asthma through regular, structured review.

3.3.3 Indicator recommendation

The following four indicators are recommended for monitoring.

- **Asthma-related general practice encounters per 100 population—**proposed for monitoring and inclusion in the *National Health Data Dictionary*.
- **Structured general practice review visits for asthma—**a new indicator is proposed for development to monitor structured general practice review visits. This is proposed as a temporary, 'program-focused' indicator looking specifically at the uptake of the Asthma 3+ Visit Plan PIP.
- General practice encounters for acute asthma should form part of a new indicator to monitor **acute general practice visits**. Currently, there are no data available to monitor this indicator and this indicator requires further development.
- **Health care visits for acute episodes of asthma—**a new composite indicator using data on Emergency Department visits, hospitalisations and general practice encounters for acute asthma. This indicator requires further development.

3.4 Rate of asthma-related emergency attendance (5)

3.4.1 Intent of indicator

- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor adverse events related to asthma.
- To monitor the impact and costs of asthma for the community (in terms of use of Emergency Department services).
- To monitor the impact and costs of asthma for the individual.

Target population: People with asthma who attend the Emergency Department for asthma.

3.4.2 Feasibility/value assessment

Emergency Department (ED) attendance for asthma is an indicator of the presence of more severe (Pollack et al. 2002) or poorly controlled asthma (Vollmer et al. 2002). The latter may imply inadequate management in the community (Adams et al. 2000; Ford et al. 2001).

ED data have also been used to detect apparent epidemics of exacerbations of asthma (Davidson et al. 1996; Marks et al. 2001) and to monitor the impact of short-term variation in environmental trigger factors such as air pollution, airborne allergens, meteorological phenomena, and viral infections (Dales et al. 2000; Johnston et al. 2002; Thompson et al. 2001). In addition, there is good evidence to suggest that attendance at the ED reflects the quality and effectiveness of asthma management in the community (Farber et al. 1998; Wakefield et al. 1997).

ED attendance may be a useful indicator of the effects of interventions to reduce the frequency and severity of asthma exacerbations (Harish et al. 2001). However, not all patients with exacerbations attend the ED and not all ED attendances for asthma are attributable to exacerbations of asthma. People with exacerbations of asthma may present to the ED or to their GP or to both for management of the exacerbation. Similarly, while GPs are the primary source of care for routine asthma management, some people with asthma do use Emergency Departments for this purpose (Dinkevich et al. 1998; Halfon et al. 1996). At least in part, the choice of service provider for management of exacerbations of asthma, and for the routine management of asthma, is dependent on the relative accessibility of these alternative service providers (Halfon et al. 1996). Factors affecting accessibility include geographical proximity, waiting times, after-hours availability, cost, and local policies which vary both geographically and over time (Crain et al. 1998; Halfon et al. 1996). This represents a problem for use of ED data alone, for the purpose of asthma data monitoring. Measurement of a composite of all services (EDs, hospitals and GPs) for management of exacerbations would be desirable.

Data sources

Currently only New South Wales and Victoria have ED data collections, and coverage is incomplete, even in those states. The participating Emergency Departments within these states are not representative of the population as a whole. Without comprehensive coverage, it is not possible to accurately establish a denominator population to allow attendance rates to be estimated. South Australia is in the process of initiating a data collection but it will not collect any information on diagnosis—it is purely a tool for the measurement of key performance indicators. Western Australia is also negotiating a similar data collection. At the national level, negotiations are proceeding with states and territories for a national minimum dataset for EDs. However, there is no agreement on the collection of diagnostic information and, hence, these data will not be useful for asthma data monitoring purposes.

The rate of ED attendances could be measured as:

1 Rate of ED attendance for asthma per 100,000 population: There are theoretical and practical limitations on the measurement and interpretation of this indicator, which are presented above.

2 Number of attendances for asthma per 100 ED presentations: This indicator reflects the proportion of the total workload for EDs that is attributable to asthma. It will be influenced by variation in the relative burden of other causes of ED presentation, but subject to this caveat, will give an indicator of trends over time.

3.4.3 Indicator recommendation

It was agreed that this indicator should be monitored. However, as the indicator can only be monitored in New South Wales and Victoria at this point in time, data development is required. Issues of representativeness and limitations of the data, as detailed above, limit the use of the data currently available.

This indicator would be most useful if it formed an element of one composite indicator measuring the direct health care costs of asthma and another new composite indicator measuring the 'rate of health care visits for acute exacerbations of asthma' (see Section 3.5). This latter indicator combines information on ED visits for asthma with information on GP visits for acute asthma care and hospitalisations for asthma as an overall indicator of need of acute asthma care.

There is a further theoretical limitation on the interpretation of ED attendance data, which is not overcome by the composite measure proposed above. The total number of exacerbations occurring in any given population subgroup will reflect the prevalence of asthma in that subgroup, as well as the severity and effectiveness of disease control in people who have asthma. In order to interpret this indicator as a measure of the latter characteristic (severity and the effectiveness of disease control), it is important to consider the variation in disease prevalence. Analysis of these data should, therefore, adjust for confounding due to variation in the prevalence of asthma.

3.5 NEW INDICATOR—Rate of healthcare visits for acute asthma exacerbations

3.5.1 Intent of indicator

This is a new indicator, recommended for further data development. The main intents are:

- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor the impact and costs of asthma for the individual.
- To monitor adverse events related to asthma.
- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To monitor the impact and costs of asthma for the community.

Target population: All people attending a GP, ED or hospital for an acute exacerbation of asthma.

3.5.2 Feasibility/value assessment

People usually seek care for acute exacerbations of asthma from GPs or from hospital Emergency Departments. While the choice between these two alternatives is partially influenced by the acuity and severity of the exacerbation (Ford et al. 2001; Wakefield et al. 1997), other extraneous factors also have a role. These are mainly factors related to the relative accessibility of these two sources of acute care such as proximity, costs (co-payments), waiting times, or hours of service (Crain et al. 1998; Halfon et al. 1996).

This indicator would combine information from three indicators:

- ***Rate of acute asthma-related general practice visits***
  Data sources: Currently there is no data source that allows separate identification of acute care versus maintenance care visits for asthma.

- ***Rate of Emergency Department visits for asthma***
  Data sources: Limited ED data are available. The limitations of these data are described in Section 5.3.
- ***Rate of hospital separations for asthma***
  Data source: National Hospital Morbidity Database.

3.5.3 Indicator recommendation

The rate of general practice visits for acute episodes of asthma and rate of Emergency Department visits and hospitalisations for asthma should form a new composite indicator called 'rate of health care visits for acute episodes of asthma', which requires further development.

3.6 Re-admission rate, within one month, for asthma (4)

3.6.1 Intent of indicator

This indicator allows us to monitor the extent to which people who have been hospitalised with an exacerbation of asthma gain and maintain adequate asthma control after discharge. This is an indicator of the effectiveness of post-acute care for people with asthma, both in hospital and in the community. The intents of this indicator are:

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To monitor return to normal function after an exacerbation of asthma.
- To monitor adverse events related to asthma.
- To develop structures to support effective and accessible asthma care.
- To monitor the impact and costs of asthma for the community.

Target population: All people discharged from hospital with a principal diagnosis of asthma.

3.6.2 Feasibility/value assessment

Re-admission rates are considered to be an indicator of quality of care (Ashton et al. 1997) and the re-admission rate for asthma is considered to be an indicator of the effectiveness and quality of asthma care. The time span for re-admission is variably defined, but one month (28 days) is often chosen as there is evidence that most preventable admissions occur within one month of discharge (Sibbritt 1995). It was noted that, in order to align with national standards, the correct time frame for this indicator should be 28 days. It is important to emphasise that factors influencing the likelihood of re-admission include the quality of care in hospital (Slack & Bucknall 1997) (in particular discharge planning) and the quality of care in the community (Sin et al. 2002) (in particular from the patient's GP or specialist.) It is not possible to partition the responsibility for re-admissions between these elements of the continuum of care. For this reason, this indicator was identified as a system indicator with the potential to measure the efficiency of the whole health care system. Quality of care can break down at several points but this indicator does not have the capacity to identify the point at which a breakdown occurs.

The re-admission rate may be expressed as:

- a proportion of all asthma-related separations which result in a re-admission within a specified time;
- population-based rate of re-admissions within a specified time frame (e.g. 28 day re-admissions per 100,000 population per year).

Expressing the rate as the proportion of all asthma-related separations is an intuitively obvious way to report re-admission rates. However, it may be influenced by hospital admission policies. For example, a hospital that admits people with relatively mild asthma will have a large denominator and, because people with mild disease are presumably less likely to be re-admitted, a small numerator on this indicator compared with an otherwise similar hospital whose admissions are limited to people with severe asthma.

Expressing the re-admission rate as a population-based rate leads to an index that is less subject to the bias described above. However, it has the disadvantage of being more difficult to measure because re-admission must be linked to area of residence, rather than hospital of admission.

Data sources

The main source of data for hospitalisations is the National Hospital Morbidity Database (NHMD) (AIHW). Currently, there is limited capacity for the identification of re-admissions for asthma in some states in this collection. State inpatient statistics collections are a more likely source of data, but access to data and data linkage will need to be negotiated with each state individually. Re-attendance to an ED is more difficult, as only New South Wales and Victoria collect ED data with diagnostic information. Linkage to hospital separation data would be required.

Hospital morbidity collections exist at the state level. Re-admissions to the same hospital can be identified in state data collections but this will exclude people who are re-admitted to a different hospital.

The number of people who are re-admitted to a different hospital is unknown but could be established by use of data linkage keys. This would need to be done by each state's central data custodians. There is a flag for 're-admissions', which could be used for asthma, but its validity and reliability are unknown and it is unlikely to be specific for re-admission for asthma. (For more details, see Data Source Review, Section 5.2.2)

It will be necessary to use the separation code to avoid double counting people who are transferred during the course of a single episode of care.

3.6.3 Indicator recommendation

This indicator is recommended for monitoring, although data development is required before it can be considered for inclusion in the NHDD. Where possible, it should be reported as an indicator of quality of care for asthma across the whole health system.

Limited further data development is required to assess the importance of re-admissions to a different hospital. However, it is proposed at this stage to monitor re-admission to the same hospital.

3.7 Hospital separation rate for asthma (6)

3.7.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor adverse events related to asthma.
- To monitor the impact and costs of asthma for the individual.
- To monitor the impact and costs of asthma for the community.

Target population: All people discharged from hospital with a principle diagnosis of asthma.

3.7.2 Feasibility/value assessment

Hospital bed utilisation reflects asthma severity and the effectiveness of disease management (Christakis et al. 2001; Diette et al. 2002). It is an important input into assessments of the cost of asthma (Boston Consulting Group 1992). The intent of this indicator is to monitor the extent to which hospital care is utilised for the management of people with asthma. This is an indicator of the effectiveness of interventions to improve asthma control (and, hence, prevent exacerbations) but also reflects the accessibility of hospital care for people with exacerbations of asthma and the extent to which alternative community-based care for exacerbations is available and supported.

Measuring hospital bed utilisation

There are three inter-related measures of hospital bed utilisation:

1 *Separation rate*. This is an index of the rate at which exacerbations requiring hospital care are occurring. In isolation from additional information on length of stay, it does not allow further assessment of the severity of those episodes. It may be substantially influenced by variation in policy on the admission of people with relatively mild exacerbations (Russo et al. 1999) and also by variation in administrative policies on the classification of people who spend several hours in the Emergency Department. The available data enumerate separations and include multiple separations for some individuals. Additional data linkage analysis is required to estimate the number of individual people who experience hospital separations for asthma in any one year. A closely related indicator is the number of individuals with hospital separations for asthma. This measure, which is independent of rates of re-admission over a 12-month period, allows separate identification of the burden of hospital admissions relative to the prevalence of the disease.

2 *Length of stay*. This measure reflects the severity of exacerbations, the existence of complicating co-morbidities and the efficiency of hospital care. However, it is also influenced, in an inverse direction, by variation in admission and administrative policies referred to above. Hence, a reduction in admissions of people with mild exacerbations will usually result in an increase in average length of stay (unless other factors also change).

3 *Total patient days*. This measure, which is derived as the multiple of the previous two, is relatively independent of the spurious variation described above. It reflects most accurately the cost burden. As it combines information on number of separations with length of stay, it cannot be taken as a direct measure of the rate of exacerbations requiring hospital care.

Factors affecting the validity of measures of hospital bed utilisation as a measure of asthma control and exacerbation rate

Use of hospital care for the management of exacerbations may be influenced by the accessibility of hospital services and the accessibility of alternative services such as GPs, especially after hours (Phelan et al. 1993). Hence, for the purpose of assessing exacerbation rate it would be more meaningful to use an index combining hospital separations, ED attendances and general practice visits for acute care. On the other hand, episodes of hospitalisation attributable to asthma usually correspond to more severe exacerbations (Adams et al. 2000; Jalaludin et al. 1998; Rasmussen et al. 2002) and, if there has been no change in accessibility of components of the health system, changes in hospital separation rates for asthma probably do reflect changes in the rate of severe exacerbations of asthma.

Variation in the prevalence of asthma may explain some variation in the rate of hospital bed utilisation for asthma. In order to be able to attribute changes in this indicator to changes in the level of control of asthma (and, hence, changes in the effectiveness of disease management) it would be important to adjust for confounding due to variation in the prevalence of asthma. This could also be achieved by monitoring a case-based rate (i.e. using the prevalence of asthma as the denominator population).

Principal diagnosis for admission versus additional diagnosis

In most cases where asthma is listed as an additional diagnosis it is probably not the reason for admission and should not be counted.

We are advised that the quality of data for recorded additional (secondary) diagnoses is not as high as it is for the recorded principal diagnosis. However, there may be useful information contained within the additional diagnoses. Under some circumstances (e.g. another respiratory diagnosis as the principal diagnosis), asthma, when listed as an additional diagnosis, may be the underlying cause of admission. Further data development to investigate this is required.

Data source

The AIHW holds the National Hospital Morbidity Database, which is a compilation of state data collected at the hospital level. Total hospital separations can be measured using this data source; however individuals cannot be ascertained without data linkage within state health department hospital morbidity collections.

3.7.3 Indicator recommendation

It is recommended that the following indicators of hospital bed utilisation for asthma be monitored:

1 Hospital separations for asthma per 100,000 resident population per year (proposed for monitoring and inclusion in the NHDD).

2 Number of individuals with hospital separations for asthma per 1,000 resident population per year (recommended for further development).

3 New indicator—Hospital patient days attributable to asthma per 100,000 resident population per year (proposed for monitoring and inclusion in the NHDD).

3.8 NEW INDICATOR—Hospital patient days for asthma

3.8.1 Intent of indicator

- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To develop structures to support effective and accessible asthma care.
- To monitor the impact and costs of asthma for the individual.
- To monitor the impact and costs of asthma for the community.

Target population: All people discharged from hospital with a principal diagnosis of asthma.

3.8.2 Feasibility/value assessment

Rates of hospital utilisation for asthma measured as number of patient days can be used as an indicator of the effectiveness of interventions to improve asthma control (and hence prevent exacerbations). They also reflect the accessibility of hospital care for people with exacerbations of asthma, and the extent to which alternative community-based care for exacerbations is available and supported. Hospital utilisation also serves as an index of cost attributable to this component of health care utilisation.

In contrast to the hospital separations indicator (described above), this indicator is weighted by duration of stay and, hence, reflects the severity of exacerbations and the efficiency of care for exacerbations, as well as the factors listed above. However, it is less influenced by factors affecting policy and hospital access for people with milder exacerbations. For further discussion on this indicator, see Section 3.7 (Hospital separation rate for asthma).

As noted above, patient days, as an indicator of hospital utilisation for asthma, may be less subject to spurious fluctuations due to changes in policy than are separations and length of stay. However, policies designed to reduce the number of admissions or reduce their duration would, if successful, result in a reduction in the number of patient days attributed to asthma (Mayo et al. 1990, 1996).

In contrast to the separations indicator, the problem of multiple separations for individuals does not arise for this indicator.

The proposed indicator is 'the rate of hospital patient days attributable to asthma per 100,000 resident population per year'.

Data source

The AIHW holds the National Hospital Morbidity Database (NHMD), which is a compilation of state data collected at the hospital level.

3.8.3 Indicator recommendation

This indicator is proposed for monitoring and for inclusion in the *National Health Data Dictionary*.

3.9 Average number of sick days due to asthma per year (7)

3.9.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor the impact and costs of asthma for the individual.
- To monitor the impact and costs of asthma for the community.

Target population: People of all ages with asthma.

3.9.2 Feasibility/value assessment

There are two costs implied in this indicator: the cost to the economy through missed work, and the personal cost of burden of disease through missing work or school; and the inability to undertake other regular daily activities. These data may be used as an input for calculations of disability adjusted life years (DALYs).

Sick days versus reduced activity days

'Sick days' is traditionally used to refer to days away from gainful employment (i.e. off work) or school. This is relatively easily quantifiable and may also be fairly readily transformed to an input to measurement of the indirect costs of asthma. However, using sick days in isolation may underestimate the impact of asthma on individuals' capacity to undertake their normal roles and tasks. People who are not engaged in gainful employment may be prevented by asthma from engaging in usual activities. Further, among those who are employed, asthma may interfere with non-employment related activities, without preventing the person from attending work (Goeman et al. 2002). These 'reduced activity days' also have an economic impact which may be included as a component of the indirect costs of asthma. However, compared with 'sick days', reduced activity days may be more difficult to reliably quantify and also more problematic to cost.

Attribution to asthma

The title of this indicator implies that it should only include reduced activity or sick days that the subject attributes to asthma. The extent to which this attribution is unreliable introduces unreliability into the measurement of this indicator. This unreliability would not be present if all reduced activity or sick days were counted, regardless of attribution. However, this latter method would lack specificity.

Data source

- The National Health Survey collects information on days off work/school or other reduced activity days due to asthma in the last 2 weeks.
- State CATI surveys collect information on reduced activity days attributed to asthma.

3.9.3 Indicator recommendation

Further development of this indicator is required, including an assessment of the reliability of various alternative formations of the indicator. This indicator is not yet at the stage of development where it can be recommended for inclusion in the *National Health Data Dictionary*. This indicator (or a similar indicator) may form one of the elements of a composite measure of the impact of asthma on quality of life that is being reviewed in another document titled *Measuring the impact of asthma on quality of life in the Australian population* which is due to be published mid-2004.

3.10 Proportion of persons who perceive their asthma as a limitation on their physical activity, social role and emotional wellbeing (8) and Proportion of people with asthma who are restricted in their performance of core activities (21)

3.10.1 Intent of indicators

- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor the impact and costs of asthma for the individual.
- To monitor the impact and costs of asthma for the community.

Target population: People of all ages with asthma.

3.10.2 Feasibility/value assessment

These two proposed indicators are closely related. The first is, in fact, a subset of the second and, hence, they will be considered together.

Health-related quality of life is the term commonly used to encompass the collective physical, emotional, social and role performance consequences of disease. Over the last decade, there has been considerable attention focused on the impact of asthma on quality of life. This has particularly arisen in the context of evaluating new therapies for asthma (Juniper et al. 2002; Price et al. 2002). It was apparent that traditional outcome measures used to assess therapy, including lung function and symptoms, did not adequately encompass the impact of the disease and its treatment, and it has now become equally important to evaluate whether people actually benefit from treatment in aspects such as quality of life. A number of disease-specific quality of life questionnaires were developed for use as outcome measures in clinical trials of asthma therapies (Guyatt et al. 1987; Jones et al. 1992; Juniper et al. 1992; Marks et al. 1992). These questionnaires were designed to be responsive to change in quality of life impacts in individuals.

Measurement of quality of life as an indicator of the burden of illness attributable to asthma presents different measurement problems. To be meaningful for this purpose the quality of life measure must be referenced against community standard values. It should also be sensitive to differences between groups and over time in the impact of asthma on quality of life. For this purpose, a generic quality of life questionnaire would be most suitable. This may be a profile, like the Short Form (SF) 36 (or similar questionnaire), which yields a score for various

components of quality of life. Alternatively, a utility measure, such as the Index of Well-Being may be used for this purpose. This has the advantage of providing an index on an interval, or possibly ratio, scale of measurement. Utility measures are also more suitable for comparison among disease entities and for inclusion in indirect cost economic assessments.

Restriction of activities is a measure of the burden of disease associated with asthma.

Two indicators were proposed in order to measure quality of life and disability. However, they are both very similar and it is recommended that they be combined into the one indicator. We are proposing a single indicator.

3.10.3 Indicator recommendation

This indicator should be measured but requires further development. The concepts and terminology adopted should be standardised, where possible, to the *International Classification of Functioning, Disability and Health* endorsed by the World Health Organisation (WHO 2001). We are in the process of undertaking further work to explore the various options for indicator formulations and the data that would be required to measure them. It is envisaged that several elements, yet to be determined, will be included to create a new composite indicator called 'impact of asthma on quality of life'.

3.11 Death rate for asthma among persons aged 5–34 years (9)

3.11.1 Intent of indicator

- To evaluate health care/clinical interventions to prevent the onset and exacerbations of asthma.
- To monitor adverse events related to asthma.
- To monitor the impact and costs of asthma for the individual.

Target population: People with asthma aged 5–34 years, as well as people of all ages with asthma.

3.11.2 Feasibility/value assessment

Mortality from asthma is seen only in a very small proportion of people with asthma. Mortality may change in response to changes in prevalence, disease severity (Jalaludin et al. 1999), changes in treatment (Beasley et al. 1999), and may also be affected by diagnostic fashion. There can be diagnostic confusion with COPD (Guite & Burney 1996; Smythe et al. 1996) particularly in people aged over 55 years, and diagnosis of death from asthma is less reliable in older people (Jones et al. 1999; Sears et al. 1986b; Smythe et al. 1996) and is most certain in the ages 5–34 years (Sears et al. 1986b). However, most asthma deaths occur in the elderly (ABS 1999). Changes in International Classification of Diseases (ICD) coding over the years have also been reflected in asthma mortality statistics. Despite these factors, deaths in all ages should be monitored in addition to deaths in the age range of 5–34 years, otherwise it is a rare event reporting system. Interpretation should take into account possible inaccuracies over a broader age range arising from diagnostic confusion in older ages.

3.11.3 Indicator recommendation

Two indicators are proposed for monitoring and inclusion in the NHDD:

1 age-standardised mortality rate for asthma in people aged 5–34 years;

2 age-standardised mortality rate for asthma in people of all ages (NEW supplementary indicator).

3.12 Prevalence rate for smoking among persons with asthma (10)

3.12.1 Intent of indicator

- To monitor exposure to and impact of environmental and other risk factors for asthma.
- To evaluate population health interventions to prevent the onset and exacerbations of asthma.

Target population: People with asthma aged 18 years and over.

3.12.2 Feasibility/value assessment

The adverse health effects of active and passive smoking are well known, but people with asthma who smoke have additional morbidity. People with asthma who smoke may have more severe asthma (Siroux et al. 2000). Smoking has been shown to affect lung function in several ways and these effects are more pronounced in people with asthma who smoke. Smoking increases airway inflammation above that usually observed in people with asthma (Chalmers et al. 2001), and Lange et al. (1998) demonstrated that smoking accelerates the annual decline in FEV_1 in people with asthma. Smokers may also find their asthma more difficult to control and it has been shown that smoking impairs the efficacy of treatment with inhaled corticosteroids (Chalmers et al. 2002), even at high doses (Pedersen et al. 1996). Smoking has also been reported as a risk factor for the development of asthma (Larsson 1995; Plaschke et al. 2000) and asthma symptoms (Rasmussen et al. 2000; Strachan et al. 1996).

'Smoking' may need to be defined in terms of frequency of smoking or quantity of cigarettes smoked. The definition of 'Tobacco smoking status' in the *National Health Data Dictionary* states that someone who smokes at least weekly is considered a regular smoker, and this is the preferred category to report in prevalence studies.

Data are available from national and state health surveys. However, people who smoke more than weekly but less than daily would not be identified in the current surveys, which do not comply with the NHDD operational definition for smoking status.

