Alliance of Nurses for Healthy Environments

Bringing Science and Passion to the Environmental Health Movement

The Economic Affliction of Asthma and Risks of Blocking Air Pollution Safeguards

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Prepared by David Gardiner & Associates, LLC

EXECUTIVE SUMMARY

This report reviews new information on the prevalence and costs of asthma in the United States. An estimated 7 million children and 17 million adults in the United States have asthma. Asthma is a chronic, sometimes debilitating condition that has no cure.

Science has established that air pollution from cars, factories, and power plants is among the major causes of asthma episodes. Air pollutants that can contribute to asthma include ground-level ozone smog, sulfur dioxide, particle pollution, and nitrogen oxides. Carbon pollution can also worsen asthma in several ways, such as by driving climate change (rising temperatures increase ozone smog concentrations) and by increasing production of airborne allergens like ragweed pollen (which is another trigger for asthma episodes).

Legislation that would greatly reduce the authority of the Environmental Protection Agency (EPA) to reduce these air pollutants under the Clean Air Act would prevent improvements in air quality – stopping reductions in emissions of carbon dioxide, fine particles, soot, and other pollutants – and would make it harder for children and adults with respiratory problems such as asthma to breathe.

This report relies on asthma prevalence and cost data from peer-reviewed science journals, the American Lung Association and the Centers for Disease Control and Prevention. (*More information about this report's methodology can be found in the Appendix.*) It reviews such data at both the national and state levels. The data show that *every* state in the nation has a significant number of people with asthma and carries a serious cost burden. More than 688,000 children had to go to the emergency room because of asthma in 2008. The total estimated incremental direct cost of asthma in the United States is more than $53 billion a year.

Limiting EPA's authority under the Clean Air Act will be a threat to public health.

INTRODUCTION TO AIR POLLUTION & ASTHMA

An estimated 7 million children and over 17 million adults in the United States have asthma.[1] Asthma is a chronic, often debilitating condition that has no cure. During an asthma episode, the airways become constricted and swollen, the chest feels tight, and it is difficult to breathe. Asthma episodes keep children out of school (accounting for about 10.5 million lost school days in 2008, according to the Centers for Disease Control and Prevention) and take adults out of the workplace (accounting for more than 14 million lost work days in 2008). The disease was also responsible for nearly 2 million emergency-room visits in 2007. In severe cases, asthma episodes can be deadly; in 2007 alone, more than 3,400 people in the United States died as a result of asthma.[2]

Science has established that air pollution from cars, factories, and power plants is among the major causes of asthma episodes. A research study published in 2002 estimated that 30 percent of childhood asthma is due to environmental exposures (including ambient air pollution), costing the nation $2 billion per year.[3] Studies also suggest that air pollution may contribute to the development of asthma in previously healthy children.[4] Air pollutants that can contribute to asthma include ground-level ozone smog, sulfur dioxide, particle pollution, and nitrogen oxides.[5]

Carbon dioxide pollution can also worsen asthma in several ways. First, carbon dioxide is the number one factor in driving climate change, and one of the best-documented effects of climate change-related pollution is an increase in ground-level ozone smog concentrations, in response to rising temperatures (the hotter the temperature and the more sunlight, the more ozone tends to form). In 2004 and 2007, a multi-disciplinary team of experts showed that warming temperatures will cause more days with unsafe ozone levels, including 11 or more days each summer in Columbus and Cleveland, OH and about 6 more days in Philadelphia, PA.[6] A 2009 study of the New York City region found that by 2020, respiratory hospitalizations are projected to rise 4–7% percent for children under the age of two because of projected climate change-related ozone smog increases.[7] Exposure to smog also heightens the sensitivity of people with asthma to allergens and impairs lung function, especially in children, pregnant women, the poor, people near urban roadways, and those who already have heart or lung ailments, often the elderly. Breathing smog

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[1] Lara J. Akinbami, et al., Centers for Disease Control and Prevention, National Center for Health Statistics, *Asthma Prevalence, Health Care Use, and Mortality: United States, 2005-2009*, NATIONAL HEALTH STATISTICS REPORTS, No. 32, Jan. 12, 2011, http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf

