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## Asthma: A Global Perspective

### LEARNING OBJECTIVES

- Discuss the global impact of asthma
- Review the data on hospitalization, costs, mortality, and quality of life for patients with asthma in the United States
- Identify available resources for improving asthma care

### KEY WORDS

asthma prevalence  
indirect costs  
direct costs

EPR-3  
quality of life  
activities of daily living

## The History of Asthma

Asthma is a disease as old as antiquity. The Egyptian Ebers Papyrus found in the 1870s contains prescriptions written in hieroglyphics for asthma that include a mixture of herbs heated on a brick so that the sufferer could inhale their fumes.<sup>1</sup>

The word *asthma* is derived from the Greek word *azein* meaning “to breathe hard.”<sup>2</sup> Greek and Roman physicians managed individuals with gasping disorders with tailored treatment plans designed to balance the individuals’ four “humors”: yellow bile, black bile, blood, and phlegm. Today, we do not use the humoral theory of medicine, but we do recommend tailoring the patient’s asthma plan to his or her unique situation.

It could be argued that our understanding of the condition had not advanced tremendously from ancient times until Hyde Salter, a London physician, described asthma as “paroxysmal dyspnoea of a peculiar char-

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acter, generally periodic with intervals of healthy respiration between the attacks,” in his *Treatise on Asthma: Its Pathology and Treatment*, published in 1860.<sup>3</sup> Salter, like many practitioners well into the 1980s, viewed asthma as an intermittent, acute condition.

It didn't help matters that Sir William Osler called asthma a “neurotic affection” in 1892.<sup>4</sup> Osler did, however, identify airway dysfunction and pathological changes in the lung such as bronchial mucosal edema, inflammation, and the production of gelatinous mucus as symptoms of the condition. He also noted that exposure to a “bizarre and extraordinary variety of circumstances” including airway infections and animal exposures induced the paroxysm. Many of the clinical descriptors Osler assigned to asthma we still use today, including spasms of the bronchial muscles, swelling of the bronchial mucosal membrane, inflammation of the smaller airway, and hay fever, which has many resemblances to asthma. He also noted that the affection runs in families and he correctly identified that the illness often begins in childhood and sometimes lasts into old age.

What has changed in recent years is that we no longer think of asthma as a collection of intermittent symptoms, but as a chronic syndrome. This shift in our point of reference has changed the way we treat the disease. The idea of controlling asthma and preventing acute exacerbations has taken center stage and is the focus of today's treatment regimens.<sup>5</sup>

### The Global Impact of Asthma

The Global Initiative for Asthma (GINA) estimates that nearly 300 million people worldwide have asthma.<sup>6</sup> Sharp increases in the occurrence of asthma in South Africa and the countries of the former Eastern Europe, including the Baltic States, particularly in children and the elderly have been noted in the last 10 years. This data however may be misleading; standardized data are still missing for many other countries in Africa, Asia, and South America, and data from some western countries may not be up to date. There are also data that suggest as countries become more westernized their asthma rates are increasing, leading investigators to hypothesize that asthma prevalence may increase globally to include an additional 100 million persons diagnosed with the illness by 2025.<sup>7</sup>

GINA defines the developing regions of the world as Africa, Central and South America, Asia, and the Pacific Basin. Asthma prevalence rates in these regions continue to rise significantly. Their investigators estimate that more than 40 million individuals in South and Central America have asthma. High prevalence rates have been reported in Peru (13.0%), Costa Rica (11.9%), Brazil (11.4%), and Ecuador (8.2%). In Africa, more than 50 million individuals are believed to have asthma. The highest asthma prevalence rates on this continent are found in South Africa (8.1%).

Almost 44 million people in the East Asia/Pacific region have asthma, although the prevalence rates, as well as reporting, vary markedly throughout the area. In China, a tenfold variation in the reported regional prevalence of asthma has been observed. Experts believe that significant increases in prevalence will be reported in China. This is attributed to China's population and the rate of economic development with associated lifestyle changes. They suggest that an absolute 2% increase in the prevalence of asthmatics in China would result in an additional 20 million asthmatics worldwide.