3.12.3 Indicator recommendation

Recommended for monitoring, although further data development is required before the indicator is ready for inclusion in the *National Health Data Dictionary*.

3.13 Prevalence rate for smoking within the household where children with asthma reside (11)

3.13.1 Intent of indicator

- To monitor exposure to and impact of environmental and other risk factors for asthma.
- To evaluate population health interventions to prevent the onset and exacerbations of asthma.
- To monitor the provision of a safe environment for people with asthma.

Target population: Children aged 0–15 years with asthma.

3.13.2 Feasibility/value assessment

Evidence from cohort studies has shown that children with pre existing asthma exposed to environmental tobacco smoke (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), increased airway reactivity (Murray & Morrison 1989; Oddoze et al. 1999) or peak flow variability (Fielder et al. 1999; Frischer et al. 1993). There is evidence that health care utilisation is increased in children exposed to ETS. Evans et al. (1987b) report a higher use of EDs in children exposed to ETS, and Gurkan et al. (2000) report that prevention of indoor smoking reduces hospital admissions in children with asthma. Recovery after hospitalisation—measured by beta agonist use and number of symptomatic days—is also impaired in children exposed to ETS (Abulhosn et al. 1997). In addition, exposure to ETS increases the risk of onset of wheezing illness in young children (Martinez et al. 1992). 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 a meta analysis of international studies which concludes 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).

In order to define household smoking a number of issues need to be considered in order to determine the most reliable method of measuring exposure. What constitutes a smoking household? Is it one where people always, usually or sometimes smoke inside the house; where residents and visitors to the house smoke inside the house; how many cigarettes are smoked daily inside the house; do people only smoke in the house when children are not present? There is also evidence that smoking outside the house limits ETS exposure but does not eliminate it (Al-Delaimy et al. 2002). Children may also spend a considerable proportion of their time in their own home or another house with other family members or carers (e.g. grandparents) who smoke. Whilst smoking by the mother is often deemed the biggest contributor to passive smoke exposure in children (Ehrlich et al. 1992; Martinez et al. 1992; Oddoze et al. 1999) there is evidence that smoking by people other than parents and outside the home also contributes significantly to ETS exposure in young children (Ownby et al. 2000; Peterson et al. 1997).

It is likely that passive smoke exposure has adverse effects on children with all wheezing syndromes of childhood. It may be more appropriate to quantify the extent of exposure of wheezing children to passive smoke.

Data on the number of cigarettes smoked in a house per day and whether smokers always or usually smoke in the house are available from the 2001 New South Wales Child Health Survey and New South Wales Continuous Health Survey program (2002). The NHS can provide data on the number of regular (daily) smokers who live in the household where children with asthma reside.

3.13.3 Indicator recommendation

This indicator is recommended for monitoring, although further data development is required.

3.14 Prevalence rate for asthma initiated (caused) by occupational exposure (12)

3.14.1 Intent of indicator

- To monitor exposure to and impact of environmental and other risk factors for asthma.
- To evaluate population health interventions to prevent the onset and exacerbations of asthma (in the occupational setting).
- To monitor the provision of a safe environment for people with asthma.

Target population: People in the workforce.

3.14.2 Feasibility/value assessment

Occupational asthma is preventable if it is detected early and there is early removal from exposure (Venables & Chan-Yeung 1997). It has been reported that up to one in ten cases of adult asthma are attributable to occupational factors (Blanc & Toren 1999) with a list of over 300 agents implicated as the cause. The onset of occupational asthma can occur after many months or, in some cases, years after exposure. The identification of causal agents and reduction or elimination of exposure to these agents can often reduce the severity of symptoms or, in some cases of early intervention, eradicate symptoms completely. Persons who remain exposed are more likely to have their health deteriorate. A population-based study in Canada (Johnson et al. 2000) concluded that the elimination of exposure to known causal agents could prevent as much as 18% of adult-onset asthma. Surveillance schemes provide the opportunity to prevent the incidence of occupational asthma through prompt initiation of hygiene investigations in hazardous workplaces and active prevention programs. Hence, surveillance for occupational asthma is a method of secondary prevention.

Asthma cases frequently constitute a large proportion of the total cases of occupational respiratory disease reported in surveillance schemes, representing up to 50% of total cases in one report (Contreras et al. 1994). This has been attributed to the rising number of new causal agents being used in the workplace and also to better recognition of the condition (Chan-Yeung & Malo 1994). As a result, occupational asthma represents the most prevalent occupational lung disease in the developed world.

There are a number of important reasons why reliable data on occupational disease and disability is valuable (Foley 1997):

- Prevalence data on occupational injury/disease allows it to be put in perspective with other public health problems and enables claims on legislative support and resources to be made.

- Research and control priorities can be determined on the basis of an objective analysis.
- Problem industries and occupations can be identified, allowing intervention strategies to be put in place to minimise the impact of occupational risk factors.
- The effectiveness of intervention and prevention strategies can be evaluated.
- The data can be used to quickly identify new workplace hazards.
- Data can be disseminated to raise awareness of the extent of the problem.

Occupational asthma can be defined as asthma induced by inhalation of substances to which exposure occurs in the workplace. These exposures may lead to the onset of asthma *de novo* as well as the aggravation of pre-existing asthma. The diagnosis is strongly supported by an improvement of the condition over weekends and holidays, but proof of a causal relationship between asthma and work-related exposure is required for the diagnosis to be confirmed (Chan-Yeung 1990). There are several ways to confirm a causal relationship between exposure of a specific agent at work and asthma.

The specific inhalation challenge is considered the gold standard for the diagnosis of allergic occupational asthma. A series of controlled inhalation challenges with an increasing dose of the suspected agent is performed to prove that the agent is the underlying cause of the condition. This is useful to identify causal agents that have not been reported previously and can also be used to pinpoint a causal agent if a subject works with several known sensitising agents. The tests are also helpful for diagnosing occupational asthma when other investigations have been inconclusive and for evaluating exposure-response relationships (Dykewicz 2001; Venables & Chan-Yeung 1997). The specific inhalation challenge is not frequently used because it is time-consuming and expensive and also because it can pose a significant health risk to the person being tested. People with unstable asthma or a high degree of airway obstruction should not be challenged because there is a risk of inducing severe bronchospasm (Dykewicz 2001). Specific inhalation challenges are performed only in a very limited number of specialised centres.

Peak flow monitoring can also be performed to provide evidence of decreasing lung function while at work. This method of testing uses the routine work activities as the challenge with readings of peak flow obtained before, during and after the work activities. Peak flow monitoring is useful because it allows for several days of monitoring away from work as well as in the workplace setting. A 20% decrease in peak flow values at work will support an occupational asthma diagnosis (Chan-Yeung 1995). One of the major problems with this approach is the difficulty in obtaining adherence to the frequent peak flow measurements which are required. Another criticism of self-recorded peak flow monitoring is that there is the possibility that subjects intentionally bias the results with a variable effort or falsify peak flow records (Malo et al. 1995).

Sensitisation tests that verify the presence of specific IgE antibodies against the causal agent can also be used. Skin prick testing or RadioAllergoSorbent Testing (RAST) can confirm sensitisation. The detection of sensitisation by this method is only applicable to high molecular weight allergens. There are no routinely available tests to identify sensitisation to low molecular weight antigens (such as isocyanates). Sensitisation tests are limited by the number of commercially available skin test extracts or RAST testing discs (Friedman-Jimenez et al. 2000). The finding of sensitisation does not equate to a diagnosis of occupational asthma: sensitisation may occur in the absence of asthma. Nevertheless, the finding of occupational sensitisation in the presence of a confirmed diagnosis of new onset asthma would strongly implicate the occupational exposure as the cause for the onset of asthma.

Measuring incidence

Since the objective of this indicator is to measure success in preventing the onset of occupational asthma, it would be preferable to monitor the incidence (onset) rate for this asthma caused by

occupational exposure. Incidence data more accurately reflect the success of preventive measures. The operation of the healthy worker effect (see below) means that the use of incidence data is particularly important in monitoring occupational asthma.

Unfortunately, the current legislative/compensation context does not encourage complete reporting of incidence. Incidence data are collected through the surveillance schemes that are operating in New South Wales, Victoria and Tasmania. Cases are notified by participating physicians (usually occupational and respiratory). These three states could be used as representative samples of the whole population as is done with the SENSOR project in the USA (Matte et al. 1990) where only four states contribute to the report.

Incidence data from compensation-based schemes (such as Workcover) are not useful because of the very low rate of compensation for occupational asthma. An alternative means of measuring incidence in specific high-risk industries is industry-based surveillance of inception cohorts of disease-free workers. Although these measures are not generalisable to the whole population they may be more valuable from a disease prevention perspective.

Measuring prevalence

In the absence of feasible measures of incidence, it will be necessary to rely on prevalence measures from surveys. Estimates from these surveys may be biased by the tendency of affected workers to leave the workforce (the healthy worker effect). However, whole population-based studies have the advantage that they include people who have had occupational asthma and have left the work place. Prevalence data can be obtained from cross-sectional surveys already conducted in Victoria and New South Wales (see Section 5.8 'Other data sources'). These surveys attributed adult-onset cases of asthma to an occupational cause if the subject was exposed to a known occupational risk factor or was working in an occupation known to be associated with risk of occupational asthma. This is an indirect method of diagnosis but is the only feasible method in large-scale population studies. There is limited potential for a time series arising from these surveys.

3.14.3 Indicator recommendation

This is an important indicator for a potentially preventable form of asthma. However, this item is not recommended for inclusion in the NHDD because of the lack of feasibility of establishing a valid and reliable time series of data that would be useful for the intended purpose.

This indicator is supported for monitoring following further development of the data source.

3.15 Prevalence rate for pre-existing occupationally aggravated asthma (13)

3.15.1 Intent of indicator

- To monitor exposure to and impact of environmental and other risk factors for asthma.
- To evaluate population health interventions to prevent the onset and exacerbations of asthma.
- To monitor the provision of a safe environment for people with asthma.

Target population: People in the workforce.

3.15.2 Feasibility/value assessment

It is important to differentiate between occupational asthma initiated by workplace exposure and as a result of aggravating a previous condition, perhaps from childhood. Difficulties may arise in distinguishing between a relapse of asthma and occupational aggravation of pre-existing asthma. Data from prevalence studies would not include this classification of asthma.

Some issues for consideration are whether to report on 'ever' aggravated or 'current' aggravation at work (e.g. in the last 12 months). 'Ever' aggravated may not be useful as it could have been some years ago and the exposure may no longer be happening.

Other issues for this indicator are the same as those for the occupationally caused asthma.

3.15.3 Indicator recommendation

There are substantial problems in defining this indicator and in collecting data for its measurement. This indicator is not recommended for monitoring.

3.16 Proportion of people with asthma who have a recent, written asthma action plan, developed in consultation with their GP (14)

3.16.1 Intent of indicator

- To evaluate health care/clinical interventions to prevent the onset and exacerbations of asthma.
- To develop structures to support effective and accessible asthma care.

Target population: People of all ages with asthma.

3.16.2 Feasibility/value assessment

A written asthma action plan (AAP) enables people with asthma to recognise deterioration promptly and respond appropriately, by integrating changes in symptoms or peak expiratory flow measurements with written instructions to introduce or alter medication. People do benefit from the use of an AAP. It was recently shown that there is a relationship between achievement of asthma control with the use of an AAP (defined by the physician) and an increase in the patient's quality of life (as assessed by the patient) (Bateman et al. 2002). There is also evidence that the use of a written AAP, in conjunction with training in self-management and regular medical review, improves outcomes, including the need for hospitalisation, GP visits and medication and lung function, in people with asthma (Gibson et al. 2002). When used in conjunction with regular follow-up and education, an AAP can improve quality of life and asthma control. On the other hand, the use of written asthma action plans in isolation from these associated elements has not been shown to improve health outcomes in people with asthma (Toelle & Ram 2002).

Asthma action plans 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 of an AAP:

- the AAP must be written;
- the AAP must be individually prescribed and not a generic example;
- the AAP must contain information to allow you to recognise the onset of an exacerbation;
- the AAP must contain information on what action to take in response to that exacerbation (usually increase or commence steroids and/or seek urgent medical care).

This indicator may be combined with 'the proportion of people with asthma who use a peak flow meter to monitor their asthma' and recommended for data development. The combination indicator would be 'the proportion of people with asthma who (use a peak flow meter to monitor their asthma/monitor their symptoms) in conjunction with their asthma action plan'. This new indicator could potentially be used to make comparisons between the effectiveness of peak flow monitoring and symptom monitoring in conjunction with the asthma action plan.

3.16.3 Indicator recommendation

The monitoring of this indicator is supported. However, in view of the lack of currently available data to measure the indicator as proposed, it will not be recommended for inclusion in the NHDD until the required data elements are available.

3.17 Proportion of people with asthma who use a peak flow meter to monitor their asthma (15)

3.17.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.

Target population: People aged 7 years and over with asthma.

3.17.2 Feasibility/value assessment

The home monitoring of peak expiratory flow rates has been a central feature of most asthma action plans since their introduction in the late 1980s. AAPs recommended by the National Asthma Council incorporate peak flow monitoring. The rationale for peak flow monitoring is that it is independent of symptom perception and it allows an objective measurement of asthma severity to be made, which can be used to adjust asthma therapy.

Although there is evidence that, under the correct conditions, people with asthma can be induced to keep a reliable peak flow record (Reddel et al. 2002), adherence with peak flow monitoring may be a problem in people who are asked to monitor over a long period of time without taking steps to enhance adherence. Diary recordings may be unreliable, especially for children. A study of peak flow diaries in children reported that approximately 50% of entries were wrongly recorded, missing or self-invented (Kamps et al. 2001). Similar findings have been reported for adults. A Canadian study found that compliance with daily peak flow measurement was poor in a group of subjects who were asked to record their morning and evening peak flows for 3 months (Verschelden et al. 1996). Compliance decreased with time, morning and evening readings were only taken on 34% of days and a substantial proportion (22%) of recorded values were self-invented.

The limitation of symptom-based self-monitoring is that there is substantial variation between subjects in the level of perception of airway narrowing. Poor perceivers may be at risk of failing to detect severe airway narrowing if they do not monitor lung function. This means that they are more likely to delay the initiation of treatment or intervention if using a symptom-based AAP. It is unclear why some people with asthma are able to accurately perceive the severity of the airway obstruction and others cannot. Studies have shown that up to 15% of people cannot gauge the severity of their asthma even when they have marked deterioration in their lung function (Rubinfield & Pain 1976). Objective measures of lung function are essential for people in this category.

However, recent evidence has suggested that AAPs based on symptom monitoring are, overall, as effective as AAPs based on combined symptom and peak flow monitoring. A study of the use of asthma action plans in New Zealand found that symptoms were more important than peak expiratory flow measurements when prompting people to make adjustments to their treatment (Wraight et al. 2002).

There is no national or state-based dataset currently available to monitor this indicator. Some local surveys have collected data on peak flow monitoring.

3.17.3 Indicator recommendation

In all four of the workshops where this indicator was discussed, omission of this indicator from the list of core indicators was advocated, in view of the lack of data and the low utilisation of peak flow monitoring. It is recommended that the use of an asthma action plan and the use of preventer medication be used as markers of asthma management and control.

Not recommended for monitoring due to the lack of evidence to support the role of peak flow monitoring in improving outcomes of asthma management.

3.18 Proportion of people with asthma who attend a health professional or carer at least 6-monthly for review of their asthma action plan (16)

3.18.1 Intent of indicator

A possible intent of this indicator may be **to evaluate health care/clinical interventions for the management of asthma and exacerbations**, but this was questioned in the New South Wales workshop, hence raising further doubts about the usefulness of this indicator.

Target population: People of all ages with asthma.

3.18.2 Feasibility/value assessment

Asthma is a chronic condition that requires continuing care. While some people with asthma will improve rapidly with self-management, for others an improvement in the severity of the condition will take much longer. An asthma action plan (AAP) is one component of asthma self-management that should not be used without seeking regular direction from a doctor. Regular review of the asthma action plan by a GP will allow for education and review of medications and treatment. People should be encouraged to attend their GP regularly so that their symptom and peak flow charts can be monitored, a supply of asthma medication can be ensured and the

importance of continuing treatment can be reinforced. This is emphasised in the sixth step of the Australian Asthma Management Plan, as recommended by the National Asthma Council, which is to 'educate and review regularly'.

It is essential to emphasise the value of the AAP and self-management. A study in New Zealand demonstrated that 2 years after a self-management program, the use of AAPs and the level of morbidity had improved but that these gains were not sustained after 4 more years (D'Souza et al. 2000). This implies that some form of review and re-intervention is required. However, it is not clear how frequent this should be. It is likely that people with asthma who remain well controlled would not need to have their AAP reviewed at 6-monthly intervals. Conversely, people with unstable, more severe asthma may require monitoring and review more frequently.

Regular review may be more of a priority for people with asthma soon after diagnosis or initial prescription of an AAP. As people become more confident in taking responsibility for their own management, their GP visits for asthma management review may be less frequent.

3.18.3 Indicator recommendation

The usefulness of monitoring this indicator was questioned in the three workshops where this indicator was discussed. There is lack of evidence on the time interval at which the AAP should be reviewed. It was felt that, in comparison to information about whether individuals had a written AAP, evidence about whether it had been reviewed in the preceding 6 months was a low priority issue.

This indicator is not recommended for monitoring. This decision was based on the lack of evidence of 6-monthly review of an asthma action plan as an effective measure of asthma management and also the lack of an appropriate data source at this point in time.

3.19 Proportion of people with asthma who have had spirometry measurements in the last 6 months (17)

3.19.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.

Target population: Children aged 7 years and over and adults with asthma.

3.19.2 Feasibility/value assessment

Office spirometry has a role in the assessment of asthma at baseline and at periodic follow-up assessments. It is used to establish the presence of airflow obstruction, the presence of reversibility (diagnostic of asthma) and the presence of a deterioration in lung function relative to the usual level. Results from spirometry tests also correlate well with morbidity (American Thoracic Society 1995) and provide people with objective feedback about the presence and severity of their asthma.

Bye et al. (1992) showed that regular spirometry was valuable in assessing the degree of airflow obstruction in children. They assessed pulmonary function in children with asthma during a routine follow-up visit when their asthma symptoms were judged to be stable and found that the group's mean FEV_1/forced vital capacity ratio was 80%. Of the 65 children studied, 17% had

FEV_1/forced vital capacity ratios of less than 72% and they concluded that underdiagnosis of airflow obstruction is inevitable if children with asthma do not have spirometry measurements during routine follow-up visits.

However, there are no published data to support the measurement of spirometric function in all people with asthma at 6-monthly intervals and this is not recommended in any published guidelines. At the present time, the status of spirometry within the Asthma 3+ Visit Plan is under review.

Data sources

There are two possible data sources for this indicator:

- **BEACH** data. The number of spirometric measurements performed per 1,000 visits is available from the BEACH data and spirometry is linked to asthma as the reason for the visit.
- **Health Insurance Commission** data derived from all patients for whom MBS spirometry payments have been claimed (not specific to asthma) or for whom Asthma 3+ Visit Plan PIP payments have been claimed (people with moderate or severe asthma).

  The MBS data do not have a diagnosis attached to the claim and hence claims for spirometry cannot be directly linked to the population with asthma. However, limiting the analysis to spirometry claims for those aged 5–34 years, in whom spirometry is most likely to have been performed for the diagnosis or assessment of asthma (rather than COPD), would make this a more valid indicator for the intended purpose.

  Asthma 3+ Visit Plan PIP payments are only made for people judged to have moderate or severe asthma and who attend three asthma review sessions with the GP. Not all GPs are registered for this program and, hence, the coverage of people with asthma is limited in an undefined manner and it would be difficult to identify a meaningful denominator using this method.

3.19.3 Indicator recommendation

In the three workshops where spirometry was discussed, there were differing opinions on the value of monitoring this indicator. The ASMA committee felt that the indicator should be monitored with the time period changed to 12 months.

3.20 Mean number of preventer prescriptions per person with asthma per year (18a), Proportion of people with asthma for whom preventers are indicated and use relievers no less than 3 times per week (18b), and The ratio of prescriptions of reliever to preventer medication among asthma patients (18c)

3.20.1 Intent of indicators

The main intention of these indicators is to assess the quality of drug therapy for asthma. This includes assessing the extent to which people who should be prescribed preventer medications are actually prescribed them and the degree of overuse of relievers to maintain asthma control. These intentions align with the following monitoring objective:

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.

Target population: People with moderate or severe asthma or those with mild asthma who have poor control.

3.20.2 Feasibility/value assessment

Drug therapy is used to improve asthma control and lung function and to prevent exacerbations. The major drug groups prescribed for asthma include:

- relievers (including short-acting beta agonists and anticholinergics)
- symptom controllers (long-acting beta agonists)
- preventers (inhaled corticosteroids and cromones)
- combination medications.

All these drugs can also be used in the management of other respiratory conditions, in particular chronic obstructive pulmonary disease (COPD), as well as asthma.

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 may be the best source of information about actual use of medication.

The three indicators proposed at the indicator workshop (as listed above) are all indirect measures of the intention to measure whether people who require preventer medication are appropriately treated. They each have important limitations.

The first proposed indicator, mean number of preventer prescriptions per person with asthma per year, measures the average number of prescriptions for preventers per person with asthma. This indicator has the following limitations: preventers are also used by people with other respiratory illness, therefore the indicator lacks specificity for asthma; it does not provide any information on the appropriateness of preventer medication; and it may be substantially influenced by large volumes of usage in a small number of individuals. Some of the data

required for this indicator are potentially available through the HIC Pharmaceutical Benefits Scheme data (numerator) and health surveys (denominator).

The second proposed indicator, proportion of people with asthma for whom preventers are indicated and use relievers no less than 3 times per week, measures the proportion of people who require medication to control asthma but appear to be overusing 'reliever' medication to achieve control. Its inclusion is based on 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). The 1997–98 NSW Health Surveys are the only published population surveys that provide information from respondents with asthma about their 'asthma control' status and the frequency of their reliever use (Marks et al. 2000).

The third proposed indicator, the ratio of prescriptions of reliever to preventer medication among asthma patients, has been proposed as a quality indicator (Shelley et al. 1996; 2000). However, its utility is limited by the lack of comprehensive data on reliever use and the inability to distinguish patients with asthma from those with COPD in the pharmaceutical data sources. There is also evidence to suggest that this is not a useful indicator of quality (Shelley et al. 1996).

3.20.3 Indicator recommendation

For the reasons stated above it was decided not to proceed with these indicators but to develop a new indicator that directly measures the proportion of people with asthma who use preventers regularly. This new indicator is described in Section 3.21.

3.21 NEW INDICATOR—Proportion of people with asthma who use preventers regularly

3.21.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.

Target population: People with moderate and severe asthma.

3.21.2 Feasibility/value assessment

Inhaled corticosteroids are recommended for the management of moderate and severe asthma (NAC 2002b). An indicator is required that reflects the level to which this management strategy is employed.

Two possible forms of this indicator were considered:

1. **Proportion of people with asthma for whom preventers are indicated and who use preventers regularly**

Numerator: Number of people with 'current' asthma for whom preventers are indicated and who report using preventer medication daily.

Denominator: Number of people with 'current' asthma for whom preventers are indicated (i.e. who meet the National Asthma Council (NAC 2002a) criteria for preventer medication or similar as shown in Table 3.1).

Table 3.1: Classification of moderate and severe asthma according to *Asthma Management Handbook* (NAC 2002a)

Symptoms/Indicators	Moderate	Severe
Wheeze, tightness, cough, dyspnoea (e.g. with viral infection or exercise)	Most days	Every day
Nocturnal symptoms	< Once/week	> Once/week
Asthma symptoms on wakening	< Once/week	> Once/week
Hospital admission or Emergency Department attendance in past year (for adults)	Usually not	Usually
Previous life-threatening attack (ICU or ventilator)	Usually not	May have a history
Bronchodilator use	Most days	> 3–4 days
FEV_1 (% predicted)	60–80%	< 60%
Morning peak flow on waking	80–90% best	< 80% best

Note: The patient should be assigned to the most severe grade in which any feature occurs.

