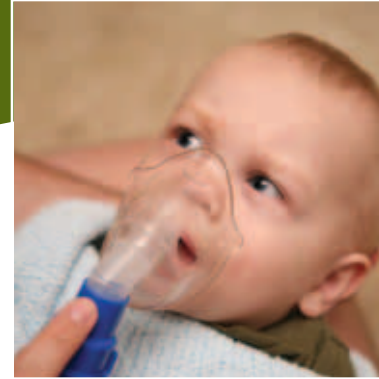


A POLICY AND PRACTICE REPORT  
LOWELL CENTER FOR SUSTAINABLE PRODUCTION  
ASTHMA REGIONAL COUNCIL



# Asthma: A Business Case for Employers and Health Care Purchasers

Polly Hoppin, ScD • Laurie Stillman, MMHS • Molly Jacobs, MPH

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The Lowell Center for Sustainable Production helps to build healthy work environments, thriving communities and viable businesses that support a more sustainable world. The Asthma Regional Council is a coalition of public agencies, NGOs and researchers that brings together the diverse organizational perspectives and resources of health, housing, education and environment to reduce the burden of asthma.

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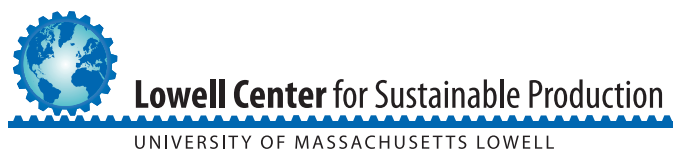
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# Foreword



Over the past decade, the unsustainable rise in rates of chronic disease and health care costs have driven policymakers and employers alike to pursue new strategies for reducing the burden of illness and improving access to health care services. As reflected in workplace wellness programs, health care quality improvement activities, and broad health insurance reform initiatives, there is a growing understanding that investment in preventing the onset and symptoms of chronic disease is a prerequisite for curbing costs and improving the value of our nation’s healthcare dollar.

With asthma in particular, we see a timely convergence of need and opportunity. On the one hand, a growing number of adults and children have uncontrolled asthma, impeding quality of life and productivity—as measured in lost school and work days. On the other, in virtually all cases, asthma can be well-controlled, and best practice guidelines and evidence-based programs to implement them have proliferated in the last decade, demonstrating cost-effective improvements in health and associated reductions in costs.

The potential for cost-savings is particularly promising for employers, who absorb costs associated with lost productivity when employees or their dependents are ill. The barriers that keep asthma control out of reach for many people are barriers that employers can help overcome: insufficient and inconsistent insurance coverage, high co-pays or other out-of-pocket expenses, lack of access to educational and environmental services provided outside the clinical visit, and for some people, workplace conditions that initiate asthma or exacerbate symptoms of existing disease.

This report reviews the evidence of the cost-effectiveness of multi-faceted interventions for asthma, and makes a “business case” for three priority steps employers can take to cost-effectively reduce the burden of asthma among employees and their dependents. I encourage employers to follow these recommendations to chart a course towards a workforce for which asthma no longer impedes well-being, and no longer generates substantial preventable costs associated with urgent care and lost productivity.

Ron Finch, EdD, Vice President  
*National Business Group on Health*

## Executive Summary

The purpose of this report is twofold: to revisit the robust body of evidence demonstrating positive health outcomes and economic benefits of comprehensive asthma programs, and to analyze its implications for employers. The evidence includes deliberations of national expert panels, published research studies and program evaluations. Though the primary audience for the report is employers, the analysis and recommendations are relevant for other institutional purchasers of health care.

Too many adults and children continue to suffer needlessly from asthma, resulting in a heavy burden for employers and employees alike. Daily, nearly 40,000 people miss work and school due to uncontrolled symptoms, and the figure is even higher when it includes workers who stay home to care for children too sick with asthma to go to school.<sup>1</sup> The good news is that proper medical care and medications, along with patient education and environmental services and supplies, can control asthma symptoms so that there are virtually no limitations on a person's daily activities and little need for expensive urgent care. This gap between the potential for asthma to be well-controlled, and the reality for thousands of people, is an enormous opportunity for employers and their employees.

The report makes a “business case” for three priority strategies employers can pursue to reduce the burden of asthma among employees and their dependents. These strategies hold promise for positive returns on investment via direct cost savings, as well as reduced rates of both absenteeism and compromised productivity at work.

The strategies are:

- Align employee health benefits with recommended best practices for asthma management, including reimbursements for assessment and monitoring of lung function and symptoms; proactive patient education; case management and disease management services where appropriate; and coverage for children and adolescents of home assessments, services and supplies to reduce environmental triggers. Employers can also address the high costs of medications by negotiating with insurers for lower charges and helping to offset out-of-pocket costs.
- Build on worksite health promotion programs to support employees in overcoming barriers to effective self-management of asthma. Such programs can range from offering on-site asthma education programs, to subsidizing co-pays for medications and preventive care, to referral to home-based education, as well as environmental supplies and services for employees and their dependents whose asthma is not well-controlled.
- Ensure healthy work environments that: a) are properly maintained so as to eliminate common asthma triggers such as molds, harsh cleaning chemicals and cigarette smoke; and b) minimize the use of chemicals associated with asthma, seeking safer alternatives.

A companion piece to this report is a checklist of recommended asthma benefits for use by purchasers of health care as they design their health benefits programs.

Employers have an important role to play in filling the gap between the potential for people with asthma to live active lives unimpeded by their illness, and the reality of frequent interruptions in their normal functioning. The research literature, affirmed by case studies, should prompt us to ask: *how can we afford not to give people with asthma access to programs that hold promise for reducing symptoms and costs?* Employers interested in promoting best practices for asthma will need to undertake analyses specific to their workplace. This report should get them started. It dispels arguments that effective programs are too expensive or unproven, and provides strategies for building on existing initiatives to fill gaps in employees' asthma care.

The Asthma Regional Council of New England and the University of Massachusetts Lowell look forward to engaging with employers and other institutional purchasers of health care as we continue our efforts with multiple sectors to reduce the burden of asthma in the United States.