Surprisingly, the highest asthma rates worldwide are found in the United Kingdom and its former colonies. On average more than 1 in 15 individuals in the United Kingdom have asthma. An estimated 20,000 first or new episodes of asthma present each week to general practitioners in the United Kingdom.<sup>8</sup> Asthma is one of the leading causes of hospital admission in children with more than 75,000 emergency hospital admissions reported annually. The data shows that an estimated one in four people have severe or moderately severe asthma that might be relieved if treatment were reviewed and made more appropriate. One in 10 people living with severe or moderately severe asthma have inadequately controlled disease despite some of the best clinical and preventive management systems.

In North America, asthma statistics are also alarming. The prevalence of asthma symptoms and diagnosed asthma in Canada and the United States is among the highest in the world. One person in 10 in North America has asthma. Rates are higher in certain racial groups including African Americans and Hispanics compared with Caucasian children. Variances in urban compared with rural areas are also noted. If Canada and Mexico are removed from the statistics, the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, report that in 2008 approximately 38.4 million people (10.2 million children and 28.2 million adults) in the United States had been diagnosed with asthma at some point during their lifetime. Of these, approximately 23.4 million individuals currently have asthma. In 2008, more than 4 million children within the United States (age 0–17 years) reported experiencing an asthma episode or attack during the previous 12 months (see Table 1.1).

Gender specific variances in asthma prevalence have been noted and seem to be age related. Overall, asthma is more common in females (13.5%) than in males (12.2%).<sup>9</sup> When specific calculations are made for age, male children (16%) were more likely than girls (11%) to have ever been diagnosed with asthma.<sup>10</sup>

Racial differences in the prevalence of asthma have also been documented. African American children report a 21.1% asthma rate compared to a 13.0% rate for Caucasian children in the United States. In adults, the numbers are a little more comparable with African Americans reporting 13.6% compared to Caucasians at 12.9% (see Table 1.2).

TABLE 1.1 Lifetime Asthma Population Estimates in Thousands by Age, United States: National Health Interview Survey, 2008

Characteristic	All Ages Total	Age (years)									
		Children Age < 18		Adults Age 18+		15-34					
		Age < 18	Age 18+	0-4	5-14	15-34	15-19	20-24	25-34	35-64	65+
<b>Total:</b>	38,430	10,190	28,240	1,499	6,576	12,382	3,645	3,621	5,116	13,891	4,083
Male	17,867	6,184	11,683	1,031	3,919	6,082	2,038	1,733	2,312	5,271	1,564
Female	20,563	4,006	16,557	468	2,657	6,300	1,607	1,889	2,804	8,620	2,519
<b>White Non-Hispanic:</b>	25,308	5,356	19,952	676	3,347	8,171	2,449	2,387	3,334	9,961	3,153
Male	11,729	3,327	8,402	476	2,116	3,965	1,296	1,194	1,474	3,939	1,233
Female	13,579	2,029	11,550	200	1,231	4,206	1,153	1,193	1,860	6,022	1,920
<b>Black Non-Hispanic:</b>	5,819	2,283	3,536	325	1,587	1,757	497	523	737	1,763	387
Male	2,795	1,378	1,417	248	888	915	333	274	308	619	126
Female	3,024	905	2,119	77*	699	842	164	249	429	1,144	261
<b>Other Non-Hispanic:</b>	2,626	826	1,800	133*	554	774	210	206*	358	924	240
Male	1,279	543	735	102*	344	416	142*	104*	170*	321	95
Female	1,348	283	1,065	31*	210*	358	68*	**	188	603	145
<b>Hispanic:</b>	4,677	1,725	2,952	364	1,087	1,680	489	505	686	1,243	303
Male	2,065	937	1,128	205	571	786	266	160*	360	392	110*
Female	2,612	788	1,824	159*	516	894	222	345	327	851	192
<b>Puerto Rican:<sup>a</sup></b>	943	344	598	44*	258	256	66*	76*	114	316	69*
Male	453	216	237	22*	176	109*	**	**	37*	104*	**
Female	490	128	361	**	82*	147	42*	**	77	211	27*