There are two potential data sources for this indicator—SAND data and health survey data. The SAND module is an add-on survey of patients delivered as part of the general practice BEACH survey. So far, four SAND modules have collected data on asthma prevalence, asthma severity (GP assessed) based on NAC criteria and asthma medication use. Using data from the 1997 NSW Health Survey, Marks et al. (2000) assessed preventer use in both a population of people with current asthma and a population of people with asthma whose self-reported symptom profile suggested that preventers were indicated. The use of the GPs to assess whether preventers are indicated, using NAC criteria, may be more valid than the survey method, although this has not been tested.

Although this indicator may more validly reflect appropriate asthma management in the target group, it is possible that imprecision in measuring the 'proportion of people with asthma for whom preventers are indicated' would introduce substantial imprecision into the measurement of this indicator.

2. Regular preventer use by people with asthma

Numerator: Number of people with 'current' asthma who report using preventer medication daily.

Denominator: Number of people with 'current' asthma.

As this indicator does not require the identification of a sub-group of people with asthma for whom preventers are indicated, it has the advantage of being more readily and reliably measured than the version of this indicator described above.

Possible data sources:

1 SAND data

Numerator: Number of people who report using preventer medication daily.

Denominator: Number of people reporting having asthma.

There have been four SAND modules conducted (with around 600 patients reporting asthma in each) where data for this indicator could be calculated. This survey collects information on prescribed medications but may not accurately reflect what people with asthma are actually taking. Furthermore, the sample for SAND is, by its nature, biased in favour of people who attend their GP for asthma care.

2 Health surveys

Numerator: Number of people who report using preventer medication daily.

Denominator: Number of people who report asthma.

3 HIC data (linking MBS and PBS data)

Numerator: People for whom an Asthma 3+ Visit Plan PIP payment has been made who use 6 or more units of inhaled corticosteroids in the 12 months after the payment.

Denominator: Total number of people for whom an Asthma 3+ Visit Plan PIP payment has been made.

Collection of numerator data is problematic as it would involve data linkage and, therefore, cannot be conducted without individual patient consent. Alternatively, a survey among people for whom PIP payments under the Asthma 3+ Visit Plan had been made could be implemented. However, there are no data on the extent to which Asthma 3+ Visit Plan recipients actually represent the population for whom preventer medicators are indicated. The problem of lack of complete coverage of the Asthma 3+ Visit Plan program has been alluded to above.

3.21.3 Indicator recommendation

This indicator is recommended for monitoring but is not yet ready for inclusion in the NHDD. Further work is required to identify an appropriate data source and finalise an operational definition for this indicator.

3.22 Proportion of schools (primary and secondary), child care centres, pre-schools and hospitals using nationally-accredited asthma education programs (19)

3.22.1 Intent of indicator

- To monitor the provision of a safe environment for people with asthma.
- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To develop structures to support effective and accessible asthma care.

Target population: School-aged children (5–18 years) and teaching staff.

3.22.2 Feasibility/value assessment

This is a complex indicator encompassing a range of possible sources, populations and settings. Consideration should be given to simplifying the indicator into the following three permutations:

Proportion of schools (primary and secondary) using nationally accredited asthma education programs

Asthma affects almost 20% of school-aged children in Australia (AIHW: Al-Yaman et al. 2002), which means that up to six children per classroom could have the disease. Children with asthma often have to take days off school due to their condition and asthma exacerbations can disrupt entire classrooms. Providing children with information about their illness helps them to take control of their health, which, in turn, can help to improve compliance and morbidity (Evans et al. 1987a; Sorrells et al. 1995). Schools provide venues for large numbers of children from the community to be educated about asthma in a centrally organised setting where they spend a significant amount of their time. A program in the United States, which targeted children aged 8–11 years, reported an improvement in several outcomes in the children from schools that received asthma education compared to schools that did not (Evans et al. 1987a). One year after the six 60-minute sessions it was shown that there was a decrease in the average duration and frequency of asthma episodes, an improvement in school grades and an increase in the number of children helping others during asthma episodes. Christiansen et al. (1997) reported significant differences between asthma symptom scores for the educated group compared to the control group in a followup of 5th-grade students who had received five sessions of asthma education. A trial conducted in Australian schools showed that students educated about asthma by their peers had lower rates of school absenteeism and reported asthma attacks than students in control groups (Shah et al. 2001).

In addition, the need to provide a safe environment in schools means that the teachers responsible for these children play an important role. School staff must be able to recognise the onset of an asthma attack and be confident in making decisions about emergency or regular drug treatment as a part of their duty of care (Bevis & Taylor 1990).

Data are available on schools using the Asthma Friendly Schools Program, which is a nationally accredited program run through the Asthma Foundations in each state and territory. The Asthma Friendly Schools Program aims to:

- improve self-management skills in those students with asthma to enable them to participate fully in daily activities including regular exercise and sport;
- increase awareness of asthma among the whole student population, their parents/carers and teachers;
- improve the ability of schools and teachers to fulfil their duty of care obligations to those students with asthma; and
- fit seamlessly into the health promotion curriculum of primary and secondary schools throughout Australia (Asthma Australia 2001).

The intent of the indicator, which includes 'to provide a safe environment for children with asthma', will only be achieved if these aims are fulfilled.

Proportion of childcare centres and pre-schools using nationally accredited asthma education programs

Interventions for accredited asthma education programs have not been implemented nationally in childcare centres and pre-schools at this point in time.

Proportion of hospitals using nationally accredited asthma education programs

Interventions for accredited asthma education programs have not been implemented nationally in hospitals at this point in time.

As interventions for accredited education programs for childcare centres, pre-schools and hospitals have not been implemented nationally, we recommend that the proportion of schools using nationally accredited asthma education programs should be the only indicator considered at this point in time. However, if there is no accredited program and there is no intention to get accreditation, we may have to move to a nationally 'recognised' asthma education program as the indicator.

Further development of this indicator was recommended at two of the workshops. There was support to propose an additional indicator to measure the effectiveness of asthma self-management education programs. Another important issue raised was the lack of an indicator to assess the knowledge and accreditation of asthma educators.

3.22.3 Indicator recommendation

Monitoring of the proportion of schools using and students exposed to nationally accredited asthma education programs is recommended initially as a program-focused indicator. This will not be recommended for inclusion in the NHDD.

Individual indicators monitoring the proportion of pre-schools, childcare centres and hospitals using nationally accredited asthma education programs are recommended for data development and monitoring in the future, when accredited programs have been implemented at a national level.

3.23 Proportion of people with asthma who have been woken at night due to their asthma (20a)

3.23.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor the impact and costs of asthma for the individual.

Target population: People of all ages with asthma.

3.23.2 Feasibility/value assessment

Waking at night with asthma symptoms is widely acknowledged as an important indicator of more severe asthma (Fix et al. 1997; Morris et al. 1996; Strunk et al. 2002). In a study of asthma deaths in Victoria, Robertson et al. (1990) found that the final attack was between the hours of 6.00 pm and 3.00 am in 53% of cases. Approximately two-thirds of people with asthma suffer from nocturnal symptoms (Storms et al. 1994). Turner-Warwick (1989) reported that as many as 73% of people with asthma were woken at night at least once per week by their asthma. Furthermore, 39% were woken nightly by their asthma and the association between nocturnal wakening and the perceived severity of asthma was highly significant. Asthma symptoms at

night, and the associated reduction in the quantity and quality of sleep, can impair performance during the day. In a study conducted in the United States of America, parents of children with asthma reported that there was a greater risk of missed school days for children and missed work days for parents when children were woken by their asthma (Diette et al. 2000). However, there are limitations to the use of this measure as an indicator of the severity of asthma:

- It is only one manifestation of more severe asthma and may not always be present when other features of severe disease are present (Colice et al. 1999; Van Keimpema et al. 1997).
- It varies over time. People with asthma may be awoken from sleep during periods of poor asthma control or during exacerbations but not during the interval or stable phase of their illness (Lockey et al. 1999). This limits the interpretability of this indicator.
- It changes with treatment, often disappearing after initiation of treatment with inhaled corticosteroids ± long-acting beta agonists (Lockey et al. 1999; Wallaert et al. 1999; Woolcock et al. 1996).

3.23.3 Indicator recommendation

Further development of this indicator is required prior to a decision on whether or not to recommend this for the NHDD. In addition, it is proposed to develop a broad-based index of asthma control for use as an indicator.

3.24 Proportion of people with asthma who experience 'morning dipping' (20b)

3.24.1 Intent of indicator

- To evaluate health care/clinical interventions for the management of asthma and exacerbations.
- To monitor regular symptoms and the frequency and severity of asthma exacerbations.
- To monitor the impact and costs of asthma for the individual.

Target population: People aged 7 years and over with asthma.

3.24.2 Feasibility/value assessment

Enhanced diurnal variation in lung function is a feature of asthma which correlates with other markers of disease severity (Bellia et al. 1988; Clark 1987). Diurnal variation may be characterised as 'morning dipping', that is the extent to which the morning lung function value (usually peak expiratory flow) is below the afternoon or daily best value.

The widespread use of long-acting beta agonist medications makes this indicator very difficult to measure. Long-acting beta agonists tend to improve morning peak flow and, hence, reduce morning dipping (Bensch et al. 2001; Tilles & Nelson 1995).

There are major problems with the feasibility of this indicator. To estimate community prevalence of morning dipping, it would be necessary for community-based monitoring of peak expiratory flow rates, at least twice daily. It would be difficult to achieve this on a large scale.

3.24.3 Indicator recommendation

This indicator is not recommended for monitoring.

4 Draft operational definitions for asthma indicators proposed by ACAM in 2003

This chapter presents draft operational definitions for the indicators proposed by ACAM for asthma monitoring after assessment of the AIHW indicators in Chapter 3 and after further consultation with stakeholders and analysis of relevant literature. The quality of the indicator and data are discussed, as well as possible data analyses and issues to consider when interpreting changes in the indicator.

4.1 Prevalence of ever having doctor-diagnosed asthma

4.1.1 Draft operational definition for the indicator

Long title:	**Prevalence of ever having doctor-diagnosed asthma**
Short title:	**Prevalence of ever asthma**
Numerator:	The number of people who report having ever been diagnosed with asthma by a doctor or a nurse.
	Source: ABS National Health Survey (from 2001), state CATI surveys.
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.).
	Source: ABS estimated resident population data.

4.1.2 Quality of the indicator

Self-report of a diagnosis of asthma has often been used in population studies to measure asthma prevalence (Robertson et al. 1991; Ruffin et al. 2001). Self-reported ever diagnosed asthma in adults has a variable sensitivity ranging from 48–100% against a diagnosis confirmed by a doctor (Burney et al. 1989b; de Marco et al. 1998; Toren et al. 1993). Specificity is higher ranging from 77–100%. A study in children reports a sensitivity of 55% and specificity of 94% for parent-reported asthma confirmed by a doctor (Glasgow et al. 2001). However, in children, identification of asthma on the basis of only a current diagnosis has been reported as underestimating asthma prevalence (Joseph et al. 1996; Shaw et al. 1992), and self-reported diagnosis of asthma is lower than asthma defined from symptoms (Cuijpers et al. 1994; Gerald et al. 2002; Grant et al. 1999; Hetlevik et al. 2000).

4.1.3 Quality of the data

The National Health Survey (ABS) and the nation-wide state Computer Assisted Telephone Interview (CATI) surveys are the two feasible nation-wide sources of data for this indicator. The general attributes of data and data quality for these surveys are described in Section 4.4.

4.1.4 Data analysis

Data can be analysed by age and sex, state, rural and remote status (ARIA) and socioeconomic status (SEIFA), both based on residential address. Due to small numbers, data for country of birth may need to be aggregated over a number of years. It would be possible to analyse this

indicator with individuals classified as being born in English-speaking versus non-English-speaking countries. Similarly, data for people who identify as being of Aboriginal or Torres Strait Islander origin may need to be aggregated over a number of years. Note that these surveys have sampled insufficient numbers of Aboriginal and Torres Strait Islander Australians to yield reliable estimates of prevalence in this population.

4.1.5 Timeliness

National Health Survey data are usually not released until 12–18 months after completion of data collection. Similar time frames exist for state health survey data, although many states are moving to a continuous data collection model that will enable a faster turnaround time for data availability.

4.1.6 Interpretation

- Comparisons of asthma prevalence across age groups should be made with caution, due to changes in diagnosis with age.
- May be subject to variation due to diagnostic and labelling fashion over time and between population groups.
- Represents a cumulative indicator and does not distinguish those with and without current manifestations of asthma.

4.1.7 Interventions that may affect the indicator

Policies reducing the incidence of asthma (i.e. primary prevention) will have a long-term impact on this indicator.

4.1.8 Cost and policy implications

None known.

4.1.9 Further development

None.

4.2 Prevalence of current doctor-diagnosed asthma

4.2.1 Draft operational definition for the indicator

Long title:	**Prevalence of current doctor-diagnosed asthma**
Short title:	**Prevalence of current asthma**
Numerator:	The number of people who report having been diagnosed with asthma and who have experienced symptoms (wheeze, shortness of breath, or chest tightness) of asthma or taken treatment for asthma in the last 12 months. Source: State CATI Surveys—asthma module (from 2002).
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.). Source: ABS estimated resident population data.

4.2.2 Quality of the indicator

Validation of indicators for asthma is complicated by the lack of an applicable criterion or gold standard. Studies that have purported to assess the validity of various epidemiological definitions of asthma have usually used a clinical diagnosis, made by a doctor or panel of doctors, as the criterion (Pekkanen & Pearce 1999; Remes et al. 2002; Valery et al. 2001). However, as noted in Section 2.1, asthma usually has episodic manifestations. Between episodes

people with asthma may be asymptomatic and demonstrate no abnormal physical signs. In the absence of direct observation during episodes of symptoms or disease exacerbations, a clinical evaluation actually obtains very limited information relevant to the diagnosis of asthma. It is unsurprising that these studies have demonstrated close correlation with data obtained by questionnaire, since the diagnostic information available to inform the 'clinical diagnosis' is essentially the same as the data that are obtained by questionnaire.

We have not identified any studies that have evaluated the diagnostic performance of tools for identifying asthma in which the presence or absence of asthma, that is the occurrence of symptoms together with reversible airflow obstruction, has been confirmed over a 12-month period of close observation. These are the only studies on which the sensitivity and specificity of any surveillance tools can be based. In the absence of these data, we summarise below some data on the relation among various measures of asthma. The interpretation of the terms of 'sensitivity' and 'specificity' below should be tempered by the caveats described above.

Population studies have used a symptom-based definition of asthma (Asher et al. 1998), but asthma presents with a broad variety of symptoms, which may or may not be present simultaneously, resulting in the use of a variety of different definitions (Asher et al. 1998; Woods et al. 2001). There are differing views among experts on which symptom or combination of symptoms is most important for the diagnosis of asthma (Werk et al. 2000).

In adults, asthma symptoms in the last 12 months have a sensitivity ranging from 26–83% and a specificity ranging from 76–100% for asthma diagnosis (Burney et al. 1989b; de Marco et al. 1998; Jenkins et al. 1996; Toren et al. 1993). De Marco et al. (1998) examined the sensitivity and specificity of single questions on symptoms in the last year, and combinations of these questions, for predicting a doctor's verification of current asthma. Individually, each question (wheeze, shortness of breath (SOB), asthma attack and ever asthma) had a high specificity (91–99%) but low sensitivity (32–68%), particularly for SOB and asthma attack. Wheeze was the most sensitive but least specific marker. The combination of asthma attack and current use of medication did not improve sensitivity but specificity remained high (99.7%). However, the combination of wheeze, and/or SOB or self-reported current asthma improved sensitivity (82.9%) but specificity dropped substantially (86.7%). In contrast, Jenkins et al. (1996) reports sensitivity of 80% and high specificity of 97% for a questionnaire based on a combination of symptoms for predicting a clinical diagnosis.

Among children, parent-reported current asthma identified on the basis of questions on various symptoms within the last 12 months has sensitivity ranging from 55–85% and specificity 81–99% for a physician-verified diagnosis of asthma (Glasgow et al. 2001; Hall et al. 2001; Jenkins et al. 1996; Remes et al. 2002). Individually, no one symptom stands out as being more sensitive or specific for a clinical verification of asthma, although nocturnal cough is usually least specific (Hall et al. 2001; Remes et al. 2002). Remes et al. (2002) report high specificity (97–98%) for symptoms of wheezing with colds or SOB with wheezing in the last 12 months, or SOB with exercise, but sensitivity is lower (66–78%). Hall et al. (2001) report highest specificity for persistent cough with colds (86%) but lowest sensitivity (63%), followed by wheezing (specificity 83%) and exercise-induced symptoms (specificity 81%). Combination of all four symptoms in this study increased sensitivity to 94% but at substantial cost to specificity (55%). Glasgow et al. (2001) also report increases in sensitivity at a cost to specificity when self-reported asthma is combined with reports of wheezing with colds. Jenkins et al. (1996) looked at symptoms from a questionnaire and report specificity of 81% and sensitivity of 85% for the questionnaire validated against a doctor diagnosis.

In both children and adults the use of composite symptom measures increases sensitivity at a cost of lower specificity.

4.2.3 Quality of the data

The nation-wide state Computer Assisted Telephone Interview (CATI) surveys are the most feasible nation-wide source of data for this indicator. The general attributes of data and data quality for these surveys are described in Section 5.4.

4.2.4 Data analysis

Data can be analysed by age and sex, state, rural and remote status (ARIA) and socioeconomic status (SEIFA), both based on residential address. Due to small numbers, data for country of birth may need to be aggregated over a number of years. It would be possible to analyse this indicator with individuals classified as being born in English-speaking versus non-English-speaking countries. Similarly, data for people who identify as being of Aboriginal or Torres Strait Islander origin may need to be aggregated over a number of years. Note that these surveys have sampled insufficient numbers of Aboriginal and Torres Strait Islander Australians to yield reliable estimates of prevalence in this population.

4.2.5 Timeliness

Reporting on the state health survey data is usually not possible before 12–18 months from completion of data collection, although many states are moving to a continuous data collection model that will enable a faster turnaround time for data availability.

4.2.6 Interpretation

- Comparisons of asthma prevalence across age groups should be made with caution, due to changes in the manifestations and diagnosis of the disease with age.
- Because the definition includes a 'doctor diagnosis' of asthma, this indicator may be subject to variation due to diagnostic and labelling fashion.

4.2.7 Interventions that may affect the indicator

Policies aimed at primary and secondary prevention of asthma may be expected to have a long-term impact on this indicator.

4.2.8 Cost and policy implications

There may be a cost associated with the inclusion of additional questions in the surveys.

4.2.9 Further development

Move to include questions for this definition of current asthma in the asthma module of the National Health Survey.

4.3 Prevalence of wheeze in the preceding 12 months

4.3.1 Draft operational definition for the indicator

Long title: **Prevalence of wheeze in the preceding 12 months**

Short title: **Prevalence of recent wheeze**

It is proposed that this indicator is monitored separately in children and adults.

Prevalence of wheeze in children:

Numerator: The number of children who report wheeze or whistling in the chest in the previous 12 months.

Source: No data source identified.

Denominator: Australian population as at 30 June for same calendar year as numerator (pop.).

Source: ABS estimated resident population data.

Prevalence of wheeze in adults:

Numerator: The number of adults who report wheeze or whistling in the chest in the previous 12 months.

Source: ABS National Health Survey (from 2001) for ages 18–44 years (not currently available for other ages).

Denominator: Australian population for ages 18–44 years as at 30 June for same calendar year as numerator (pop.).

Source: ABS estimated resident population data 2001.

4.3.2 Quality of the indicator

It is recognised that there are many causes of wheeze, other than asthma, particularly in young children and in older people. Hence, this should not be considered as an indicator of the prevalence of asthma but rather an indicator of this particular respiratory symptom, which arises from many different causes.

4.3.3 Quality of the data

The National Health Survey (ABS) can be used to estimate the nation-wide prevalence of recent wheeze in adults. The general attributes of data and data quality for this survey are described in Section 5.4.

4.3.4 Data analysis

Data can be analysed by age and sex, state, rural and remote status (ARIA) and socioeconomic status (SEIFA), both based on residential address. Due to small numbers, data for country of birth may need to be aggregated over a number of years. It would be possible to analyse this indicator with individuals classified as being born in English-speaking versus non-English-speaking countries. Similarly, data for people who identify as being of Aboriginal or Torres Strait Islander origin may need to be aggregated over a number of years. Note that these surveys have sampled insufficient numbers of Aboriginal and Torres Strait Islander Australians to yield reliable estimates of prevalence in this population.

4.3.5 Timeliness

Reporting on the National Health Survey is usually not possible before 12–18 months from completion of data collection.

4.3.6 Interpretation

- Comparisons of prevalence of recent wheeze across age groups should be made with caution, due to changes in the causes of wheeze with age.
- There will be limited historical data for this prevalence indicator.

4.3.7 Interventions that may affect the indicator

Interventions designed to prevent and control wheezing illness (asthma, COPD and virus-associated wheeze) would be expected to have an impact on this indicator.

4.3.8 Cost and policy implications

There may be a cost associated with the inclusion of additional questions in the surveys.

4.3.9 Further development

A nation-wide source of data for this indicator in children is yet to be identified.

4.4 Prevalence of airway hyperresponsiveness

4.4.1 Draft operational definition for the indicator

Long/short title: Prevalence of airway hyperresponsiveness

Further work is required to select the appropriate measure of airway hyperresponsiveness for surveillance purposes and to identify appropriate data sources.

4.4.2 Quality of the indicator

Airway hyperresponsiveness (AHR) is a physiological hallmark of asthma and has been shown to be closely associated with asthma symptoms (Burney et al. 1989a; Peat et al. 1987a; Rijcken et al. 1987; Sears et al. 1986a; Woolcock et al. 1987) and outcomes of asthma (Toelle et al. 1992; Toelle et al. 1997). A significant dose response relationship between response to histamine challenge and a range of asthma symptoms, diagnosis of asthma, and use of asthma medications has also been reported (Rijcken et al. 1987; Woolcock et al. 1987). Use of AHR as a tool for epidemiological surveillance is complicated by the range of agents used to elicit the airway response and the continuous distribution of the response, which must be arbitrarily dichotomised to estimate the prevalence of AHR. AHR is not found solely in people with asthma symptoms (Pattemore et al. 1990; Rijcken et al. 1987; Salome et al. 1987), and there are many people who have symptoms of asthma, particularly children, who do not have AHR (Enarson et al. 1987; Pattemore et al. 1990; Sears et al. 1986a; Shaw et al. 1992). The meaning of these discordant states remains unclear.

4.4.3 Quality of data

No data source identified, although a range of local and regional data collections have been reported.

4.4.4 Data analysis

No data source identified.

4.4.5 Timeliness

No data source identified.

4.4.6 Interpretation

The interpretation of trends in this measure will be dependent on establishing a series in which AHR is measured in a standardised manner. The main strength of this indicator will be its reliability in the face of changes in diagnostic and labelling fashion.

4.4.7 Interventions that may affect the indicator

Interventions for the prevention and control of asthma can be expected to influence this indicator.

4.4.8 Cost and policy implications

Measurement of this indicator in population studies has substantial cost implications and would need to form part of a national health measurement survey or, alternatively, a series of local or regional surveys in a well-defined area.

4.4.9 Further development

Substantial development is required to agree on a specific challenge protocol and a methodology for its use in population monitoring and surveillance.

4.5 Rate of asthma-related general practice encounters

4.5.1 Draft operational definition for the indicator

Long title:	**Asthma-related general practice encounters per 100 population**
Short title:	**Rate of asthma-related general practice encounters**
Numerator:	Estimated proportion of general practice encounters where asthma was managed (for designated year) multiplied by the number of claims for Medicare reimbursement for Professional Attendances Group A1 and A2 (for that year). Source: BEACH data and HIC MBS statistics.
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.). Source: ABS estimated resident population data for designated year.

