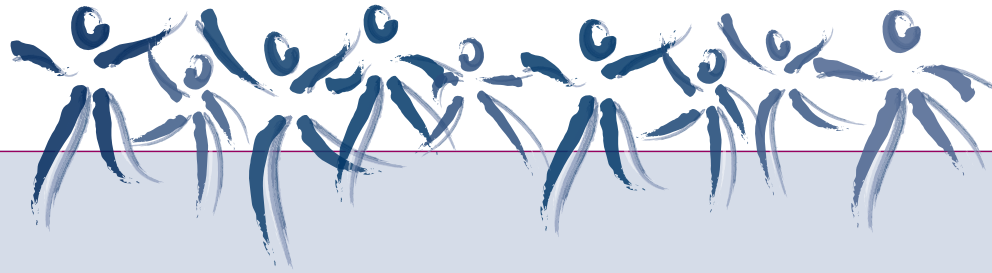


4. Mortality



Key points	50
Introduction	50
4.1 Time trends in asthma deaths	50
4.2 International comparisons.....	52
4.3 Population subgroups.....	54
4.4 Seasonal variation in mortality risk	61
4.5 Comorbidities in people who died from asthma.....	62
4.6 Asthma as an associated cause of death in deaths attributed to other causes.....	63
Summary.....	64

Key points

- There were 402 deaths attributed to asthma as the underlying cause in 2006. This represents 0.30% of all deaths in that year.
- There was a 69% decrease in the mortality attributed to asthma between 1989 and 2006; however the rate of mortality due to asthma in Australia remains high on an international scale.
- Deaths due to asthma occur in all age groups, although the risk of dying from asthma increases with age.
- The age distribution of asthma deaths is quite different to that observed for all-cause deaths. Of all asthma deaths in 2006, 32% occurred among people aged 5–64 years. In contrast, the proportion of all-cause deaths in this age group was only 20%.
- People living in more socioeconomically disadvantaged areas have a higher risk of dying from asthma than people who live in more advantaged areas.

Introduction

There is evidence that effective management of asthma can reduce the risk of death due to this disease (Suissa et al. 2000). Monitoring trends and differentials in rates of death due to asthma assists in the evaluation of existing measures to control the impact of asthma.

In this chapter, we investigate time trends in asthma deaths, seasonality of deaths due to asthma as well as differences in age-standardised asthma mortality rates according to age, sex, remoteness of residence, socioeconomic status and country of birth. These analyses are limited to deaths in which asthma was listed as the underlying cause of death. The underlying cause of death is defined as the condition which is 'deemed to have started the train of events that led to death' (ABS 2003). We also investigate international comparisons in asthma mortality rates, comorbidities in people who died from asthma and asthma as an associated cause of death.

Asthma was certified as the underlying cause of 402 deaths in 2006. This corresponds to an asthma mortality rate of 1.80 (95%CI 1.63–1.98) per 100,000 population, representing 0.30% of all deaths.

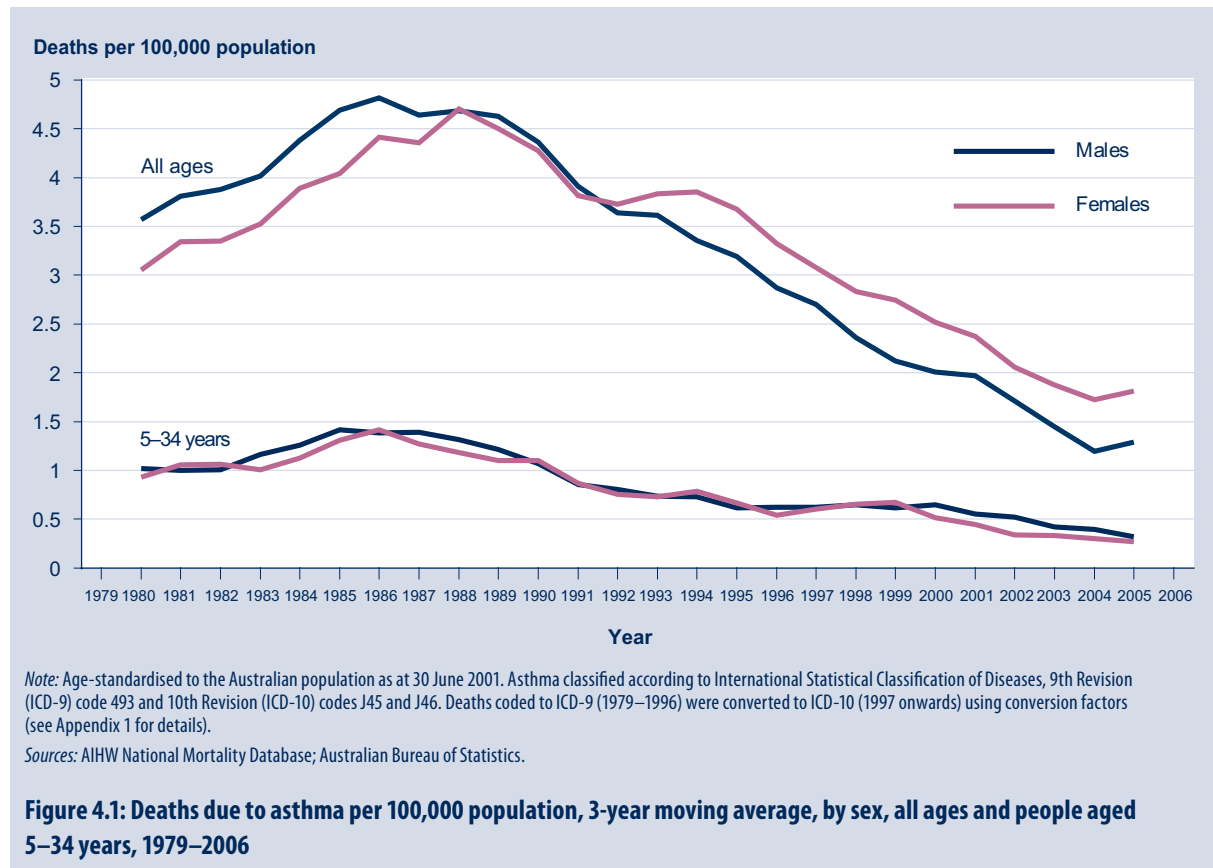
4.1 Time trends in asthma deaths

In this section, we investigate trends in asthma deaths since 1979. Age-specific comparability factors were applied to data on deaths due to asthma which occurred before 1997, and hence were coded under the International Classification of Diseases, 9th Revision (ICD-9), to enable comparison with more recent data coded using ICD, 10th Revision (ICD-10) (see Appendix 1, Section A1.10.3).

All ages

In 1979, the rate of mortality attributed to asthma was 2.84 per 100,000 population and this steadily increased to a high of 4.99 per 100,000 in 1989. After that peak, the rate declined steadily by almost 70% to 1.54 per 100,000 in 2003. The rate remained stable in 2004 and 2005 at 1.51 and 1.49 per 100,000, respectively, but increased to 1.80 per 100,000 population in 2006.

