

5.3 Invasive mechanical ventilation

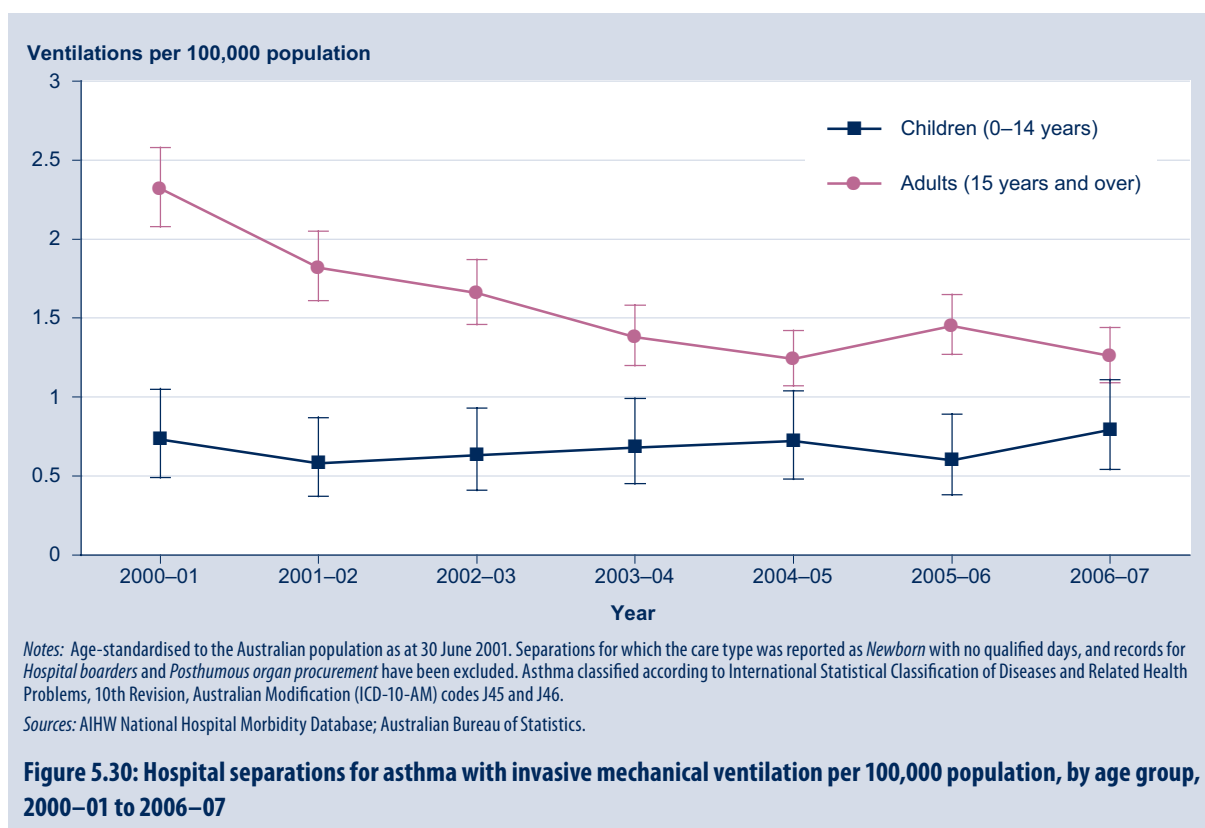
A small proportion of people with severe exacerbations of asthma either stop breathing altogether or decrease their breathing to such an extent that they are at risk of stopping breathing. This represents a severe, imminently life-threatening event and can only be averted by the introduction of artificial mechanical ventilation via an endotracheal tube attached to a positive pressure ventilator, otherwise known as a 'life support machine'. This procedure is sometimes referred to as invasive mechanical ventilation to distinguish it from a non-invasive form of ventilation that is used in less severe circumstances. Monitoring trends and differentials in the occurrence of this event, which is routinely recorded in hospital statistics, provides insights into the epidemiology of severe, life-threatening asthma and, possibly, asthma deaths.

Within the National Hospital Morbidity Database, information is included about procedures during hospital care. This section presents data relating to the use of mechanical ventilation where the principal diagnosis was asthma. A list of all the procedure codes included in these analyses is provided in Appendix 1 (Section A1.9.5).