4.5.2 Quality of the indicator

There are no data available about the validity and reliability of this indicator. This may be affected by changing patterns in the prevalence, morbidity and severity of asthma and other conditions treated by GPs and changing patterns in care-seeking, thus making interpretations of any indicator changes problematic. This indicator relies on the accuracy and completeness of BEACH data.

4.5.3 Quality of data

There are low participation rates by GPs (29.8%) in the BEACH program and although post-stratification weighting is used to adjust for differences between the sample and the GP population, the sample may not be representative of general practice and, therefore, data on morbidity may not be an accurate reflection on the current situation in general practice. However, BEACH still remains the most reliable and representative source for this data.

International comparisons

The USA collects data on asthma-related visits to primary care physicians via regular ambulatory care surveys. These data are combined with other utilisation and cost data and used as a measure of the economic cost of asthma. The UK collects information on primary care visits for asthma in order to monitor interventions that reduce or avoid the risk of asthma (Pearson et al. 1999).

4.5.4 Data analysis

Disaggregation of BEACH data is possible by age, sex, ethnicity (English-speaking or non-English-speaking background), socioeconomic status (based on address of residence and SEIFA or personal healthcare card status), and remoteness (based on ARIA).

4.5.5 Timeliness

This indicator can be reported on regularly within 6 months of the close of the annual data collection.

4.5.6 Interpretation

This indicator will be influenced by programs to improve asthma care in the community, including the Asthma 3+ Visit Plan PIP and GP division care plans. It may also be affected by:

- Changes in GP bulk billing behaviour; availability of GPs who bulk bill; and relative accessibility of alternative sources of acute and primary care for asthma (e.g. Emergency Departments; pharmacists; community asthma clinics).
- Changing patterns in the prevalence, morbidity and severity of asthma.
- Changing patterns in other conditions treated by GPs.
- Changing patterns in care seeking.
- Systemic changes that affect the accessibility of GPs and other health care service providers.

Changes to this indicator should be interpreted with these influences in mind and, where possible, this indicator should be considered in context with indicators of prevalence, severity, and other health care utilisation.

The Asthma 3+ Visit Plan, which funds planned review encounters by GPs, encourages patients to seek regular planned care to reduce symptoms and prevent acute exacerbations. Thus, the rate of asthma-related general practice encounters may initially rise, and later fall, if the intervention has the desired effect.

4.5.7 Interventions that may affect the indicator

Programs aimed at improving asthma care in the community, including the Asthma 3+ Visit Plan PIP and GP division care plans.

4.5.8 Cost and policy implications

Currently no major cost or policy implications would occur if this indicator was monitored.

4.5.9 Further development

None.

4.6 NEW program-focused indicator—Rate of structured general practice asthma review visits

4.6.1 Draft operational definition for the indicator

Long title:	**Rate of structured general practice asthma review visits**
Short title:	**Rate of Asthma 3+ Visit Plan payments**
Numerator:	Number of claims for completed Asthma 3+ Visit Plan PIPs.
	Source: HIC health statistics data (from November 2001).
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.).
	Source: ABS estimated resident population data.

This indicator is proposed as a temporary, 'program-focused' indicator looking specifically at the uptake of the Asthma 3+ Visit Plan PIP. The number of Asthma 3+ Visit Plan PIP claims should be measured for the duration of the Plan, with total counts, cumulative counts and rate per 100,000 resident population reported.

4.6.2 Quality of the indicator

This indicator relies on the accuracy and completeness of Medicare claims by general practitioners made for the Asthma 3+ Visit Plan.

4.6.3 Quality of data

The data are based on claims for remuneration for structured asthma review visits made by general practitioners.

4.6.4 Data analysis

Data disaggregated by age and gender is available on the HIC web site. Disaggregation by ethnicity (English-speaking or non-English-speaking background), socioeconomic status (based on address of residence or healthcare card status), and ARIA may also be possible.

4.6.5 Timeliness

This indicator can be reported quarterly, when the data become available on the HIC health statistics web site.

4.6.6 Interpretation

The interpretation of this indicator will be influenced by other activities including:

- Changes in GP bulk billing behaviour.
- Relative accessibility of alternative sources of acute and primary care for asthma (e.g. Emergency Departments; pharmacists; community asthma clinics).
- Changes in the structure of general practice and to the nature of the PIPs.

Changes to this indicator should be interpreted with these influences in mind.

4.6.7 Interventions that may affect the indicator

- GP division care plans.
- Government policy on PIPs.
- Systemic changes that affect the accessibility of GPs and other health care service providers.

4.6.8 Cost and policy implications

No costs will be incurred for measuring this indicator.

4.6.9 Further development

None.

4.7 Hospital re-admissions for asthma within 28 days

4.7.1 Draft operational definition for the indicator

Long title:	**The proportion of people admitted to hospital with asthma who are re-admitted for asthma within 28 days**
Short title:	**Hospital re-admissions for asthma**
Numerator:	Number of people discharged from hospital with a principal diagnosis of asthma (ICD-10-AM J45/J46) who are re-admitted within 28 days to the same hospital with a diagnosis of asthma.
Denominator:	(1) Number of hospital separations for asthma (ICD-10-AM J45/J46) in the year. Source: State hospital inpatient collections. (2) Australian population as at 30 June for same calendar year as numerator (pop.). Source: ABS estimated resident population data.

A supplementary indicator including all ED attendances for asthma within 28 days of hospital discharge will be measured where appropriate data are available.

4.7.2 Quality of the indicator

Validity

There is conflicting evidence as to whether global re-admission rates are an indicator of quality of care. A meta-analysis of re-admissions by Ashton et al. (1997) determined that there is evidence that early re-admission is related to the process of inpatient care. However, about half of the studies in this review failed to show any relationship between quality of care and hospital re-admission.

Planned interventions for *specific* conditions have demonstrated a reduction in re-admissions (Benbassat & Taragin 2000; Madge et al. 1997); and for conditions such as asthma, where there are recommended guidelines for care that have been shown to benefit outcomes, there is evidence that improved patient care results in a reduction in the rate of re-admission (Blais et al. 1998; Madge et al. 1997; Mayo et al. 1990; Sin et al. 2002; Sin & Tu 2001).

Reliability

As for all the hospitalisation (and mortality) indicators, reliability will be influenced by variation in the propensity of attending medical practitioners to diagnose and label people as having asthma.

4.7.3 Quality of data

Data on re-admission to hospital are not currently available in the National Hospital Morbidity Database. As hospital inpatient data collections are based on individual hospital admissions rather than individual patients, calculation of re-admission rates requires either inclusion of a data item in the collection to specify whether the admission is a 're-admission' within 28 days or linkage analysis of multiple admissions for the same patient using patient identifiers (e.g. date of birth and residential address or postcode). Western Australia is currently the only state to use unique patient identifiers, which enables the calculation of re-admission rates to any hospital to be determined without linkage analysis. See also Section 5.2.2.

4.7.4 Data analysis

Disaggregation of data is possible by age (0–4, 5–14, 15–34, 35–64 and 65+ years), all ages plus all children, all adults, sex, state, and geographic. Due to small numbers it may not be possible to disaggregate by country of birth. Disaggregation by Aboriginal and Torres Strait Islander status in some jurisdictions should be interpreted with caution at this stage, as the reliability of collection is variable.

4.7.5 Timeliness

Unknown as re-admissions will need to be calculated by each state. National hospital separations data are generally available one year after the end of the relevant financial year.

4.7.6 Interpretation

This indicator will be used to assess system-wide performance in the care of people who have required hospital care for asthma. The quality of hospital inpatient care, discharge planning and community care for people with asthma will all influence the risk of re-admission.

This indicator may also be spuriously altered by changes in the accessibility of hospital care. In other words, changes in the policies and practices in relation to hospital admission and timing of hospital discharge may affect rates of re-admission. Furthermore, a shift in classification of patients for payment-related purposes may affect the number of admissions and re-admissions attributed to asthma.

4.7.7 Interventions that may affect the indicator

Improvements in the quality of hospital and community care for people with asthma can be expected to have an impact on this indicator.

4.7.8 Cost and policy implications

There will be a cost associated with regular data extraction as re-admission rates are not routinely analysed in most states and territories.

Data extraction will need to be negotiated with individual jurisdictions.

4.7.9 Further development

Further development of this indicator is required. Re-admissions to the same hospital can be identified. A project using New South Wales and Western Australian re-admission data should be undertaken, in order to determine the rate of re-admissions for asthma to different hospitals. Analysis of data from the linked Victorian hospital admissions and Emergency Department attendance dataset should be performed.

Two extensions of this indicator are foreshadowed. First, the numerator would be expanded to include re-attendance at hospital for acute care for asthma. This would include both ED re-attendance and re-admission to hospital. An additional proposed extension is to expand the denominator to include all hospital attendances for asthma. It may be possible to monitor this indicator via the dataset linking Victorian hospital admissions with Emergency Department attendances, developed by the Victorian Department of Health and Human Services. Analyses of these data should be undertaken to investigate the feasibility of monitoring this indicator. It may be possible to commission a similar project in New South Wales. Further work is required to develop indicators and data sources for these extensions of this indicator.

4.8 Hospital separation rate for asthma

4.8.1 Draft operational definition for the indicator

Long title:	**Hospital separations for asthma per 100,000 resident population per year**
Short title:	**Rate of hospital separations for asthma**
Numerator:	Total number of hospital separations from Australian private and public hospitals assigned to a principal diagnosis of ICD-9-CM code 493 or ICD-10-AM code J45 or J46 for a particular calendar year. Source: AIHW Hospital Morbidity data collection.
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.).

For subgroup analysis, the denominator population is that in which persons included in the numerator reside.

4.8.2 Quality of the indicator

Validity

Hospital admissions for asthma occur due to disease exacerbations or periods of poor control. Hence, hospital separations can be considered an appropriate indicator of asthma control and management. A hospital episode is more costly for the individual and the community (Boston

Consulting Group 1992), and it therefore seems reasonable to include hospital separations in estimates of the burden of disease.

There is some evidence in support of construct validity for this indicator. It has been demonstrated that hospital admissions for asthma are related to a range of factors, including severity (Adams et al. 2000; Jalaludin et al. 1998; Rasmussen et al. 2002), non-compliance with treatment regimes (Homer et al. 1996), and demographic factors such as age, sex, ethnicity, education and socioeconomic status (Castro et al. 2001; Chen et al. 2001a; Diette et al. 2002). There is evidence that hospital separations are associated with the quality and nature of primary health care services (Christakis et al. 2001; Griffiths et al. 1997). People are more likely to be hospitalised if they are not receiving medication in accordance with accepted standards (Homer et al. 1996), or if they do not have consistent contact with a regular care provider in the community (Christakis et al. 2001). Admissions to hospital are also more likely in those without an asthma action plan (Adams et al. 2000).

Reliability

As for all the hospitalisation (and mortality) indicators, reliability will be influenced by variation in the propensity of attending medical practitioners to diagnose and label people as having asthma. There has been limited work on 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, and that this accuracy decreases with age (Osborne et al. 1992).

4.8.3 Quality of data

State data collections are compiled from all hospital separations at the level of the hospital. Data are collected from all public general and psychiatric hospitals, private hospitals and private day surgery facilities. A small number of mainly private facilities do not provide data but these vary from year to year. Data are, therefore, largely representative of the population who use hospital services. Data validation is undertaken in conjunction with state data providers.

Completeness of data recording is unknown. All states and territories undertake regular coding audits either at the state or local level (AIHW 2002). Where possible, standard definitions for data items are used.

The quality of coding of asthma diagnoses is unknown. Limited validation has been undertaken.

Changes to coding practice will impact on the quality of this indicator. Validation studies have demonstrated that diagnostic accuracy is higher in younger age groups. The impact of changes to ICD coding is less well studied. A dual coded dataset has been used to quantify age-group-specific comparability factors. These will be incorporated into the analysis of time series extending prior to 1998.

4.8.4 Data analysis

Ages 0–4, 5–14, 15–34, 35–64 and 65+ years, all ages plus all children, all adults, sex, country of birth, SEIFA (but data should be aggregated across the 3 years around the Census, otherwise estimates are unreliable), ARIA.

4.8.5 Timeliness

Data are usually available 12–18 months after the end of the financial year.

4.8.6 Interpretation

A number of issues affecting the interpretation of this indicator have already been alluded to (see Section 3.7.2). Important factors to consider include:

- The difference in interpretation between number of separations and number of individuals who have hospital separations. The total number of separations for small hospitals or areas may be inordinately influenced by multiple admissions by a small number of individuals.
- Changes in hospital admission and discharge policies may have apparently spurious impacts on this indicator.
- The confounding influence of variation in the prevalence of asthma.
- The variable overlap with other indicators of acute health care utilisation for asthma (including ED visits and acute general practice visits).
- Changes to ICD coding have been shown to affect hospital separations.

There are a number of other factors to consider in interpreting the hospital admission data:

- Annual and monthly rates should be examined to investigate seasonal variation.
- Rates for children aged 1–4 years are considerably higher than rates for children aged 5–9 years, therefore, it is recommended that these age groups are presented separately.
- Local area data may be useful for examining local environmental and policy issues. The extent to which these data can be localised will be limited by the precision of the estimates.
- The reliability of coding for Indigenous Australians is uncertain. Any analysis by Aboriginal and Torres Strait Islander status should be undertaken with extreme caution and trend analysis should not be attempted.
- The issue of variation in diagnostic and labelling practices, which has been alluded to elsewhere in this document, also applies to the interpretation of hospital bed utilisation data. In particular, there can be diagnostic overlap with COPD, especially in people aged over 55 years, and with other respiratory conditions in infants.

4.8.7 Interventions that may affect the indicator

Interventions to improve asthma control and reduce severity will impact on hospital separations and patient days.

Availability of care—particularly after-hours care—will impact on hospitalisation rates. This may result in higher hospitalisation rates in regions where choice of after-hours care is limited.

Changing patterns of management in ED and changes to hospital admission criteria will affect hospital separation rates for asthma.

4.8.8 Cost and policy implications

Analysis and reporting of the indicator is a cost.

Encourage the use of age-group-specific comparability factors when looking at data across ICD code conversions.

4.8.9 Further development

Data development is required to investigate whether separations for which asthma is recorded as an additional diagnosis should, under some circumstances, be included in data for asthma separations.

4.9 Number of individuals with separations for asthma

4.9.1 Draft operational definition for the indicator

Long/short title: **Number of individuals with separations for asthma per 1,000 resident population per year**

Numerator: Total number of individuals who had hospital separations from Australian private and public hospitals assigned to a principal diagnosis of ICD-9 code 493 or ICD-10 code J45 or J46 for a particular calendar year.

For geographically-based subgroup analysis, the numerator should be based on the residential address of the index patient.

Denominator : Australian population as at 30 June for same calendar year as numerator (pop.).

For subgroup analysis, the denominator population is that in which persons included in the numerator reside.

4.9.2 Quality of the indicator

See Section 4.8.2. This indicator has the advantage of not being influenced by a small number of individuals who are hospitalised on several occasions in any given year.

4.9.3 Quality of data

See Section 4.8.3.

4.9.4 Data analysis

Ages 0–4, 5–14, 15–34, 35–64 and 65+ years, all ages plus all children, all adults, sex, country of birth, SEIFA (but data should be aggregated across the 3 years around the Census, otherwise estimates are unreliable), ARIA.

4.9.5 Timeliness

Data for hospital separations are usually available 12–18 months after the end of the financial year.

4.9.6 Interpretation

See Section 4.8.6.

4.9.7 Interventions that may affect the indicator

See Section 4.8.7.

4.9.8 Cost and policy implications

Analysis and reporting of the indicator is a cost.

Encourage the use of age-group-specific comparability factors when looking at data across ICD code conversions.

4.9.9 Further development

Data development will be required to establish data linkage models enabling this indicator to be measured. Following further development it is proposed that this indicator is included in the *National Health Data Dictionary*.

4.10 Hospital patient days for asthma

4.10.1 Draft operational definition for the indicator

Long title:	**Hospital patient days attributable to asthma per 100,000 resident population per year**
Short title:	**Hospital patient days for asthma**
Numerator:	**For asthma separations assigned to ICD-9:** Total number of hospital patient days from Australian private and public hospitals assigned to ICD-9 code 493 for a particular calendar year (n). **For asthma separations assigned to ICD-10:** Total number of hospital patient days from Australian private and public hospitals assigned to ICD-10 code J45 and J46 for a particular calendar year (n). Source: AIHW Hospital Morbidity data collection.
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.).

Where the analysis is undertaken for subgroups, it is important that the resident address of the numerator and the denominator populations coincide.

4.10.2 Quality of the indicator

See Section 4.8.2.

4.10.3 Quality of data

See Section 4.8.3.

4.10.4 Data analysis

Ages 0–4, 5–14, 15–34, 35–64 and 65+ years, all ages plus all children, all adults, sex, country of birth, SEIFA (but data should be aggregated across the 3 years around the Census, otherwise estimates are unreliable), ARIA.

4.10.5 Timeliness

Data are usually available 12–18 months after the end of the financial year.

4.10.6 Interpretation

See Section 3.7.2 where differences in the interpretation of separations and patient days are described. This data indicator combines information on length of stay and separation rate. It can be interpreted as an indicator of the overall hospitalisation-related burden of asthma for a given period and location. In comparison with the separation rate, it is less susceptible to variation in policy and practice in relation to the admission of people with mild–moderate asthma. On the other hand, it should not be interpreted as an indicator of the rate of acute exacerbations of asthma. Factors influencing access to hospital admission and duration of hospital stay for people with exacerbations of asthma will influence this indicator.

4.10.7 Interventions that may affect the indicator

Interventions designed to improve asthma control and the management of asthma in the community will influence this indicator.

4.10.8 Cost and policy implications

See Section 4.8.8.

4.10.9 Further development

None.

4.11 Death rate for asthma among persons aged 5–34 years

4.11.1 Draft operational definition for the indicator

Long title:	**Age-standardised mortality rate for asthma in people aged 5–34 years**
Short title:	**Death rate for asthma, ages 5–34 years**
Numerator:	**For deaths assigned to ICD-9:**
	Total number of deaths in Australia assigned to ICD-9 code 493 as underlying cause of death for a particular calendar year (n).
	For deaths assigned to ICD-10:
	Total number of deaths in Australia assigned to ICD-10 code J45 and J46 as underlying cause of death for a particular calendar year (n).
	Source: AIHW National Mortality Data Collection.
Denominator:	Australian population as at 30 June for same calendar year as numerator (pop.).
	Source: ABS.

4.11.2 Quality of the indicator

Validity

There is some evidence in support of construct validity for this indicator. Asthma deaths have been associated with changes in management, under-treatment or poor compliance with treatment (Bucknall et al. 1999), and a range of demographic factors including age, ethnicity (Castro et al. 2001; Grant et al. 2000), socioeconomic status (Castro et al. 2001; Volmer 2001) and rural residence (Jones & Bentham 1997). Reduced risk of death has been observed in people taking regular inhaled corticosteroids (Sin & Tu 2001).

Reliability

The reliability of this indicator will be influenced by variation in the propensity of attending medical practitioners to diagnose and label people as dying from asthma. Validation studies of asthma deaths coded on death certificates reveal that adult deaths from asthma are under-enumerated (Guite & Burney 1996; Hunt et al. 1993; Smythe et al. 1996) or over-enumerated (Jones et al. 1999; Sears et al. 1986b; Sidenius et al. 2000). It is generally considered that asthma diagnosis is fairly unambiguous in people under age 45 years and coding is, 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, multiple factors complicate the coding and results are less reliable (Jones et al. 1999; Sidenius et al. 2000; Smythe et al. 1996). In addition, coding changes are known to affect death certification considerably, but the extent to which diagnostic fashion affects death certification is less well studied.

4.11.3 Quality of data

- The data set is considered nearly complete, as the registration of deaths is a legal requirement in Australia.
- There is probably under-enumeration of Aboriginal and Torres Strait Islander Australians in several states.

Australians who die overseas are not included in the statistics.

4.11.4 Data analysis

- Disaggregation by sex, geographic location, country of birth, SEIFA (but data should be aggregated across the 3 years around the Census, otherwise estimates are unreliable), ARIA.
- Caution is advised when using the Aboriginal and Torres Strait Islander status variable. For 1990 and later years data for South Australia, Western Australia and the Northern Territory can be considered sufficiently reliable for analysis. Queensland can be used from 1998 onwards. Trend analysis of Aboriginal and Torres Strait Islander status data should be avoided.
- Small group/area analysis will be limited by the small size of resulting data cells.

4.11.5 Timeliness

There is a lag in processing of death registrations, with approximately 5% of deaths in any calendar year being registered in the following year. Therefore, the statistics relate to the number of deaths registered rather than those that actually occurred. A variable for year of death is included in the data set and it is preferable to report by year of death in public health settings as this is a more accurate reflection of population incidence.

4.11.6 Interpretation

Variation in mortality rates between population groups and over time may be attributable to variation in the prevalence of asthma, as well as variation in case fatality rates. To use this indicator for assessing case fatality rates, analysis adjusting for variation in the prevalence is required. Changes to ICD coding have been shown to affect asthma mortality data. This indicator may be affected by variation diagnostic and labelling fashion.

4.11.7 Interventions that may affect the indicator

Interventions to improve asthma control, prevent exacerbations and improve asthma management will have an impact on this indicator.

4.11.8 Cost and policy implications

Analysis and reporting of the indicator is a cost.

Encourage the use of conversion factors when looking at time series data that spans ICD code conversions.

4.11.9 Further development

Validation of coding accuracy in all ages and particularly in older age groups.

Evaluation of asthma listed as one of multiple causes of death, rather than principal cause of death.

4.12 NEW supplementary indicator—Death rate for asthma among persons of all ages

4.12.1 Draft operational definition for the indicator

Long title:	**Age-standardised mortality rate for asthma in people of all ages**
Short title:	**Death rate for asthma, all ages**
Numerator:	**For deaths assigned to ICD-9:**
	Total number of death occurrences in Australia assigned to ICD-9 code 493 as underlying cause of death for a particular calendar year (n).

For deaths assigned to ICD-10:

Total number of death occurrences in Australia assigned to ICD-10 code J45 and J46 as underlying cause of death for a particular calendar year (n).

Source: AIHW National Mortality Data Collection.

Denominator: Australian population as at 30 June for same calendar year as numerator (pop.).

Source: ABS

4.12.2 Quality of the indicator

See Section 4.11.2.

4.12.3 Quality of data

See Section 4.11.3.

4.12.4 Data analysis

- Disaggregation by ages 0–4 years, 5–34 years, 35–64 years and all ages, sex, geographic location, country of birth, SEIFA (but data should be aggregated across the 3 years around the Census, otherwise estimates are unreliable), ARIA.
- Caution is advised when using the Aboriginal and Torres Strait Islander status variable. For 1990 and later years data for South Australia, Western Australia and the Northern Territory can be considered sufficiently reliable for analysis. Queensland can be used from 1998 onwards. Trend analysis of Aboriginal and Torres Strait Islander status data should be avoided.
- Small group/area analysis will be limited by the small size of resulting data cells.

4.12.5 Timeliness

See Section 4.11.5.

4.12.6 Interpretation

- The numerator should be adjusted for age-group specific comparability factors across ICD-9 to ICD-10 changes as follows: 1.0 (i.e. no conversion) for those aged <35 years; 0.84 for those aged 35–64 years, and 0.68 for those aged 65+ years.
- The attribution of death to asthma is subject to inaccuracy in persons aged greater than 45 years and most deaths from asthma occur at older ages.
- Variation in mortality rates between population groups and over time may be attributable to variation in the prevalence of asthma, as well as variation in case fatality rates. To use this indicator for assessing case fatality rates, analysis adjusting for variation in the prevalence is required.

4.12.7 Interventions that may affect the indicator

See Section 4.11.6.

4.12.8 Cost and policy implications

See Section 4.11.7.

4.12.9 Further development

Validation of coding accuracy in all ages and particularly in older age groups.

Evaluation of asthma listed as one of multiple causes of death, rather than principal cause of death.

