



Trends in the Prevalence of Asthma

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The asthma epidemic of the last few decades may have peaked; studies suggest that the incidence and prevalence of asthma has decreased in some countries in the last few years, although other studies suggest continuing small increases in prevalence. Increasing awareness and changing diagnostic habits make precise evaluation of epidemiologic trends difficult in the absence of a gold-standard test for asthma, and on a global basis uncertainty persists. Trends in prevalence in some populations (eg, immigrants, farming communities) suggest both adverse and beneficial effects of specific environmental factors. Although the effects of indoor allergens, dampness, and mold and of outdoor air pollutants, especially traffic related, have traditionally dominated risk-factor research, more recent epidemiologic and clinical studies have focused on metabolic and nutritional factors, including maternal obesity and vitamin D levels, mode of delivery and its effect on the infant microbiome, fetal and infant growth, the psychosocial environment, and medication use by mother and infant. It is likely that changes in incidence and prevalence are due to multiple factors, each contributing a relatively small effect. Longitudinal studies from pregnancy through childhood to adulthood will yield greater insights into the complex pathways leading to asthma.

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Abbreviations: AHR = airway hyperresponsiveness; ISAAC = International Study of Asthma and Allergies in Childhood

The substantial upward trend in the reported prevalence of asthma in the latter part of the 20th century has been termed the “asthma epidemic.” Compared with 50 years ago, when only 2% to 4% of the population reported asthma,^{1,2} recent data suggest 15% to 20% or more of the general population in many countries suffer from asthma,^{3–5} clearly a cause for concern.

There are many questions to be addressed in reviewing this modern-day epidemic. Has the prevalence of asthma really increased? Is prevalence still increasing, has it reached a plateau, or is it even decreasing? Are the changes in prevalence global or population spe-

cific? Are the changes in prevalence evident across all levels of severity? What factors may underlie these changes? And finally, what further studies are needed to understand recent trends in the prevalence of asthma?

In 2006, Eder et al⁴ highlighted substantial increases in the prevalence of asthma in children and young adults in almost every country where repeated population-based surveys of the prevalence of asthma had been undertaken. The most striking increases were in westernized countries such as Australia, Canada, and the United Kingdom, which already had substantial rates of reported asthma, but significant increases were also noted in Asia and eastern Europe, which had a much lower baseline prevalence. That the changes were not simply reflective of diagnostic habits was suggested by the similar changes in reporting of the prevalence of asthma symptoms, irrespective of an asthma diagnosis.

Also in 2006, Asher et al⁵ reported on global time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood, using cross-sectional data from the International Study of Asthma and Allergies in Childhood (ISAAC), which was repeated in many countries with at least

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5 years between surveys. For asthma ever, most countries reported an increase. However, for current wheezing, there was a trend toward a decrease in prevalence in those countries with initially higher prevalence and no consistent change in countries with modest or low prevalence. While there was an increase in the overall prevalence of asthma ever across the repeated surveys, the frequency of reporting four or more episodes in the last 12 months in several of the countries with higher prevalence (such as the United Kingdom and New Zealand) was lower in phase 3 than in phase 1 of the ISAAC,⁶ suggesting that the overall increase in asthma mainly reflected milder disease. In countries with lower baseline prevalence, this differentiation of severity judged by frequency of episodes was less evident.

DIFFICULTIES IN STUDYING THE EPIDEMIOLOGY OF ASTHMA

There are a number of specific difficulties in studying the epidemiology of asthma. There is no standardized definition of the disease, and, increasingly, the heterogeneity of the “asthmas” is being recognized. There is no gold-standard diagnostic test, as symptoms, although still the best indicator of the presence of asthma, are nonspecific and have a significant differential diagnosis.^{7,8} Airway hyperresponsiveness (AHR) can be increased in a proportion of children who have never had symptoms of asthma^{9,10} and likewise can be absent on the day of testing despite a clear history of symptoms over time that are fully consistent with asthma.¹¹ There is increasing community awareness of asthma, leading to changing diagnostic habits, and international classification systems have also changed over time, all leading to difficulties determining the reality and accuracy of reported trends. There is some evidence for overdiagnosis of asthma. Aaron et al¹² studied adults with physician-diagnosed asthma, using objective testing of AHR and withdrawal of therapy to confirm or negate the diagnosis, and reported that one-third of the adults assessed did not have sufficient evidence on these objective measurements to validate the diagnosis.

Illustrating the difficulties inherent because of increased community awareness is a study by Kälvesten and Bråbäck,¹³ who examined time trends for the prevalence of asthma among schoolchildren in a Swedish district. Repeated cross-sectional surveys with identical study design were conducted among schoolchildren aged 7 to 16 years in 1985, 1995, and 2005 (response rates were 91%, 94%, and 81%, respectively). There was an increased positive response to screening questions on asthma between 1985 and 1995 (10.0% to 14.5%) but no increase in 2005 (14.2%).

The prevalence of three or more asthma-like symptoms decreased, yet the prevalence of doctor-diagnosed asthma increased steadily since 1985, suggesting a component of community awareness and changing diagnostic habit.

The prevalence of asthma in a population is related not only to the incidence of the disease but also to its duration, which reflects persistence. In a national study of 333,294 patients with a recorded diagnosis of asthma, drawn from the health database of 422 British practices, the incidence of asthma decreased in all patients from the period of 2001 to 2005, from 6.9 to 5.2 per 1,000 people.¹⁴ Among children there was a 38% reduction in incidence and a 34% reduction in lifetime prevalence of asthma, whereas among adults there was an age-dependent increase in lifetime prevalence ranging from 22% to 28%, reflecting the persistence of disease despite a lower incidence.

IS THE PREVALENCE OF ASTHMA STILL INCREASING?

Repeated use of identical screening questionnaires in serial cross-sectional studies in Italy between 1990 and 2010 revealed an increase in the prevalence of asthma from 4.1% to 6.6%; wheezing increased from 10.1% to 13.9%, and allergic rhinitis from 16.8% to 25.8%.¹⁵ Other studies reported increases in some communities but not others with similar genetic background; for example, Finnish Karelia showed an increase in asthma (5.5% to 8.1%) and hay fever (8.1% to 13.2%), but no such increases occurred in adjacent Russian Karelia, where there has been no evidence of an asthma epidemic.¹⁶ In Ontario, Canada, age- and sex-standardized asthma prevalence increased from 8.5% in 1996 to 13.3% in 2005, a relative increase of 55%.¹⁷ Asthma incidence increased in children by 30% but was relatively stable in adults.

In contrast to the reported increases, asthma prevalence in some populations appears to have reached a plateau or even decreased. In Greece, population surveys in 1978, 1991, 1998, 2003, and 2008 yielded prevalences of 1.5%, 4.6%, 6.0%, 6.9%, and 6.9%, respectively (ie, no change in the last 5 years).¹⁸ In Turkey, surveys in 1992, 1997, 2002, and 2007 yielded prevalences for asthma of 8.3%, 9.8%, 6.4%, and 3.3%, respectively, with similar downward trends in hay fever and eczema.¹⁹ The Aberdeen school survey, which was one of the first to report increased prevalences in repeated surveys,²⁰ noted decreasing rates of wheezing in the last three surveys, which were conducted in 1999, 2004, and 2009 (27.9%, 25.2%, and 22.2%, respectively; $P < .001$) with a greater reduction seen in girls than boys.²¹ In Merseyside children, doctor-diagnosed asthma increased from 1991 to 1998,

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