# Introduction

In the United States, employers pay a large share of the nation’s 2 trillion dollar health care bill. The country’s employment-based health insurance market covers nearly two out of every three Americans under the age of 65.<sup>2</sup> As the primary purchasers of health care, U.S. employers are concerned about the persistent rise in costs, which has consistently outpaced the rate of increase in workers’ wages or inflation over the past decade.<sup>3</sup>

Employers are also concerned about the effectiveness of their health care dollars in enabling employees and their families to live healthy active lives, and in minimizing losses in productivity due to illness. Global competitiveness is an important consideration for U.S. businesses, yet the leading U.S. economic competitors (Canada, Japan, Germany, the United Kingdom, and France) spend, on average, 63 cents for every dollar that the U.S. spends on health care, and are getting more value in terms of workforce health and quality of care.<sup>4</sup>

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**“By investing in good health, we can add billions of dollars in economic growth in the coming decades.”**

Ross DeVol, Director of Regional Economics and the Center for Health Economics, Milken Institute

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Particularly for chronic diseases, such as diabetes, cancer, and asthma—which account for 75% of our nation’s health care bill—U.S. employers need strategies to maintain the health of their employees at a reasonable cost. And with their substantial purchasing power, employers have the potential to influence the focus and quality of health care.

Asthma is a chronic disease that should be of concern to employers, as well as to other institutional purchasers of health care. Too many adults and children suffer needlessly from asthma, resulting in a heavy burden on employers and employees alike. Daily, nearly 40,000 people miss work and school due to uncontrolled symptoms, and the figure is even higher when it includes workers who stay home to care for children too sick with asthma to go to school.<sup>5</sup> The good news is that proper medical care and medications, along with patient education and environmental services and supplies, can control asthma symptoms so that there are virtually no limitations on a person’s daily activities and little need for expensive urgent care. This gap between the potential for asthma to be well-controlled, and the reality for thousands of people, is an enormous opportunity for employers and their employees. There is now a robust base of evidence on cost-effective approaches organizations can take to bring asthma under control. Increasingly, employers are applying these approaches in the workplace with good results.

This paper makes the business case for employers investing in improving the health of their employees with asthma. It offers recommendations—based on the research literature and on case studies—for steps businesses can take to align their employees’ insurance coverage with clinical best practices for asthma, to support employees in overcoming barriers to effective self-management, and to ensure that the workplace environment is “asthma-friendly.” The recommendations in the paper are relevant to employees and the organizations that represent them, to individual employers and to other institutional purchasers of health care, and to policy makers who understand the potential for action by purchasers to influence the health care marketplace and leverage a higher-value health care system.

# Asthma: A Preventable Disease out of Control

**A**sthma is a potentially life-threatening respiratory condition, and is routinely among the top ten leading chronic diseases afflicting the working population in the United States.<sup>6</sup> It is characterized by inflammation and constriction of the airways in reaction to allergens or irritants that are inhaled into the lungs, making it difficult to breathe.<sup>7</sup> An asthma attack can be frightening and stressful for those living with the disease, and for those who care for them. Symptoms include persistent coughing and shortness of breath, which can significantly interrupt daily routines including sleep, exercise, and attendance at school or work, and can also result in high utilization of urgent and costly health care services. In severe cases when the disease is not managed properly, asthma can result in prolonged hospitalizations or can be fatal.

The incidence of asthma has increased dramatically over the past several decades, currently affecting over 22 million people in the U.S. alone.<sup>8,9</sup> Across the country, approximately 9.1% of children<sup>10</sup> and 7.3% adults<sup>11</sup> currently have asthma. A large percentage of people with asthma report that their symptoms are not well-controlled, impairing their normal daily functioning. In Massachusetts in 2006, only 1 in 4 adults were considered to have well-controlled asthma, and



## Factors Associated with Asthma in Indoor Home Environments

### Common Allergen

- Cockroaches
- Mice/Rats
- Mold/mildew
- Dust mites
- Household pets
- Outdoor allergens

### Common Irritants

- Cleaning chemicals
- Sprays/scents
- Environmental tobacco smoke
- Indoor/outdoor fumes (gas/wood burning stoves, diesel engines)

among children, approximately 65% were classified as having “not well-controlled” or “very poorly-controlled” asthma.<sup>12</sup> Similar results have been found across the New England region.<sup>13</sup>

One distinguishing characteristic of asthma is its prevalence across the age spectrum. The costs of most chronic illnesses, including diabetes and heart disease, are associated largely with older workers. In contrast, asthma strikes young and old alike, affecting not only employees themselves but also their dependents, both children and the elderly.

A second distinguishing characteristic of asthma is the importance of environmental exposures in exacerbating symptoms and, in some cases, contributing to its initial onset. Reducing exposure to environmental triggers can often make the difference between living productively with asthma versus being severely impeded by asthma attacks. A variety of environmental factors associated with asthma are commonly found in homes of people from all socio-economic backgrounds, but sub-standard home environments—typically occupied by low income and minority people—are particularly problematic.

The work environment may also initiate or exacerbate asthma: it is estimated that 10–15% of new onset adult asthma is caused by workplace exposures, and that exposures at work trigger asthma attacks in another 10% of adults with pre-existing disease.<sup>14</sup> (Appendix A provides examples of work-related exposures known to cause or exacerbate asthma.)

Because of the importance of environmental triggers, individualized asthma care plans and asthma management programs for populations must include steps to identify allergens and irritants, as well as reduce use of and exposure to these triggers in all settings where those with asthma live and work. This is particularly true of indoor environments, where people spend the majority of their time.

Though relatively little is known about how to prevent asthma from developing in the first place, the knowledge base about how to control the symptoms of asthma is robust. Widely accepted national best practice guidelines for managing asthma—called the NAEPP Guidelines<sup>15</sup>—include appropriate medications, consistent monitoring of symptoms, and asthma education, along with steps to reduce environmental triggers. There is strong evidence about cost-effective interventions to control asthma, and models for how to translate the research evidence into health improvements and cost savings for large numbers of people.



### Barriers to Quality Asthma Care

- Insufficient and inconsistent insurance benefits
- High costs of medication
- Lack of educational services and case management
- Challenges in reducing exposure to environmental triggers

Yet despite the wide acceptance of the NAEPP Guidelines by health professionals, and recommendations about how to implement them in different settings, many people with asthma still do not receive the interventions and services they need. There are reasons for this that can be tackled with concerted action.<sup>16</sup> Of particular importance are insufficient and inconsistent insurance benefits; expensive medications; lack of availability of educational services and case management; and challenges in reducing exposure to environmental triggers. Employers have an important role to play in overcoming each of these barriers.