4.13 Prevalence of smoking in people with asthma

4.13.1 Draft operational definition for the indicator

Long title:	**Prevalence of people with asthma who smoke any tobacco product at least weekly**
Short title:	**Prevalence of smoking in people with asthma**
Numerator:	The number of people aged 18 years and over who have asthma and who smoke any tobacco product weekly or more frequently. Source: Uncertain.
Denominator:	Current prevalence of asthma among people aged 18 years and over (see prevalence indicators in Sections 4.1 and 4.2). Source: State CATI surveys (from 2002).

4.13.2 Quality of the indicator

Self-reported smoking status is often used to measure prevalence and assess the effects of smoking in population health surveys, and this comes with questions concerning the validity and reliability of self-reported data. Exposure to cigarette smoke can be assessed via biological markers. Cotinine is the primary breakdown product of nicotine, and smoking status via self-report has been validated against serum cotinine (Caraballo et al. 2001; Vartiainen et al. 2002), and nicotine and cotinine levels in hair (Eliopoulos et al. 1996). These studies report that self-reported smoking status is generally reliable and accurate and reported cigarette consumption correlates well with cotinine levels.

4.13.3 Quality of data

Numerator data source

The data source for the numerator has not been identified at this stage.

Denominator data source

The nation-wide state Computer Assisted Telephone Interview (CATI) surveys are feasible nation-wide sources of data for the denominator. The general attributes of these surveys are described in Section 5.4. Features specifically relevant to collection of prevalence data for the denominator are discussed under 'Prevalence' (Sections 4.1 and 4.2).

4.13.4 Data analysis

Small numbers may limit the data disaggregation to age and sex, state, rural and remote status (ARIA) and socioeconomic status (SEIFA). Due to small numbers, data for country of birth and people who identify as Aboriginal or Torres Strait Islander origin may need to be aggregated over a number of years.

4.13.5 Timeliness

State health survey data can be turned around within about 12–18 months, although many states are moving to a continuous data collection model which will enable a faster turnaround time for data availability.

4.13.6 Interpretation

Specific issues will be identified when a data source is finalised.

4.13.7 Interventions that may affect the indicator

Programs aimed at reducing smoking, particularly in people with asthma.

4.13.8 Cost and policy implications

None known.

4.13.9 Further development

It will be necessary to identify surveys in which the NHDD definition for smoking status is applied and the definition for current asthma is also applied concurrently. Following further development it is envisaged that this indicator will be submitted for inclusion in the NHDD.

4.14 Prevalence of smoking in the household where children with asthma reside

4.14.1 Draft operational definition for the indicator

Long/short title:	**Prevalence of smoking in the household where children with asthma reside**
Numerator:	The number of people aged less than 15 years with (a) current asthma or (b) wheeze in the previous 12 months and who live in a household where one or more regular smokers (see NHDD definition) resides. Source: Uncertain.
Denominator:	The number of people aged less than 15 years with (a) current asthma or (b) wheeze in the previous 12 months (see prevalence definitions). Source: State CATI surveys (from 2002).

4.14.2 Quality of the indicator

As with measurement of smoking status, most exposure to environmental tobacco smoke (ETS) in children is self-reported (in older children) or reported by a caregiver on behalf of a child. There are a number of studies that have validated exposure to ETS with biological markers such as cotinine and nicotine in blood, hair and urine. However the reliability of parental reporting of exposure is uncertain. Kohler et al. (1999) report that a third of parents understated or even withheld the truth about their child's passive smoke exposure. Similar results were found by Peterson et al. (1997), and Margolis et al. (1997) reports very little correlation between parental report of exposure and urinary cotinine measurements. Other studies report a good correlation between reported cigarette consumption and biomarkers of exposure (Al-Delaimy et al. 2002; Oddoze et al. 1999; Seifert et al. 2002).

4.14.3 Quality of data

No identified data source.

4.14.4 Data analysis

Children aged 0–15 years by age group, SEIFA, ARIA, country of birth/ethnicity, Aboriginal and Torres Strait Islander status.

4.14.5 Timeliness

No identified data source.

4.14.6 Interpretation

No identified data source.

4.14.7 Interventions that may affect the indicator

Interventions to reduce smoking and reduce passive smoking will result in a reduction in the number of children exposed.

4.14.8 Cost and policy implications

There will be a cost associated with establishing a regular question module in state or national data collections.

4.14.9 Further development

There is a need to establish a method of measuring childhood exposure to environmental tobacco smoke that has acceptable validity and is feasible to measure in large-scale studies.

4.15 Prevalence rate for asthma initiated (caused) by occupational exposure

4.15.1 Draft operational definition for the indicator

Long title:	**Prevalence rate for asthma initiated (caused) by occupational exposure**
Short title:	**Prevalence of occupational asthma**
Numerator:	The total number of asthma cases attributed to exposure at work at a given time within the survey population.
	Source: Local, state collections of occupational asthma prevalence data.
Denominator:	Denominator populations for the two surveys.
	Source: Survey populations.

4.15.2 Quality of the indicator

The problems in the interpretation of prevalence data for occupational asthma are discussed in Section 3.14.2.

4.15.3 Quality of data

There is no ongoing data source for reporting on this indicator. Various ad hoc collections will provide some data to report on the prevalence of occupational asthma at the present time. Data obtained from cross-sectional surveys will provide the opportunity for direct comparisons on the prevalence of occupational asthma in Australia and other countries.

An evaluation of these data is provided in Section 5.8 (Other data sources). There is a potential for selection bias arising from low response rates in both surveys. The method of attribution of asthma is indirect. There is no definite intention to establish a time series.

4.15.4 Data analysis

Analysis by industry and occupational group is most relevant. However, other disaggregations may also be relevant including age group, gender, socioeconomic status and English-speaking versus non-English-speaking background.

4.15.5 Timeliness

Data are presently available. However, there are no definite plans for further collection of data, which would enable the establishment of a time series.

4.15.6 Interpretation

Prevalence surveys are based on self-reporting and there are only data from one point in time, with nothing to compare them to.

4.15.7 Interventions that may affect the indicator

Occupational health and safety policies designed to prevent occupational sensitisation and asthma would be expected to influence this indicator.

4.15.8 Cost and policy implications

If further collections of prevalence data are to be conducted, there will be a cost involved.

The establishment of a mandatory notification scheme or attempts to improve the response rates for the voluntary schemes already in place would incur costs.

4.15.9 Further development

Data development is required to enhance the currently available data on the incidence of occupational asthma.

4.16 Proportion of people with asthma who have a recent, written asthma action plan, developed in consultation with a health professional

4.16.1 Draft operational definition for the indicator

Long title:	**Proportion of people with asthma who have a written, recent asthma action plan, developed in consultation with a health professional**
Short title:	**Proportion of people with asthma with an asthma action plan**
Numerator:	Number of people with asthma ('Current asthma', see Section 4.2) who have an individualised, written asthma action plan, incorporating information on how to recognise the onset of an exacerbation of asthma and information on what action to take in response to that exacerbation, developed in consultation with a health professional. Source: State health surveys (CATI data).
Denominator:	Total population of people with asthma ('Current asthma', see Section 4.2). Source: State health surveys (CATI data)

This indicator could also be measured using data from the BEACH and SAND data collections as well as the National Health Survey. However, in all cases it would be necessary to specify a different criterion for the diagnosis of asthma.

4.16.2 Quality of the indicator

Validity of the indicator

Face validity: The indicator has face validity. Questions about AAPs have been used in other surveys (e.g. the National Health Survey).

Content validity: Inclusion of the four essential elements listed above contributes to the content validity of this proposed definition.

Reliability of the indicator

Although this has not been formally evaluated, there have been consistent and sensible results obtained from previous surveys (e.g. the National Health Survey) that used the following three questions:

1 Do you have a written AAP?

2 Did you get this action plan from a doctor/nurse/chemist/other?

3 Is your action plan similar to this? (Interviewees are then shown an example of an AAP recommended by the National Asthma Council which includes name, date, best peak flow

and then separate sections labelled asthma under control, asthma getting worse, asthma is severe, and emergency).

4.16.3 Quality of data

The nature and quality of the surveys and other data sources proposed for this indicator are described in Chapter 5 (Data source review).

SAND data on this indicator may be biased due to the Hawthorne effect (i.e. the reporting GPs may be influenced to provide AAPs by the survey itself). Hence, it may be necessary to ask these questions retrospectively, with a question such as 'before this visit, did the patient have a written asthma action plan?'.

4.16.4 Data analysis

Disaggregation is possible by age, sex and SEIFA. Country of birth and Aboriginal and Torres Strait Islander status numbers are probably too small, but there is the option of aggregating these data over a longer time frame.

BEACH data will allow disaggregation into age, sex, SEIFA and Remote and Rural category. SAND data will allow the further disaggregation into levels of severity of asthma.

4.16.5 Timeliness

National Health Survey data will be available within a year of finishing data collection, but the survey is only undertaken every 3 years.

CATI data are usually reported approximately 12 months after data collection is finished but with most states moving to a continuous program, data may be available sooner.

4.16.6 Interpretation

The interpretation of this indicator will depend on which elements of the proposed operational definition are used in the data collection. There are no existing data that allow the content of the plan to be assessed (3rd and 4th elements of the proposed definition). Hence, measurements based on the existing available data should be interpreted with caution as they may refer to a diverse range of AAPs.

4.16.7 Interventions that may affect the indicator

The uptake of the Asthma 3+ Visit Plan will influence the proportion of people with an AAP.

Any campaign or intervention that promotes the use of an AAP will affect the indicator.

4.16.8 Cost and policy implications

If questions for a SAND module need to be compiled, there will be a cost involved.

If extra questions are required to determine whether the AAP contains the four essential elements described, costs will be incurred.

4.16.9 Further development

Data development is recommended to enhance this indicator by incorporating the 3rd and 4th essential elements into future questionnaires.

4.17 The proportion of people with asthma who have had spirometry measurements in the last 12 months

4.17.1 Draft operational definition for the indicator

Long title:	**The proportion of people with asthma who have had spirometry measurements in the last 12 months**
Short title:	**Proportion of people with asthma who have had recent spirometry**
Numerator:	Number of claims for spirometry in a given year for people with asthma.
	Source: Uncertain.
Denominator:	Total number of people with asthma.
	Source: National Health Survey, State CATI surveys.

4.17.2 Quality of the indicator

At present the indicator is not measurable in the recommended form. Data on MBS claims for the performing spirometry are available but it is not possible to separately identify the occasions of service for the performance of spirometry in people with asthma.

4.17.3 Quality of data

No identified data source.

4.17.4 Data analysis

No identified data source.

4.17.5 Timeliness

No identified data source.

4.17.6 Interpretation

No identified data source.

4.17.7 Interventions that may affect the indicator

The uptake of the Asthma 3+ Visit Plan may affect the indicator.

4.17.8 Cost and policy implications

If a SAND module attached to the BEACH data collection needs to be designed, there will be a cost involved.

4.17.9 Further development

Identification (or development) of a data source that is able to separate out spirometry performed for the assessment of asthma as opposed to other respiratory conditions.

4.18 Program-focused indicator—Proportion of schools using a nationally accredited asthma education program (the Asthma Friendly Schools program)

4.18.1 Draft operational definition for the indicator

Long title:	**The proportion of schools using a nationally accredited asthma education program**

Short title:	**Proportion of schools using the Asthma Friendly Schools program**
Numerator:	Number of schools recognised as using the Asthma Friendly Schools program.
	Source: Asthma Australia/Australian Department of Health and Ageing.
Denominator:	Total number of schools in Australia.
	Source: Australian Department of Health and Ageing.

The proportion of students in Australia using the Asthma Friendly Schools program should also be monitored. The draft operational definition for this indicator is:

Long definition:	**The proportion of students in schools using a nationally accredited asthma education program**
Short definition:	**Proportion of students using the Asthma Friendly Schools program**
Numerator:	Number of students in schools recognised as using the Asthma Friendly Schools program.
	Source: Asthma Australia/Australian Department of Health and Ageing as well as the state departments of education.
Denominator:	Total number of students in Australian schools.
	Source: The state departments of education.

4.18.2 Quality of the indicator

The number of schools using the program may be overestimated if the check-listing of essential criteria is not strict (e.g. there is no cross-checking of the essential criteria having been fulfilled by the school). Most states do perform rigorous cross-checking.

Validity of the indicator

Face validity: The data will provide a count of the schools listed as being registered in the Asthma Friendly Schools program, which may or may not be equivalent to the number of schools 'using' a nationally accredited asthma education program.

Content validity: We are only able to measure the number of schools recognised as being Asthma Friendly. The effect this has on asthma outcomes, asthma knowledge, self-management and providing a safe environment for people (in particular, children) with asthma is not directly extractable from these data. If the aims of the Asthma Friendly Schools program are met, the indicator will fulfil the purpose for which it was developed. Providing only a cumulative count of the schools registered in the Asthma Friendly Schools program will not necessarily fulfil the intent of this indicator.

Criterion validity: The program is currently being evaluated by Professor Shane Thomas and associates of La Trobe University, who have been contracted to evaluate both the impact and the qualitative aspects of the program. The peer-led education program, which is offered as one of the alternative curriculum programs for secondary schools in the Asthma Friendly Schools Project, has been evaluated (Shah et al. 2001). It was shown that an overall improvement in quality of life and activities was observed in children who participated in the program when compared to children who did not participate in the peer-led program.

Reliability of the indicator

This has not yet been evaluated.

4.18.3 Quality of data

All schools are targeted. The data are recorded at state level by the individual Asthma Foundations after a follow-up to check that the essential criteria have been met. There are

differences in the way compliance with the criteria for accreditation is assessed. While Asthma Foundations in some states require evidence to support the claim that the accreditation criteria have been met, in other states accreditation is awarded on the basis of the signed statement of compliance from the school principal.

4.18.4 Data analysis

The proportion of schools will be disaggregated into primary, secondary or primary/secondary schools as well as Government, Catholic or Independent schools.

The proportion of students receiving asthma education will be disaggregated by the level of school they are attending (primary, secondary or primary/secondary) as well as by the type of school they are attending (Government, Catholic or Independent).

Individual schools will be disaggregated by ARIA classification.

Schools and students will also be analysed by state, since there have been slight variances in the rollout of the Asthma Friendly Schools program in each state due to differences in the time frames and methods of approaching the schools.

4.18.5 Timeliness

Previous year, possibly 6 months.

4.18.6 Interpretation

Once most of the schools are registered in the program, the cumulative frequency will plateau out. After this time it may be important to consider how many schools are registering or renewing their registration in the Asthma Friendly Schools program.

4.18.7 Interventions that may affect the indicator

Depends on ongoing support for the Asthma Friendly Schools program or equivalent.

4.18.8 Cost and policy implications

Staff training is organised to coincide with staff meetings etc. in order to make efficient use of time. There may be costs incurred by the school for the purchase of asthma first aid equipment, if the Asthma Foundation does not provide them.

4.18.9 Further development

The proportion of pre-schools, childcare centres and hospitals using nationally accredited asthma education programs is recommended for data development and monitoring in the future, when accredited programs have been implemented at a national level.

4.19 Proportion of people with asthma who have been woken from sleep due to their asthma symptoms

4.19.1 Draft operational definition for the indicator

Long title:	**Proportion of people with asthma who have been woken from sleep due to their asthma symptoms**
Short title:	**Proportion of people woken at night due to their asthma**
Numerator:	Number of people with asthma who have been woken from sleep due to asthma symptoms in the preceding week. Source: Unknown.
Denominator	Number of people with asthma. Source: Depends on numerator source.

4.19.2 Quality of the indicator

Nocturnal asthma symptoms are frequently used as a measure of disease severity. The National Asthma Education and Prevention Program expert panel II recommends the use of the frequency of nocturnal asthma awakenings as a central feature in the classification of the severity of asthma (NAEPP 1997). Other variables included in the recommendations are the frequency of asthma exacerbations and symptoms during the day, the degree of activity limitation due to asthma as well as physiologic measures of lung function. The guidelines state that the presence of only one of the severity features for a category is sufficient to place the patient in that category. For example, a person can be classified as having severe persistent asthma based solely on the presence of frequent night-time symptoms. Colice et al. (1999) applied the NAEPP recommendations for asthma severity to a group of 1,429 people with asthma and reported that overall categorisation was largely determined by the presence and frequency of nocturnal asthma symptoms.

Morris et al. (1996) calculated Kappa statistics for the test-retest reliability of questions in the severity module of the Monash Respiratory Questionnaire regarding nocturnal asthma. The question 'how often have you been woken from sleep by an attack of asthma in the last 12 months?' showed 'good' reproducibility, while the question 'how often have you been woken from sleep by an episode of wheezing in the last 12 months?' demonstrated 'excellent' reproducibility.

There are significant associations between the severity of asthma symptoms and the presence of nocturnal asthma. People with nocturnal asthma (defined as waking at night due to asthma at least once per month for the previous 6 months) have been shown to have significantly higher ($p<0.0001$) mean severity scores than those without nocturnal asthma (Fix et al. 1997).

The presence of nocturnal symptoms has also been linked with a significant increase in the number of sick absences, emergency room visits and the risk of hospitalisation (Ng 2000).

It is important to specifically ask about the presence of nocturnal symptoms since it has been shown that people often do not spontaneously report waking at night due to their asthma (Meijer et al. 1995).

4.19.3 Quality of data

No identified data source.

4.19.4 Data analysis

No identified data source.

4.19.5 Timeliness

No identified data source.

4.19.6 Interpretation

No identified data source.

4.19.7 Interventions that may affect the indicator

Interventions aimed at improving the management of asthma in the community would be expected to have an impact on this indicator.

4.19.8 Cost and policy implications

There will be a cost associated with the establishment of questions that specifically address the operational definition on the nocturnal asthma indicator if they are to be included in regular data collections at the state or national level. For example, the current question in the New South Wales health survey relating to nocturnal asthma is: 'How many nights in the last month has your sleep been disturbed by your asthma?' This would need to be revised to be able to

report on the draft operational definition, which is the 'number of people with asthma who have been woken from sleep due to asthma symptoms in the preceding week'.

4.19.9 Further development

Further development of this indicator is required prior to a decision on whether or not to recommend this for the *National Health Data Dictionary*. In addition, it is proposed to develop a broad-based index of asthma control for use as an indicator.

5 Data source review

There are a considerable number of national, state and local data sets that collect information on asthma. However, in many cases the data collected are not suitable for asthma monitoring for a range of reasons (e.g. a lack of comparability due to the use of different definitions, absence of a suitable time series, or lack of relevance for monitoring of any of the indicators in the current set). Identifying data sources and making a decision regarding their suitability for asthma monitoring were therefore of primary importance. Initially, once a data source was identified, it was then aligned with the indicator(s) that it may be able to monitor. Following this the data were described (Table 5.1), and then an assessment of the data was made on the basis of a set of identified criteria (Table 5.2).

Table 5.1: Preliminary criteria for data description

Criteria	Description
Asthma definition	Factors used to determine an asthma case
Coverage	Are data available for local area, state, nationally?
Population	Target population for the study
Sample size	Size of the sample in the study
Sampling method	Method for selecting population
Frequency/year of study/survey/time series available	When the study was conducted and how often, to give an indication of availability of time series data
Completeness of data	Response rate
Disaggregation	Age, sex, Aboriginal and Torres Strait Islander status, ethnicity, socioeconomic status (SEIFA), geographic area (ARIA)

Note: Based on criteria developed by the Public Health Information Development Unit for the Nationwide Chronic Disease and Associated Risk Factor Information and Monitoring System.

Table 5.2: Preliminary criteria for data source assessment for use in asthma monitoring

Criteria	Description
Availability	Willingness of data source custodians to participate in a monitoring system for asthma
Completeness of data	Proportion of all people with asthma who are identified by the data source
Representativeness	Whether the people with asthma in the data source are representative of people with asthma in the population
Timeliness	Time taken from data collection to data availability and the availability of time series data for trends

Note: Based on monitoring criteria developed by Klaucke et al. 1988 for evaluating public health surveillance.

This chapter provides an assessment of the status of asthma indicators and the main data sources that are available for their reporting and monitoring. Limitations of the data are presented and, where applicable, issues regarding availability or the lack of availability. The information in this chapter is collated from consultations held with individuals and state and national data custodians.

5.1 National Mortality Database

One recommended asthma indicator is based on the Australian death data:

- age-standardised death rate for asthma among persons aged 5–34 years.

A further, related indicator, has been proposed:

- age-standardised death from asthma among persons of all ages.

Mortality from asthma is a rare event and asthma deaths have been progressively declining over the last decade. Changes in mortality attributed to asthma may reflect changes in prevalence, disease severity, treatment, and/or diagnostic fashion. Changes in ICD coding over the years have also been reflected in asthma mortality statistics. There can be diagnostic confusion with chronic obstructive pulmonary disease (COPD) at ages where this disease is prevalent and, for this reason, diagnosis of death from asthma is deemed most certain in the ages 5–34 years. This age range is commonly used for international comparisons of mortality rates attributable to asthma. However, this age range excludes most asthma deaths since the majority of asthma deaths occur in the elderly.

Registration of deaths is the responsibility of individual state and territory Registrars of Births, Deaths and Marriages. Information on 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. Other details about the deceased are provided by a relative or other person associated with the deceased, or by an official from the organisation where the death occurred. The forms on which this information is recorded form the basis of data provided by Registrars to the Australian Bureau of Statistics (ABS), for compilation into the aggregate statistics that comprise the National Mortality Database (ABS 2002c).

In Australia, the registration of deaths is a legal requirement and for this reason the data set is considered nearly complete, although there may be under-identification of Aboriginal and Torres Strait Islander Australians. The statistics include all deaths registered in Australia during the registration year, including those whose usual place of residence is overseas. Australians who die overseas are not included in the statistics (ABS 2002c). The ABS-published data on deaths does not include deaths in Australian waters, whereas the data set held at the AIHW includes deaths on Australian soil and in Australian waters (AIHW 2001).

From 1979 until 1 January 1999, deaths were coded according to the International Classification of Diseases version 9 (ICD-9). Deaths registered from 1 January 1999 were coded using ICD-10. Deaths occurring during 1997 and 1998 were coded using both versions of the ICD in order to quantify the impact of the change on the data.

The second recent major change to coding of mortality data in Australia occurred in 1997, with the introduction of automated coding. The use of automated coding for mortality data allows for the production of multiple causes of death, improved consistency of coding, and enhanced international comparability in mortality statistics (ABS 2001b). The dual coding of data from 1997 means that a time series is available from the introduction of automated coding, and there is only a single break in the time series resulting from the changeover from ICD-9 to ICD-10.

An analysis of the dual coded mortality data for asthma demonstrates that it is one of the conditions most affected by the change from ICD-9 to ICD-10, with an overall comparability factor of 0.75 (ABS 2002c). An analysis by ACAM of dual coded data (provided by the AIHW Population Health Unit) demonstrates that there is marked age dependence in the comparability factors. There is virtually no impact of the coding change below age 35 years. However, above this age there is a progressively greater change: fewer deaths are coded to asthma in the older age groups in ICD-10 than would have been coded to asthma in these age groups using ICD-9.

There are several other factors that need to be considered in interpreting the asthma mortality indicator.

- There is a lag in processing of death registrations, with approximately 5% of deaths in any calendar year being registered in the following year (ABS 2002c). The statistics relate to the number of deaths registered rather than those that actually occurred. A variable for year of death is included in the data set and it is preferable to report by year of death in public health settings as this is a more accurate reflection of population incidence.
- The identifier for Aboriginal and Torres Strait Islander Australians is not reliable in all states. The ABS advises that for 1990 and later years, data for South Australia, Western Australia and the Northern Territory can be considered sufficiently reliable for analysis. Also, Queensland can be used from 1998 onwards. In addition, the Aboriginal and Torres Strait Islander identifier changed in 1998, from dichotomous (Indigenous/non-Indigenous) to separate identification of Aboriginal and Torres Strait Islander Australians.
- Occupation is not useful for examining associations between occupation and asthma, as only the last occupation is recorded, not lifetime employment history. In addition, the reliability of responses is unknown.

5.2 National Hospital Morbidity Database and the state Health Department hospital databases

Two asthma indicators are based on hospital separations data:

- rate of hospital separations for asthma
- rate of hospital re-admissions for asthma within 28 days.