<b>Mexican/Mexican-American:<sup>a</sup></b>	2,590	1,044	1,545	245	633	988	304	345	340	604	120
Male	1,042	490	553	118	272	444	177*	102*	165*	185	**
Female	1,547	555	993	127*	361	544	126*	243*	175	419	96
<b>Region:</b>											
Northeast	6,738	1,861	4,877	194	1,185	2,129	832	379	918	2,530	700
Midwest	9,725	2,509	7,216	427	1,596	3,189	851	1,094	1,244	3,567	945
South	12,885	3,798	9,087	614	2,456	3,962	1,164	1,175	1,623	4,486	1,367
West	9,081	2,022	7,059	264	1,338	3,101	798	974	1,330	3,308	1,070
<b>Ratio of Family Income to Poverty Threshold:</b>											
0–.99	6,518	2,314	4,204	489	1,487	2,098	577	808	713	2,057	388
1.00–2.49	10,971	3,354	7,617	412	2,312	3,547	1,059	1,089	1,399	3,123	1,578
2.50–4.49	10,365	2,418	7,947	337	1,484	3,528	1,065	1,012	1,452	3,750	1,266
4.50 and above	10,576	2,103	8,473	261	1,293	3,210	945	713	1,552	4,962	851

All relative standard errors are < 30% unless otherwise indicated.

\* Relative standard error of the estimate is 30%–50%; the estimate is unreliable.

\*\* Relative standard error of the estimate exceeds 50%.

† Numbers within selected characteristics may not sum to total due to rounding.

<sup>a</sup> As a subset of Hispanic.

Source: National Health Interview Survey, National Center for Health Statistics, CDC, Compiled 1/25/2008. Available: <http://www.cdc.gov/asthma/nhis/08/table1-1.htm>. Accessed April 16, 2010.

TABLE 1.2 Lifetime Asthma Prevalence Percents by Age, United States: National Health Interview Survey, 2008

Characteristic	Age (years)											
	All ages Total	Children Age < 18		Adults Age 18+		15-34					15-34	
		0-4	5-14	15-34	15-19	20-24	25-34	35-64	65+			
Total:	12.9	13.8	12.5	7.2	16.4	15.1	17.4	17.5	12.7	11.7	11.0	
Male	12.2	16.4	10.7	9.8	19.0	14.8	19.4	16.6	11.5	9.1	9.8	
Female	13.5	11.1	14.2	4.6	13.6	15.5	15.4	18.4	14.0	14.2	11.9	
<b>White Non-Hispanic:</b>	12.9	13.0	12.9	6.1	14.8	16.7	19.4	18.7	14.1	12.0	10.6	
Male	12.3	15.9	11.2	8.4	18.4	16.1	20.4	18.3	12.5	9.6	9.5	
Female	13.6	10.0	14.5	3.7	11.1	17.2	18.3	19.2	15.7	14.3	11.4	
<b>Black Non-Hispanic:</b>	15.8	21.1	13.6	11.1	26.4	15.8	16.6	18.1	14.0	13.0	12.4	
Male	16.3	24.7	12.2	16.4	28.4	17.4	21.8	21.3	12.6	10.2	10.3	
Female	15.4	17.3	14.7	5.4*	24.2	14.3	11.2	15.5	15.3	15.2	13.6	
<b>Other Non-Hispanic:</b>	13.1	14.0	12.8	8.0*	17.4	12.7	14.3	14.1*	11.4	12.6	14.0	
Male	13.2	17.8	11.1	12.7*	20.2	14.4	18.9	15.3*	11.7	9.1	12.5	
Female	13.1	9.9	14.3	3.6*	14.1	11.3	9.5*	**	11.2	15.8	15.2	
<b>Hispanic:</b>	10.1	10.9	9.7	7.2	13.0	10.8	12.7	14.0	8.4	8.4	11.7	
Male	8.7	11.6	7.2	7.9	13.3	9.5	14.1	8.2	8.1	5.2	10.0*	
Female	11.6	10.2	12.3	6.5*	12.6	12.2	11.4	20.9	8.8	11.8	13.0	
<b>Puerto Rican:<sup>a</sup></b>	21.1	22.7	20.3	10.5*	29.4	19.3	16.4	25.4*	18.3	20.5	22.6	
Male	21.0	26.5	17.6	9.1*	37.2	19.7*	17.6*	28.7*	14.8*	14.3*	25.6*	
Female	21.2	18.2	22.5	**	20.2*	19.1	15.7*	**	20.7	26.1	19.2*	