# High Business Costs Associated with Asthma

## Direct Medical Costs

Research suggests that annual per capita employer expenditures for patients with asthma are approximately 2.5 times those of people without the disease.<sup>17</sup> Yet effective asthma management can preempt a substantial portion of these costs. Of the estimated \$19.7 billion spent on asthma in the U.S. in 2007, \$4.7 billion was spent on preventable visits to the hospital.<sup>18</sup> With appropriate proactive asthma care, nearly all hospitalizations—along with other urgent care and emergency room visits—can be avoided.<sup>19</sup>

## Average Costs for Health Care Utilization for Asthma

Health Care Service	Cost
An emergency department visit for asthma that did not result in admission to the hospital (adults and children)	\$691
A hospital stay for asthma (adult)	\$9,261
A hospital stay for asthma (child)	\$7,987

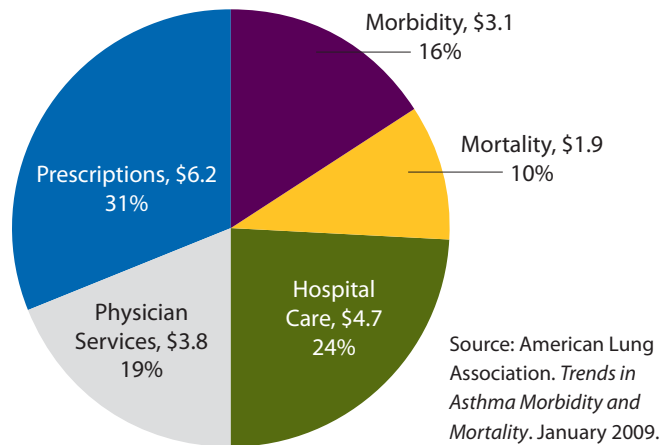
Source: Agency for Healthcare Research and Quality. Healthcare Cost and Utilization Project (HCUP). Rockville, MD. 2006.

## Additional Costs from Lost Productivity

In addition to direct costs, chronic illnesses can affect employee productivity by increasing short term disability, absenteeism and “presenteeism,” a term referring to employees’ sub-par performance while at work because of illness or another stressor.<sup>20</sup> For adults, asthma is the fourth leading cause of work absenteeism and the seventh leading cause of presenteeism.<sup>21</sup> Research suggests that presenteeism can cut individual productivity by one-third or more,<sup>22</sup> and costs employers substantially more than absenteeism. Indeed, experts estimate that presenteeism accounts for 72.5% of total costs associated with asthma in working populations while absenteeism, including short-term disability, accounts for roughly 8.6%.<sup>23</sup>

Estimates of the societal impact of these “indirect costs,” (costs that are indirect from the perspective of those who pay for health care, but still have a direct impact on employers) vary widely. On the low end, the American Lung Association attributes a total of \$5 billion per annum in lost productivity

**Distribution of Asthma Costs in the U.S. (2007): \$19.7 Billion in Total Costs (costs displayed in \$ billions)**



to morbidity (illness) and mortality (deaths) due to asthma.<sup>24</sup> Using more comprehensive employer data sets, the American Hospital Association, citing an analysis by Avalere Health, arrived at much higher figures: workers with asthma may miss as many as 125 million workdays each year, with an associated price tag of up to \$23 billion.<sup>25</sup>

In contrast to other chronic diseases that don’t commonly affect young people, many missed work days associated with asthma can be attributed to the need to stay home and take care of children with acute exacerbations. Among children, asthma is the leading cause of school absences from a chronic illness.<sup>26</sup> These youngsters miss an average of 2.5 more days of school each year than do their peers without asthma.<sup>27</sup> Asthma in children accounts for an annual loss of nearly 13 million school days per year<sup>28</sup> (approximately 8 days for each student with asthma) and more hospitalizations than any other childhood disease.<sup>29</sup> Between 1990 and 2000, the costs associated with the time adults lost from work due to caring for a child sick from asthma increased by 88%.<sup>30</sup>

Moreover, employees may be distracted by a family member’s asthma when they do go to work—an example of presenteeism. A study by Finkelstein and colleagues concluded that parents working while worrying about their sick children lost more productivity than did employees who worked while dealing with their own asthma symptoms.<sup>31</sup>

# A Business Case for Employer Decision-Making

The high rates of uncontrolled asthma in both adults and children, the associated preventable costs, and the growing understanding about cost-effective interventions that can prevent symptoms, make a compelling case for programs to reduce the burden of the disease. What factors should an employer consider in determining the level of investment in asthma that makes sense for its employee population?

In general, there is a business rationale for an additional health-related service if an added expenditure results in a positive *return on investment* (ROI) and/or can be considered *cost effective*. ROI calculates dollars saved relative to dollars invested. A “cost effective” intervention is one where costs for a given health improvement are a good value as compared to other standard interventions.<sup>32</sup> A positive ROI and/or evidence of cost-effectiveness are solid business reasons to invest in a new service.

In considering new investments in asthma management, insurance companies and health plans examine health outcomes, the reasonableness and affordability of anticipated program expenditures, and potential savings in health care costs. Employers should not limit themselves to these health payer considerations alone. Instead, when making business decisions about additional employee health offerings, employers should *also* take into account likely savings from fewer absences and improved productivity of healthy employees, along with less tangible business considerations such as the positive impact on worker morale and loyalty, which in turn can impact recruitment and retention of employees over the long term.

## What is the business case for my company?

### The Asthma Return on Investment Calculator

In 2009, a user-friendly on-line tool was developed by Thomson Reuters for the federal Agency for Healthcare Research and Quality (AHRQ). Called the “Asthma Return on Investment Calculator,” this tool can help health policymakers, purchasers, and insurers understand the financial implications of investing in asthma quality improvement programs that primarily focus on asthma education. The Calculator is based on evidence from 52 studies and is available free of charge through the AHRQ website: <http://statesnapshots.ahrq.gov/asthma>.

To estimate an ROI from these asthma programs, we ran two scenarios assuming low and high program costs found in the literature. The scenarios are based on:

- a national employer of 5,000 employees
- an employer-sponsored insurance package that includes an asthma quality improvement program targeting children and adults with persistent asthma
- a program lasting three years and achieving full impact within the first year
- the Calculator’s default values for population demographics and asthma prevalence, as well as health care and productivity costs

Based on the above characteristics, the Asthma Return on Investment Calculator concludes that investment in asthma education will result in savings from reduced use of health care services and reduced absenteeism, generating:

1. An ROI of \$9.84 per dollar invested for programs that cost \$85 per participant (low cost program);
2. An ROI of \$1.52 per dollar invested in more comprehensive programs (e.g. repeat visits, provision of supplies/materials) with higher costs of \$1559 per participant.