An additional, related hospital utilisation indicator has been proposed:

- rate of hospital patient days for asthma.

5.2.1 Hospital separations and patient days

Hospital separation rate provides some insight into the severity of asthma, and if patient days and length of stay are also examined, can provide information that would contribute to an estimate of the economic cost of asthma.

Hospital separations data are available at the hospital, state or national level. In all states and territories administrative and clinical patient data are collected and collated at the institutional level. These data are then aggregated by the various state and territory health departments. In addition to this the data from each agency are sent to the AIHW which maintains a national hospital separations database—the National Hospital Morbidity Database (NHMD).

The NHMD includes data relating to people admitted in almost all hospitals: public and private acute hospitals, public and private psychiatric hospitals, and private free-standing day hospital facilities. Virtually all public and most private hospitals are included—with the exception of a few free-standing day care facilities—although the number and type of hospitals included and missing has varied over the years (AIHW 2002). Hospitals outside the jurisdiction of a state or territory health authority are also excluded (such as hospitals operated by the Department of Defence or Correctional Services).

The NHMD includes patient level data that are based on the annually updated National Minimum Dataset for Admitted Patient Care (AIHW 2002). There are no unique patient identifiers attached to data items in this data source. Records are included for each separation,

not for each patient, so anyone who is admitted more than once in the year will contribute more than one record. In addition, people admitted in one year but separated in another will be included for the year in which they separated. Demographic, administrative and length of stay data are included, along with diagnostic information.

Hospital data are currently coded using the ICD-10 Australian Modification (ICD-10-AM). Prior to this, hospital data were coded using a clinical modification of ICD-9 (ICD-9-CM). From 1 July 1998 New South Wales, the Northern Territory, Victoria and the Australian Capital Territory used ICD-10-AM, but the changeover did not happen in the remaining states until 1 July 1999. A small sample of hospitalisations was subject to a dual coding analysis for the financial year 1995–96. Analysis of these data by ACAM has demonstrated an age trend in the comparability between ICD-9-CM and ICD-10-AM data. Similarly to the mortality data, the coding change had little impact on the classification of hospitalisations for asthma in people aged less than 35 years. At older ages, ICD-9-CM greatly overestimates hospitalisation rates for asthma compared to ICD-10-AM.

There are several other issues that should be noted in relation to hospitalisation data for asthma. Transfers between hospitals result in more than one 'separation' for the episode of care. As the NHMD contains a record for each separation this may result in an overestimation of separations for asthma. 'Mode of separation' data could be used to correct for this although this has not been validated, and nationally there are usually around 20,000 more separations with a mode of separation of transfer than there are with a mode of admission of transferred (N Grayson, AIHW pers. comm., 14 August 2002). NHMD data are reported by financial year, as that is how it is collected and provided in the jurisdictions. However, for epidemiological analyses it is often more useful to report by calendar year. The conversion from financial year to calendar year basis will result in the following breaks in ICD coding:

- 1994 to first half of 1998:
  - ICD-9-CM all states and territories;
- second half of 1998 to first half of 1999:
  - ICD-9-CM for Queensland, South Australia, Western Australia and Tasmania
  - ICD-10-AM for New South Wales, Victoria, the Northern Territory and the Australian Capital Territory;
- second half of 1999 to 2000:
  - ICD-10-AM all states and territories.

Data quality

Data are validated in conjunction with data providers. Data that are supplied using non-standard definitions or classifications are mapped to current *National Health Data Dictionary* (NHDD) definitions where possible.

Whilst NHDD definitions form the basis of the NHMD, actual definitions used by data providers may vary from year to year. The AIHW recommends that comparisons between states and territories, reporting years and hospital sectors are made with caution.

The variable for Aboriginal and Torres Strait Islander Australians is not very reliable due to problems with identification of status. For 1998–99 and earlier years, the data should be analysed with extreme care. For 1999–2000 only data for the Northern Territory and South Australia are considered acceptable, and for 1998–99 only data for the Northern Territory, South Australia and Western Australia are acceptable.

Due to problems with the reliability of the country of birth codes in the hospital morbidity data, country of birth is only available for 1996–97 and subsequent financial years.

5.2.2 Hospital re-admissions

Data on re-admission to hospital is not currently available in the NHMD. As hospital inpatient data collections are based on individual hospital admissions rather than individual patients, calculation of re-admission rates requires either inclusion of a data item in the collection to specify whether the admission is a 're-admission' within 28 days or linkage of multiple episodes by the same patient using patient identifiers.

Each patient is assigned a **medical record number** at the time of first admission to a hospital. This potentially allows rates of re-admissions to the same hospital to be determined. Patients who are admitted to one hospital and then re-admitted to another hospital cannot be identified without identifying information to link the admissions. Some states, territories or regional health services have systems to uniquely identify patients across different hospital facilities, and there is a national move toward more unique patient identifiers. Most state and territory data sets contain an **'unplanned re-admission flag'** which is currently reported by the admission clerk based on self-reported information about past hospital admission in the last 28 days, obtained at the time of admission.

Re-admission rates across areas and states have been calculated using state data sets and probabilistic linkage techniques, which require patient identifiers (including date of birth, residential address or postcode and sex). In New South Wales, the Health Department has been routinely undertaking probabilistic record data linkage for some time and, more recently, Victoria has used similar techniques to calculate re-admission rates for health services. The probabilistic model reduces the problem of identifying people who are re-admitted to another hospital. This model uses person-based information (name and address) and allows the monitoring of individual re-admissions. These data could be used to estimate the degree of under-enumeration of re-admissions due to failure to identify re-admissions to another hospital in the routine data analysis. Probabilistic record data linkage can provide an appropriate method of measuring re-admissions to hospital for asthma until unique patient identifiers are available at a state and national level.

Western Australia is currently the only state to use unique patient identifiers. Each person attending a metropolitan hospital in Western Australia is assigned a unique medical record number, although this does not extend to rural areas (E Lloyd [WA Department of Health], pers. comm., 21 August 2002).

5.3 Emergency Department data collections

The indicator for rate of asthma-related emergency attendance is reliant upon collection of ED visits related to a diagnosis of asthma. Currently only two states can provide information for this indicator: Victoria and New South Wales.

In New South Wales, data are collected from 50 of the 143 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 areas, with only a selection of hospitals participating.

Not all hospitals report provisional diagnosis information consistently. The lack of universal coverage and a consistent coding system limits the value of this data source for long-term data monitoring.

The value in this data source is its timeliness. Data can be accessed within 1 month and can, therefore, be used to monitor short-term changes in attendances, which may reflect the acute effect of environmental changes.

The Victorian Emergency Department Minimum Dataset (VEMD) operates across Victoria in 30 hospitals that have 24-hour EDs. As with New South Wales, the coverage is not state-wide. Local systems may collect data through a range of codes but when submitted to the central VEMD, codes must be converted to VEMD universal format and all diagnoses are coded according to ICD-10-AM (Victorian Department of Human Services 2001). Data are available by calendar year, 3 months after the end of the calendar year.

There are a number of issues to be considered with using ED data for asthma monitoring. The relationship between presentations to the ED and general practitioner (GP) for asthma is unclear. One key difference is severity of disease, with people having an acute severe attack more likely to present to the ED than their GP. However, this may not necessarily be the case in areas where GP services are limited, costly or after hours services are not available; in these instances the ED may be used as a GP service. This is particularly relevant for rural areas. Variation in ED attendances might be related to variation in the severity of asthma or variation in the proportion of cases attending EDs. Therefore, these two data sources should ideally be examined in tandem, but separation of the effects one has on the other will be difficult.

When total annual counts are reported, important environmental issues about asthma are missed (e.g. high February incidence of asthma and seasonal peaks). The seasonal variation associated with asthma is an important characteristic to report over time.

Until recently, states and territories had various ED data collections operating with different coverage and different data items collected. The Australian Department of Health and Ageing managed a project to develop a national minimum data set for Emergency Departments (NMDS). A final draft of the data set was submitted to the National Health Data Committee in July 2002, and all public hospitals began collecting the necessary data from July 2003 (N Grayson, AIHW pers. comm., 2 December 2003). The NMDS collects information on waiting times in EDs and demographic characteristics of non-admitted patients (National Health Data Committee 2003). Clinical information, such as the presenting problem or diagnosis, is not included. Currently only two states collect information on diagnosis—New South Wales and Victoria. There are plans for further development of this NMDS.

5.4 Survey data

A number of survey data collections are undertaken at the national, state and local levels. Data are collected across a range of content areas, but methodologies differ, content areas vary according to national, state and local priorities, and questions are not currently standardised. Consequently, it is possible to monitor several indicators using survey data, but for some indicators it may only be possible to get state-level data.

5.4.1 ABS National Health Survey

The National Health Survey (NHS) has been conducted by the ABS across Australia since 1977, every 5 years. The ABS has recently revised its program of population health surveys and from 2001 the survey will be conducted every 3 years.

Information on health status, use of health services and facilities, and health and lifestyle characteristics is obtained from residents of a sample of private dwellings.

Households from all states and territories are sampled randomly using a stratified multi-stage area sample to ensure that all eligible members of the population within a given state and territory have an equal chance of selection. Residents from hospitals, nursing homes, convalescent homes, boarding schools, prisons, single quarters from military establishments,

non-Australian military personnel in Australia, overseas visitors, and diplomatic personnel from overseas governments are excluded.

The survey aims to obtain national benchmark information on a range of health issues, enable trends to be monitored over time, and provide information on health indicators for NHPAs and important population subgroups (ABS 2002d). Content has differed between surveys, and for asthma in particular a continuous time series is not available, due to changes in the enumeration of asthma prevalence in the survey.

The key advantages of the NHS are that it is a national collection, and traditionally has a very high response rate—the 2001 survey reports 92% of the sample were fully responding (ABS 2002a). Measures taken to minimise non-response include face-to-face interviews, bilingual interviewers where necessary, follow up of respondents where there is no response, and weighting to population benchmarks to reduce bias from non-response. However, the information is self-reported, and there is no published data on the accuracy of data collection and responses. Small area analysis is generally not possible below capital city/rest of state comparisons. Unit record files cannot be released unless they are confidentialised, which results in the loss of geographic information. In addition, purchase of the data is costly.

From 2001, it will be possible to monitor the following indicators using the NHS dataset. However, for some indicators there are also other data sources, which may be more appropriate to use.

Table 5.3: List of indicators based on National Health Survey data

Indicator
Prevalence rate for asthma
Rate of asthma-related GP visits[(a)]
Rate of asthma-related emergency attendance (in people with asthma)[(b)]
Hospital separation rate for asthma (in people with asthma)[(a)*]
Average number of sick days due to asthma per year[(b)(c)]
Prevalence rate for smoking among people with asthma
Prevalence rate for smoking within the household where children with asthma reside [(d)]
Proportion of people with asthma who have a recent, written asthma action plan developed in consultation with their GP

(a) Alternative data sources also available.

(b) Within last 2 weeks.

(c) Also days of reduced activity if this indicator is amended.

(d) Depends on definition of asthma used.

5.4.2 State Computer Assisted Telephone Interview (CATI) surveys

Most states and territories have had programs of Computer Assisted Telephone Interview (CATI) health surveys in operation for varying lengths of time. The Australian Capital Territory, the Northern Territory and Tasmania do not have their own infrastructure but have developed collaborative arrangements with New South Wales; Western Australia and South Australia; and Victoria respectively. In New South Wales and Queensland, data collection, analysis and reporting are managed entirely in house. In other states, data collection is outsourced.

New South Wales and Victoria use modified random digit dialling methods, which take prefixes from the electronic White Pages (EWP) and combine these with four-digit suffixes, which are randomly generated. This ensures that people with unlisted numbers are included in

the survey. Queensland has used extended electronic White Pages sampling since 2000. The current EWP listing is supplemented with additional numbers appearing in the past 4 to 5 years of EWP listings. Because it is a telecommunications practice to re-utilise numbers, the method ensures that many unlisted numbers are included in the sample. In Western Australia and South Australia, the proportion of phone numbers that are unlisted is lower than other states and, therefore, these states use numbers randomly selected from the EWP. All surveys exclude residents of nursing homes, hospitals, or other institutions from their sample. Response rate ranges from 65% to 90% for adults and around 85% for children, depending on the survey sampling techniques and the region surveyed.

CATI surveys are conducted more frequently than the NHS and during 2002 New South Wales, South Australia, Western Australia and Victoria will move to a program of continuous surveys, which will allow more timely reporting of data. There is capacity for small area analysis in most surveys, with over sampling in rural areas in many cases. The survey programs are designed to be able to quickly respond to emerging policy and health needs. The methodology allows for inclusion of some population groups difficult to reach by other means, such as people in remote locations, and, in New South Wales and Victoria, people from non-English-speaking backgrounds.

All information is self-reported. The CATI methodology means that people without a telephone are under represented and these are often people who are poorer, unemployed or live in remote areas. The methodologies differ slightly from state to state and questions are not standardised, which means that, currently, estimates between states cannot be compared.

Prevalence estimates for the general population are generated by the application of weights to adjust for the differences in probabilities of selection among respondents. In New South Wales, post-stratification weights are also calculated to adjust for the fact that different segments of the population are more likely than others to live in households with a telephone and to take part in a survey, resulting in over- or under-representation of some groups (NSW Health Department 2001).

Whilst most states undertake data accuracy checks of a sample of their records, there is no published data on the accuracy of data collection and response.

The National CATI Health Survey Technical Reference Group was established as a subcommittee of the National Public Health Information Management Working Group, in order to develop and standardise methods and tools for CATI health surveys. Asthma prevalence questions have been standardised and will be collected in all states and territories from 2002. A process of field-testing is being undertaken for other asthma questions to be included in state health surveys.

Table 5.4 summarises the activities of state health survey programs up until 2002.

Table 5.4: Summary of state health survey programs

State/ territory	Surveys conducted	Years conducted	Target group	Sampling/ methodology	Sample size	Asthma definition (current)	Time series	Indicators covered
ACT	ACT Child Health Survey (in conjunction with NSW)	2001	Ages 0–12 years	Two stage cluster sample. Random digit dialling	500	Ever doctor-diagnosed asthma plus treatment for asthma or symptoms of asthma in last 12 months	No	1 Prevalence 3 Acute GP visits for asthma by people with asthma 5 ED visits by people with asthma 10 Prevalence of smoking in people with asthma 11 Prevalence of smoking in households where children with asthma reside 14 Asthma action plan from GP 18 People for whom preventers indicated and use preventers regularly *(derived)* 20 Woken at night due to asthma
NSW	NSW Child Health Survey	2001	Ages 0–12 years	Two stage cluster sample. Random digit dialling	8,500	Ever doctor-diagnosed asthma plus treatment for asthma or symptoms of asthma in last 12 months	From 2001	
	NSW Health Survey	1997, 1998, continuous from 2002	Age 18 years and over	Two stage cluster sample; random digit dialling	17,000 per year. 20,000 from 2002	Ever doctor-diagnosed asthma plus treatment for asthma or symptoms of asthma in last 12 months	Yes	1 Prevalence 3 Acute GP visits for asthma by people with asthma 5 ED visits by people with asthma 10 Prevalence of smoking in people with asthma 11 Prevalence of smoking in households where children with asthma reside 14 Asthma action plan from GP 18 People for whom preventers indicated and use preventers regularly *(derived)* 20 Woken at night due to asthma 21 People with asthma restricted in core activities *NB not for children*

(continued)

Table 5.4 (continued): Summary of state health survey programs

State/ territory	Surveys conducted	Years conducted	Target group	Sampling/ methodology	Sample size	Asthma definition (current)	Time series	Indicators covered
NT	WANTSA	2000	Age 18 years and over	Random selection from EWP; person in household with next birthday selected	2,500	Ever told by a doctor have asthma. Current = yes to 'do you still have asthma?'	No	1 Prevalence
Qld	Qld Health Survey	1998, 2000	Aged 18 years and over	EWP using last several years; population proportional	1,625	Ever doctor-diagnosed asthma plus treatment for asthma or symptoms of asthma in last 12 months *NB different questions used in 1998*	No	1 Prevalence 3 Acute GP visits for asthma by people with asthma 5 ED visits by people with asthma 7 Sick days from asthma *(N.B. reduced activity days)* 14 Asthma action plan from GP 15 People using peak flow metre to monitor asthma 18 People for whom preventers indicated and use preventers regularly *(derived)* 20 Waken at night due to asthma 21 People with asthma restricted in core activities
	Qld Chronic Disease Survey	2000	Aged 18 years and over	EWP using last several years; population proportional	795	Ever doctor-diagnosed asthma plus treatment for asthma or symptoms of asthma in last 12 months *NB different questions used in 1998*	No	
SA	NW Adelaide Health Survey	2000		Random selection of population of NW Adelaide from telephone White Pages			No	

(continued)

Table 5.4 (continued): Summary of state health survey programs

State/ territory	Surveys conducted	Years conducted	Target group	Sampling/ methodology	Sample size	Asthma definition (current)	Time series	Indicators covered
SA	SA Omnibus surveys/Health Monitor	Annually from 1991	Aged 15 years and over	Multistage systematic clustered area sample: random sample of ABS collector districts. Within each CD random start point selected then 10 households selected using a fixed skip interval; person with next birthday selected	>2,000	Ever been told have asthma with confirmation by doctor? Current asthma based on yes to 'do you still have asthma?'	From 1992	1 Prevalence 10 Prevalence of smoking in people with asthma 14 Asthma action plan from GP 18 People for whom preventers indicated and use preventers regularly *(derived)* 20 Woken at night due to asthma 21 People with asthma restricted in core activities *NB not for children*
	SERCIS surveys	1997–2001	Aged 18 years and over	Multistage systematic clustered area sample: random sample of ABS collector districts. Within each CD random start point selected then 10 households selected using a fixed skip interval; person with next birthday selected	3,000 annually	Ever been told have asthma with confirmation by doctor? Current asthma based on yes to 'do you still have asthma?'		1 Prevalence
	SAMSS	Continuous from 2002	All ages	As above	6,600 annually		2002+	1 Prevalence
	WANTSA	2000	Aged 18 years and over	Random selection from EWP; person in household with next birthday selected	2,500	Ever told by a doctor have asthma Current = yes to 'do you still have asthma?'	No	1 Prevalence
WA	WANTSA	2000	Aged 18 years and over	Random selection from EWP; person in household with next birthday selected	10,000	Ever told by a doctor have asthma Current = yes to 'do you still have asthma?'	No	1 Prevalence

(continued)

Table 5.4 (continued): Summary of state health survey programs

State/ territory	Surveys conducted	Years conducted	Target group	Sampling/ methodology	Sample size	Asthma definition (current)	Time series	Indicators covered
WA	WA Health Survey	1995	15 years and over	Random selection from EWP; person in household with next birthday selected	5,700	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)?	No	1 Prevalence 14 Written asthma action plan 15 Have a peak flow meter (*NB: not use*) 18 People for whom preventers are indicated and use preventers regularly (derived)
	WA Continuous Health Survey Program	From 2002		Random selection from EWP; person in household with next birthday selected		Ever doctor diagnosed asthma plus treatment for asthma or symptoms of asthma in last 12 months	From 2002	1 Prevalence
	WA Aboriginal Child Survey	2000–01	0–17 years	Representative sample across WA covering approximately 1/6 of the WA Indigenous population.	>5,000	Has your child ever had asthma? Current= yes to "in the last 12 months has your child taken medication for wheezing or asthma?"	No	1 Prevalence 18 Medication use
Tas	Healthy Communities Survey	1998	Adults 18–74 years	Stratified age, sex and SLA sample drawn from electoral role* *NB this was a postal survey*	25,000	Ever had asthma diagnosed by a health professional. Current = yes to 'have you had asthma in last 12 months'	No	1 Prevalence 10 Prevalence of smoking in people with asthma
Vic	Victorian Population Health Survey	2001	Aged 18 years and over	Random digit dialling, stratified by DHS region	7,500 to 10,000 per annum	Ever told by a doctor have asthma. Current = yes to 'do you still have asthma?'	Continuous program commenced in 2002	1 Prevalence 10 Prevalence of smoking in people with asthma 14 Asthma action plan from GP

5.5 BEACH (Bettering the Evaluation and Care of Health) and SAND (Supplementary Analysis of Nominated Data) general practice 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 Statistics and Classification Unit (GPSCU), a collaborating unit of the Family Research Centre of the University of Sydney and the Australian Institute of Health and Welfare (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. With 100 different GPs collecting information every 5 weeks, 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/Veteran 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 (medications prescribed or advised including brand, form, strength and dosage), 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 each week, postcode of main practice, etc.).

SAND data

The SAND data are collected as a supplementary data set of the BEACH program and focus on information about the patient's health, management and risk factors such as smoking and alcohol consumption (Britt et al. 2001). At each encounter, surveyed using BEACH, the GP is requested to ask people specific questions at the bottom of the recording form for the SAND collection. Each pack of recording forms is divided into three blocks—one containing 40 forms with SAND questions about patient height and weight for estimating body mass index, alcohol consumption and smoking status; the remaining 60 forms in each pack are divided into two blocks of 30 forms. Different SAND questions are asked of the patient in each block (around 6,000 encounter forms) and these vary throughout the year. Ten to twenty SAND topics are covered annually. Organisations sponsoring blocks of SAND data collection can ask questions on topics of their choice and have access to the detailed reports.

Analysis

Raw BEACH data is weighted to adjust for the under-representation of GPs less than 35 years in the sample and for the GP activity level. The data analysis takes into account the single stage clustered study design (Britt et al. 2001).

Availability

The survey is ongoing and available through regular reports. Information is analysed and reported on within 6 months of completion of the data collection phase for each financial year. Information directly available from the BEACH data includes: rates of GP encounters for asthma, medications recommended or prescribed at these encounters, other reasons for encounter and diagnoses managed, tests ordered and procedures conducted (e.g. spirometry). Where additional analysis of data is required, access and resources will need to be discussed with the GPSCU. So far, three SAND modules have looked at the asthma prevalence in general practice, medication use and management practices. Information from these SAND modules may be useful. Table 5.5 summarises these modules, the key issues examined and the sample size and time period of the data collection. The future inclusion of new or modified asthma modules to address data requirements for asthma indicators may be possible.

Table 5.5: Summary of SAND modules on asthma

Features	SAND abstract No. 3 (AIHW GPSCU 2000)	SAND abstract No. 22 (AIHW GPSCU 2001)
Key Issues examined	The prevalence of asthma in general practice patients; asthma severity;current medications for asthma; effectiveness and any adverse effects of medications	The prevalence of asthma in general practice patients; asthma severity based on the NAC's severity classification; management of asthma; the effectiveness and adverse effects of treatment
Sample	4,285 encounters from 213 GPs; 630 patients with asthma	5,495 encounters from 95 GPs; 661 patients with asthma
Estimated asthma prevalence	14.7%	12.8%
Asthma severity (adult)		
Severe	38 (8.3%)	30 (5.5%)
Moderate	133 (28.9%)	133 (24.5%)
Mild	131 (28.7%)	380 (70%) mild + very mild
Very mild	158 (34.3%)	
Asthma severity (child)		
Persistent	7 (5.1%)	6 (5.1%)
Frequent	30 (22.2%)	24 (20.3%)
Infrequent	98 (72.6%)	88 (74.6%)
Time period	30/3/99–7/6/99	28/11/00–15/01/01

Representativeness

In 2000–01, only 29.8% of GPs who were contacted and available actually participated in the BEACH Program. A comparison of participating and non-participating GPs revealed that GPs aged 55 years and older were over-represented and those younger than 35 years of age were under-represented. There is no information available on patients who refused to participate. As younger GPs see younger patients and possibly those with more acute conditions, then younger patients and certain conditions may be underestimated in the sample. Post-stratification weighting of the sample has been conducted to adjust for these age differences and activity level of the GPs and ensure that the sample is representative. A study by Driver et al. (1991) found that morbidity information collected from patients via a random sample of GPs was representative of patients attending general practice, even when participation rates were as low as 29%. Even with the post-stratification weighting of the

sample, with such low participation rates, the sample may not be representative of general practice and, therefore, data on morbidity and its management may not be an accurate reflection on the current situation in general practice.