<b>Mexican/Mexican-American:<sup>a</sup></b>	8.7	9.7	8.1	7.0	11.2	9.4	11.4	14.4	6.2	6.9	8.5
Male	6.8	9.0	5.6	6.5	9.7	7.8	13.1*	7.9*	5.4*	4.1	**
Female	10.7	10.4	10.9	7.5*	12.7	11.2	9.6	21.9	7.2	9.9	11.5
<b>Region:</b>											
Northeast	13.3	15.2	12.7	6.0	17.9	16.8	23.4	11.5	15.8	12.0	9.9
Midwest	13.5	14.0	13.3	8.7	15.9	15.9	17.0	21.6	12.4	12.7	10.8
South	12.0	14.7	11.2	8.5	17.3	13.3	15.2	15.8	11.1	10.5	10.1
West	13.2	11.4	13.8	4.9	14.3	16.0	17.0	19.9	13.6	12.2	13.8
<b>Ratio of Family Income to Poverty Threshold:<sup>b</sup></b>											
0–99	16.4	17.0	16.0	10.7	21.0	14.9	14.4	17.2	13.2	18.8	12.2
1.00–2.49	13.1	13.9	12.8	6.1	17.2	14.6	17.1	16.9	12.1	12.2	11.6
2.50–4.49	12.6	12.6	12.5	6.5	13.9	15.9	20.3	18.6	12.6	11.2	11.5
4.50 and above	11.4	12.6	11.1	6.2	14.4	15.1	17.1	17.3	13.3	10.1	9.1

All relative standard errors are < 30% unless otherwise indicated.

\* Relative standard error of the estimate is 30%–50%; the estimate is unreliable.

\*\* Relative standard error of the estimate exceeds 50%.

<sup>a</sup> As a subset of Hispanic.

<sup>b</sup> Missing responses imputed.

Source: National Health Interview Survey, National Center for Health Statistics, CDC. Compiled 1/25/2008. Available: <http://www.cdc.gov/asthma/nhis/08/table2-1.htm>. Accessed April 16, 2010.

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In 2008, 4.7 million Hispanic Americans reported having been diagnosed with asthma at some point in their lifetime.<sup>11</sup> Overall, Hispanic adults had lower rates of asthma than non-Hispanic white adults and non-Hispanic black adults. However, the data show significant variances among Hispanic subgroups. Specifically, Puerto Ricans reported an asthma rate of 21.1%, while Mexican/Mexican-Americans reported a rate of 8.7%.

Regionally, Americans in the Midwest report higher asthma rates (13.5%) compared to those in the Northeast (13.3%); the west (13.2%) and southern United States (12.0%) report even lower rates.