From the late 1970s, the asthma mortality rate was higher in males than females for most years, but since the late 1980s, the mortality rate has declined more among men than women (Figure 4.1; see also Appendix 2, Table A2.7). Since the early 1990s, the mortality rate has remained higher in females than males and in 2006, the asthma mortality rate was about 1.3 times as high in females (2.04 per 100,000 population) than males (1.52 per 100,000 population).



The increase in deaths attributed to asthma in 2006, compared with 2005, was limited to people aged 65 years and over. Among males, it was more than balanced by a decrease in the number of deaths attributed to chronic obstructive pulmonary disease (COPD) in this age group, with a resultant decline in deaths due to all forms of obstructive lung diseases (ICD-10 codes J40–47). However, among females, there was no decrease in the number of deaths attributed to COPD among those aged 65 years and over and, hence, there was an overall small increase in the number of deaths attributed to obstructive lung disease in this age group (Figure 4.2).

People aged 5–34 years

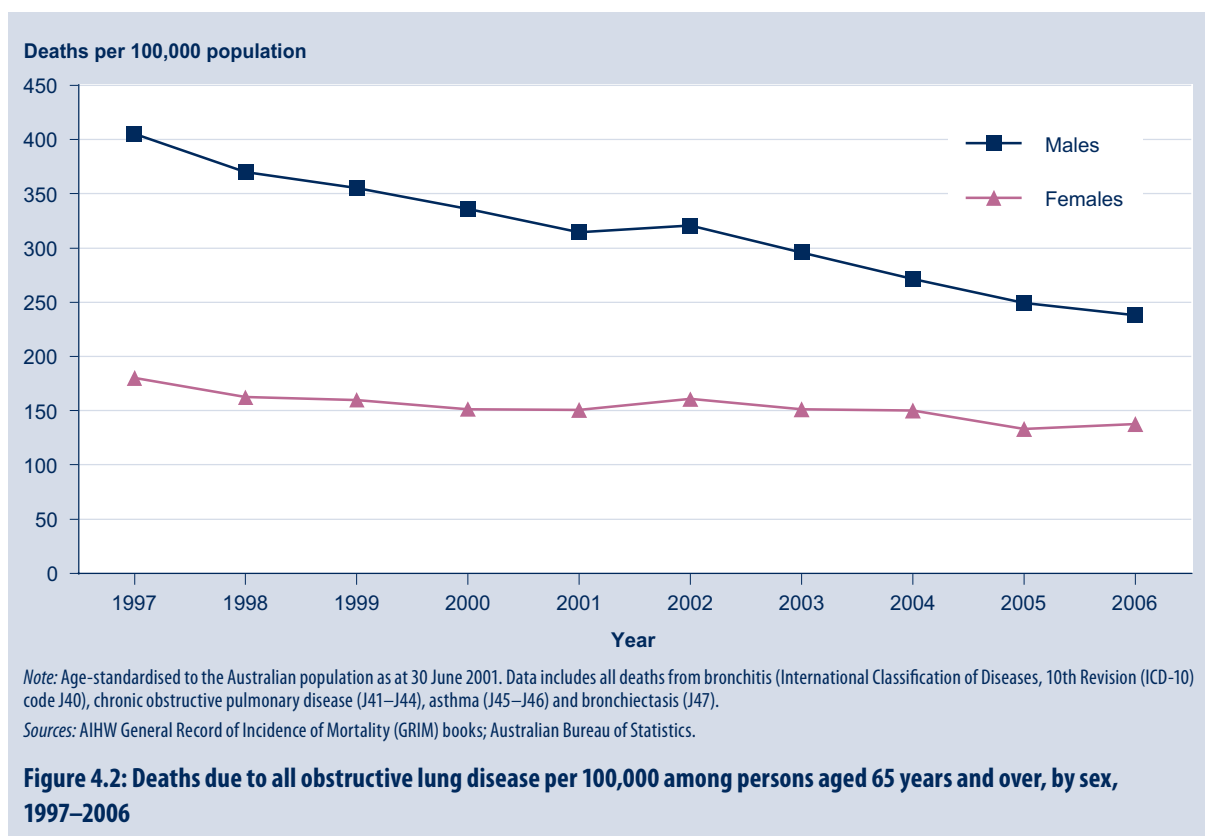
Because attribution of death to asthma is more certain among those aged 5–34 years, this age group is commonly used for examining time trends and for making international comparisons. In older people, other causes of death, in particular chronic obstructive pulmonary disease, commonly cause difficulties in the attribution of causes of death (Jones et al. 1999; Sears et al. 1986; Smyth et al. 1996). This is due to the complexity of diagnosis of respiratory problems in the elderly. In fact, there is also considerable overlap between self-reported diagnoses of asthma, chronic bronchitis and emphysema (Abramson 2005).

Since the mid to late 1980s, the rate of death attributed to asthma in 5–34-year-olds declined substantially (Figure 4.1; see also Appendix 2, Table A2.8). However, in contrast to the trend observed in the population as a whole, in this more-limited age group, there has been little difference between the sexes in the mortality rate due to asthma.

