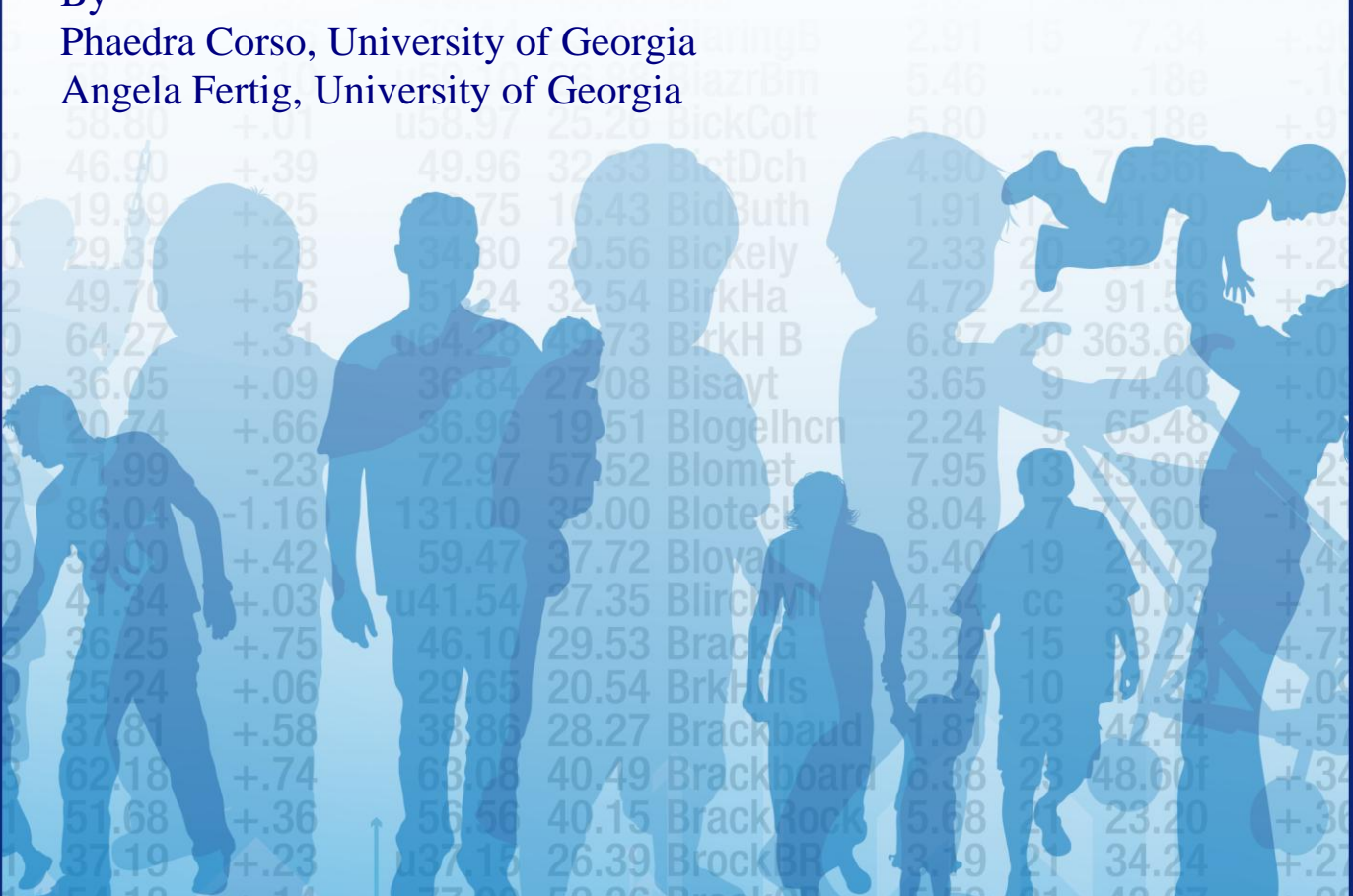


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# The Long-term Economic Costs of Asthma

By  
Phaedra Corso, University of Georgia  
Angela Fertig, University of Georgia



The views expressed are those of the authors and not necessarily those of the University of Georgia or of the Partnership or of The Pew Center on the States.