Timeliness

Information is analysed and reported on within 6 months of completion of the data collection phase for each financial year. Where additional analysis of data is required, additional time may be required to process the data.

Quality of the data

Validity and reliability of data recorded by the general practitioner

Britt et al. (1998) compared the recoding of morbidity data by GPs for the BEACH Program, with two trained observers independently viewing a videotape of the encounters. They found that there was good overall agreement between observers and GPs for the overall distribution of morbidity and recording at the chapter level. However, validity and reliability of GP recording at the rubric level was lacking. A different study showed good agreement between GP recording and patient recall of reasons for encounter and problems managed (Britt et al. 1992).

Accuracy of data entry

The BEACH Program conducts a quality assurance program to ensure reliability of data entry. It includes the ongoing development and implementation of computer assisted error-checking procedures during data entry, the validating of samples of data entered against original recording forms and logical data checks during the data cleaning and analysis using specific SAS programming (AIHW GPSCU 2002).

Although the BEACH data may be less valid and reliable at the very detailed level than might be expected, currently it is the only reasonably reliable and valid method of collecting detailed information about morbidity and its management in general practice across Australia.

Data disaggregation

Disaggregation of BEACH data is possible by age, sex, Aboriginal and Torres Strait Islander status, ethnicity (non-English-speaking background or not), socioeconomic status (based on postcode or healthcare card status), and rural and remote status (RRMA). Due to the small sample size of the SAND data, disaggregation may be limited to age, sex, ethnicity (non-English-speaking background or not) and socioeconomic status (based on postcode or healthcare card status). The Office of Aboriginal and Torres Strait Islander Health does not recommend disaggregation of BEACH data according to Aboriginal and Torres Strait Islander status.

5.6 Pharmaceutical data overview

Currently, asthma medications may be obtained in a range of ways depending on the type of drug and the individual's situation. Some may be purchased over the counter (e.g. salbutamol inhalers), on prescription and dispensed at a community pharmacy as a private script or through the Australian Government's Pharmaceutical Benefits Scheme (PBS) and the Repatriation Pharmaceutical Benefits Scheme (RPBS), or via hospital pharmacies.

The PBS and RPBS provide Australian residents with access to medicines at subsidised prices. Most medicines available on prescription are subsidised under the PBS and the RPBS.

The PBS began operation in June 1948 as a way of providing free community access to a small number of 'life saving and disease preventing drugs'. It has grown into a large subsidised scheme covering almost 600 generic drugs (Briggs 2002).

The maximum co-payment for a pharmaceutical benefit item on the PBS is currently $22.40 for general patients and $3.60 for concessional patients (health care cardholders and pensioners) (Briggs 2002). When an individual or family in the general patient category spends more than the current threshold of $686.40 on PBS items in a particular year, then a safety net is in place, which subsidises the costs of pharmaceuticals listed on the PBS and they pay only $3.60 per prescription for the rest of the calendar year. There is also a safety net threshold of $187.20, for concessional patients, after which PBS items are free of charge for the rest of the calendar year (Briggs 2002).

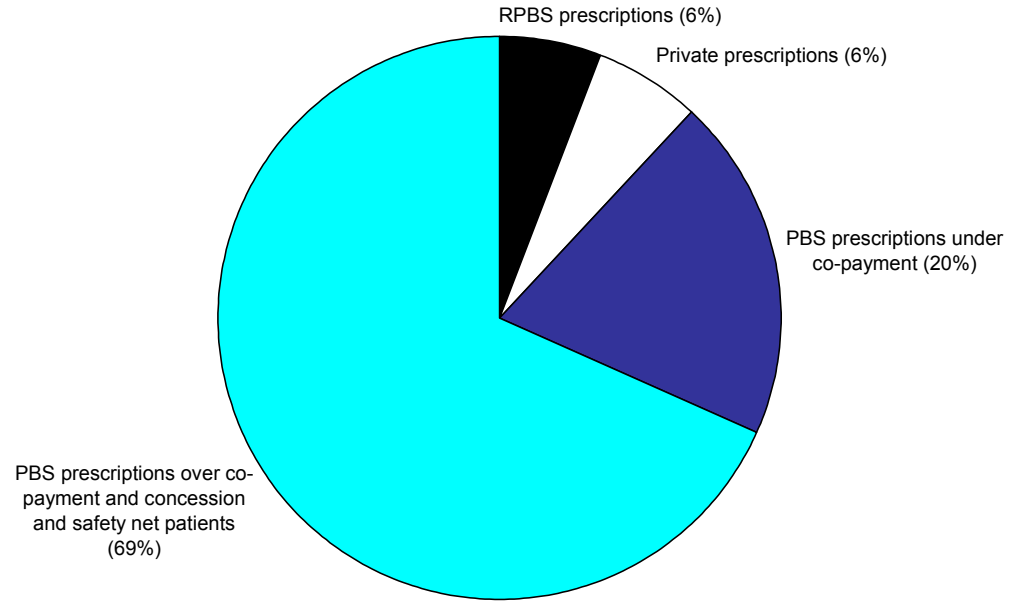
The RPBS provides a similar subsidised scheme for returned servicemen and women to a more extensive range of pharmaceuticals with a concessional co-payment ($3.60) and a concessional safety net. Access to both schemes is restricted to Australian residents and visitors from those countries with which Australia has a Reciprocal Health Care Agreement (including the United Kingdom, Ireland, New Zealand, Malta, Italy, Sweden, the Netherlands and Finland).

The community prescription statistics are only available for prescriptions where a claim for payment is submitted under the PBS or RPBS to the Health Insurance Commission (HIC). This includes all scripts dispensed under the RPBS and all scripts dispensed under the PBS for concession patients and for general patients where the cost of the prescription is above the co-payment level or where the safety net has been reached.

Prescriptions dispensed under these two schemes make up around 75% of all community (i.e. non-public hospital) prescriptions (DHAC 1999). Almost 20% of prescriptions in 1998 were dispensed for medications costing less than the co-payment level and the patient pays the full price. Another 6% of community prescriptions are not listed on the PBS or RPBS and are available only on private prescription with the full cost paid by the patient (DHAC 1999) (Figure 5.1).

In order to estimate usage of non-subsidised prescription medicines (i.e. where drugs were priced under the PBS general patient co-payment or available only on private prescription), a community pharmacy survey, the Pharmacy Guild Survey (PGS), was commissioned by the Drug Utilisation Sub-Committee of the Pharmaceutical Benefits Advisory Committee. (See Section 5.6.3 for further information on the PGS.)

IMS Health can provide information about sales of over-the-counter pharmaceutical products for a fee for service but there is currently no other formal mechanism in place for collecting information on over-the-counter medications in Australia.



Source: DHAC 1999.

Figure 5.1: Distribution of community prescriptions, Australia, 1998

5.6.1 IMS Health

IMS Health collects data on the sales of pharmaceutical products from major manufacturers and wholesalers operating in Australia and worldwide.

The value of these data is that they reflect supply (and hence purchases) of specific medications. As some 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 utilisations of drugs cannot be assessed using these data.

5.6.2 Pharmaceutical Benefits Scheme statistics

Availability

Statistics on both the PBS and the RPBS are available from the HIC. Online interactive data reports for PBS statistics can be created from January 1992 to August 2002 at <http://www.hic. gov.au/providers/health_statistics/statistical_reporting/pbs.htm>. Reports can be collated for individual pharmaceutical benefits item numbers or therapeutic grouping. They can be categorised by state, patient category (PBS—General—Ordinary, PBS—General—Safety Net, PBS—Concessional—Ordinary, PBS—Concessional—Free Safety

Net, PBS—Other—Doctor's Bag, RPBS—Ordinary, RPBS—Free Safety Net) and time period. More complex reports are available directly from the HIC on a fee for service basis.

Completeness of data

The PBS statistics only provide information on community subsidised prescriptions. PBS statistics do not provide any information about the demographics of the patients, nor the condition for which the medication is being prescribed.

Timeliness

Interactive PBS statistics provide information that is very timely with only a 2-month delay between final data collection for the month and availability in the online reporting system. Ad hoc reports will have time delays depending on resources required.

Quality of the data

There is no published information on the quality of PBS statistics. The data are based on claims for PBS and RPBS rebates and, therefore, are likely to provide accurate information about the drug types and quantities dispensed.

Data disaggregation

Prescription information does not contain any data on the individuals receiving medication other than their concession status, the state of issue, and the date. Information on age, sex, SLA of residence, ethnicity, etc. is not available on this data set and, thus, disaggregation is limited.

5.6.3 Pharmacy Guild Survey (PGS)

The PGS is an ongoing survey established in 1990, which collects total dispensing information for each year from a stratified random sample of 150–250 pharmacies. The sample was selected so that it is representative of all operational pharmacies based on PBS dispensing volume and geographical location and was stratified into four groups according to PBS dispensing volume from the previous year. However, participating pharmacies must be members of the Pharmacy Guild of Australia and use a particular dispensing software program to be eligible to participate. From the survey data, estimates of the prescription volumes for non-subsidised medicines were calculated. The volumes of each non-subsidised drug are estimated by multiplying the total survey estimates by a weighting factor (which is calculated for each of the four strata by comparing the number of pharmacies in the sample with the total number of pharmacies in Australia). The data collection is funded by the Pharmaceutical Branch of the Department of Health and Ageing.

Availability

Data from the 1998 PGS are available in *Australian Statistics on Medicines 1998* (DHAC 1999). Data from the 1999 and 2000 PGS and for January and February 2001 are available in *Australian Statistics on Medicines 1999–2000* (DHAC 2003).

Completeness of data

The Department of Health and Ageing combines the actual counts of those prescription categories submitted to the HIC for payment of the PBS/RPBS subsidy and available through PBS statistics with the prescription estimates for the non-subsidised community prescriptions from the PGS. For example, in 1998, the number of salbutamol prescriptions dispensed under the RPBS and PBS was 3,576,443, and the PGS estimated that another 931,007 salbutamol prescriptions were dispensed as a co-payment or a private script. Thus,

the estimated total community usage of salbutamol prescriptions in 1998 was 4,507,450. The PGS does not collect any information on patient demographics, nor the condition for which the medication is being prescribed.

Timeliness

The data from the 1999 PGS were delayed due to technical problems, however, it is expected that PGS will be ongoing and that future reports will be more prompt.

Quality of the data

There have been no studies conducted to assess the validity or reliability of PGS data.

Data disaggregation

The PGS does not collect enough information to allow disaggregation at any level.

5.6.4 Issues around using pharmaceutical data sources to measure asthma indicators

Currently all preventer medications are purchased on prescription and cost more than the minimum subsidy. However, reliever medications are frequently purchased without prescription (over-the-counter) and when purchased on prescription cost less than the minimum subsidy. Hence, the PBS does not collect complete information on bronchodilator (reliever) medications.

The PBS does not collect any information on the reasons for prescribing. Thus, there is no way of identifying whether a patient using these medications has asthma or COPD or an acute respiratory infection.

These data limitations lead to underestimation of purchase of some reliever medications except in those with lower socioeconomic status, those who are older (receiving the aged pension) or who personally or whose family uses a lot of medications annually. Although these data can be supplemented by PGS, there remains a significant proportion of individuals who obtain reliever medication over-the-counter.

The lack of data on patients' demographics and conditions severely limits the ability to disaggregate the data and assess the contribution of various factors in the use of medications for asthma.

5.7 Medical Benefits Scheme data

Availability

The HIC provides statistics on the claims made to the Medical Benefits Scheme (MBS). As with PBS data, online interactive data reports for MBS items can be created from January 1993 to within 3 months of the current point in time and are available at <http://www.hic.gov.au/statistics/dyn_mbs/forms/mbs_tab4.shtml>.

Reports on individual benefit item numbers can be collated by time period, state, age and sex. More complex reports are available directly from the HIC on a fee for service basis.

Completeness of data

The MBS data only provide information on items claimed by general practitioners, doctors and specialists in the community. The principal items that may be of use for monitoring

asthma indicators are spirometry and the Asthma 3+ Visit Plan SIP items. Information about spirometry or asthma management in public hospital or outpatient settings is not enumerated in the MBS data and spirometry items may relate to conditions other than asthma, especially COPD.

Timeliness

MBS data collection is ongoing, with data available from 1984, and free online interactive MBS statistics are available from 1993. This online service provides information that is very timely with only a 3-month delay between final data collection for the month and availability in the online reporting system. Ad hoc more specific data reports can be produced by the HIC, their timeliness and costs depending on the complexity of the data required and the availability of resources.

Quality of the data

There is no published information on the quality of MBS statistics. The data are based on Medicare details and claims made by medical practitioners or patients for reimbursement and, therefore, are likely to provide quite accurate information about the MBS items. Data on spirometry items will overestimate the use of spirometry in people with asthma.

Data disaggregation

MBS data contain a range of information about the individuals based on their Medicare card details. This includes age, sex, postcode, state of issue, and the date of service. Information on ethnicity and Indigenous status is not available.

5.8 Other data sources

5.8.1 Occupational asthma data

Occupational asthma is preventable if it is detected early and there is early removal from exposure. Surveillance schemes provide the opportunity to control and, in some cases, eliminate the incidence of occupational asthma through prompt initiation of hygiene investigations in hazardous workplaces and active prevention programs. There are two asthma indicators based on occupational asthma data:

- prevalence rate for asthma initiated (caused) by occupational exposure;
- prevalence rate for pre-existing occupationally-aggravated asthma.

Prevalence of occupational asthma data

The data sources that could be used to estimate the prevalence rate for occupational asthma are results from population-based surveys such as the European Community Respiratory Health Survey (ECRHS), which was conducted in Victoria, and the Cooperative Research Centre for Asthma (CRCA) survey, which was conducted in New South Wales.

Victorian data

This survey was conducted using the internationally-implemented ECRHS protocol. Respiratory symptoms, medication use, an occupational history as well as demographic information was collected from a random sample of 20–44 year olds in 1992 (response rate 42%) and again recently. Bronchial hyperresponsiveness to methacholine was assessed in a subset of the sample.

'Doctor-diagnosed asthma' and 'current asthma', defined as wheeze within the last 12 months and the presence of bronchial hyperresponsiveness (defined as a 20% or more fall in FEV_1 after a dose of <2 mg methacholine), were measured.

The identification of occupational asthma in this study was based upon the identification of asthma onset after occupational exposure to known occupational allergens or sensitisers.

New South Wales data

The New South Wales occupational asthma survey, conducted under the auspices of the CRCA, was a cross-sectional postal survey of adults. The survey was mailed to 14,066 adults aged 20–49 years who were selected at random from the New South Wales electoral roll. After two additional mailouts, 5,331 subjects completed and returned the questionnaire (response rate 37.9%). Asthma was defined as doctor-diagnosed asthma and occupational asthma was defined as adult onset asthma, which occurred during or after reported exposure to a list of occupations and exposures known to be at risk for occupational asthma.

Evaluation

Both these surveys have the same limitations for assessing the burden of occupational asthma:

- The attribution of asthma to an occupational cause is not certain. People who developed asthma as a result of exposure to an unlisted or unidentified occupational sensitiser would not be included and, further, people who develop asthma due to a non-occupational cause during or after exposure in a high-risk job would be falsely identified as having occupational asthma.
- The response rate for both surveys is low, raising the possibility of selection bias.
- There is no existing or proposed time series for these data.

On the other hand, the general population basis for both surveys means that the 'healthy worker effect', which leads to under-enumeration of cases of occupational asthma in workplace surveys, should not be a problem.

Incidence of occupational asthma

The incidence of occupational asthma is monitored in Australia in three states via the Surveillance of Australian workplace Based Respiratory Events (SABRE) scheme. The SABRE scheme has been in operation in Victoria and Tasmania since 1997 and in New South Wales since 2001. SABRE is a voluntary, anonymous reporting scheme for work-related lung disease and is based on the SWORD scheme in the United Kingdom. Occupational and respiratory physicians are asked to report all new cases of respiratory illness to SABRE every 2 months. The notification form lists 11 specific respiratory illnesses as well as an 'other' option and physicians are asked to indicate the number of new cases of each illness they have diagnosed in the last 2 months. Two of the options relate specifically to occupational asthma and these are:

- the number of new cases of occupational asthma due to sensitisation; as well as
- the number of new cases of occupational asthma due to irritation (Reactive Airways Dysfunction Syndrome).

The option of 'I have no cases to report' is also available. Physicians also complete a worksheet listing details of patients with new diagnoses such as demographic data, occupational and employment factors, work-related factors, the likelihood of diagnosis and

intervention or recommendation. A consent form must be signed if cases are to be included in the New South Wales report.

Newsletters are prepared every 2 months by SABRE and provide details of the total number of diagnoses reported, causal agents and the most common occupations reporting each condition.

There are limitations with voluntary reporting schemes such as the SABRE scheme. One of the main problems encountered is a low participation rate. Participation rates tend to decrease as time progresses and volunteers become less enthusiastic. Specialists and doctors are less willing to participate if the condition is not a notifiable disease. With these factors in mind, an under-notification of occupational asthma cases is inevitable with a voluntary reporting scheme. Occupational asthma data are also influenced by the physician's ability to establish a causal link between the work environment and failing health. The accuracy of the identification of causal agents will depend on regular notification of changes in workplace chemical use as well as changes in the components of chemicals used in the workplace. Taking regular measurements of lung function in the workplace to provide evidence for a causal link may provide a disincentive to some workers because of the tediousness of the process or perhaps peer pressure. There may also be disincentives for workers to report cases because they are concerned about losing their job or becoming involved in litigation.

Occupational asthma data from workers' compensation claims

In Australia, workers' compensation data only include occurrences in which the claimant was absent from work for 5 or more days, which excludes 46% of the total number of compensation cases (Foley 1997). Even though this represents only 8% of the total number of working days lost, a frequent criticism of workers' compensation data in Australia is that they underestimate the true level of work-related injury/disease experienced by Australian workers.

The National Occupational Health and Safety Commission collates the workers' compensation statistics from each state. Each compensation claim that resulted in fatality or permanent or temporary disability with an absence from work for 5 or more working days is included. The data are collected annually and include sociodemographic data and occupation factors. The compensation-based statistics show very few cases of occupational asthma because it is rarely compensated.

5.8.2 Education data sources

There is one asthma indicator that relates to education:

- proportion of schools (primary and secondary), childcare centres, pre-schools and hospitals using nationally accredited asthma education programs.

There are currently no data available for nationally accredited asthma education programs being run in childcare centres, pre-schools or hospitals. The proportion of primary and secondary schools using one nationally accredited asthma education program can be monitored using data collected through the Asthma Foundation in each state.

Proportion of schools using nationally accredited asthma education programs

Asthma Australia and the state and territory Asthma Foundations have developed a national program, which targets school students, schoolteachers and parents/carers to help raise awareness of the disease and reduce its impact on the schooling system. This program is called the Asthma Friendly Schools program.

Schools registered in the Asthma Friendly Schools Program are recorded by the Asthma Foundations at state level and forwarded to the Australian Department of Health and Ageing quarterly. The data are available from 2001 in most states and earlier from Western Australia where the program commenced in the previous year. The type of school (Government, Catholic or Independent), the level (primary, secondary or composite) and the ARIA classification are collected. The data are reported as cumulative values for the number of schools registering their interest in the program as well as registering in the program.

Although the Asthma Friendly Schools package is broadly similar in its content in all states, there are differences in detail. While most of the states have the same education program for primary school students, the secondary student packages vary with possible resources being a video package, a peer-led education package or a CD-ROM. Victorian schools have no boundaries on the minimum and maximum requirements for asthma education in the curriculum. There are also differences in the way compliance with the criteria for accreditation is assessed. While Asthma Foundations in some states require evidence to support the claim that the accreditation criteria have been met, in other states accreditation is awarded on the basis of the signed statement of compliance from the school principal. The Asthma Friendly Schools data will only provide a cumulative number of schools registered in the program. Professor Shane Thomas and associates of La Trobe University have been contracted to evaluate both the impact and qualitative aspects of the program. The effectiveness of the program is also being evaluated in Queensland, where a pre- and post-survey has been conducted to measure the gain in knowledge after the implementation of the program.

5.9 Issues around data disaggregations

5.9.1 Why disaggregate data to report on indicators?

Health status may be influenced by many factors, including age, sex, socioeconomic status, Indigenous origin, and geographical area.

One of the objectives of ACAM is to examine social, geographical and environmental differentials that may influence the development and burden associated with asthma, therefore, it is important that reports on the asthma indicator include the analysis and presentation of data about these differentials. Where possible, all indicators will be analysed according to the following disaggregations:

- age
- sex
- Index of Relative Socioeconomic Disadvantage (IRSD)
- Aboriginal and Torres Strait Islander Status
- Accessibility and Remoteness Index of Australia (ARIA).

5.9.2 SEIFA Index of Relative Socioeconomic Disadvantage (IRSD) [1]

There is good evidence that a social gradient in health exists, with people with less affluent people experiencing poorer health and more affluent people having fewer illnesses and living many years longer . Therefore, it is important to identify and measure this key determinant of health. Only a few measures have been developed that consider a range of social and economic circumstances and incorporate them into one index or summary score.

The SEIFA Index of Relative Socioeconomic Disadvantage is one of four indexes developed by the ABS to measure different characteristics of socioeconomic aspects associated with geographic locations (ABS 2003), 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 depending on its purpose.

The other three indexes are:

- Index of Relative Socioeconomic Advantage/Disadvantage
- Index of Economic Resources
- Index of Education and Occupation.

The IRSD has been selected for disaggregating the data on asthma indicators 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 using principal component analysis, which essentially reduces related variables to a new set of correlated components. When ordered, the first few components explain most of the variation in the original variables. (For more details on the development of the index see ABS 2003).[2] The indices are constructed so that relatively advantaged areas have high index values. This means that relatively disadvantaged areas in all indexes have relatively low index values. The indexes are available for a number of geographic areas, including all of Australia, Statistical Local Areas (similar to local government areas), and Census Collection Districts.

As with all summary measures, the IRSD has a number of limitations including:

- Where some aspects of socioeconomic status may be under represented, the index cannot completely represent that aspect of socioeconomic advantage or disadvantage.
- Access to services such as schools, shops, transport and community services are not represented in the indexes. These are integral to the concepts of advantage and disadvantage.
- The indexes are ordinal measures and should not be used for analyses that attempt to quantify socioeconomic conditions. For example, a Collection District with a score of 1,200 is not twice as advantaged as one with a score of 600.

1 The information presented here is based largely on a report prepared by the Australian Bureau of Statistics on SEIFA indexes (ABS 2003).

2 For a full explanation of the derivation of each of the indexes see ABS 2003, pp. 12–17.

- The index reflects the socioeconomic status of an area, not an individual. Therefore, it is possible for a relatively affluent person to live in an area of relative disadvantage, and vice versa.
- Interpretation of the index is more straightforward for areas with extreme values on the index. This is because areas that have a large proportion of households with similar characteristics are more homogenous and will have the lowest or highest index scores.
- Information on family structure is not strongly represented in the indexes. Therefore, they are not good at differentiating between different family types.
- Data for some CDs are not available to ensure confidentiality, and ensure that meaningful values are incorporated into the index. This affects approximately 1% of all CDs.
- Direct comparison of index scores between Censuses should not be made due to changes in geographic boundaries, and changes in classifications such as occupation coding or family income.
- Changes in geographic boundaries and population mobility also mean that estimates may be unreliable for some years. It is recommended that data are aggregated across the 3 years around the Census to counteract these effects.

Although there are limitations to the use of this index, it remains one of the few well-developed summary measures, based on Australian circumstances, to classify and analyse data for this purpose.

5.9.3 Aboriginal and Torres Strait Islander identification and enumeration

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. In addressing the problem of data monitoring in relation to Aboriginal and Torres Strait Islander Australians, it is important to steer a middle course that acknowledges both these issues. In part, this requires expressing reservations about the conclusions that are drawn. In some cases it will be feasible to discuss the likely direction of bias.