Interpretation

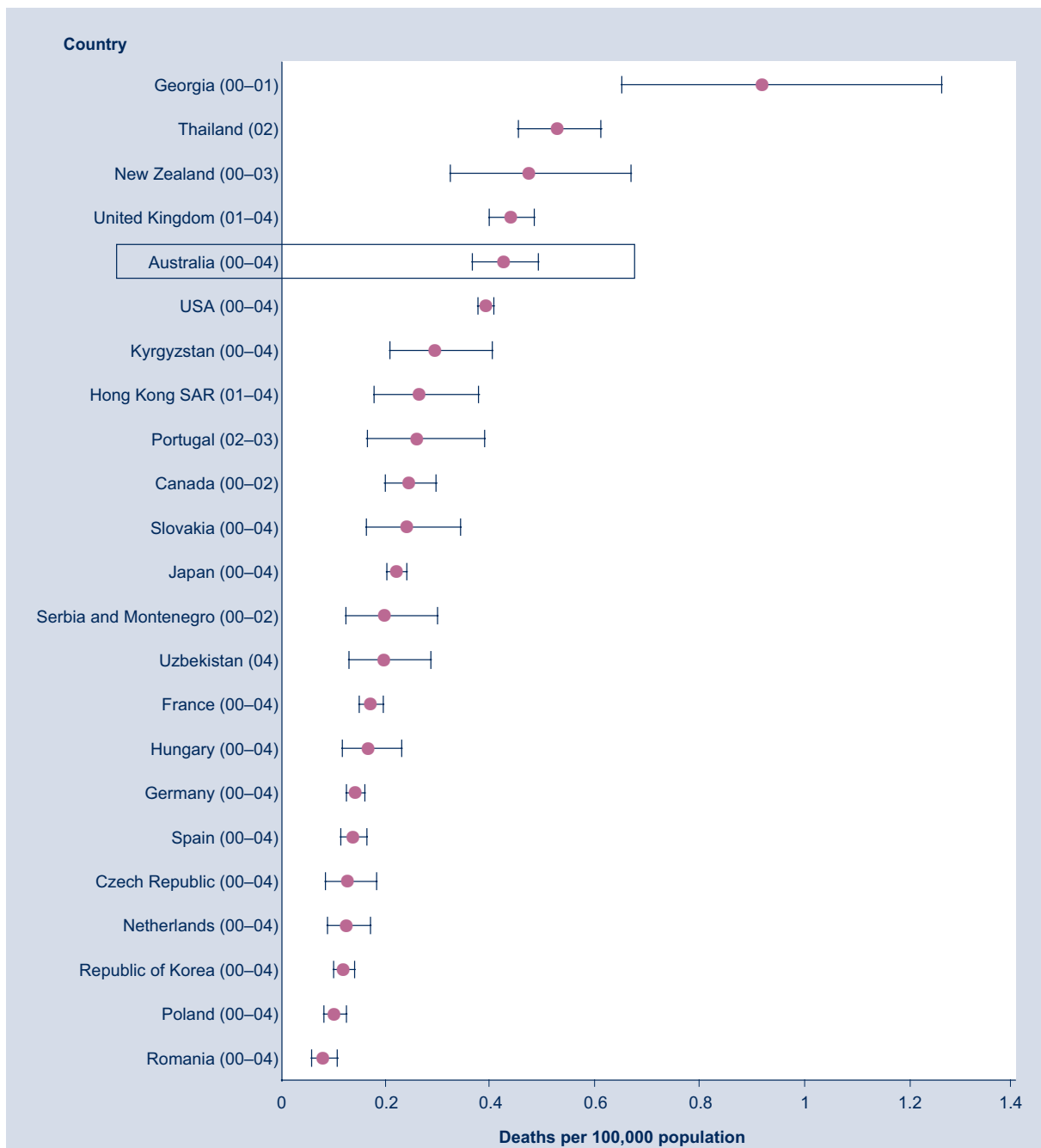
The reason for the long-term reduction in the rate of asthma mortality is uncertain. There has been no corresponding decline in the prevalence of asthma among adults. Hence, the reduction in deaths due to asthma must be largely attributable to a reduction in the risk of dying among people who have asthma. The introduction of asthma management guidelines in the early 1990s, together with changes in the availability and use of treatments for asthma since then, may have contributed to this favourable outcome. Policy initiatives at state and national levels, including targeted funding and increased awareness amongst health professionals and patients with asthma, have also occurred over this period. Finally, environmental changes, which affect the severity of asthma and the severity of exacerbations of the condition, may have also played a part in reducing the rate of asthma mortality.

The rise in deaths among people aged 65 years and over in 2006 is a cause for some concern. While it may be partially attributed to diagnostic transfer from other forms of obstructive lung disease, this does not seem to be the explanation in females, where there has been a slight rise in overall mortality due to obstructive lung disease (Figure 4.2). Further increases in the near future would require investigation and action.



4.2 International comparisons

Mortality rates due to asthma in Australia are relatively high by international standards. Similar rates are reported for the United States, United Kingdom and New Zealand (Figure 4.3). However, many other countries, including Japan, France, Germany, Spain and Poland, have lower rates of asthma mortality.



Notes

1. Data are for countries reporting to the World Health Organization Statistical Information System (WHOSIS) Mortality Database in International Classification of Diseases, 10th Revision (ICD-10) format (J45 and J46). Analysis of these data was undertaken by the Australian Centre for Asthma Monitoring (ACAM) and all interpretations and conclusions published here are those of ACAM and not WHO, which is responsible only for the provision of the original data.
2. Data for Australia 2004 and New Zealand 2002 and 2003 were sourced separately (see below).
3. For each country, data are the average over one or more years during the period 2000–2004 (years of coverage for each country are shown in brackets).
4. Rates are age-standardised to the WHO World Standard Population (Ahmad et al. 2001). Only those countries for which the relative standard error for the average asthma mortality rate was less than 25% are included.

Sources

1. Data were obtained from the WHO Mortality Database for all countries, except Australia for 2004 and New Zealand for 2002 and 2003.
2. Data for Australia for 2004 were obtained from the AIHW General Record of Incidence of Mortality (GRIM) Book for asthma (AIHW 2007b).
3. Data for New Zealand for 2002 and 2003 were obtained from the New Zealand Health Information System 2006.

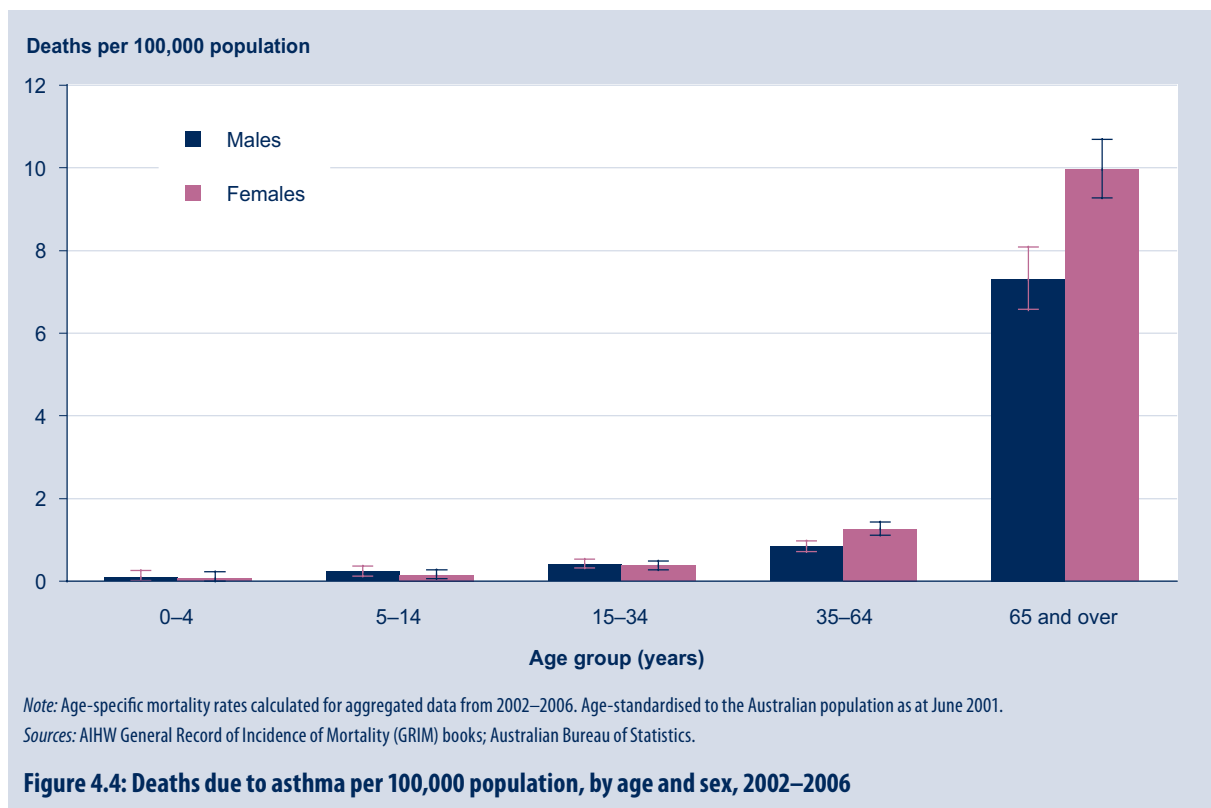
Figure 4.3: World ranking of asthma mortality per 100,000 population, people aged 5–34 years, 2000–2004