The Asthma Return on Investment Calculator does not factor in savings due to reduced presenteeism. Because presenteeism accounts for an estimated 72.5% of total asthma-related costs, the actual ROI is likely to be substantially more than the estimate generated by the Calculator.

# Controlling Asthma and Its Costs: The Evidence Base for Implementing Best Practices

## Best Practices for Asthma Management

**T**he most recent NAEPP Guidelines (2007) focus on components of “best practices” considered essential for managing asthma and keeping asthma symptoms under good control.<sup>33</sup>

1. Assessment and monitoring
2. Comprehensive pharmacologic therapy
3. Education for a partnership in asthma care
4. Control of environmental triggers and co-morbid conditions

Knowledge about these four best practice components is an important first step for effectively managing asthma, but the real challenge is in fully implementing the NAEPP Guidelines. Historically, the focus for implementation has been on the clinical setting. As asthma rates have risen, research studies have identified models for programs to supplement clinical care, including more intensive patient education and interventions to control environmental triggers.

Using research results as their guide, public health departments, community coalitions, health plans, and employers have begun to implement comprehensive evidence-based programs that are improving symptoms of asthma for a cost comparable to standard pharmacological interventions, and in some cases, reducing overall costs. These programs are overcoming barriers to accessing needed medical, educational and environmental services and supplies. Together with quality clinical care tailored to the individual, they deliver high value best practices for asthma.

The following summarizes the evidence on the effectiveness and costs of interventions to implement the best practices described in the NAEPP Guidelines. Later in the report, we make recommendations about how employers can facilitate access to such interventions for their employees.

### Implementing Best Practices 1 and 2

Clinicians tend to focus on (and insurance most frequently pays for) the two components of the NAEPP Guidelines that



typically occur in a doctor’s office: 1) improving assessment of asthma severity and monitoring of symptoms; and 2) prescribing controller and rescue medications. There is a wealth of evidence showing the importance of regularly assessing symptoms and taking proper medications to keep asthma under control and enable people with the disease to lead healthy active lives.<sup>34</sup> Yet many people with asthma do not have access to appropriate assessment and medications.

High costs and co-payments are one important barrier for some patients in consistently accessing the medications and services they need. As part of disease management programs, some employers and insurers have initiated programs to remove this financial barrier by reducing co-payments or otherwise subsidizing medications. These initiatives are often grounded in Value-Based Insurance Design, which promotes the use of clinical services when the clinical benefit exceeds the costs.<sup>35</sup> Pitney Bowes, a Stamford, Connecticut-based

company, attributed an annual decrease of 15% in overall asthma-related costs to a decision to place all asthma medications in the first tier of its formulary, requiring a 10 percent coinsurance payment, rather than 30 percent or 50 percent.<sup>36</sup> Several health plans, including Aetna and Humana, have developed similar reduced copay initiatives. Humana's RxPlus program lowers copayments for members with diabetes and asthma.<sup>37</sup> ActiveHealth Management, an independent patient-management subsidiary of Aetna, also focuses on prescription medications, lowering co-payments for inhaled steroids used to prevent asthma symptoms as well as a range of medications for other chronic diseases.<sup>38</sup>

### Implementing Best Practices 3 and 4

Relatively few patients have access to the two remaining components of asthma best practices: patient education and control of environmental triggers. This is a critical gap and opportunity. An increasingly robust body of evidence shows that they not only improve asthma symptoms, but do so at

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**While the majority of studies either focus on asthma education or home-based environmental interventions, but not both, a 2000 study by Jowers and colleagues documented the health and cost benefits of programs when these interventions were combined in a comprehensive disease management program. When children (ages 12 and older) and adults with medium to high risk asthma were provided asthma education, disease management services and home visits that also addressed asthma triggers in the home, there were statistically significant reductions in the use of costly acute health care services, improved quality of life measures, and reduced work days lost (see Appendix C). The financial benefits from improved productivity and reduced health care costs resulted in a return on investment of \$4.64 saved for each \$1 invested in the program.**<sup>39</sup>

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a reasonable cost. In hundreds of studies, asthma education sessions delivered in the clinic, home or workplace have overcome key factors in poorly managed asthma, including patients' low expectations for controlling their disease, confusion over using different kinds of medications, and misuse of medical equipment. Asthma education has been shown to be effective when delivered by people with clinical expertise

## Show Me the Evidence

### Asthma Education

**A**sthma education sessions can occur in many different settings, including the workplace. Benefits of asthma education include reduced asthma symptoms, improved quality of life, improved medication adherence, and fewer activity limitations/restrictions.

The federal Expert Panel convened to update the NAEPP Guidelines found "abundant" scientific evidence that asthma self-management education programs reduce urgent care visits and hospitalizations, and improve overall health status for both children and adults.<sup>40</sup> These programs include (a) basic facts about asthma, (b) self-management techniques/self-monitoring skills (either peak flow or symptom-based monitoring), (c) proper use of medications, and (d) actions to mitigate or control environmental exposures that exacerbate symptoms.

On the basis of an additional review of the literature on the cost-effectiveness of asthma education programs, the NAEPP Expert Panel recommended "that asthma self-management education delivered by trained health professionals be considered for policies and reimbursements as an integral part of effective asthma care."<sup>41</sup> For details on studies demonstrating net cost savings of asthma education programs for "high-risk" patients (people with persistent moderate/severe asthma, or high utilizers of urgent care), see Appendix C, Table 2.