Socioeconomically, asthma is more often reported among persons with a family income in the lowest poverty levels. It has been hypothesized that families living at or below the poverty threshold are more likely to live in substandard housing and have higher exposure rates to pest-related allergen and asthma triggers.<sup>12</sup>

### Hospitalization Rates

Trends show a growing number of hospitalizations that can be directly attributed to asthma, particularly for children. In Europe, acute asthma is the most common cause of hospital admissions among children.<sup>13</sup> The *Asthma in America* survey,<sup>14</sup> conducted by telephone from May 21 to July 7, 1998, identified that approximately 9% of asthma patients required hospitalization, 23% needed emergency department treatment, and 29% had to have an unscheduled emergency appointment because of their asthma. Hospitalization rates for African Americans are 50% higher than for Caucasian patients. In children the hospitalization rate can be 150% higher for African Americans than for Caucasians.<sup>15</sup> The data also shows that more women than men are hospitalized for asthma. An analysis of hospital discharge data from 2005 showed that 296,000 hospital discharges were reported for females, while 192,000 were reported for males.<sup>16</sup> The hospitalization discharge data from 1995–2005 also shows variations on age groups for asthma. For individuals younger than 15 years of age and those aged 15–44 years, hospital discharge rates declined. The rates for individuals 45–64 years of age have remained stable, while discharge rates for those 65 years of age and older have risen 33%.<sup>9</sup>

In 2005, a reported 12.8 million physician office visits, 1.3 million outpatient department visits, and almost 1.8 million emergency room visits were reported for or attributed to asthma; 1.1 million of the emergency room visits were for adults and 696,900 visits were for children.<sup>9</sup>

### Mortality

Internationally, 180,000 deaths are attributable to asthma each year.<sup>17</sup> Although variations in asthma reporting somewhat skew this data, the World

Health Organization (WHO) reports that most asthma-related deaths occur in low- and lower- to middle-income countries. Worldwide asthma mortality rates have declined since the 1980s<sup>8</sup> (see Table 1.3).

In the United States, 3816 people died of asthma in 2004 and an estimated 3857 died in 2005.<sup>18</sup> Age-related variances were noted in the data, with individuals over the age of 65 being more likely to die from asthma than those in other age groups. Women were also more likely to succumb to their symptoms, with some 64% of asthma deaths in 2004 occurring in females. African Americans were more than three times more likely to die from asthma than Caucasians. Overall, however, there is some positive data as asthma deaths in the United States have been continuously declining for the past 6 years.<sup>15</sup>

## What Does Asthma Cost?

The economic implications of a diagnosis of asthma are staggering. The WHO has reported the annual costs of asthma exceed those of tuberculosis and HIV combined.<sup>16,19</sup> These costs are usually attributed to poor asthma control and disease management, with a disproportionate number of patients using

**TABLE 1.3** Highest Documented Asthma Mortality Rates in the World\*

<i>Ranking</i>	<i>Country</i>	<i>Proportion of Population (%)</i>
1.	China	36.7
2.	Russia	28.6
3.	Uzbekistan	27.2
4.	Albania	20.8
5.	South Africa	18.5
6.	Singapore	16.1
7.	Romania	14.7
8.	Mexico	14.5
9.	Malta	11.6
10.	Colombia	10.1

Note: The United States ranks 25th on this listing with a rate of 5.2 case fatalities per 100,000 asthmatics.

\* The asthma mortality comparisons between the different countries has been made using mortality rates in the 5–34-year age group. The authors used the WHO country-specific mortality data for ICD codes 490 to 493 and data from the two most recent years in which it was available for each country.

Adapted from: Masoli M, Fabian D, Holt S, et al. Global Initiative for Asthma (GINA) program: the global burden, 2004. Available at: <http://www.ginasthma.com>.

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a larger portion of the healthcare dollars.<sup>20,21</sup> The evaluation of asthma costs considers both direct costs, which include the cost of medications and treatment, and indirect costs, such as loss of school or work days and decrease in productivity. In Europe the estimated total cost of asthma is \$21.65 billion per year. Outpatient costs account for approximately \$4.65 billion of these expenses, while medications account for \$4.4 billion annually. Indirect costs of \$11.99 billion are directly attributed to poor asthma control. In England, for example, 69% of parents or partners of parents of children with asthma report taking time off from work because of their child's asthma-related complications. Thirteen percent report that they have lost a job because of their child's asthma.<sup>22</sup>