4.3 Population subgroups

Age and sex

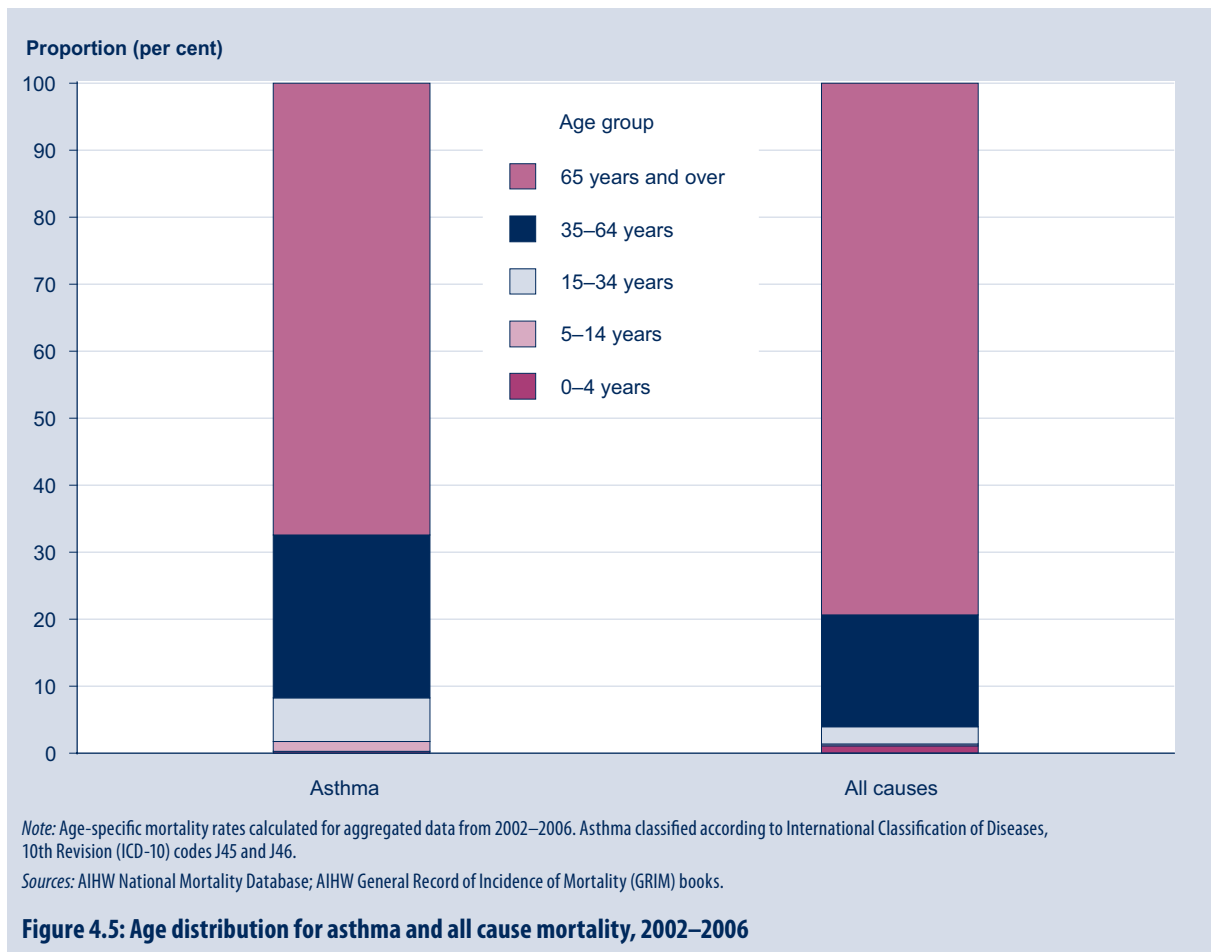
While deaths due to asthma occur in all age groups, the risk of dying from asthma increases with age in both males and females (Figure 4.4). Most deaths attributed to asthma occur in people aged 65 years and over. This is also the age group in which chronic obstructive pulmonary disease (COPD) is common. There is substantial overlap in the clinical features of asthma and COPD. As a result, the attribution of death to one or the other of these diseases is not reliable in clinical practice or in mortality statistics.

There are more deaths attributed to asthma among females aged 65 years and over than males of the same age. The relative importance of sex differences in the risk of asthma and gender differences in the labelling of airway disease in this age group is uncertain.



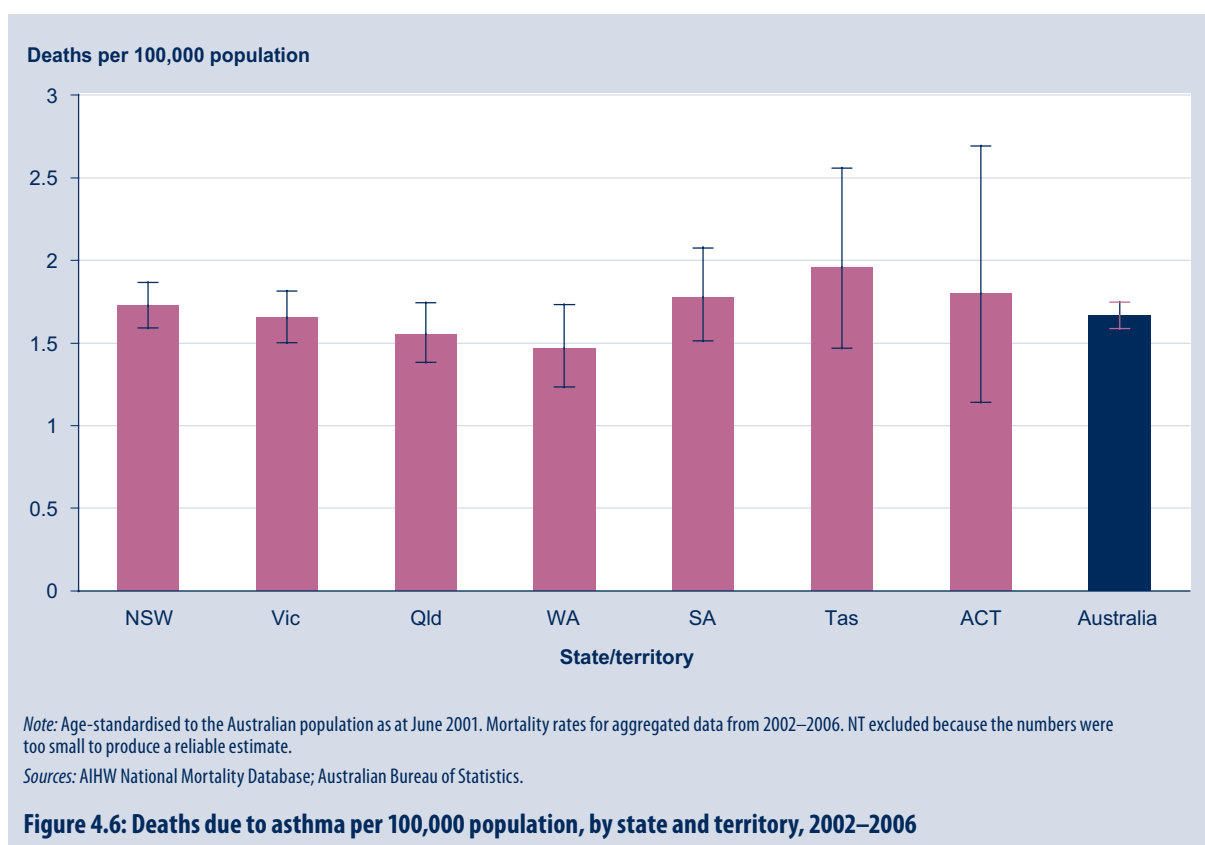
During 2002–2006, most deaths due to asthma occurred in people aged 65 years and over (figures 4.4 and 4.5). However, the proportion of asthma-related deaths that occurred at this age (67%) was smaller than the proportion of deaths due to all causes in this age group (79%; Figure 4.5).