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**A 2003 randomized controlled trial of adults receiving group education sessions in the clinic, by phone and at home by an Asthma Nurse Specialist, at a cost of \$186 per patient, saved \$6,650 per patient in direct and indirect health care expenditures (\$36 saved in health care costs and lost work days for every \$1 spent on the program).**<sup>42</sup>

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### Home-Based Environmental Trigger Reduction

For controlling environmental triggers at home, both the federal NAEPP Expert Panel and the Centers for Disease Control and Prevention's (CDC) Task Force on Community Preventive Services found a strong body of evidence showing that multi-faceted home-based environmental interventions, tailored to allergen and irritant sensitivities, reduce asthma morbidity in children.<sup>43,44</sup> The CDC Task Force "recommends the use of home-based multi-component, multi-trigger environmental interventions for

children and adolescents with asthma on the basis of strong evidence of effectiveness in significantly reducing symptom days, improving quality of life or symptom scores, and reducing the number of school days missed.<sup>45</sup> On the basis of a follow-up economic review of over a dozen studies, the CDC Task Force “finds that the combination of minor to moderate environmental remediation with an educational component provides good value for the money invested based on improvement in symptom free days, savings from averted costs of asthma care, and improvement in productivity.”<sup>46</sup> (For a review of the cost-effectiveness literature, see Appendix C.) Some research on adults has shown improvements in symptoms from home-based environmental interventions,<sup>47</sup> though there have been too few studies on adults to draw strong conclusions about effectiveness or costs of such programs.<sup>48</sup>

**The national Inner City Asthma Study demonstrated that a moderate intensity home-based environmental intervention program for high-risk children, delivered by an environmental counselor over the course of 5 visits, cost \$28 for each symptom-free day gained (total program costs \$1469/person).<sup>49</sup> These costs are well within the range of what payer organizations have determined are “reasonable” for improving health outcomes, and far less than the medication Xolair (omalizumab), which costs \$523 per symptom-free day for patients with moderate-severe, uncontrolled allergic asthma.<sup>50</sup>**

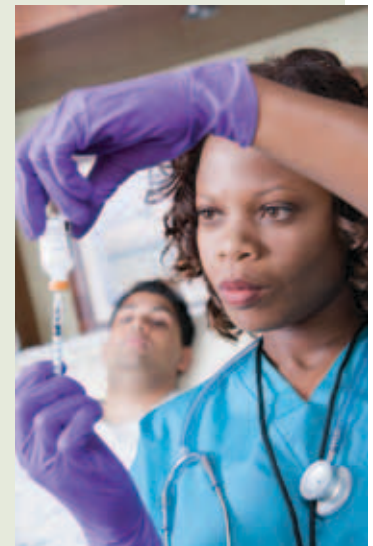
#### **Work-Related Environmental Trigger Reduction: Opportunities for Reducing the Burden of Asthma**

Most of the attention by the research community to reducing environmental triggers for asthma, and programs developed on the basis of that research, has focused on the home environment, with particular attention to children. In contrast, there is relatively little literature on both the health and economic impacts of modifications of work environments to reduce asthma symptoms. However, a 2002 assessment by the National Institute for Occupational Safety and Health (NIOSH) concluded that improvements in indoor air quality in *non-industrial* work settings (for example, health care institutions and schools) have the potential to reduce asthma episodes 6–15% and to accrue

economic benefits of \$200–\$600 million nationwide.<sup>51</sup> In these settings, where some 70% of U.S. workers are employed, exposures are not dissimilar to those found in homes. Like home-based interventions, steps to reduce asthma triggers include attending to building features (healthier building design, materials and contents), building practices, including janitorial products, and the design and maintenance of ventilation systems.

In some non-industrial work settings, and many industrial work environments, exposures to chemicals pose additional risks to workers. Typically, interventions where exposures are prevalent focus on removing workers with pre-existing asthma from the exposure. Reports of such interventions show improvements in symptoms that may translate into reduced costs associated with urgent care and poor work performance.<sup>52,53</sup> If feasible, however, reducing the use of substances associated with asthma, and/or replacing them with less toxic products, is the better approach. “Toxics use reduction” removes hazards known to be capable of causing and exacerbating asthma, and it takes into account other health outcomes of concern such as carcinogenicity. There is not an extensive research literature on cost and health outcomes of toxics use reduction approaches, though case studies of measures taken in individual facilities show promise for both financial and health outcomes.<sup>54</sup>

**To mitigate the dramatic rise in asthma among hospital workers, a teaching hospital substituted powdered natural rubber latex gloves with powder-free gloves. This substitution resulted in an extremely small increase in glove costs (2–3% over 4 years) while reducing costs associated with lost work time and Workers’ Compensation claims.<sup>55</sup>**



(such as nurses and respiratory therapists) as well as by specially trained health outreach or community health workers. When delivered to patients with moderate or severe asthma, and/or those who are high utilizers of urgent care, asthma education can generate net cost savings (See Appendix C).<sup>56</sup>

In addition, home or workplace assessment and interventions to reduce environmental exposures are beneficial, particularly for people with low literacy levels, or for those living or working in environments with high levels of mold, dust, cockroaches, chemicals and other asthma triggers.

As noted above, research studies and programs to provide asthma education and reduce environmental triggers have proliferated, increasing knowledge about their effectiveness and about their costs. In recent years, several national expert review panels have convened to conduct systemic reviews of the asthma education and environmental intervention literature, and have concluded that these programs are typically good value investments.<sup>57, 58</sup> (See sidebar: “Show Me the Evidence” for more details.)

### **Additional Business Approaches for Delivering Best Practices: Disease Management and Case Management**

To facilitate access by people with asthma to best practices, some organizations—including payers and employers—are contracting with disease management companies to provide additional support to those diagnosed with chronic diseases beyond what they receive from their health care providers. For patients with co-morbidities or with particularly challenging life situations that affect their health, some organizations are assigning case managers to help patients manage the array of services they may need. For such high risk patients, studies show that one-on-one tailored programs with case management are likely to generate a positive return on investment.<sup>59</sup>

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**Through both case management and asthma education, Harvard Pilgrim Health Care’s pediatric Asthma Outreach Program saved \$7.69-\$11.67 for every \$1 spent on a case manager’s salary because of reduced use of the emergency room and reduced hospitalizations.<sup>60</sup>**

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It is worth noting that although disease management programs typically include several of the asthma best practice components, particularly asthma education and medication reinforcement, they rarely offer home visit services for environmental assessments and interventions—important components of proper asthma management for people whose asthma is not under control.

### **Investing in Asthma Management: Impact on Health Insurance Premiums**

In today’s high-cost health care market, employers, health care purchasers and employees are reluctant to make changes to health care benefits that may result in increased health insurance premiums. Yet, because the evidence is strong that asthma management programs tailored to the particular employee population and workplace will result in savings—both from reduced use of urgent care and reduced absenteeism and presenteeism—health insurance premiums should not increase as a result of employer investment in managing asthma. For employers who self-insure, cost savings—including savings from increased productivity among employees with asthma—should translate into reduced insurance premiums. For employers who do not self-insure but instead purchase health insurance products, the insurer, rather than the employer, will realize any cost savings from reduced use of urgent care. Therefore, when negotiating with insurers on adding asthma benefits, employers should make an evidence-based case that the additional services will be cost-effective and may generate net cost savings, and thus that premiums should not increase.