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 data sets such as hospital statistics and mortality collections. However, the quality and usefulness of data on Indigenous populations depend on the completeness and accuracy of data collection and, ultimately, the consistent standardised identification of Aboriginal and Torres Strait Islander Australians in data collections (ABS 2001c).

Issues around Indigenous population estimates

Since 1981, the ABS has used a standard definition for the identification of Indigenous Australians in the Census and all other surveys it has undertaken, and in 1995 it formally adopted the question 'are you of Aboriginal or Torres Strait Islander origin' as the standard question for identifying Indigenous Australians. This standard has also been included in the NHDD, adopted by the Registrar Generals (ABS 2001c), and is also used in most state CATI Health Survey collections. However there have been substantial increases in the Indigenous

population between census collections that cannot be fully explained by natural increase (Ross 1999) and this has generated uncertainty about interpretation of the standard question and how responses may change over time (see Ross 1999, for a full discussion of this issue). In turn, this has led to difficulty estimating and projecting the Indigenous population and has generated uncertainty about the accuracy of rate and ratio statistics using Census-based estimates as the denominator. Changes in responses to the question also affect the numerator in collections such as births, deaths and hospital statistics, which makes the assessment of trends difficult. In addition, the question on Indigenous status is often not filled in on census forms—in 1996 over half a million people did not respond to this question. The proportion of Indigenous and non-Indigenous non-respondents is unknown.

These problems have an impact on the validity of population estimates and projections, which rely on data from the most recent Census counts, with adjustments for births, deaths and internal migration (ABS 2002b). For these reasons, the ABS refers to population estimates for Aboriginal and Torres Strait Islander Australians as 'experimental estimates' (ABS 1998b). 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.

Issues around administrative data collections

Hospital morbidity

Identification of Indigenous people in public hospital morbidity collections has only recently been standardised across Australia, with all states adopting the NHDD definition of Aboriginal and Torres Strait Islander status in the 2000–01 collection (AIHW 2002). Prior to this, the method of Indigenous identification varied considerably across Australia, and in hospitals within states data could be collected using different forms in either paper-based or electronic format. However, data are still only considered acceptable in South Australia and the Northern Territory, and for years prior to 1998–99 any use of the identifier for Aboriginal and Torres Strait Islander Australians should be undertaken with caution (N Grayson, AIHW pers. comm., 4 June 2002). Health Departments in all states and territories are involved in a range of initiatives to improve the quality of data for Aboriginal and Torres Strait Islander Australians.

Mortality collection

The ABS standard question on Indigenous status has been adopted by all states and territories on the death registration form, and all states and territories except Western Australia on the death certificate (ABS 2001c). However, whilst most deaths (and therefore Indigenous deaths) are registered in Australia, Indigenous status is not always recorded on death notification forms. Therefore, the number of Indigenous deaths registered in any one year is probably under-enumerated (ABS 2002d). This varies between states. The ABS only uses data in its analyses that it considers of sufficient quality and coverage. Whilst there is some under-enumeration in all jurisdictions, the ABS advises that data for South Australia, Western Australia and the Northern Territory can be considered sufficiently reliable for analysis from 1990 onwards, and data for Queensland can be used from 1998 onwards (Cunningham & Paradies 2000). It is not known how representative these jurisdictions are of deaths among all Indigenous people.

Approximately 15% of deaths of Indigenous people are subject to late registration compared with 4% in the non-Indigenous population (Cunningham & Paradies 2000). The comparatively small number of Indigenous deaths also means they will be more affected by other administrative events such as changes in processing and clearing of backlogs of

notifications (Cunningham & Paradies 2000). Fluctuations in registrations from year to year will, therefore, have a greater impact on Indigenous deaths and do not necessarily reflect changes over time.

Health surveys

The National Health Survey in 1995 and again in 2001 included oversampling of Aboriginal and Torres Strait Islander populations to enable more reliable estimates of health status of these populations. An Indigenous Health Survey will again accompany the National Health Survey in 2004, for a similar purpose. 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 and SAND data

The sample frame of the BEACH data collection has not been designed to produce statistically significant results for population subgroups such as Indigenous Australians. Furthermore, the Indigenous status indicator in the BEACH data is incomplete and, hence, this data set may not provide reliable estimates for the Aboriginal and Torres Strait Islander population.

Health Insurance Commission data

There is no reliable identification of Aboriginal and Torres Strait Islander status on the HIC database at this stage. Over time, this will improve but at present the HIC data sets cannot be used for disaggregations by Aboriginal and Torres Strait Islander status.

5.9.4 Remoteness and access to services

Accessibility to health and education services plays an important role in the successful treatment and management of asthma. It has been shown that areas in England with poor access to large hospitals used these facilities less often and had an increased risk of asthma mortality (Jones & Bentham 1997; Jones et al. 1998).

For many years, there have been concerns about the difficulties that people living in rural and remote areas of Australia have in accessing services regarded as 'normal' in other areas. Remoteness had previously been a concept that lacked precision. Prior to 1998, the official basis on which remoteness was classified was the Rural, Remote and Metropolitan Areas (RRMA) classification. The primary purpose of RRMA was to distinguish remote Statistical Local Areas (SLAs) from rural SLAs. It classified areas as remote (remote centre, other remote area), rural (large rural centre, small rural centre, other rural area) and metropolitan (capital city urban centre, other metropolitan urban centre). In the RRMA classification, remoteness was established by the application of complex calculations to measurements of straight-line distances between centres. However, the complexity of this system, the use of straight-line distances rather than actual travel distances, and the overlapping of remoteness and rurality all limited the interpretability and validity of this system of classification.

Australian Standard Geographical Classification (ASGC) based on the Accessibility/Remoteness Index of Australia (ARIA) classification

In recognition of the limitations of the existing system as a way of describing the population's accessibility to services, the Australian Department of Health and Ageing commissioned a project in 1997 designed to standardise the classification and index of remoteness. As a result, the Accessibility/Remoteness Index of Australia (ARIA) was

developed in 1998 by the National Key Centre for Social Applications of Geographical Information Systems at the University of Adelaide. The main aim of ARIA was to measure remoteness solely on the basis of geographical accessibility, and excluding urban/rural, socioeconomic and population size factors. The ABS has developed its own geographical classification, the Australian Standard Geographical Classification (ASGC), which is based on ARIA. The summary presented here has been derived from three sources (ABS 2001a; Aylward et al. 2000; DHAC 2001).

ARIA is based on physical geography, whereby areas are classified on the basis of the proximity (that is, the distance people must travel on a road network) to the nearest service centre (that is, an area with access to goods, services and opportunities for social interaction). The range of goods and services available at the service centre will depend on its size. Thus, the population size of the service centre serves as a proxy for the service availability. The road distance serves as a proxy for the extent of remoteness from those services. Road distance (rather than straight line distance) was chosen because it is the predominant mode of transport, whether by private motor vehicle or public transport (e.g. buses).

ARIA derives the level of remoteness from the accessibility to the 545 designated 'service centres' that had a population greater than 1,000 in the 1996 Census. The service centres are grouped into five categories, based on their population at that time:

- category A service centre: >250,000 population (all services available)
- category B service centre: 48,000–249,999 population
- category C service centre: 18,000–47,999 population
- category D service centre: 5,000–17,999 population
- category E service centre: 1,000–4,999 population (limited services available).

An analysis revealed that the main differences between the five categories of service centre were 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 each of the five different categories of service centres outlined above. A graduated weighted distance rule is applied for islands. For each locality, the ratio of the shortest distance to the national mean shortest distance is calculated for each category of service centre. For each locality the resulting scores for each of the five categories are summed to yield an overall ARIA index score.

For example, when calculating an ARIA index score for a locality (e.g. Broome), one must first calculate the shortest road distance from Broome to the nearest category A service centre. This value is divided by the Australian mean shortest road distance for that category (mean shortest distance) to produce an individual score (or ratio) for each of the five categories of service centre as follows:

$$\text{Category A score} = \frac{\text{shortest road distance from Broome to category A service centre}}{\text{Australian mean shortest distance to category A service centre}}$$

Each individual score is thresholded at 3.0 (i.e. three times the Australian mean) in order to minimise extreme values. Localities with category scores higher than 3.0 are considered 'remote' in terms of service availability for that category and are given a category score equal to the threshold. It was thought that a threshold of 3.0 was justifiable in classing a locality as 'remote' since it would require a person to travel a distance of 1,239 km to a category A service centre, which is a long drive.

This calculation is repeated to produce a score for categories B, C, D and E. These five individual values are then summed and the result is a single ARIA score ranging from 0 (representing high accessibility) to 15 (representing high remoteness).

The possible values gained are grouped into five different ASGC categories, as outlined in Table 5.6. The five ASGC categories were derived on the basis of natural breaks or clusters within the ARIA index score distribution. Balance across the categories and broad compatibility with the Rural, Remote and Metropolitan Areas Classification (RRMA—the predecessor of ARIA) were also taken into account when developing the ASGC categories.

Table 5.6: ABS classes of remoteness by ASGC and their definition

ASGC classification	ARIA index score	Definition
Major cities of Australia	0–0.2	Geographic distance imposes minimal restriction upon accessibility to the widest range of goods, services and opportunities for social interaction
Inner regional Australia	>0.2–2.4	Geographic distance imposes some restriction upon accessibility to the widest range of goods, services and opportunities for social interaction
Outer regional Australia	>2.4–5.92	Geographic distance imposes a moderate restriction upon accessibility to the widest 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

Each of the populated localities across Australia (11,879 in total) has been assigned an ARIA index score in an attempt to assess its remoteness from goods, services and opportunities for social interaction. In this way, an indicator of remoteness can be calculated for each and every facility or person based on the populated locality in which they are located or reside. For people residing outside these populated localities, a 1 km grid was constructed with each 1 km by 1 km grid cell being assigned an ARIA index score. These scores were derived from the ARIA scores of the six closest populated localities for each grid cell. An ARIA index score for any point in Australia can be calculated using the grid and it also forms the basis for calculations of average ARIA values for larger areas.

Points located within a service centre have an ARIA index score of zero, since the shortest road distance to the service centre is zero. The zero score represents, by definition, urban centres with a population of greater than 250,000 and accounts for almost 60% of the Australian population. It was initially proposed that the zero ARIA score be adopted as a class in its own right, where it would include most of the larger capital cities (Hobart and Darwin are not included) as well as Newcastle, Gold Coast–Tweed Heads and Canberra–Queanbeyan. This proposal was dismissed because it was felt that significant urban areas in New South Wales and Victoria (e.g. Maitland, Wollongong, the New South Wales Central Coast and Geelong) needed to be included in the highly accessible category. With this in mind, the range of 0–0.2 was adopted for the most accessible category.

At the other end of the scale, the cut-off point of 5.92 was chosen to maximise the population size of areas classed as remote. With these considerations in place, it may still be impossible to publish all the variables from sample surveys in some states, even when remote area data are aggregated to the national level. In these cases, the 'remote' and 'very remote' ARIA classes may need to be combined.

Advantages of the ASGC classification

- The index is relatively stable over time. ARIA remoteness scores will only change if population centres move to a different service centre category by becoming more/less remote or if there are significant changes to Australia's road network.
- The index is flexible. ARIA can be used to generate a remoteness score for any existing area in Australia.
- The index is conceptually simple. ARIA measures remoteness in terms of geographic location only. The index does not confuse concepts of rurality with issues of remoteness. The ARIA index takes into account that locations can be both rural and accessible or, alternatively, urban and remote.
- The index is precise. ARIA classes are derived from road distance measurements to the town centre and not just straight-line distances ensuring high precision even at an extremely small geographical scale.

ASGC provides a simple and logical definition and methodology to assess remoteness from goods and services that can be used for any location in Australia. The classification takes into account the distance involved for people to access goods and services and also the fact that a greater range of goods and services will be available at service centres with a large population. Road conditions, travel time and seasonality are not incorporated into the classification since they would make the index unsuitable for use as a national geographic classification by making it volatile. ASGC is based only on physical geography, and is not intended for use in isolation as a measure of socioeconomic status. This system of classification attempts to distinguish remoteness in terms of accessibility alone. For this reason, there is an increased scope for the examination of the relationship between ASGC and variables such as population size and density as well as demographic characteristics, which are excluded from the definition of ASGC. ASGC provides an objective assessment of remoteness and is useful for the targeting of assistance by government departments. The ARIA classification has been accepted by a broad range of users, including the ABS, where it has recently been proposed as the national standard measure of remoteness, as well as various government departments and agencies.

Abbreviations

AAP	asthma action plan
ABS	Australian Bureau of Statistics
ACAM	Australian Centre for Asthma Monitoring
ACT	Australian Capital Territory
AHR	airway hyperresponsiveness
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index of Australia
ASMA	Australian System for Monitoring Asthma
BEACH	Bettering the Evaluation and Care of Health
BMI	body mass index
CATI	Computer Assisted Telephone Interviewing
CATI TRG	National CATI Health Survey Technical Reference Group
CD	Collection District (Census)
COPD	chronic obstructive pulmonary disease
CRCA	Cooperative Research Centre for Asthma
DALY	Disability Adjusted Life Years
ECRHS	European Community Respiratory Health Survey
ED	Emergency Department
EEWP	extended electronic White Pages
ETS	environmental tobacco smoke
EWP	electronic White Pages
FEV_1	forced expiratory volume in 1 second
GP	general practitioner
GPSCU	General Practice Statistics and Classification Unit
HIC	Health Insurance Commission
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 Classification of Diseases version 10—Australian Modification
IRSD	Index of Relative Socioeconomic Disadvantage
MBS	Medical Benefits Scheme
NAC	National Asthma Council
NAEPP	National Asthma Education and Prevention Program
NCATSIS	National Centre for Aboriginal and Torres Strait Islander Statistics
NHDC	National Health Data Committee

NHDD	National Health Data Dictionary
NHPA	National Health Priority Area
NHMD	National Hospital Morbidity Database
NHS	National Health Survey
NMDS	National Minimum Dataset
NSW	New South Wales
NT	Northern Territory
OATSIH	Office of Aboriginal and Torres Strait Islander Health
PBS	Pharmaceutical Benefits Scheme
PGS	Pharmacy Guild Survey
PHIDU	Public Health Information Development Unit, University of Adelaide
PIP	Practitioner Incentive Program
Qld	Queensland
RADS	Reactive Airways Dysfunction Syndrome
RAST	RadioAllergoSorbent Test
RPBS	Repatriation Pharmaceutical Benefits Scheme
RRMA	Rural, Remote and Metropolitan Areas (classification)
SA	South Australia
SABRE	Surveillance of Australian workplace Based Respiratory Events
SAMSS	South Australia Monitoring and Surveillance System
SAND	Supplementary Analysis of Nominated Data
SEIFA	Socioeconomic Indexes For Areas
SENSOR	Sentinel Event Notification System for Occupational Risks
SERCIS	Social, Environment and Risk Context Information System
SIP	Service Incentive Payment
SLA	Statistical Local Area
SOB	shortness of breath
SWORD	Surveillance of Work-related and Occupational Respiratory Diseases (UK)
Tas	Tasmania
Vic	Victoria
VEMD	Victorian Emergency Department Minimum Dataset
WA	Western Australia
WANTSA	Collaborative Health and Wellbeing Survey (Western Australia, Northern Territory and South Australia)

Glossary

Acceptability: Willingness of custodians to participate in a monitoring system for asthma.

Age-specific rate: The number of cases or deaths per 100,000 persons per year for a specific age group. Five-year age groups are commonly used when calculating age-specific rates.

Age-standardised rate: An adjusted rate to ensure that the study population (e.g. state or Census division) has the same age distribution as the standard population.

Concurrent validity: A type of criterion validity, where a new measure correlates with a gold standard measure, and both measures are administered at the same time.

Construct validity: The extent to which there is agreement between a hypothesised association and a specific measure or procedure.

Content validity: The extent to which a measurement is representative of the concepts it is intended to reflect. It relies on judgements—from individual (see *face validity*) or from key experts.

Criterion validity: The correlation of a new measure with another measure that is considered to be the gold standard. It can be divided into two types: concurrent validity and predictive validity.

Data availability: The extent to which data are accessible at the current point in time.

Data completeness: Proportion of all people with asthma (+ relevant characteristic) who are identified by the system.

Data development: Further progress and expansion of data deemed important for monitoring but either not currently being collected at all or not being collected in a suitable manner for use at this point in time.

Data disaggregation: A subset or breakdown of a dataset to create smaller categories for comparison (e.g. age, sex, socioeconomic status).

Data source: The survey, dataset, organisation or individual from which relevant data can be obtained.

Denominator: The lower portion of a fraction used to calculate a rate or a ratio. When calculating a rate, the denominator is usually the population at risk.

Face validity: The predominant type of content validity. A subjective evaluation by the researcher that the measurement (indicator) is measuring the concept or topic (PHIDU 2001).

Feasibility: The degree to which an indicator is useful in measuring the specified objectives, with discussion about its importance, value and also whether the indicator is measurable.

Goal: The broad outcome to which program objectives are directed.

Incidence: A measure of the frequency with which a new case of illness occurs in a population over a period of time. The numerator is the number of new cases developing per unit of time and the denominator is the population at risk.

Indicator: A measure that can be used to monitor the effectiveness and impact of interventions and policies to improve health and provide effective, accessible and quality health care. Indicators provide a means of monitoring differences between population subgroups, identifying problems that need action and also tracking progress towards eliminating these problems over time.

Intent: Describes the potential purposes for which the indicator was developed.

Monitoring: Includes the ongoing, systematic collection of data and the evaluation, analysis and distribution of findings essential to the planning and review of public health practice.

Numerator: The upper portion of a fraction used to calculate a rate or ratio.

Objective: The specific statements that describe a directional change or action that should result from an effective intervention. Objectives contribute to the fulfilment of specified goals, thus several objectives may be associated with one goal.

Operational definition: A quantifiable description of what to measure and the steps to follow to consistently measure it.

Predictive validity: A type of criterion validity, where a new measure correlates with a gold standard measure, which is administered at a later time.

Predictive value positive: Assesses the proportion of persons identified as cases (+ required characteristic) who actually have asthma (and the relevant characteristic).

Prevalence: The number of cases of a condition existing for a specified population at a given time.

Proportion: A type of ratio in which the numerator is included in the denominator, expressed as a percentage in this report.

Random sample: A sample in which each individual had the same chance of being selected.

Rate: The frequency of an event within a defined population (e.g. 46 per 100,000 people with asthma).

Reliability: The extent to which a measure, procedure or instrument yields the same result on repeated occasions or across methods of collection.

Representativeness: Assessing if and how well the population on which the data is based represents the target population of the indicator.

Response rate: The percentage of completed measures (e.g. questionnaires in a survey, or participants in a research project).

Responsiveness to change (sensitivity to change): Degree to which a measure reflects changes over time.

Sensitivity: The proportion of people with a disease who are correctly identified as having the disease (i.e. true positive).

Sensitivity over time: The ability of the system to pick up changes over time.

Specificity: The proportion of people without a disease who are correctly identified as not having the disease (i.e. true negative).

Timeliness: The time from data collection to data availability and availability of data series.

Validity: The degree to which a variable or intervention accurately reflects or measures the specific concept that it is attempting to measure or accomplishes what it is meant to accomplish. (See also *content*, *construct*, *criterion* and *face validity*.)

Value: The usefulness and worth of the indicator.

Appendix: Contributors and acknowledgments

Australian System for Monitoring Asthma committee membership

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Mr David Muscatello	National Health Information Management Group nominee
Mr Robin Ould	National Asthma Council nominee
Professor Richard Ruffin	University of Adelaide & Queen Elizabeth Hospital, Woodville
Ms Anne Taylor	CATI Technical Reference Group nominee

Australian Centre for Asthma Monitoring

Ms Deborah Baker
Ass./Prof. Guy Marks
Ms Leanne Poulos
Ms Margaret Williamson

Participation in consultation process

The following people participated in the national consultation process undertaken to discuss the national asthma indicator set. Many more people were invited but were unable to participate due to other commitments.

Australian Capital Territory

Dr Fadwa Al Yaman	Australian Institute of Health and Welfare
Ms Rachel Balmanno	Department of Health and Ageing
Mr Andrew Benson	Department of Health and Ageing
Dr Peter Charlton	Health Insurance Commission
Dr Ching Choi	Australian Institute of Health and Welfare
Ms Joy Eshpeter	Department of Health and Ageing
Ms Susan Garner	Department of Health and Ageing
Ass./Prof. Nicholas Glasgow	Academic Unit of General Practice, University of Sydney
Ms Narelle Grayson	Australian Institute of Health and Welfare
Dr Bronwen Harvey	Department of Health and Ageing
Ms Monica Johns	Department of Health and Ageing
Ms Colleen Krestensen	Department of Health and Ageing
Ms Jonette McDonnell	Department of Health and Ageing
Ms Maureen Millar	Australian Bureau of Statistics
Ms Janice Miller	Australian Institute of Health and Welfare
Mr Andrew Phillips	Australian Institute of Health and Welfare
Dr Anne Louise Ponsonby	National Centre for Epidemiology and Population Health
Ms Marelle Rawson	Australian Bureau of Statistics
Ms Sally Rubenach	ACT Department of Health, Housing and Aged Care
Mr John Shelton-Agar	Australian Institute of Health and Welfare
Ms Kym Starr	Department of Health and Ageing
Mr Phil Trickett	Australian Institute of Health and Welfare
Mr Robert Van der Hoek	Australian Institute of Health and Welfare

New South Wales

Ass./Prof. Helena Britt	General Practice Statistics and Classification Unit, AIHW
Ms Lindsay Cane	Asthma New South Wales
Dr Peter Carroll	National Asthma Reference Group and Pharmaceutical Association of Australia
Ms Margo Eyeson-Annan	New South Wales Department of Health
Dr Graham Miller	General Practice Statistics and Classification Unit, AIHW
Dr Matthew Peters	Concord Hospital
Dr Ron Tomlins	National Asthma Reference Group & National Asthma Council

Queensland

Dr John Aloizos	National Asthma Reference Group and General Practice Partnership Advisory Council
Ms Kerry Grimes	Queensland Department of Health
Mr Peter Lonsdale	Asthma Queensland
Dr Gayle Pollard	Queensland Department of Health
Dr Geri Taylor	National Asthma Reference Group and National Health Priority Action Council

South Australia

Dr Ral Antic	Royal Adelaide Hospital
Mr Paul Basso	Department of Human Services
Dr Justin Beilby	Department of General Practice, University of Adelaide
Ms Catherine Chittleborough	Department of Human Services
Professor Alan Crockett	Flinders Medical Centre
Mr Andre Duszynski	Department of General Practice, University of Adelaide
Ms Kay Gallary	Asthma Foundation of South Australia
Ms Julie Mitchell	Department of Human Services
Professor Louis Pilotto	Flinders Medical Centre
Dr Wendy Scheil	Department of Human Services

Tasmania

Ms Karen Hinton	Department of Health and Human Services

Victoria

Ass./Prof. Michael Abramson	The Alfred Hospital
Professor Gary Anderson	University of Melbourne
Mr Zahid Ansari	Department of Human Services
Ass./Prof. Don Campbell	Royal Melbourne Hospital
Dr Chris Hogan	The Royal Australian College of General Practitioners
Professor Robyn O'Hehir	The Alfred Hospital and Monash University
Mr Robin Ould	Asthma Victoria
Ms Dianne Reidlinger	Department of Human Services
Ass./Prof. Colin Robertson	Royal Childrens Hospital
Ass./Prof. Susan Sawyer	Royal Childrens Hospital Centre for Adolescent Health
Ms Kristine Whorlow	National Asthma Council

Western Australia

Ms Sherylle Baker	Asthma Foundation of Western Australia
Ms Alison Daly	Health Department of Western Australia

Ms Jo Horrex	Asthma Foundation of Western Australia
Dr Alan James	Sir Charles Gairdner Hospital
Professor Peter le Souef	Princess Margaret Hospital for Children
Ms Elizabeth Lloyd	Health Department of Western Australia
Professor Bill Musk	Sir Charles Gairdner Hospital
Dr Peter Sly	Telethon Institute for Child Health Research
Mr Matthew Tweedie	Asthma Foundation of Western Australia

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