In contrast, deaths among people aged 5–64 years represented a larger proportion of asthma deaths (32%) than all-causes deaths (20%, respectively).



States and territories

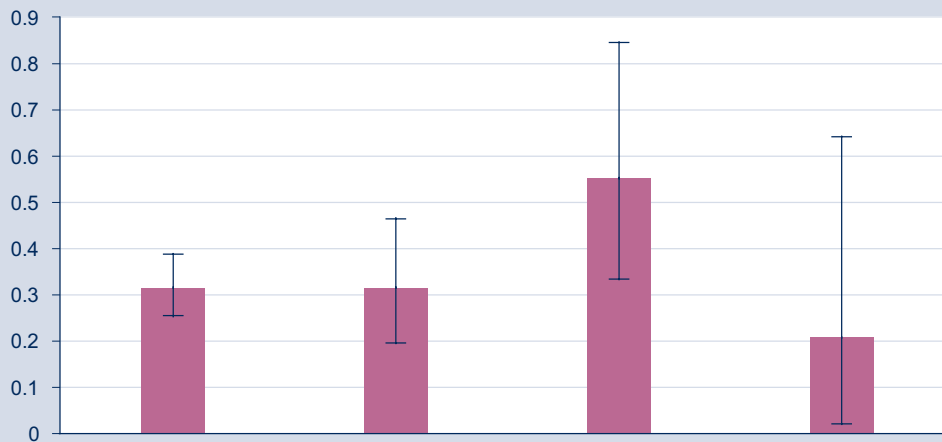
During 2002–2006, mortality rates due to asthma ranged from 1.5 per 100,000 population in Western Australia to 2.0 per 100,000 population in Tasmania (Figure 4.6). However, the small number of deaths in the states and territories with smaller populations means that the differences need to be interpreted with caution.



Urban, rural and remote areas

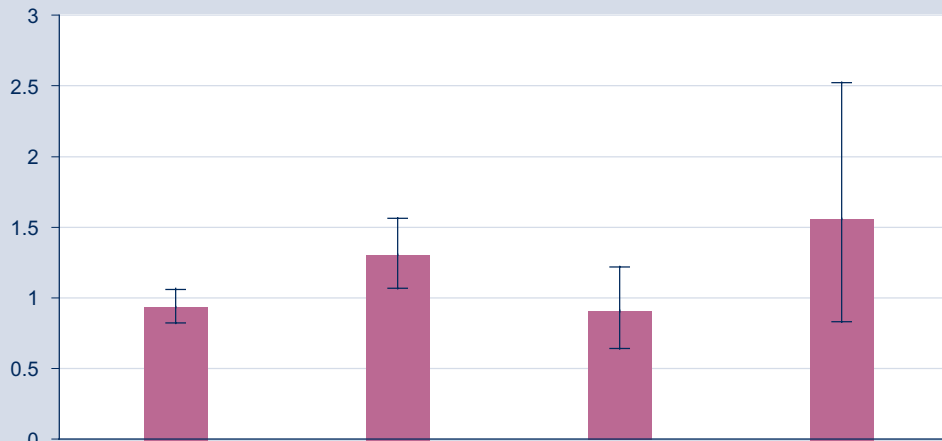
There was little variation in the mortality rate for asthma according to remoteness of residence for those aged 5–34 years, 35–64 years and 65 years and over (Figure 4.7). Due to the small number of deaths from asthma that occurred in remote areas of Australia, it was not possible to reliably estimate age-specific rates for these areas individually. For the purposes of this report, we have amalgamated deaths that occurred in remote and very remote areas of Australia.