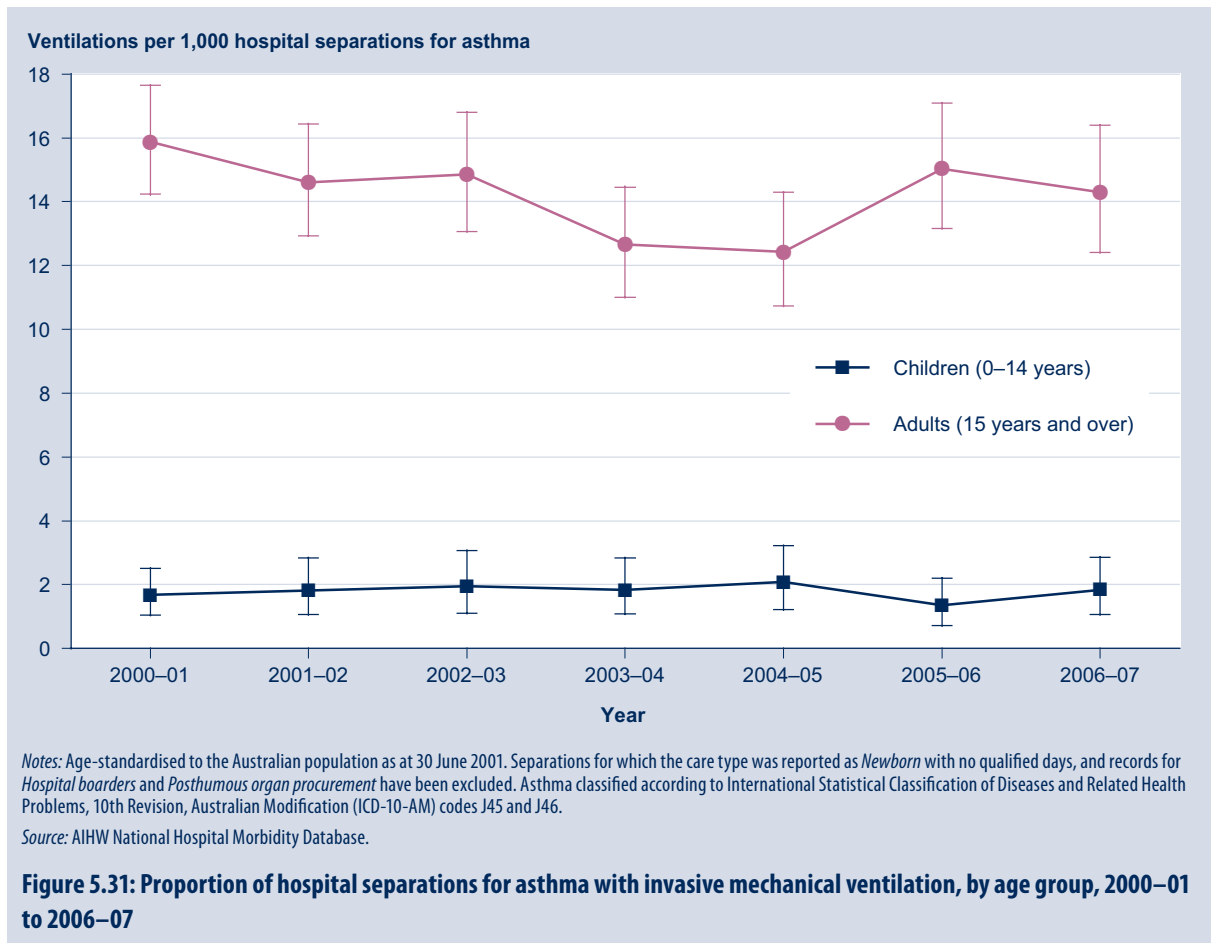
Between 2002–03 and 2006–07, 1,263 people admitted to hospital with a principal diagnosis of asthma required mechanical ventilation, 138 of whom were 'same-day separations'. In 2006–07, the overall age-adjusted rate of mechanical ventilation for asthma was 11.7 per 1,000 hospital separations for asthma.