In the United States the annual economic cost of asthma is \$19.7 billion (\$14.7 billion in direct healthcare costs and \$5 billion for indirect costs). The *Asthma in America* survey provides a snapshot of the indirect costs of asthma in the United States. The survey interviewed 2509 adults with asthma or parents of children with asthma, as well as more than 700 healthcare providers from across America. The survey found that when compared to the general public, the people with asthma averaged 75% more sick day usage. The respondents who reported having severe asthma were shown to have spent approximately 4 days in bed in the previous month due to their asthma. Almost half of the adults with asthma (47%) said that their disease has caused them to change their expectations about what they are able to do, with almost two-thirds (64%) of respondents admitting that their health limits their activities. In the general public only 1 in 4 (26%) people believe their health limits their activities. The true impact of asthma on an individual's daily routine, also known as their activities of daily living, is hard to quantify. On days when their asthma is less active, there may be minimal impact on the individual's behavior. On more active asthma days, basic activities such as walking to the restroom and eating may be difficult. The asthmatics surveyed noted that their asthma caused limitations in sports and recreation (48%), normal physical exertion (36%), sleeping (36%), and general lifestyle overall (31%). Nearly half of the asthmatics surveyed (45%) said there are things that they would like to do that they cannot do because of their asthma.<sup>23</sup>

A partner study, *Children and Asthma in America*, conducted by telephone interview from February to May 2004, collected data from 801 children (or their care providers), 4–18 years of age with a current asthma diagnosis. This data shows that for many children their asthma is uncontrolled. In the month prior to the survey, 67%, or about two-thirds, of the children had experienced daytime, nighttime, or exercise-induced symptoms; 19%, or 1 in 5 children, had experienced daytime symptoms three times a week to daily; and 22% reported nighttime symptoms once a week to daily. More than half of the children (54%) had missed school or daycare in the past year because of their asthma with an average of nearly 4 days missed. This had a negative impact on the parents as well, with 39% reporting that they had missed

work in the past year due to their child's asthma. Poorly controlled asthma was shown to have a direct negative impact on the quality of the children's lives. When surveyed, 62% of the children reported that they were limited by their asthma and in their activities of daily living as well as participating in sports, having pets, sleeping, attending school, and/or joining in outdoor activities with friends and family.<sup>22</sup>

## Managing Asthma

As is apparent from this data, the burden of asthma on those with the condition as well as the healthcare systems and economies of the world is huge. Differences in healthcare systems, standards of living, and access to care prevent any easy global fix for the problem. Asthma is also not a healthcare priority for many nations, though significant proportions of their populations suffer from the illness. In Africa for example, most governments concentrate their healthcare efforts on reversing poor nutrition, poor housing, and halting the spread of infectious diseases such as HIV/AIDS. Many governments lack the resources to tackle these priorities, let alone asthma.<sup>8</sup>

GINA guidelines, updated in December 2009, stress the importance of implementing guidelines at the national and local level that include a wide variety of professional groups and other stakeholders, establishing a system of care that evaluates the effectiveness and quality of care delivered, and focusing on the most cost-effective management approaches that are available to as many patients as possible.<sup>23</sup> These guidelines include a detailed implementation plan as well as a checklist on the issues for national and local asthma implementation strategies to assist the healthcare systems.<sup>24</sup>

In the United States, there are several options available for improving asthma control (see Box 1.1). Healthy People 2010, a national initiative to improve overall health, identified asthma as a significant respiratory illness and has established goals for better management of the disease. The program advises that the effective management of asthma includes four components: avoiding or controlling the factors/triggers that may make asthma worse, utilizing appropriate medications tailored to the severity of the disease, effective and objective monitoring of the disease by the patient and the healthcare professional, and patient-focused disease management.<sup>25</sup>

America Breathing Easier is part of the CDC's National Asthma Control Program based on the Healthy People 2010 goals for asthma.<sup>9</sup> This program funds state, city, and school programs to improve asthma awareness; creates, establishes, and expands surveillance systems, trains health professionals, and educates individuals with asthma and their families and community.