[2] Akinbami, et al., Centers for Disease Control and Prevention (2011)

[3] Phillip J. Landrigan, et al., *Environmental Pollutants and Disease in American Children: Estimates of Morbidity, Mortality, and Costs for Lead Poisoning, Asthma, Cancer, and Developmental Disabilities*, ENVIRONMENTAL HEALTH PERSPECTIVES, 110:721-28, July 2002, http://ehp03.niehs.nih.gov/article/fetchArticle.action?articleURI=info%3Adoi%2F10.1289%2Fehp.02110721

[4] *See, e.g.,* Rob McConnell, et al., *Asthma in exercising children exposed to ozone: a cohort study*, THE LANCET, 359(9304):386-91, Feb. 2002, http://www.ncbi.nlm.nih.gov/pubmed/11844508

[5] Agency for Toxic Substance and Disease Registry (ATSDR), *Case Studies in Environmental Medicine* website, Oct. 2007, http://www.atsdr.cdc.gov/csem/asthma/envfactors.html

[6] Jonathan A. Patz, Patrick L. Kinney, et al., *Heat Advisory: How Global Warming Causes More Bad Air Days*, July 2004, http://www.nrdc.org/globalWarming/heatadvisory/heatadvisory.pdf; NRDC, *Heat Advisory: How Global Warming Causes More Bad Air Days*, Sept. 2007, http://www.nrdc.org/globalWarming/heatadvisory/heatadvisory07.pdf

[7] Mount Sinai School of Medicine, *Future Climate Change Likely to Cause More Respiratory Problems in Young Children*, Press Release, May 3, 2009, http://www.pas-meeting.org/2009Baltimore/Press/Sheffield.pdf

can trigger chest pain, coughing, reduce lung function and worsen asthma, permanently scarring people's lungs.[8]

Second, rising carbon dioxide levels increase production of airborne allergens because carbon dioxide makes ragweed and other allergenic plants grow larger and produce more pollen – another trigger for asthma episodes and the allergies that affect an estimated 36 million Americans.[9] A new study released in the *Proceedings of the National Academy of Sciences* finds that warmer weather in the last 15 years has already made autumn ragweed pollen seasons longer – by as much as 13 to 27 days in a swath of Midwestern states from Texas northward into Canada, with states like Minnesota and Wisconsin showing some of the strongest effects.[10] If these warming trends continue as projected under a changing climate, the health of people with severe allergies or asthma could suffer.[11] (Other pollutants from burning fossil fuels may also help deliver pollen allergens deep into the lungs and worsen allergy and asthma symptoms.[12])

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[8] Christopher J. Portier, et al., *A Human Health Perspective On Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change*, Environmental Health Perspectives/NIEHS, Apr. 22, 2010, http://www.niehs.nih.gov/health/docs/climatereport2010.pdf

[9] Thomas R. Karl, et al. (eds.), U.S. Global Change Research Program, *Global Climate Change Impacts in the United States*, 2009, http://www.climatecommunication.org/PDFs/climate-impacts-report.pdf; American Academy of Allergy, Asthma and Immunology, *Ragweed Heats Up With Climate Change*, ALLERGY & ASTHMA ADVOCATE, Fall 2008, http://www.aaaai.org/patients/advocate/2008/fall/falladvocate08.pdf

[10] Lewis Ziska, Kim Knowlton, et al., *Recent warming by latitude associated with increased length of ragweed pollen season in central North America*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, Feb. 22, 2011, http://www.pnas.org/content/early/2011/02/11/1014107108.abstract

[11] F. Allen-Ramey, et al., *Sensitization to common allergens in adults with asthma*, J AM BOARD FAM PRACT 18(5):434-439, Sept.-Oct. 2005, http://www.ncbi.nlm.nih.gov/pubmed/16148256