# Promoting Best Practices for Asthma: Strategies and Recommendations

**O**n the basis of the evidence showing positive impacts on health outcomes by a wide range of programs, the NAEPP convened experts to develop recommendations about how best to implement the asthma Guidelines. This “Guidelines Implementation Panel” identified roles for multiple organizations beyond clinical practitioners to help address the asthma epidemic: organizations that engage people in settings where they live, work and play, and organizations that pay for health care.<sup>61</sup> The recommendations are broad, and include having purchasers examine their insurance policies for gaps and barriers to appropriate proactive care, developing protocols and coverage for in-home environmental trigger assessments and education, and developing approaches to limiting workplace triggers, among others.

The following recommendations build on those put forward by the NAEPP Guidelines Implementation Panel, considering the unique perspective and opportunities of the employer as a purchaser of health care, a steward of employee well-being, and a decision-maker about the quality of the work environment.

## Employer Strategies for Reducing the Burden of Asthma

Once employers have made the business decision to promote evidence-based guidelines for asthma prevention and management, what steps should they take to invest their health care dollars wisely? Opportunities for employers fall into three major categories:

1. Modifying employee insurance benefits and health plan offerings to ensure that they align with best practices put forth by the NAEPP Guidelines;
2. Building on worksite health promotion programs to support employees in overcoming barriers to effective self-management;
3. Ensuring that the work environment—in which employees spend many of their waking hours—is “asthma-friendly.”

### Strategy #1: Aligning Health Benefits with Best Practices

Whether they “self-insure,” or negotiate benefit packages offered by health plans or commercial insurance, employers and their brokers can improve the quality of asthma care and reduce costs via the design of health benefits. These packages should cover and promote the use of cost-effective asthma management services that emphasize proactive care. By carefully crafting health benefits so that evidence-based services are paid for, employers can support their employees in effectively managing their symptoms, and reduce costs associated with acute asthma exacerbations.

## Designing and Negotiating Your Employee Health Benefits

### If your company self-insures:

- Compare your current plan offerings with the best practices for asthma management outlined in this report.
- Make certain that provider reimbursements align with best practices.
- Consider eliminating or reducing co-payments for prevention-oriented care, including recommended use of controller medications, to improve medication adherence.

### If you are a large or mid-sized company that either directly, or through a broker, negotiates health insurance packages:

- Select health insurance products that most closely align with best practice guidelines described in this report.
- If you have a fee-for-service plan, request coverage for services that may be considered less customary, but are proven to prevent asthma exacerbations, including education, case management, and home trigger assessments.
- To address insurance company pre-established co-payments, develop an employee reimbursement policy that provides incentives for prevention-oriented care and medications.

A person with asthma should have insurance that covers the range of interventions that may be needed to effectively control his or her disease. Employers' interests appear to ally with those of their employees: 40% believe that health benefits are "extremely or very important" for improving worker productivity.<sup>62</sup> Yet despite the evidence that investing in best practices makes economic sense, most employer-sponsored insurance plans fall short of ensuring that bene-

### Modifying Insurance and Health Plan Coverage: Optima Health, Virginia Beach, Virginia

**O**ptima Health is a non-profit managed care system including a Medicaid HMO and commercial HMO, PPO and POS plans. Employers contracting with Optima Health provide employees and their dependents that have asthma with access to asthma education and support for managing environmental triggers. Optima Health members are categorized into three different interventions depending on their asthma severity. Mailed materials and group asthma education classes are offered to those at low risk. These same services and phone-based case-management support are offered to members of moderate asthma risk. For those considered high risk, based on recent hospitalizations or excessive use of rescue medications, Optima Health combines asthma education with an average of four home-based environmental interventions provided by visiting nurses or respiratory therapists, in order to provide more intensive asthma management guidance in the home.

Optima Health has tracked improvements in asthma outcomes among its members, which have translated into significant cost savings. Between 1994 and 2004, asthma hospitalizations among Optima members in commercial plans decreased by 54% while emergency room visits decreased 18%. Overall costs for members considered high risk and receiving the home-based environmental interventions decreased by 35%. Optima Health estimates that they saved \$4.40 for every \$1 spent on the program. In 2005, Optima Health was recognized by the U.S. Environmental Protection Agency as a leader in asthma management.

Source: Environmental Protection Agency. *Optima Health: 2005 Winner of EPA's National Environmental Leadership Award in Asthma Management*. Available at: [http://www.epa.gov/asthma/pdfs/optima\\_health\\_case\\_history.pdf](http://www.epa.gov/asthma/pdfs/optima_health_case_history.pdf). Accessed November 15, 2009.

ficiaries can access all four best practice elements of asthma management if they need to, as recommended by the NAEPP Guidelines. Plans may fall short because certain services, some kinds of providers and specific supplies are not covered, or because the cost of co-pays and deductibles discourages access by some patients. For people whose asthma impairs their daily functioning, these gaps in insurance are key barriers to accessing services and supplies that can bring their asthma under control.

Insurance specifications for standard asthma treatment have been described elsewhere.<sup>63</sup> The following recommendations supplement these specifications by *focusing on common gaps in insurance coverage* known to impede people with asthma from accessing best practices for asthma.<sup>64</sup> They also reflect the NAEPP Guidelines Implementation Panel's recommendations, mentioned above.

**Recommendation: Employers should make certain that health insurance covers all four best practice elements recommended by the NAEPP Guidelines, paying particular attention to common gaps** as follows:

1. Insurance should pay for regular disease **assessment and monitoring** of lung function by clinicians, including pulmonary function testing conducted in the clinic or laboratory setting, and for the peak flow meters needed by patients to monitor their symptoms at home. It should also provide for full access to allergists' and specialists' diagnostic tests, especially allergy testing.
2. Insurance should provide benefits without financial barriers that would keep patients from taking **appropriate medications**. Specifically, plans should consider value-based steps that: 1) reduce or eliminate co-pays, and/or design drug formularies to ensure that brand name drugs needed by the patient, or for which there are no generic alternatives, are placed in a lower-cost category; 2) reimburse for multiple prescriptions for inhalers and spacers, so people with asthma can have them at school, at work, and more than one for home use, in cases where they live in more than one place.
3. Insurance should pay for longer clinical office visits devoted to **asthma education** and necessary follow-up, and for reinforcement sessions with asthma educators and/or community health workers with appropriate asthma



training, conducted in the clinic, home, school, workplace, or community. Insurance should also cover the costs of case management services for high-risk patients.