The American Lung Association has several patient and professional tools to assist in asthma management, as well as active state and regional chapters that provide direct support at the local level.

**12** CHAPTER 1**Box 1.1 Useful Asthma Resources**

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The Global Initiative for Asthma (GINA)  
<http://www.ginasthma.com/>

American Lung Association  
<http://www.lungusa.org/>

Centers for Disease Control and Prevention: Asthma  
<http://www.cdc.gov/asthma/>

National Asthma Education and Prevention Program (United States)  
<http://www.nhlbi.nih.gov/about/naepp/>

Guidelines for the Diagnosis and Management of Asthma (EPR 3; United States)  
<http://www.nhlbi.nih.gov/guidelines/asthma/>

NHLBI: Physician Asthma Care Education  
<http://www.nhlbi.nih.gov/health/prof/lung/asthma/pace/>

American Academy of Allergy, Asthma, and Immunology  
<http://www.aaaai.org/>

American College of Allergy, Asthma, and Immunology  
<http://www.acaai.org/>

American Association for Respiratory Care  
<http://www.aarc.org/>

American College of Chest Physicians  
<http://www.chestnet.org/>

American Thoracic Society  
<http://www.thoracic.org/>

Association of Asthma Educators  
<http://www.asthmaeducators.org/>

Practitioners in the United States can also turn to the National Heart, Lung, and Blood Institute (NHLBI). A division of the National Institutes of Health (NIH) the NHLBI manages several initiatives that can assist asthma patients and their care providers. Among these is the National Asthma Education and Prevention Program (NAEPP). This agency has established goals of raising asthma awareness as a serious chronic disease; as well as insuring effective diagnosis and treatment. Administered and coordinated by the NHLBI, the NAEPP works with intermediaries such as major medical associations, voluntary health organizations, and community programs to educate patients, health professionals, and the general public. The NHLBI is also the organization that convenes the “Expert Panel” that develops the

guidelines for asthma used in the United States. The most current version of the Expert Panel Report is Version 3 (EPR-3). The Physician Asthma Care Education (PACE) program, also supported by the NHLBI, is a two-part interactive, multimedia educational seminar. The goal of this program is to improve physician awareness, ability, and use of communication and therapeutic techniques to reduce the effects of asthma on children and their families. PACE provides instruction on how to document, code, and improve asthma counseling reimbursement for providers as well. The program can be conducted at the local level and involves two 2.5-hour interactive sessions, which should be held one week apart.

Many state and local health departments, as well as school systems, have developed programs to increase asthma awareness and improve care. Practitioners are encouraged to contact their local agencies to determine their available resources.

## References

1. National Library of Medicine. Origins of Western Medicine. [http://www.nlm.nih.gov/hmd/breath/breath\\_exhibit/MindBodySpirit/origins.html](http://www.nlm.nih.gov/hmd/breath/breath_exhibit/MindBodySpirit/origins.html). Accessed April 6, 2009.
2. Soukhanov A, ed. *Encarta World English Dictionary*. New York: St. Martin's Press; 1999. <http://encarta.msn.com/encnet/features/dictionary/dictionaryhome.aspx>. Accessed April 6, 2009.
3. Salter HH. *On Asthma: Its Pathology and Treatment*. London: John Churchill; 1860.
4. Osler W. *Principles and Practice of Medicine*. New York: D. Appleton and Co.; 1892.
5. National Heart, Lung, and Blood Institute. *National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma Full Report 2007*. <http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf>. Accessed April 2, 2009.
6. The Global Initiative for Asthma. *2008 Update of the GINA Report*. Global Strategy for Asthma Management and Prevention. <http://www.ginasthma.com/>. Accessed April 6, 2009.
7. Masoli M, Fabian D, Holt S, et al. Global Initiative for Asthma (GINA) program: the global burden of asthma: executive summary of the GINA Dissemination Committee report. *Allergy*. 2004;59:469–478.
8. Masoli M, Fabian D, Holt S, et al. Global Initiative for Asthma (GINA) program: the global burden 2004. <http://www.ginasthma.com>. Accessed April 9, 2009.
9. Centers for Disease Control and Prevention's National Asthma Control Program. America Breathing Easier. <http://www.cdc.gov/asthma/NACP.htm>. Accessed April 15, 2009.
10. US Department of Health and Human Services, Centers for Disease Control and Prevention Vital and Health Statistics. Summary Health Statistics for U.S. Children: National Health Interview Survey, 2008. Series 10, No 244. December