[12] R.B. Knox, et al., *Major Grass Pollen Allergen Lol p 1 Binds To Diesel Exhaust Particles: Implications for Asthma and Air Pollution*, CLIN EXP ALLERGY 27(3):246-251, Mar. 1997, http://www.ncbi.nlm.nih.gov/pubmed/9088650; D. Diaz-Sanchez, et al., *Diesel Exhaust Particles Directly Induce Activated Mast cells to Degranulate and Increase Histamine Levels and Symptom Severity*, J ALLERGY CLIN IMMUNOL 106(6):1140-46, Dec. 2000, http://www.ncbi.nlm.nih.gov/pubmed/11112898 ; R.J. Pandya, et al., *Diesel Exhaust and Asthma: Potential Hypotheses and Molecular Mechanisms of Action*, ENVIRON HEALTH PERSPECT 110(suppl 1):103-112, Feb. 2002, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241152/ ; R. Hauser, et al., *The Upper Airway Response to Pollen Is Enhanced by Exposure to Combustion Particulates: A Pilot Human Experimental Challenge Study*, ENVIRON HEALTH PERSPECT 111(4):472-477, Apr. 2003, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241430/

MEASURES IN CONGRESS

Despite the impacts of air pollution on public health, there are several Congressional measures under consideration that would prevent improvements in air quality. During the week of April 4, several votes to block the EPA from regulating carbon pollution are expected, and some members have been working to add language blocking EPA regulatory authority to a new budget deal needed to prevent a government shut-down. These measures, if enacted, are expected to increase respiratory related disease.

The House is expected to vote on a bill (H.R. 910) from Energy and Commerce Chairman Fred Upton (R-MI) to prevent the EPA from limiting carbon pollution. The bill would also repeal the EPA's scientific finding that carbon is a health-threatening pollutant.

In the Senate, several proposals to block or delay the EPA's plans to reduce carbon pollution are being offered as amendments to an unrelated small business bill:

- Senate Minority Leader Mitch McConnell (R-KY) has introduced as an amendment the text of the bill from Rep. Fred Upton and Sen. Jim Inhofe (H.R. 910 and S. 482) to repeal the EPA's authority under the Clean Air Act to set limits on carbon pollution, threatening the Clean Air Act's health benefits.
- Sen. Jay Rockefeller (D-WV) has introduced an amendment that would block the EPA from taking any action under the Clean Air Act to limit carbon pollution from power plants or other stationary sources for two years. History shows that delays, once enacted, are easily extended.
- Sen. Debbie Stabenow (D-MI) has introduced an amendment that would similarly block enforcement of carbon pollution safeguards for two years and would prevent accurate accounting of emissions from agricultural activities.
- Sen. Max Baucus (D-MT) has introduced an amendment that would also prevent accurate accounting of emissions from agricultural activities and would prevent EPA from requiring comprehensive operating permits based solely on carbon pollution.

In addition to these efforts to block EPA from reducing carbon pollution, a number of other proposals seek to block EPA from reducing other dangerous pollution, including soot, smog, mercury, arsenic, and other cancer-causing pollutants. Originally adopted as amendments to the House-passed budget resolution in February, the following proposals may also be pushed by some members for inclusion in the new Continuing Resolution:

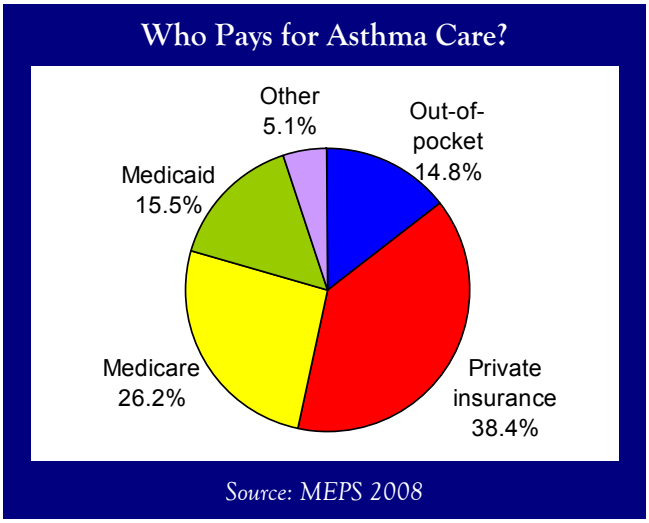
- An amendment (#563) by Rep. Kristi Noem (R-SD) that would block the EPA from updating national air quality safeguards for soot pollution (coarse particulate matter).
- An amendment (#466) by Rep. Ted Poe (R-TX) that would even more strictly prevent the EPA from regulating <u>any</u> greenhouse gas from power plants and other industrial sources.
- An amendment (#165) by Rep. John Carter (R-TX) that would block the EPA from updating clean air safeguards to further limit soot, mercury, arsenic, and cancer-causing toxic pollution from cement kilns.