5.3.1 Time trends

Between 2000–01 and 2004–05, there was a gradual decline in the rate of hospital separations requiring mechanical ventilation among people aged 15 years and over: from 2.32 to 1.24 per 100,000 population (Figure 5.30). In 2006–07, the rate among people aged 15 years and over was 1.26 per 100,000 population. In contrast, the trend among children has remained relatively constant during this same period (range 0.58–0.79 per 100,000 population).



A similar trend has been observed for the age-adjusted proportion of adults and children admitted with asthma who required mechanical ventilation (Figure 5.31). There was a gradual decline in the proportion of adults admitted with asthma who required invasive mechanical ventilation between 2000–01 and 2004–05 (from 15.9 to 12.4 per 1,000 separations) and then a recent rise (14.3 per 1,000 asthma separations in 2006–07). Over the same period, there was little change in the proportion of children aged 0–14 years who required mechanical ventilation during a hospital stay for asthma.

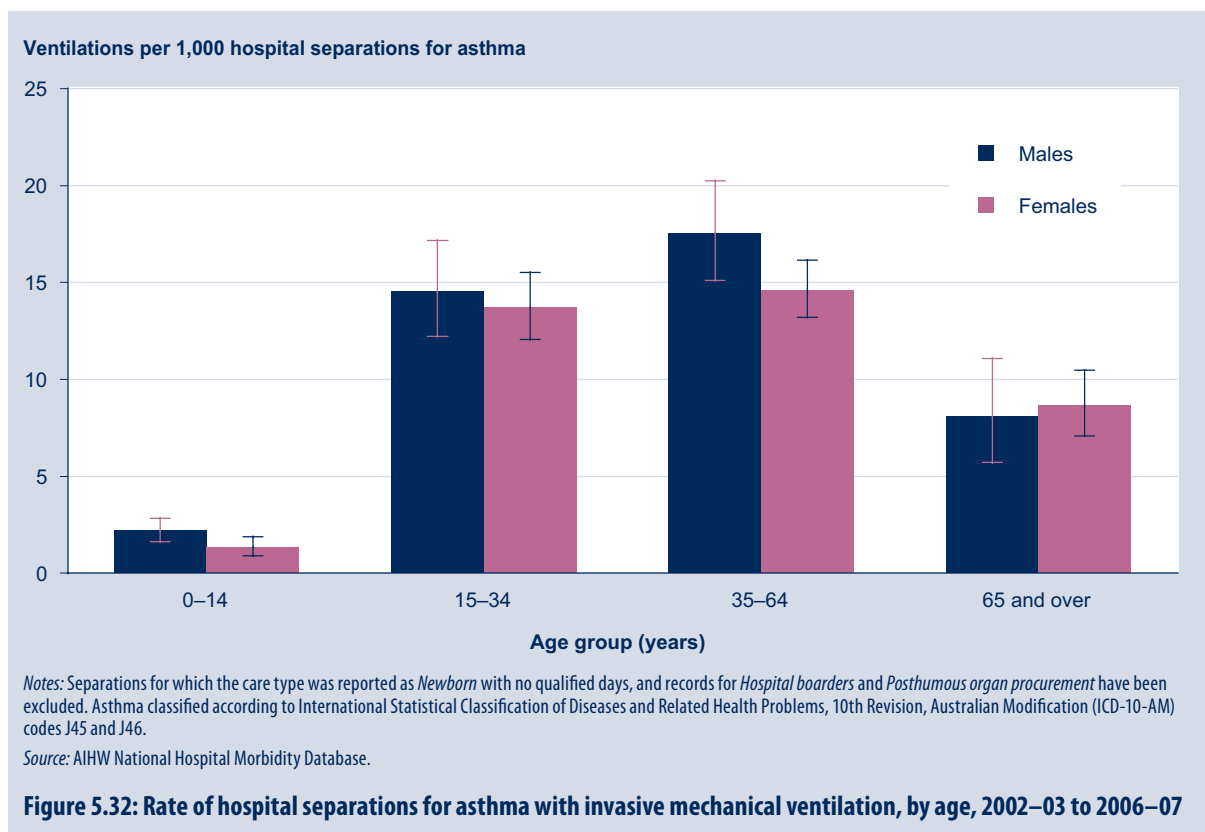


5.3.2 Population subgroups

Age and sex

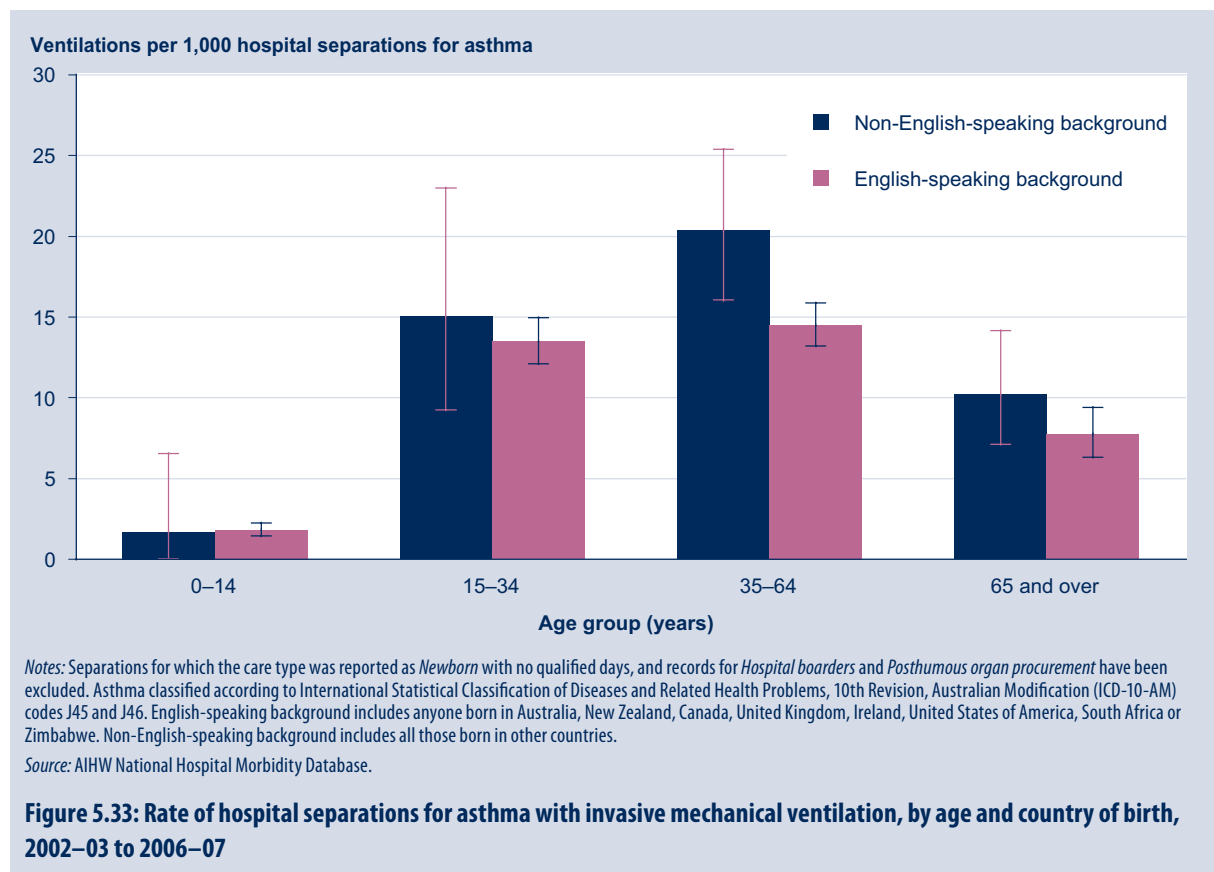
During 2002–03 to 2006–07, adults aged 35–64 years had the highest age-adjusted proportion of hospital separations for asthma that were associated with a period of invasive mechanical ventilation (Figure 5.32). Patients aged 65 years and over with asthma were significantly less likely than those aged 15–64 years to have undergone invasive mechanical ventilation, which may reflect a lower average level of severity among separations in this age group. However, an active decision on the part of patients, families and clinicians not to instigate invasive mechanical ventilation on certain patients approaching the end of life may also have contributed to this trend.