Deaths per 100,000 population



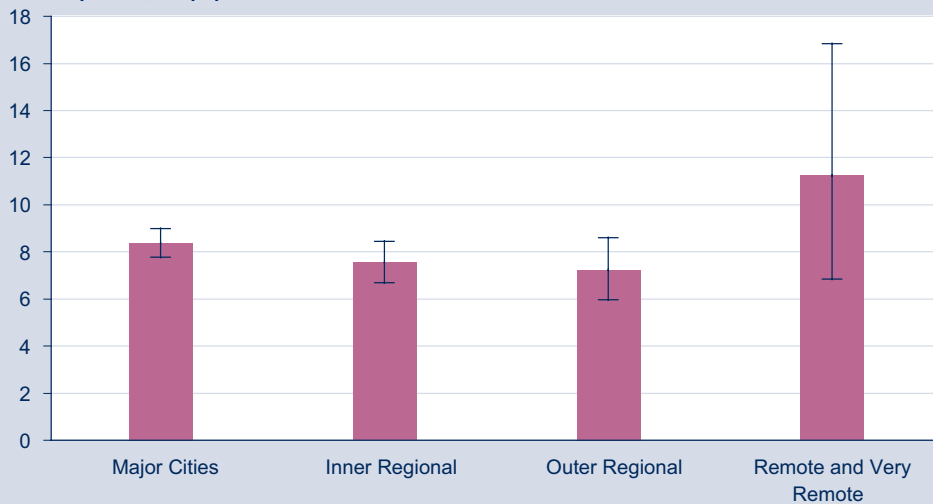
5-34 years

Deaths per 100,000 population



35-64 years

Deaths per 100,000 population



65 years and over

Remoteness category

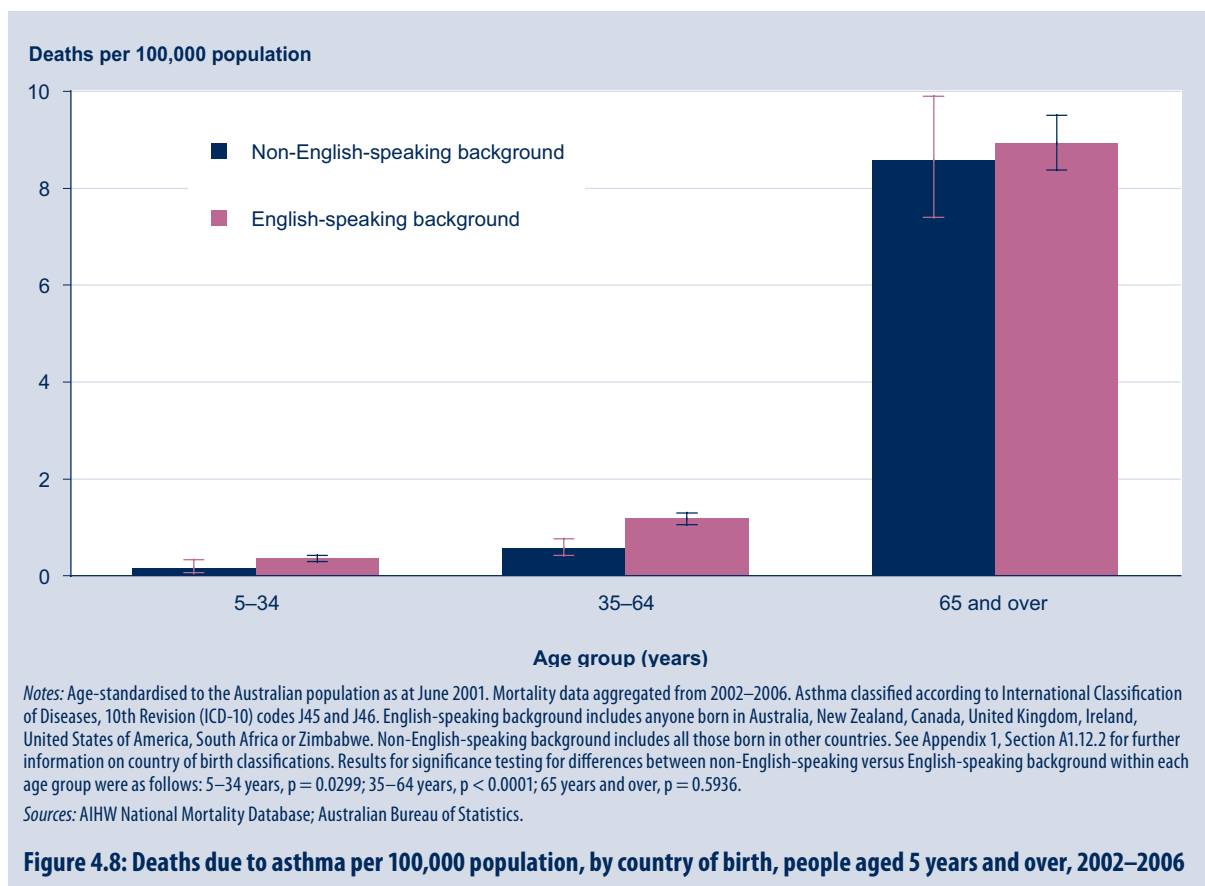
Notes: Age-standardised to the Australian population as at June 2001. Mortality rates for aggregated data from 2002–2006. Asthma classified according to International Classification of Diseases, 10th Revision (ICD-10) codes J45 and J46. Remoteness classified according to the Australian Standard Geographical Classification (ASGC) categories of remoteness. Y axis has different scale for each age group.

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

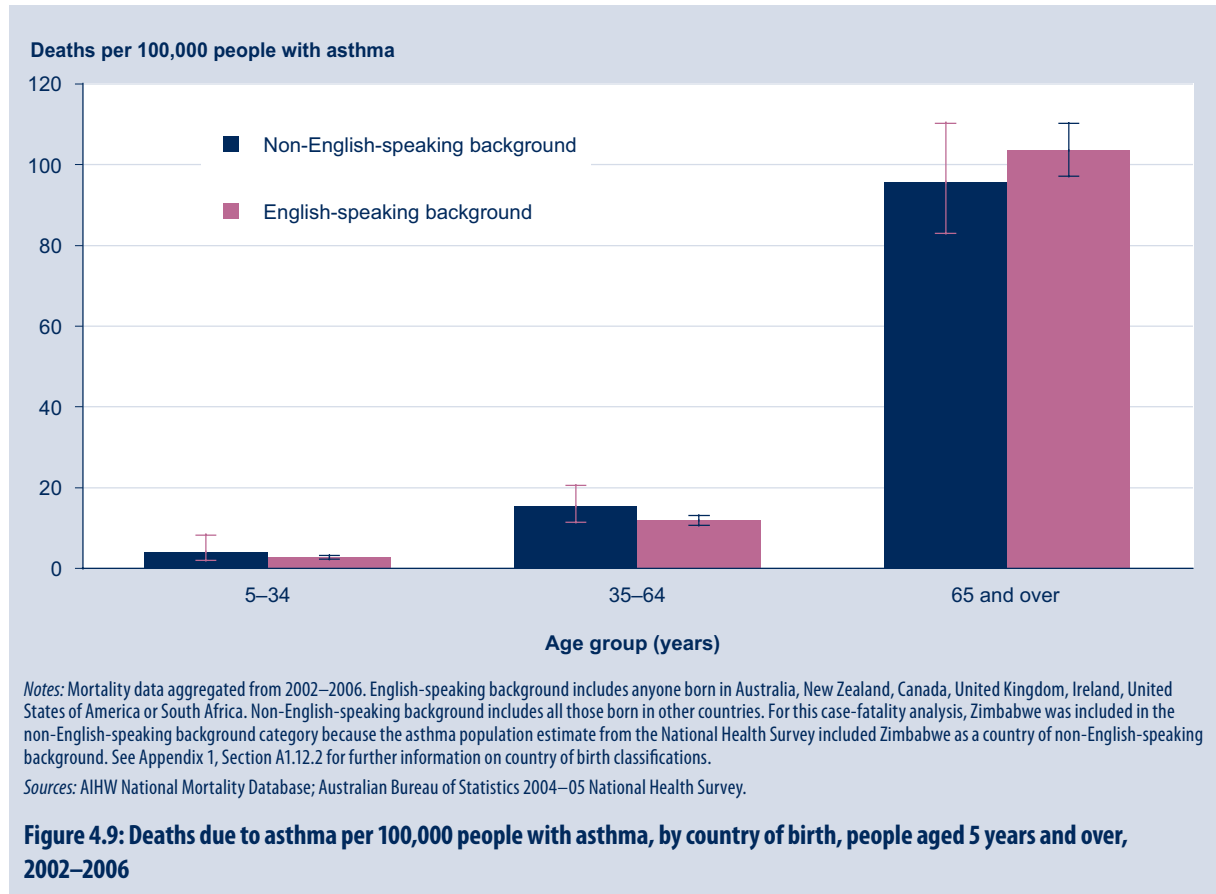
Figure 4.7: Deaths due to asthma per 100,000 population, by remoteness, people aged 5 years and over, 2002–2006

Country of birth

Among those aged 5 years and over, the mortality rate due to asthma was higher among people from an English-speaking background (1.85 per 100,000 population) compared with those from a non-English speaking background (1.46 per 100,000 population) ($p = 0.0014$). The disparity was largest among those aged 35–64 years and those aged 5–34 years (Figure 4.8).