- Insurance should cover **environmental trigger reduction supplies and services** in the home for children and adolescents as appropriate and needed. Insurance should pay for smoking cessation programs and associated pharmacotherapy for all people who smoke. However, patients whose asthma is consistently under control may not need home visits and environmental interventions or supplies. For those whose asthma is not under control, insurance benefits should include education about environmental triggers, home assessments and needed supplies (e.g., mattress/pillow covers; HEPA air and vacuum filters; integrated pest management supplies). In the relatively rare cases where home environments require professional services to reduce exposure to triggers, insurance plans should allow for reimbursement of such services, consistent with the CDC Task Force recommendations.<sup>65,66,67</sup> Insurance should also pay for same-day visits to two specialists for people with co-morbidities.

### **Strategy #2: Building on Worksite Health Promotion Programs to Support Employees in Overcoming Barriers to Effective Self-Management of Asthma**

While removing insurance barriers to appropriate asthma care is necessary, this may not be enough for employees to access optimal care. In addition to modifying insurance benefits, employers should also consider building upon existing on-site or off-site health promotion programs, or launching new initiatives to facilitate access to asthma services and supplies. Vendors such as disease management companies or health plans can assist employers in designing and delivering these programs.

### **Recommendation: Employers should consider facilitating access to the following services, by providing them in house or contracting with a vendor:**

- asthma education, and disease or case management services;
- evidence-based home visit programs for those employees or dependents whose asthma is not under control. In addition to reinforcement of appropriate use of medications for all people with asthma, home visits for children and adolescents should include environmental assessments and supplies and/or professional services to reduce exposure to triggers;
- flu shot clinics for employees and their dependents.

## **Workplace Health Promotion: Bank One's Worksite-Based Asthma Disease Management Program**

**B**ank One, the fifth largest US bank-holding corporation, with over 80,000 employees, was one of the first companies to offer a worksite-based asthma education program. The FirstAir Asthma Education Program was offered to employees who had been identified via available databases as having a history of asthma. The program's objectives were to educate employees about the value of optimal asthma management and to provide them with information to enhance their role in their own care.

The Bank One program consisted of five 1-hour weekly educational classes at lunchtime taught by an asthma nurse specialist. To promote attendance at the sessions, incentives were provided, such as a free lunch, a subscription to *Asthma Magazine*, a tote bag containing educational materials about asthma, a pillow encasement cover, and a booklet on how to keep the home environment "asthma-friendly" among others. Forty-five percent of eligible employees participated in the program. Those that participated demonstrated significant improvements in asthma control, better communication with providers about their asthma, more knowledge about asthma, increased medication compliance, and greater self-confidence regarding medication usage—improvements that were retained for at least one year after the program. The program did not track health care utilization or costs, however prior studies of workplace programs suggest that improvements in asthma control as observed in this program are likely to result in reduced costs associated with expensive health services and with reduced productivity.

Source: Burton WN, et al. "Asthma Disease Management: A Worksite-Based Asthma Education Program," *Disease Management*. March 2001;4(1)3-13.

As noted above, where insurance falls short of reimbursing for recommended medications or services, or requires high co-pays and deductibles, employers should also consider reimbursing employees for out-of-pocket expenses to encourage them to take advantage of prevention-oriented medications and care. One possible mechanism for facilitating such reimbursements is the Health Spending Account.



Finally, employers should encourage employees to request a personalized written Asthma Action Plan from their doctor, and to have it on hand at work for their own reference.

### Strategy #3: Ensuring Healthy Work Environments

Because of the large numbers of adults whose asthma appears to result from exposures in the workplace, as well as the high percentage of people who report that their asthma is worse on the job, employers should seek to create “asthma-friendly” work environments. Some of the steps needed to improve the work environment for people with asthma are straightforward, similar to “good housekeeping” measures in the home. Others involve reducing or eliminating exposure to substances associated with the onset or exacerbation of asthma.

Given the substantial costs of presenteeism and absenteeism, some of these steps will likely prove cost effective, while others may be cost-prohibitive. Employers should systematically consider data particular to their workforce, including the prevalence of disease, the rates and costs of asthma-associated presenteeism and absenteeism, and asthma-related health care and disability costs—as they determine appropriate steps to take.

**Recommendation:** Employers should consider two strategies to improve the quality of the work environment for asthma:

- a) *Good housekeeping practices* to minimize exposures to ubiquitous allergens and irritants.
- b) *Workplace-specific measures to minimize exposures to asthmagens and asthma triggers, including adopting safer products and practices.* Steps to prioritize the reduction of exposures to and use of asthma-related substances include:
  - identifying substances used in the particular workplace that have been linked to asthma;
  - examining facility-specific information about asthma problems and potential asthma-related exposures;
  - reviewing safer alternatives and exposure reduction opportunities;
  - decision-making about reducing uses of, or exposures to, asthma-related substances.

In addition to the above population-level measures, employees should also consider the needs of individual employees with asthma and make appropriate accommodations. (For a more detailed description of this framework for decision-making about workplace interventions, see Appendix B.)

### Healthy Work Environments: the Toxics Use Reduction Act Program

The Toxic Use Reduction Act (TURA) Program is world renowned for its innovative work with businesses to reduce their use of hazardous chemicals. Established in 1989 by the Commonwealth of Massachusetts, the TURA Program provides confidential technical assistance and research to promote the use of safer alternatives and toxics use reduction in the workplace. Since the inception of the program, partnering companies have reduced the amount of toxic chemicals used in manufacturing processes by 40%, and toxic releases to air, water and soil by 91%.

Forty-one chemicals capable of causing or exacerbating asthma have been reported to TURA as being used in Massachusetts industry. Since 1990, the partnership between the TURA Program and Massachusetts businesses has reduced the high-volume use of asthma-related chemicals by 27%. Case studies of Massachusetts manufacturers demonstrate the potential for assessment of chemical use and toxics use reduction planning to reduce health hazards and improve the bottom line for individual companies.

Source: Toxic Use Reduction Institute, [www.turi.org](http://www.turi.org); and Jacobs M, et al. *Asthma-Related Chemicals in Massachusetts: an Analysis of Toxics Use Reduction Act Data*. Lowell Center for Sustainable Production. July 2009.

## Conclusion

**E**mployers and other purchasers of health care services have a significant stake in the health of the people who work for them and special leverage in improving employee health status. By facilitating employees' access to services and supplies that prevent the onset or complications of chronic disease, employers have the potential to improve the value of their health care dollar, control the unsustainable rise in medical costs, and increase worker productivity, satisfaction and health status.