Males aged 0–14 years with asthma required invasive mechanical ventilation at an age-adjusted rate that was 1.6 times as high as that for females of the same age (2.2 per 1,000 admitted patients compared with 1.3 per 1,000; $p = 0.0029$). Among people aged 15 years and over, the age-adjusted rate for males aged 35–64 years was 1.2 times as high as the corresponding rate for females (17.5 per 1,000 admitted patients compared with 14.6 per 1,000; $p = 0.0373$) but there were no major differences between males and females aged 15–34 years or 65 years and over in the likelihood of using invasive mechanical ventilation.



Country of birth

Older adults of non-English-speaking background were more likely to require invasive mechanical ventilation during a hospital separation for asthma than those from an English-speaking background (Figure 5.33). Among those aged 35–64 years, people of non-English-speaking background had an age-adjusted rate of invasive mechanical ventilation that was 1.4 times as high as that for people with an English-speaking background ($p = 0.0026$). This may reflect more severe disease and, possibly, delayed implementation of effective treatment for exacerbations in people aged 35–64 years of non-English-speaking background.



5.3.3 Mortality and morbidity

While mechanical ventilation for asthma is a relatively rare event, people who are admitted to hospital with asthma and who require mechanical ventilation have a longer length of stay and a greater risk of dying in hospital compared with other patients admitted with asthma.

Between 2000–01 and 2006–07, there were 1,949 people admitted to hospital with a principal diagnosis of asthma who required invasive mechanical ventilation. The average length of stay over this period was much higher among those that required invasive mechanical ventilation (9.5 days) than among those that did not require the procedure (2.4 days) (Table 5.2). Of those who required mechanical ventilation, 7.9% died in hospital compared with 0.1% of those who were hospitalised with asthma but did not require mechanical ventilation. Children aged 0–14 years accounted for a minority (5.3%) of hospital deaths among those requiring mechanical ventilation while 6.3% occurred in people aged 15–64 years.

Table 5.2: Average length of stay and proportion of hospital deaths among those who did and did not require invasive mechanical ventilation during a hospital admission for asthma, all ages, 2000–01 to 2006–07

Year	Mechanical ventilation		No mechanical ventilation	
	Average length of stay (days)	Proportion of hospital deaths (%)	Average length of stay (days)	Proportion of hospital deaths (%)
2000–01	10.9	8.6	2.5	0.1
2001–02	10.1	6.9	2.5	0.1
2002–03	9.4	7.4	2.4	0.1
2003–04	8.8	10.1	2.3	0.1
2004–05	8.6	4.8	2.3	0.1
2005–06	9.2	8.0	2.2	0.1
2006–07	8.4	8.7	2.2	0.1
2000–01 to 2006–07	9.5	7.9	2.4	0.1

Notes: Separations for which the care type was reported as *Newborn* with no qualified days, and records for *Hospital boarders* and *Posthumous organ procurement* have been excluded. Asthma classified according to International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) codes J45 and J46. *Source:* AIHW National Hospital Morbidity Database.

Between 2003–04 and 2005–06, the proportion of people aged 65 years and over who died during a hospital admission for asthma in which mechanical ventilation was required was between 21% and 24% but in 2006–07 it decreased to 10%. Over the same period, the proportion aged 15–64 years who died ranged from 3% to 10% (data not shown). Overall, those aged 65 years and over were 3.7 times (95% CI 2.5–5.4) more likely to die in hospital after undergoing invasive mechanical ventilation than those aged 15–64 years ($p < 0.0001$).

Summary

The use of invasive mechanical ventilation signifies active management of a severe, life-threatening exacerbation of asthma. It is a rare event among people admitted with asthma; only 241 out of 36,588 people admitted with asthma required invasive mechanical ventilation during 2006–07. Patients who required invasive mechanical ventilation for asthma in 2006–07 had a much longer average length of stay (8.4 days) and a higher rate of mortality in hospital (8.7%) than those who did not require the procedure during their asthma admission (2.2 days and 0.1%, respectively). Among children, the rate of mechanical ventilation for asthma is very low compared with adults. Older adults from non-English-speaking backgrounds who are admitted to hospital with asthma are more likely to require invasive mechanical ventilation than people from English-speaking backgrounds.