By blocking the EPA with these and similar measures, lawmakers would be allowing increases in soot, smog, carbon, and other air pollution that will damage public health. According to a recent EPA analysis, the Clean Air Act amendments of 1990 currently prevent 1.7 million cases of asthma exacerbation (saving $90 million) and by 2020 will prevent 2.4 million (saving $130 million).[13]

[13] EPA, *The Benefits and Costs of the Clean Air Act from 1990 to 2020*, Mar. 2011, http://www.epa.gov/oar/sect812/feb11/fullreport.pdf (Table 5-6)

PREVALENCE & COST OF ASTHMA ACROSS ALL 50 STATES

Data from the Centers on Disease Control and Prevention and from the American Lung Association make clear the prevalence and costs of asthma in the United States. As illustrated in the map and table on the following pages, states with higher populations tend to have more citizens with asthma and thus tend to see higher asthma costs, but *every* state in the nation has a significant number of people with asthma and carries a serious cost burden. As Table 1 shows, more than 688,000 children had to go to the emergency room because of asthma in 2008. The total estimated incremental direct cost of asthma in the United States is more than $53 billion a year.



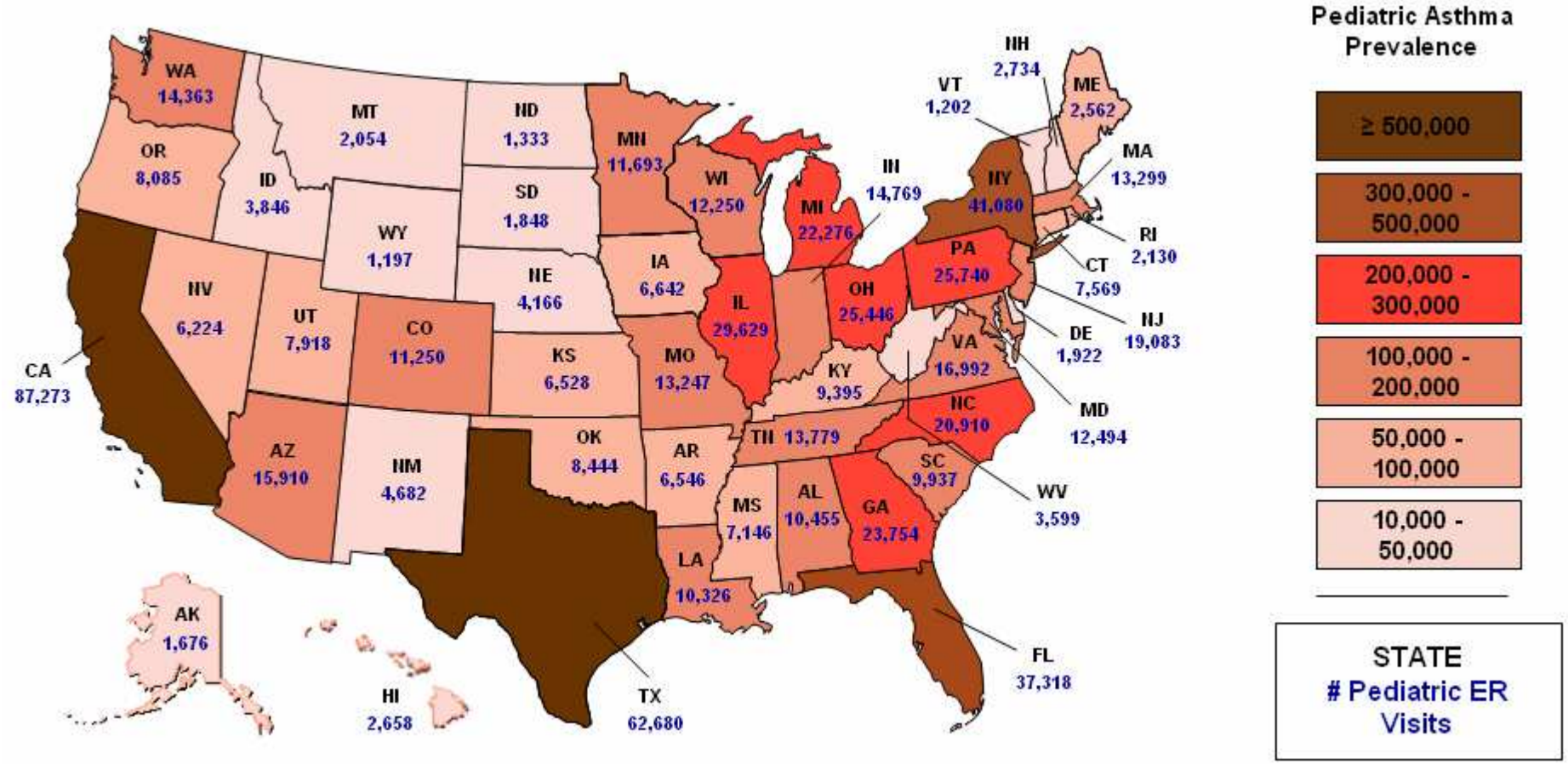
And who bears these costs? According to the U.S. Department of Health and Human Services' Agency for Healthcare Research and Quality, almost 15 percent of the costs are paid out-of-pocket. That is equivalent to just under $8 billion a year. Private insurance covers more than 38% of the costs, equivalent to more than $20 billion a year.[14]