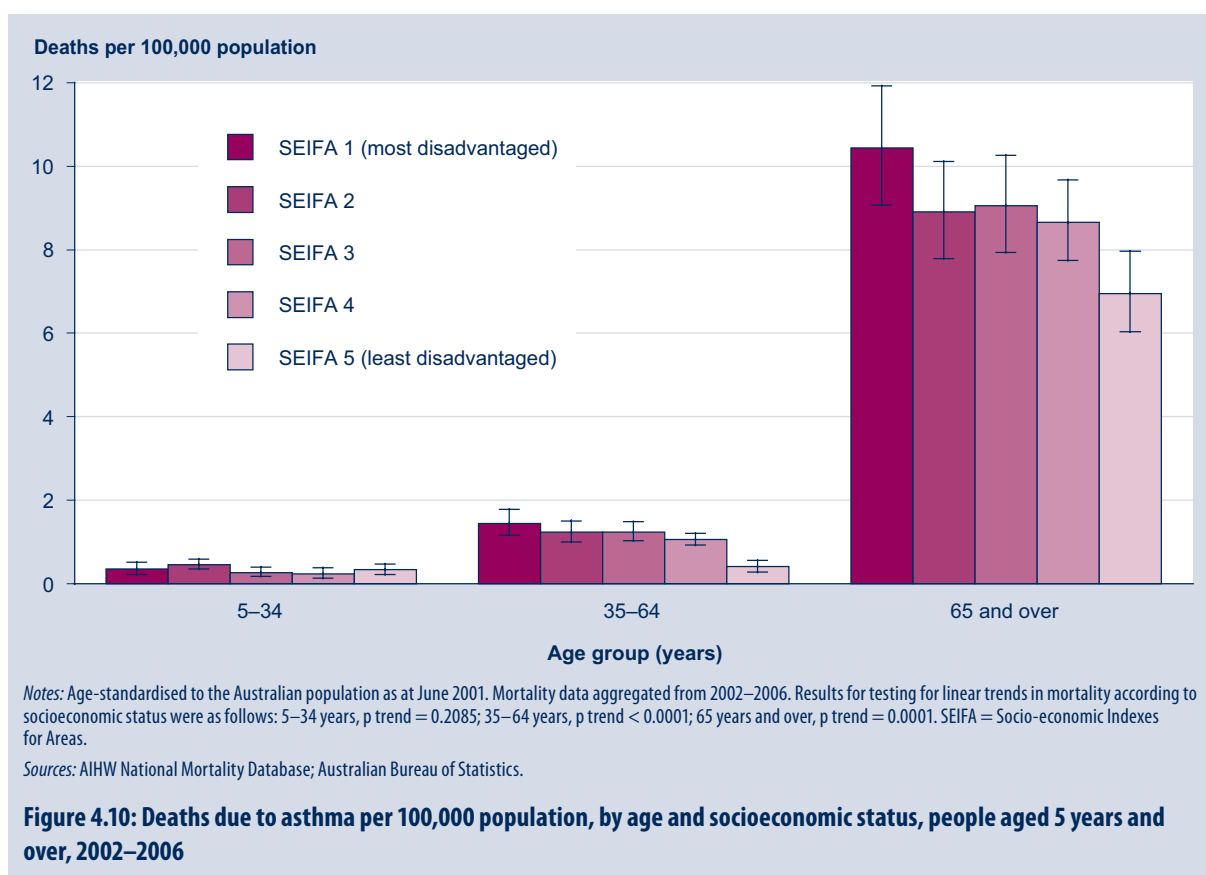
The case-fatality rate due to asthma in all age groups was similar among people from English-speaking and non-English-speaking backgrounds (Figure 4.9).



Socioeconomic disadvantage

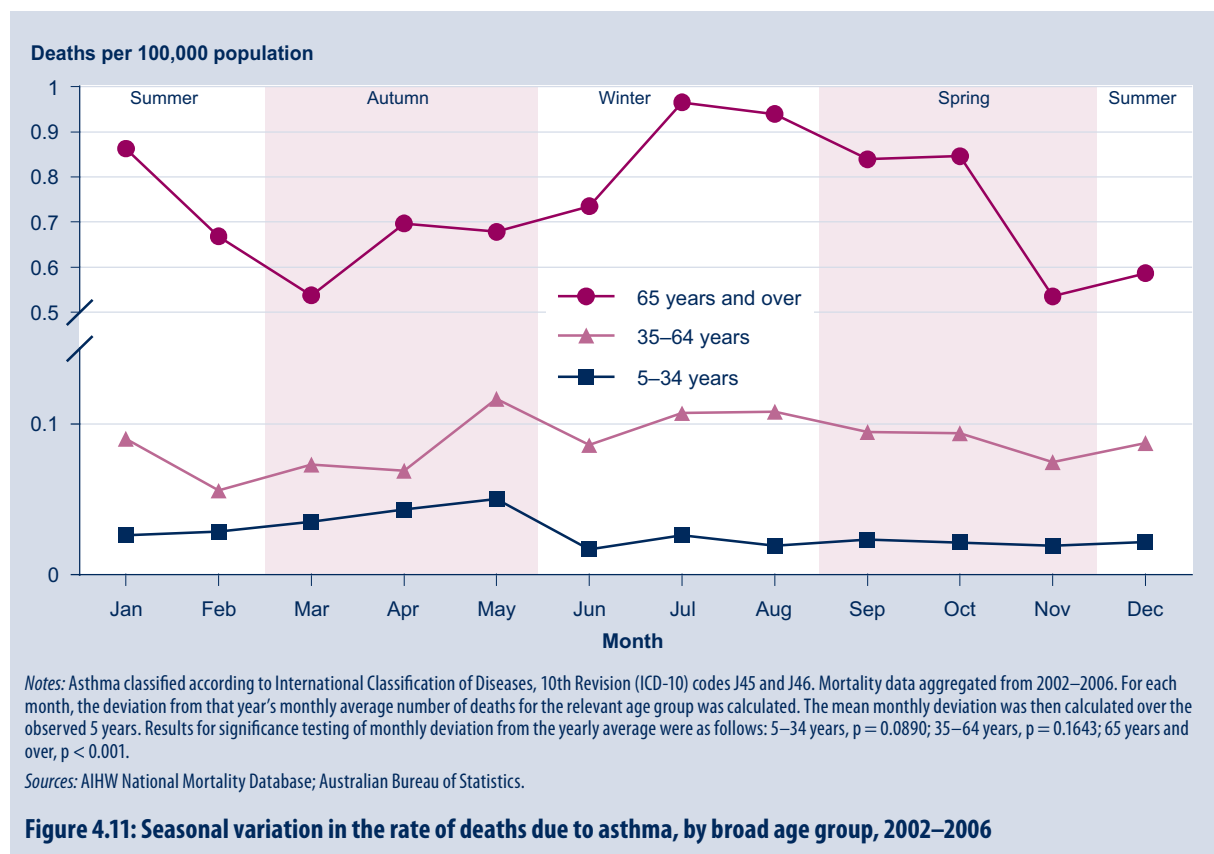
As with asthma prevalence, socioeconomic disparities also exist in regard to the severity of the disease and in health-seeking behaviours. In children, it has been shown that severe asthma is associated with lower socioeconomic status and poverty (Babin et al. 2007; Mielck et al. 1996). Studies from the United States of America also show an increase in the risk of asthma mortality related to lower socioeconomic status (Castro et al. 2001; Grant et al. 2000).