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901 E Street, NW, 10<sup>th</sup> Floor Washington, DC 20004  
(202) 552-2000 [www.PartnershipforSuccess.org](http://www.PartnershipforSuccess.org)

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## Executive Summary

Asthma is the most common chronic disease in childhood, affecting 8.5 percent of children in the United States. It is one of the most common causes of school absenteeism, a major cause of disability and/or restricted activity among children, and is one of the leading causes of hospitalizations among children. In addition, children with asthma continue to suffer as adults, affecting not only their quality of life but their lifetime productivity as well. Children with asthma miss 2.48 more days of school than their peers (which means their parents are likely to miss work to care for them), and adults miss 5.7 days of work because of their own illness.

This report calculates the lifetime economic costs of asthma for all people born in the year 2000 who develop this diagnosis (approximately 380,000 people): \$7.2 billion, including \$3.2 billion in medical costs and \$4 billion in work/productivity loss. While asthma cannot currently be cured, it can be controlled through improved health care and environmental factors – strategies that can save significant sums for our nation.

## Report

Asthma is the most common chronic disease in childhood, affecting 8.5 percent of children in the United States. It is one of the most common causes of school absenteeism, a major cause of disability and/or restricted activity among children, and is one of the leading causes of hospitalizations among children. In addition, children with asthma continue to suffer as adults, affecting not only their quality of life but their lifetime productivity as well. It is one of the most common causes of school absenteeism (Wang, Zhong, and Wheeler, 2005), a major cause of disability and/or restricted activity among children, and is one of the leading causes of hospitalizations among children (Mushinski, 1997). In addition, children with asthma continue to suffer as adults, affecting not only their quality of life but their lifetime productivity as well.

Because of its high prevalence and chronic nature which requires ongoing treatment, the economic costs of asthma, including both direct medical costs and indirect costs associated with lost productivity, are substantial. Estimates of the annual costs of asthma in the US range between \$12.7 and \$19.7 billion (Weiss and Sullivan, 2001; American Lung Association, 2007) and the annual costs for children alone range between \$2.0 and \$3.2 billion (Wang, Zhong, and Wheeler, 2005; Weiss, Sullivan and Lyttle, 2000).

These annual cost estimates underestimate the savings that could be achieved by averting cases of asthma in a particular cohort of children because asthma is a chronic disease with costs that span many years. Annual estimates of asthma reflect a cross-sectional view of costs for all persons within that time period and are not dependent on when the asthma first occurred. In contrast, incidence-based cost of illness analysis quantifies the present value of lifetime costs associated with asthma for a particular cohort (Finkelstein and Corso, 2003). Estimates of the lifetime costs of asthma are not available in the literature. We address this research gap by developing an estimate of the lifetime cost of asthma for one specific birth cohort.

## Brief Background

Asthma is a chronic inflammatory disorder of the respiratory system characterized by acute episodes of airway obstruction, airway inflammation, and airway hyper-responsiveness. The clinical manifestations are wheezing, coughing, and shortness of breath. The exact disease process is yet unknown, but there have been many advances in the management of these symptoms so that these children and adults can lead normal, productive lives.

The prevalence of asthma is characterized by a few important features. First, the prevalence is higher among children (8.5%) than among adults (6.7%) (CDC 2007). Although the prevalence rates have been steady for a decade in the US, there was a period between 1980 and 1996 which saw large increases in asthma rates, particularly among children age 0 to 4 years (Akinbami and Schoendorf, 2002). More than half of all cases of persistent asthma start before age 3 and 80 percent begin before age 6 (Martinez 2002). Thus, this disease affects very young children, having the potential to disrupt their educational attainment and other experiences which could shape their productive adult lives.