Besides the direct costs of asthma, of course, there are many more costs (which are not explored in this report). As mentioned earlier, asthma episodes that keep children out of school (10.5 million lost school days in 2008) and adults out of the workplace (more than 14 million lost work days in 2008) result in significant indirect costs to individuals, states, and society.[15]

[14] U.S. Department of Health & Human Services, Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey (MEPS), *Table 4: Total Expenses and Percent Distribution for Selected Conditions by Source of Payment: United States, 2008*, http://meps.ahrq.gov/mepsweb/data_stats/tables_compendia_hh_interactive.jsp?_SERVICE=MEPSSocket0&_PROGRAM=MEPSPGM.TC.SAS&File=HCFY2008&Table=HCFY2008_CNDXP_D&_Debug=

[15] Lara J. Akinbami, et al., Centers for Disease Control and Prevention, National Center for Health Statistics, *Asthma Prevalence, Health Care Use, and Mortality: United States, 2005-2009*, NATIONAL HEALTH STATISTICS REPORTS, No. 32, Jan. 12, 2011, http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf

FIGURE 1: MAP OF PEDIATRIC ASTHMA PREVALENCE & E.R. VISITS IN THE UNITED STATES (2008)[16]



[16] Prevalence data from *Estimated Prevalence and Incidence of Lung Disease by Lung Association Territory* (2010): American Lung Association, Epidemiology and Statistics Unit, http://www.lungusa.org/finding-cures/our-research/trend-reports/estimated-prevalence.pdf. Pediatric ER visits were derived from the ALA prevalence data and from CDC ratios on pediatric versus adult health care use: *Asthma Prevalence, Health Care Use, and Mortality: United States, 2005-2009* (2011): Centers for Disease Control and Prevention, National Center for Health Statistics, http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf

TABLE 1: COSTS OF ASTHMA IN THE UNITED STATES[17]