This is reflected in Australian mortality data, which show a significant relationship between increasing levels of socioeconomic disadvantage and higher risk of death from asthma, particularly among those aged 35–64 years and 65 years and over (Figure 4.10). Among those aged 5–34 years, there is no evidence of this relationship. These same trends, or lack thereof, exist for both males and females (data not shown).



4.4 Seasonal variation in mortality risk

The risk of death due to asthma varies with the time of year and is different between age groups. Studies from the United States (Weiss 1990) and the United Kingdom (Marks & Burney 1997) have demonstrated higher rates of asthma deaths during winter months among older people. Data for Australia (Figure 4.11) reflect a similar pattern in people aged 65 years and over, while for those aged 35–64 years, the risk of death due to asthma is higher in late winter and May. This pattern could reflect the impact of the winter rise in influenza and pneumonia. In contrast, among those aged 5–34 years, the highest death rates tend to occur in April and May, coinciding with mid-late autumn.



4.5 Comorbidities in people who died from asthma

This section describes the prevalence of selected comorbid conditions listed on the death certificate as associated causes of death among people whose underlying cause of death was asthma.

Among people whose deaths were attributed to asthma, the most common comorbidity was heart, stroke and vascular disease, which was listed on 29.4% of all death certificates (Table 4.1), including 15.4% among those who died aged 35–64 years and 39.0% among those who died aged 65 years and over.

Of all deaths due to asthma between 2001 and 2005, 26.2% had an acute respiratory infection (ICD-10 codes J0–J22) listed as an associated cause of death. It is well established in children (Johnston et al. 1995, 1996) and adults (Green et al. 2002) that viral infections are an important trigger for exacerbations of asthma leading to hospitalisation. The relatively low prevalence of acute respiratory infections recorded in association with deaths attributed to asthma may indicate that other factors are more important in precipitating fatal attacks. However, it is also possible that preceding viral infections did occur but that the attending medical practitioner who certified the patient's death was not aware of the antecedent events.

The proportion of people who died from asthma and who had comorbid conditions listed elsewhere on the death certificate increased with age. Among those aged 65 years and over, 11% had COPD or bronchiectasis listed as a comorbid condition. In contrast, only 6% of non-asthma deaths among people aged 65 years and over had COPD or bronchiectasis listed as a comorbid condition. Furthermore, 7% of non-respiratory deaths among people aged 65 years and over had COPD or bronchiectasis listed as a comorbid condition.

Table 4.1: Comorbidities in people who died from asthma, by broad age group, 2001–2005

Comorbidity	Proportion of asthma deaths (per cent)		
	35 to 64 years	65 years and over	All ages
Influenza, pneumonia and other acute lower respiratory infections	10.3	36.2	26.2
Chronic obstructive pulmonary disease (COPD) and bronchiectasis	8.8	10.8	9.3
Diabetes mellitus	7.8	9.9	8.5
Heart, stroke and vascular disease	15.4	39.0	29.4
Arthritis and osteoporosis	1.9	8.0	5.6
Mental and behavioural problems	1.9	2.3	2.0
Cancer	1.5	4.6	3.3

Notes

1. Results for people aged under 35 years are not presented because the number of deaths due to asthma with a comorbid condition listed was too small to produce a reliable estimate.
2. Associated causes of death are not mutually exclusive. Therefore, the columns for each age group can add up to more than 100%.
3. Asthma was classified according to International Classification of Diseases, 10th Revision (ICD-10) codes J45 and J46. Comorbidities were classified as follows: Influenza and pneumonia (J0–J22); COPD and bronchiectasis (J40–J44, J47); diabetes mellitus (E10–E14); heart, stroke and vascular disease (I20–I25, I60–I69, I50, I70–I79); arthritis and osteoporosis (M00–M25, M80–M82); mental and behavioural disorders (F30–F39, F40–F48, F90–F98); and malignant neoplasms (i.e. cancer) (C00–C97).

Source: AIHW National Mortality Database.

4.6 Asthma as an associated cause of death in deaths attributed to other causes

Asthma is relatively uncommonly listed as an associated cause of death in people dying of other causes. Between 2001 and 2005, there were 657,765 deaths in Australia (ABS 2008). Asthma was listed as an *associated* cause of death on 4,652 death certificates (0.71%) during this time.

Cardiovascular disease (heart, stroke and vascular disease) was most commonly listed as the underlying cause of death among deaths where asthma was an associated cause (41.1%). Among all deaths from cardiovascular disease, asthma occurred as an associated cause for only a small proportion (0.91%) (Table 4.2). Aside from cardiovascular disease, the other most common underlying causes of death where asthma was listed as an associated cause were cancer (21.4%) and diabetes (4.2%) (data not shown).

The underlying causes of death for which asthma was most likely to be an associated cause of death were arthritis and osteoporosis (1.20%) and diabetes (1.16%) (Table 4.2). Among those aged 5–34 years, 3.70% of those who died from COPD or bronchiectasis had asthma listed as an associated cause of death.

Table 4.2: Proportion of deaths due to other causes where asthma was listed as an associated cause, 2001–2005 (per cent)

Condition	Age group (years)			
	5–34	35–64	65 and over	All ages
Malignant neoplasms (cancer)	0.30	0.46	0.56	0.53
Endocrine, nutritional and metabolic diseases	0.74	1.89	1.15	1.25
Diabetes mellitus	0	1.41	1.12	1.16
Mental and behavioural disorders	n.p.	0	0.57	0.80
Diseases of the circulatory system	0.98	1.07	0.92	0.93
Heart, stroke and vascular disease	1.51	0.97	0.90	0.91
Diseases of the respiratory system	0.52	1.32	0.44	0.51
Influenza, pneumonia and other acute respiratory tract infections	0.83	1.78	0.31	0.39
Chronic obstructive pulmonary disease (COPD) and bronchiectasis	3.70	1.25	0.54	0.61
Other upper respiratory tract diseases	0	3.03	0	0.62
Diseases of the musculoskeletal system and connective tissue	1.47	1.22	0.83	0.88
Arthritis and osteoporosis	0	1.40	1.20	1.20
Total deaths	0.46	0.72	0.72	0.71

n.p. Not published (numbers too small to produce a reliable estimate)

Sources: AIHW General Record of Incidence of Mortality (GRIM) books; ABS 2008.



Summary

Death due to asthma is uncommon. However, the long-term decline in mortality rates due to asthma has levelled out over the last 3 years, with a slight increase among older people in 2006. The rate in Australia remains high by international standards.

The risk of death due to asthma increases with age. However, compared to deaths from all causes, a higher proportion of deaths due to asthma occur in younger age groups. Between 2002 and 2006, 67% of all deaths due to asthma occurred in those aged 65 years and over. In this older age group, mortality attributed to asthma was more common in women. People aged 35 years and over living in socioeconomically disadvantaged areas had higher mortality rates due to asthma than those living in socioeconomically advantaged localities.

Around one-quarter of all deaths from asthma are associated with respiratory infections.