Second, asthma disproportionately affects minority and low-income populations. Current asthma prevalence is higher among blacks (9.2%) and those of Puerto Rican descent (14.5%) compared with whites (6.9%) (CDC 2007). It is also more prevalent among those below the federal poverty threshold (10.3%) compared to those living above poverty (6.4% to 7.9%) (CDC, 2007). As a result, this disease contributes to the disparities in health and income that persist in the US.

## Methods

In this analysis, we estimate the lifetime costs of asthma from birth to age 79 for the cohort of births born in 2000 (n=4.059 million). We consider both direct medical costs and indirect costs associated with lost productivity measured in 2000 US dollars. The direct costs of asthma included in this analysis are medications, hospitalizations, emergency department visits, and physician/outpatient visits where asthma was listed as the first diagnosis. The indirect costs include parents' work loss when the children missed school due to asthma and own work loss due to asthma when this cohort reaches working age.

For both direct and indirect costs, we restrict the analysis to costs that are asthma-specific only. For example, we included only those marginal productivity losses that were specific to the asthma illness, as opposed to total productivity losses that might occur in any birth cohort. This is a conservative approach to measuring cost of illness because it excludes spill-over costs if asthma impacts other co-morbidities (Akobundu et al., 2006). These estimates are similarly conservative and represent a lower bound estimate because we do not include the indirect costs associated with lifetime earnings lost due to asthma-related deaths and lower lifetime earnings due to asthma's effect on educational outcomes (for which we found no empirical evidence).

Specifically, we sum up the total lifetime costs for medications, hospitalizations, emergency department visits, and physician/outpatient visits due to asthma for all children age 0 in 2000 with asthma in the United States, n=245,964, assuming an average life expectancy of 79 years. In each progressive year, we make adjustments for all-cause mortality and adjust future costs to reflect present value assuming a 3% discount rate. To calculate the lifetime indirect costs of asthma, we sum the value of the parents' work loss due to a child missing school (or daycare) until the child is age 17 and then sum the value of the grown child's own work loss due to asthma until age 64, again adjusting for all cause mortality and using a 3% discount rate to calculate net present value.

We make three important assumptions in our estimation of lifetime costs. We assume that the prevalence of asthma, the progression of asthma, and the treatments and associated medical costs of asthma do not undergo any dramatic changes in this cohort's lifetime. Given recent increases in both the prevalence of asthma and medical costs in general, these are strong assumptions. These assumptions are necessary because we cannot predict these trends or prices into the future; however, they also ensure that these lifetime cost estimates are conservative.

## Data

We obtained the self-reported prevalence of current asthma by age group (0-4, 5-14, 15-34, 35-64, and 65+) from the National Surveillance for Asthma report (CDC, 2007).<sup>1</sup> We computed rates of current asthma in the population for each age group using these figures and applied this to our 2000 birth cohort, as described above. The average probability of dying from all causes at each age comes from the 2000 life table reported in the National Vital Statistics Reports (2002).

The medical care utilization estimates came from the National Surveillance for Asthma report (CDC, 2007). The report provided the average annual rate of hospitalization, emergency department visits, physician visits, and outpatient visits with asthma as the first listed diagnosis per 100 persons with current asthma.<sup>2</sup> This CDC report did not include any rates of medication use by individuals with asthma. Instead we estimated costs of medications using analyses done by Weiss, Sullivan and Lyttle (2000) who calculated total asthma medication expenditures in 1994. We used a per capita medication cost computed from their calculation and adjusted it to 2000 dollars using the current price index (CPI) for medical care.