State	Adults with Asthma	Children with Asthma	Pediatric Emergency Room Visits	Pediatric Hospital Stays	**TOTAL**: Estimated Incremental Direct Cost of Asthma
TOTAL U.S.	**19,442,300**	**6,950,069**	**688,057**	**111,201**	**$53,216,541,693**
Alabama	275,092	105,609	10,455	1,690	$768,693,434
Alaska	47,705	16,934	1,676	271	$130,253,665
Arizona	463,033	160,711	15,910	2,571	$1,256,982,733
Arkansas	177,039	66,125	6,546	1,058	$490,720,504
California	2,294,825	881,543	87,273	14,105	$6,413,650,933
Colorado	299,131	113,633	11,250	1,818	$833,260,298
Connecticut	232,994	76,458	7,569	1,223	$622,963,011
Delaware	63,267	19,414	1,922	311	$166,244,634
Florida	943,933	376,950	37,318	6,031	$2,669,159,520
Georgia	600,575	239,936	23,754	3,839	$1,698,467,762
Hawaii	95,641	26,851	2,658	430	$246,189,524
Idaho	98,038	38,844	3,846	622	$276,559,184
Illinois	762,045	299,285	29,629	4,789	$2,143,955,408
Indiana	439,352	149,179	14,769	2,387	$1,185,531,341
Iowa	175,837	67,088	6,642	1,073	$490,442,756
Kansas	181,419	65,942	6,528	1,055	$498,926,781
Kentucky	313,947	94,897	9,395	1,518	$821,833,173
Louisiana	264,409	104,304	10,326	1,669	$744,889,919
Maine	106,273	25,877	2,562	414	$264,685,357
Maryland	402,170	126,197	12,494	2,019	$1,062,798,918
Massachusetts	484,754	134,335	13,299	2,149	$1,242,591,753
Michigan	744,025	225,007	22,276	3,600	$1,947,905,595
Minnesota	308,321	118,111	11,693	1,890	$860,994,671
Mississippi	152,211	72,177	7,146	1,155	$455,049,739
Missouri	377,910	133,807	13,247	2,141	$1,031,613,550
Montana	71,400	20,743	2,054	332	$185,091,989
Nebraska	94,537	42,082	4,166	673	$276,687,024
Nevada	164,493	62,865	6,224	1,006	$459,029,589
New Hampshire	105,219	27,616	2,734	442	$266,376,722

[17] Based on the 2008 asthma prevalence estimates from the American Lung Association shown in Figure 1, costs from 2002-2007 in 2009 dollars from The Journal of Allergy and Clinical Immunology (2010), and 2005-2007 Pediatric/Adult ratios from the CDC. For more information, see the Methodology in the Appendix.

State	Adults with Asthma	Children with Asthma	Pediatric Emergency Room Visits	Pediatric Hospital Stays	**TOTAL**: Estimated Incremental Direct Cost of Asthma
New Jersey	568,274	192,753	19,083	3,084	$1,532,975,870
New Mexico	125,481	47,296	4,682	757	$348,737,073
New York	1,315,096	414,951	41,080	6,639	$3,480,298,910
North Carolina	526,945	211,215	20,910	3,379	$1,491,740,168
North Dakota	39,395	13,467	1,333	215	$106,498,192
Ohio	832,338	257,027	25,446	4,112	$2,190,605,418
Oklahoma	242,665	85,291	8,444	1,365	$661,061,682
Oregon	250,851	81,671	8,085	1,307	$669,308,697
Pennsylvania	891,605	260,003	25,740	4,160	$2,313,439,717
Rhode Island	86,412	21,514	2,130	344	$216,242,424
South Carolina	281,238	100,371	9,937	1,606	$769,434,343
South Dakota	43,269	18,665	1,848	299	$125,349,534
Tennessee	423,452	139,185	13,779	2,227	$1,132,688,049
Texas	1,286,716	633,131	62,680	10,130	$3,896,474,032
Utah	157,440	79,982	7,918	1,280	$482,201,037
Vermont	48,081	12,138	1,202	194	$120,682,495
Virginia	544,013	171,632	16,992	2,746	$1,439,644,878
Washington	464,016	145,081	14,363	2,321	$1,225,106,418
West Virginia	136,978	36,352	3,599	582	$347,645,292
Wisconsin	401,531	123,734	12,250	1,980	$1,056,216,614
Wyoming	36,911	12,090	1,197	193	$98,641,363

