

F. COSTS OF ENVIRONMENTALLY ATTRIBUTABLE DISEASES IN THE ARAB-AMERICAN COMMUNITY IN THE DETROIT AREA

Lauren M. Zajac, BS; Jerome O. Nriagu, PhD, DSc;
Kathryn Savoie, PhD; Adnan Hammad, PhD;
Hikmet Jamil, MD, PhD

INTRODUCTION

Asthma is a chronic disease of airways that generates a large annual cost for the patient, placing a particularly heavy burden on those communities where a large percentage of residents live below the poverty line and do not have health insurance. Minority and poor communities have higher than average asthma morbidity, and the epidemic has become an issue of environmental justice due to the disease's correlation with environmental factors.¹ High incidence of respiratory disease and death has been consistently shown in epidemiologic studies in urban centers.² Asthma patients make up 4%-10% of urban populations and are likely to be minorities. Furthermore, central urban neighborhoods are likely to have the greatest amount of air pollution exposures, and evidence shows that a disproportionate number of minorities are exposed to high levels of air pollution.³ An estimated 80% of Hispanics and 65% of Blacks live in areas that fail to meet the National Ambient Air Quality Standards (NAAQS), compared with 57% of Whites in the United States.⁴ Elevated levels of two criteria pollutants, ozone and particulate matter, are associated with increased asthma exacerbations. The costs of asthma care and management are becoming an increasingly important problem for minority and low-income communities. Determining the expected costs of asthma in vulnerable communities is necessary to focus attention on preventive measures, setting priorities of intervention, and allocating resources for dealing with disease burden in a community.⁵ This study deals with annualized costs of

asthma and incorporates both direct and indirect costs (including social and quality of life costs) to provide a comprehensive economic analysis of the disease. The unique feature of this study that distinguishes it from previous studies done on the cost of environmentally attributable diseases is the inclusion of many indirect and quality-of-life costs, which has led to an improved generalized cost model for an at-risk community.

METHODS

A number of databases and previous studies have been published and are used to derive the cost factors incorporated into the study.⁶⁻¹¹ The default values for medication strategies and cost components provide a general guide; the actual procedures or medications used may differ from patient to patient and from community to community. The default rates of usage provided in the tables are taken from government or other sources and reflect national averages; therefore, they may not accurately represent costs in individual communities. The cost components and rates of usage for the Arab-American community in Dearborn were collected directly from the appropriate sources in the community. Tables with estimates for the following parameters have been compiled: direct costs (prescription medication, diagnosis, emergency room visit, hospitalization, visit to clinic or physician's office, and loss of productivity), indirect costs (including transportation, asthma control devices, and alternative treatments), quality-of-life costs, and premature death costs. These

From the University of Michigan School of Public Health, Department of Environmental Health Sciences, Ann Arbor (LMZ, JN); Arab-American Center for Economic and Social Services (ACCESS), Dearborn (KS, AH, HJ); Department of Family Medicine, Wayne State University, Detroit (HJ); Michigan.

values (national or default or Dearborn-specific) are available upon request.

The computer model used in this model was created with Microsoft Excel (Microsoft Corp., Redmond, Wash.). The cost model is available on CD-ROM and contains background information on the diseases (including relation to environmental factors), comprehensive instructions, and a computer-based cost calculator.

RESULTS AND DISCUSSION

Tables have been compiled that provide lists of various cost components for both children and adults who have moderate and severe asthma (available on request, contact lzajac@umich.edu). The tables are a general model that can be applied to data obtained from any community to calculate an average annual total cost for asthma. The total annual cost for each component can be determined by multiplying the rate of usage and the cost of each unit. The rates of usage presented in the tables reflect national averages provided by various data sources and may be applied as default values to any community if more specific rates are not available for

the community involved in the study. The last three columns of each table are the Metro Detroit (Dearborn)-specific values used in the Arab-American cost burden analysis.

The annual cost burden for asthma determined by the model exceeds \$100 million for the Arab-American population near Detroit. This represents a heavy burden to a community in which most residents live in poverty and is recognized as being medically under-served by the state of Michigan.

ACKNOWLEDGMENTS

Data are from a study funded by Grant #R25 10003-01A1 from the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH). Adnan Hammad, PhD, principal investigator.

REFERENCES

1. Brown P, Mayer B, Zavestoski S, Luebke T, Mandelbaum J, McCormick S. The health politics of asthma: environmental justice and collective illness experience in the United States. *Soc Sci Med.* 2003;57.
2. Liou PJ, Zhang JE. Air pollution. In: Swift DL, Foster WM, eds. *Air Pollutants and the Respiratory Tract*. New York, NY: Marcel Dekker, Inc; 1999:1-38.
3. Kinney PL, Chillrud SN, Ramstrom S, Ross J, Spengler JD. Exposures to multiple air tox-

ics in New York City. *Environ Health Perspect.* 2002;110(suppl 4):539-546.

4. Delfino RJ. Epidemiologic evidence for asthma and exposure to air toxics: linkages between occupational, indoor, and community air pollution research. *Environ Health Perspect.* 2002;110(suppl 4):573-589.
5. Landrigan PJ, Schecher CB, Lipton JM, Fahs MC, Schwartz J. Environmental pollutants and disease in American children: estimates of morbidity, mortality, and costs for lead poisoning, asthma, cancer, and developmental disabilities. *Environ Health Perspect.* 2002; 110(7):721-728.
6. Centers for Disease Control (CDC). Asthma prevalence, healthcare use and mortality, 2000-2001. Available at: www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm. Accessed September 24, 2003.
7. Ciesternas MG, Blanc PD, Yen IH, et al. A comprehensive study of the direct and indirect costs of adult asthma. *J Allergy Clin Immunol.* 2003;11(6).
8. Harvard Center for Risk Analysis. Catalog of preference scores. Available at: <http://www.hcra.harvard.edu>. Accessed September 23, 2003.
9. National Heart, Lung and Blood Institute NHLBI. Guidelines for the diagnosis and management of asthma. 1997. Available at: www.nhlbi.nih.gov. Accessed September 20, 2003.
10. Smith DH, Malone DC, Lawson KA, Okamoto LJ, Battista C, Saunders WB. A national estimate of the economic costs of asthma. *Am J Respir Crit Care.* 1997;156:787-793.
11. United States Environmental Protection Agency (EPA) (2003). Cost of asthma: cost of illness handbook. Available at: <http://www.epa.gov/oppt/coi/view.html>. Accessed September 8, 2003.