The unit medical costs came from 1995 estimates produced by Begley et al (2000). They estimated that the routine cost for a hospitalization was \$2,385, the routine cost for an emergency department visit was \$383, and the cost for an initial physician outpatient visit was \$63. These values were adjusted to 2000 dollars using the CPI for medical care. These costs are conservative compared to other estimates available in the literature because they are costs and not charges, representing a more accurate value of the resource expended.<sup>3</sup>

The productivity loss estimates are based on findings from Wang, Zhong, and Wheeler (2005) for children and from Eisner et al (2002) for adults. Specifically, the average child with asthma missed 2.48 more days of school than the average child without asthma (Wang, Zhong, and Wheeler, 2005) and adults with asthma worked 5.7 fewer days a year than those without asthma (Eisner et al (2002)). We valued work loss at \$114 per day, based on estimates from Haddix, Teutsch and Corso (2003, Table 1.1a). Because families with asthmatic children may have lower incomes on average, we chose the value of a work day loss based on the average earnings of all adults, including those with zero earnings, instead of the average earnings of employed adults, and we do not include the value of losses in household productivity. In addition, we do not adjust for a nominal increase in wages over time, which is commonly done in this literature.

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<sup>1</sup> Their calculations are based on data from the National Health Interview Survey for 2001-2003.

<sup>2</sup> Their estimates of the hospitalization rates are based on data from the National Hospital Discharge Survey, 1980-2004. Their estimates of the rate of emergency department visits are based on data from the National Hospital Ambulatory Medical Care Survey, 2001-2003, and their estimates for the rates of physician office visits and outpatient visits are based on data from the National Ambulatory Medical Care Survey, 2001-2003.

<sup>3</sup> Weiss and Sullivan (2001) use \$3,101 for the average hospitalization costs for asthma and a range of costs for emergency department visits between \$248 and \$457 depending on age.



## Results

The breakdown of the lifetime economic costs of asthma for children born in the year 2000 is presented in Table 1. Approximately 380,000 children in this cohort will get asthma in their lifetime and, as a result, \$3.2 billion dollars will be spent on their medical care and medications by the time they reach age 79. More than half of these direct medical expenses will be for medications. For this group, the productivity losses due to their parents having to stay home from work with them or their own missed work days over their lifetime is valued at \$4.0 billion. The loss in productivity among the cohort when they are adults is more than twice the loss associated with their parents' work loss when they are children. Overall, the total lifetime economic impact of asthma for this birth cohort is \$7.2 billion.

Table 1: Breakdown of the Lifetime Economic Costs of Asthma

	Lifetime Cost Estimate (2000\$ millions)
Medications	\$1,806
Hospitalizations	\$688
Emergency Department Visits	\$256
Physician Visits	\$414
Outpatient Visits	\$55
<b>Total Direct Medical Costs</b>	<b>\$3,220</b>
Parents' Work Loss	\$1,301
Own Work Loss	\$2,713
<b>Total Indirect Productivity Costs</b>	<b>\$4,014</b>
<b>Total Lifetime Costs of Asthma</b>	<b>\$7,234</b>

## Conclusion

This analysis is the first to produce an estimate of the lifetime cost of asthma in the United States. We find that the costs that could be saved by averting cases of asthma among only the 2000 birth cohort would be \$7.2 billion. These costs are disproportionately associated with children, minorities and low-income populations. Overall, these costs are large. For comparison, the total lifetime costs of injuries to children age 0-4 in the United States in 2000 (a broader cohort that considered here) are \$16.0 billion (Finkelstein et al, 2006).

In addition, we find that while the ongoing treatment of this chronic disease has a substantial price tag, the direct costs of medical care associated with asthma are less than the lifetime losses in productivity due to this disease. Asthma interventions that reduce the number of school or work days missed could have huge indirect cost savings. Thus, while research should continue to understand the disease process, significant savings may be achieved immediately through asthma interventions involving inhaled corticosteroid therapy and management education that reduce the occurrence of acute episodes and related hardships associated with asthma (Mellon and Parasuraman 2004).

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