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2009. Available: [http://www.cdc.gov/nchs/data/series/sr\\_10/sr10\\_242.pdf](http://www.cdc.gov/nchs/data/series/sr_10/sr10_242.pdf). Accessed April 13, 2010.
11. Centers for Disease Control and Prevention. Trends in Asthma Morbidity and Mortality. *National Center for Health Statistics, National Health Interview Survey Raw Data, 1997–2006*. Analysis performed by American Lung Association Research and Program Services using SPSS and SUDAAN software. <http://www.lungusa.org/atf/cf/%7B7A8D42C2-FCCA-4604-8ADE-7F5D5E762256%7D/ASTHMA1.PDF>. Accessed April 1, 2009.
  12. Cohn RD, Arbes SJ Jr, Jaramillo R, Reid LH, Zeldin DC. National prevalence and exposure risk for cockroach allergen in U.S. households. *Environ Health Perspect*. 2006;114(4):522–6.
  13. European Lung Foundation. *European Lung White Book*. Brussels, Belgium: European Respiratory Society and the European Lung Foundation; 2003.
  14. *Asthma in America: A Landmark Survey*. GlaxoSmithKline; 1998. <http://www.asthmainamerica.com>. Accessed April 6, 2009.
  15. Beasley R. The burden of asthma with specific reference to the United States. *J Allergy Clin Immunol*. 2002;109(5):S482–S489.
  16. American Lung Association. *Trends in Asthma Morbidity and Mortality*. November 2007. <http://www.lungusa.org/atf/cf/%7B7A8D42C2-FCCA-4604-8ADE-7F5D5E762256%7D/ASTHMA1.PDF>. Accessed April 1, 2009.
  17. World Health Organization. WHO fact sheet 206: bronchial asthma. <http://www.who.int/mediacentre/factsheets/fs206/en>. Accessed April 6, 2009.
  18. Centers for Disease Control and Prevention. National Center for Health Statistics. National Vital Statistics Reports. Deaths: Final Data for 2004. August 21, 2007;55(19). <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma03-05/asthma03-05.htm>. Accessed on April 14, 2009.
  19. Braman SS. The Global Burden of Asthma. *Chest*. 2006;130(1):4S–12S.
  20. Sennhauser FH, Braun-Fahrlander C, Wildhaber JH. The burden of asthma in children: a European perspective. *Paediatr Respir Rev*. 2005;6(1):2–7.
  21. Marcus P, Arnold RJ, Ekins S, et al. A retrospective randomized study of asthma control in the US: results of the CHARIOT study. *Curr Med Res Opin*. 2008;24(12):3443–52.
  22. *Children and Asthma in America: A Landmark Survey*. GlaxoSmithKline; 2004. <http://www.asthmainamerica.com>. Accessed April 6, 2009.
  23. The Global Initiative for Asthma (GINA). *Global strategy for asthma management and prevention*. Updated 2009. <http://www.ginasthma.com>. Accessed April 9, 2010.
  24. The Global Initiative for Asthma (GINA). *Global strategy for asthma management and prevention*. Updated 2008. <http://www.ginasthma.com>. Accessed April 9, 2009.
  25. US Department of Health and Human Services. Respiratory Diseases. In: *Healthy People 2010*. [http://www.healthypeople.gov/Document/HTML/Volume2/24Respiratory.htm#\\_Toc489704825](http://www.healthypeople.gov/Document/HTML/Volume2/24Respiratory.htm#_Toc489704825). Accessed April 15, 2009.