APPENDIX: METHODOLOGY

This report uses asthma prevalence data from:

- *Estimated Prevalence and Incidence of Lung Disease by Lung Association Territory* (2010): American Lung Association, Epidemiology and Statistics Unit, http://www.lungusa.org/finding-cures/our-research/trend-reports/estimated-prevalence.pdf

This report uses asthma cost data from:

- *Costs of Asthma in the United States: 2002-2007* (2011): The Journal of Allergy and Clinical Immunology 127: 145-152, Dr. Sarah Beth Barnett and Dr. Tursynbek A. Nurmagambetov, http://www.jacionline.org/article/S0091-6749(10)01634-9/abstract

This report uses data on the ratio of pediatric versus adult asthma health care use from:

- *Asthma Prevalence, Health Care Use, and Mortality: United States, 2005-2009* (2011): Centers for Disease Control and Prevention, National Center for Health Statistics, http://www.cdc.gov/nchs/data/nhsr/nhsr032.pdf

These three reports are mostly complementary, with data categories that largely can be linked. One area where there is a slight difference is that the Journal article uses the time period 2002-2007 for costs, whereas the CDC ratios are based on the annual average from 2005-2007 and the ALA uses 2008 prevalence data. This does not pose a problem for purposes of this report, however, given the partial overlap and proximity of the years involved, as well as the fact that, if anything, the inclusion of earlier years for costs means that the cost estimates could now be seen as conservative since they are based on a period with slightly lower prevalence.

The estimates of asthma prevalence are based on data provided by the American Lung Association. The ALA cautions that adding pediatric and adult asthma prevalence estimates does not produce a valid estimate of the total prevalence in the state, as the pediatric estimates are based on age-specific national rates (NHIS) applied to age-specific county population estimates (US Census), while the adult estimates are based on state rates (BRFSS) applied to county population estimates (US Census).

The cost data from The Journal of Allergy and Clinical Immunology focuses on the incremental direct cost of asthma, specifically considering the costs of prescription medication, office-based medical provider visits, emergency department visits, hospital outpatient visits, and hospital inpatient stays. Here we distinguish between pediatric and adult visits by incorporating the ratios on asthma health care use by children and adults provided by the Centers for Disease Control and Prevention.

The data on who pays for asthma care comes from the U.S. Department of Health & Human Services, Agency for Healthcare Research and Quality, Medical Expenditure Panel Survey (MEPS), *Table 4: Total Expenses and Percent Distribution for Selected Conditions by Source of Payment: United States, 2008*, http://meps.ahrq.gov/mepsweb/data_stats/tables_compendia_hh_interactive.jsp?_SERVICE=MEPSSocket0&_PROGRAM=MEPSPGM.TC.SAS&File=HCFY2008&Table=HCFY2008_CNDXP_D&_Debug=. The MEPS table provides figures for chronic obstructive pulmonary disease (COPD) and asthma combined.

About the Groups

Health Care Without Harm is an international coalition of more than 430 organizations in 52 countries, working to transform the health care sector worldwide, without compromising patient safety or care, so that it is ecologically sustainable and no longer a source of harm to public health and the environment. For more information on HCWH, see www.noharm.org.

The National Association of School Nurses is the expert voice for optimal student health and for professional development of school nurses. Every child has access to a school nurse all day, every day. The National Association of School Nurses supports the health and educational success of children and youth by developing and providing leadership to advance school nursing practice by specialized registered nurses. For more information on NASN, see www.nasn.org.

The Alliance of Nurses for Healthy Environments, launched in 2008 by a group of national nurse leaders from several nursing sub-specialties, works to promote healthy people and healthy environments by educating and leading the nursing profession, advancing research, incorporating evidence-based practice, and influencing policy. For more information on the Alliance, see www.enviRN.org/anhe.