As this paper has discussed, asthma is one of the top ten health conditions that commonly affect employees, and can have a substantial impact on employers' bottom lines. A conservative estimate is that asthma costs the U.S. \$19.7 billion annually, much of it borne by the business sector through expensive health care utilization and lost productivity, including absenteeism, disability and presenteeism.

Employers have an important role to play in filling the gap between the potential for people with asthma to live active lives unimpeded by their illness, and the reality of frequent interruptions in their normal functioning. The research literature, affirmed by case studies, should prompt us to ask: *how can we afford not to give people with asthma access to programs that hold promise for reducing symptoms and costs?* Employers interested in promoting best practices for asthma will need to

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**There is good news about asthma. With proper medical care and medications, quality education to help people manage their disease, and supplies and services to reduce environmental triggers, adults and children can thrive. People once unable to sleep, work or play can return to their jobs and to school, thus reducing both the human and financial costs associated with their disease.**

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undertake analyses specific to their workplaces. This paper should get them started. It dispels arguments that effective programs are too expensive or unproven, and provides strategies for building on existing initiatives to fill gaps in employees' asthma care.

The Asthma Regional Council of New England and the University of Massachusetts Lowell look forward to engaging with employers and other institutional purchasers of health care as we continue our efforts with multiple sectors to reduce the burden of asthma in the United States.



# Appendix A

## Factors in the Workplace Associated with Asthma

Substances that can cause or trigger asthma in the workplace include a broad range of chemicals such as formaldehyde or toluene diisocyanate, and biological agents such as mold.<sup>68</sup> The Association of Environmental and Occupational Clinics and other sources point to hundreds of individual chemicals capable of causing occupational asthma and exacerbating workers'

preexisting disease.<sup>69</sup> The table below provides some examples of these risk factors. For an employer, work-related asthma not only contributes to lost productivity and higher health care costs, but also can result in the loss of skilled and experienced employees, when workers are moved to a job or location where they are not exposed to the asthma toxicants.

### Examples of Factors in the Workplace Associated with Asthma

Source-Type	Examples	Occupations
Substances of Animal Origin	Laboratory animals, animal products, insects, birds	Laboratory/research workers, animal handlers, grain and poultry workers, veterinarians
	Egg protein	Egg producers
	Dust mites/grain mites	Farmers, grain-store workers, fisherman (sleeping quarters), libraries, offices with upholstered furniture and carpeting
Substances of Insect Origin	Cockroaches	Kitchen/restaurant/food storage workers, workers in buildings with kitchens/restaurants/ food storage
Substances of Plant Origin	Grain dust, flour	Grain handlers, millers, grain elevator workers, makers, coffee workers, food processors
	Wood dust	Carpenters, construction workers, sawmill workers, furniture makers, cabinetmakers
	Natural latex rubber	Health care workers
Substances of Chemical Origin	Isocyanates	Polyurethane industry, plastics, varnish workers, spray painters
	Acid anhydrides	Epoxy/polyester resin, plastic, paint workers
	Formaldehyde	Hospital workers
	Glutaraldehyde	Health care workers, janitorial workers
	Cleaning agents	Health care workers, janitorial workers, office workers, day care workers
Metals	Platinum	Platinum refinery workers, jewelers, electroplating workers
	Nickel	Metal-plating workers, stainless steel workers
	Chromium	Manufacturers of pigments, tannery workers, precision casters, stainless welders
Biological Enzymes	Fungal amylase	Manufacturing workers, bakers
	Pancreatin, pepsin, bromelin, flaviastase	Pharmaceutical workers
Medications	Penicillins, methyl dopa, cephalosporins, spiramycin, sabutamol intermediate, phenylglycine chloride, tetracycline, ipecacuanha, opiates	Pharmacists, nurses, physicians, factory workers, pharmaceutical workers
Molds/Mildew		Teachers, workers in damp/poorly ventilated office/work spaces

Source: Table adapted from: Christiani DC. "Asthma," in: *Preventing Occupational Disease and Injury*. 2nd Edition. Levy BS, Wagner GR, Rest KM and Weeks JL (eds). Washington DC: APHA, 2005. The table incorporates additional information from Malo J-L et al. "Appendix: Agents Causing Occupational Asthma with Key References," in: *Asthma in the Workplace*. 3rd Ed. Bernstein LI, Chan-Yeung M, Malo J-L, Bernstein DI (eds). New York: Taylor & Francis, 2006.

## Appendix B

### Framework for Fostering Asthma-Friendly Work Environments

The following steps aim to guide employers in making changes to their work environments that will reduce job hazards and exposures to asthma-related substances.

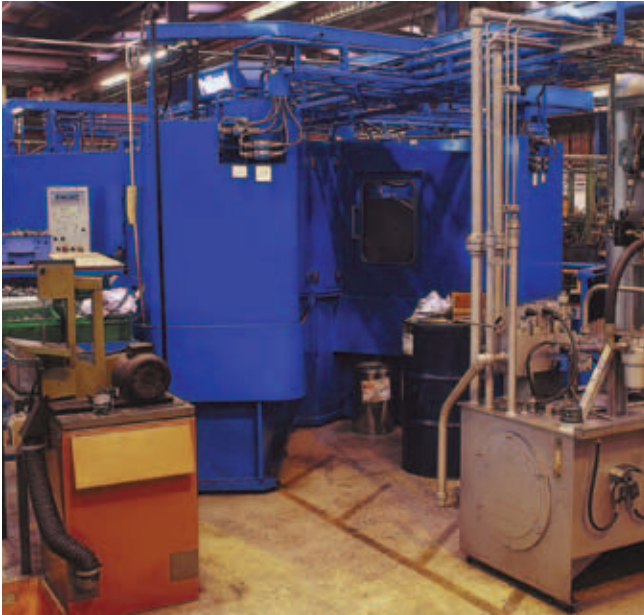
1. **“Good housekeeping” strategies** for minimizing levels of common allergens and irritants known to cause or exacerbate asthma are straightforward. They include controlling dust, cockroach and rodent allergen, and mold, similar to practices that ensure asthma-friendly home environments. Good housekeeping strategies can include removing carpeting (which tends to trap dust-mites, pollen and mold spores), maximizing wipeable surfaces, using integrated pest management for control of cockroaches and rodents, promptly repairing leaks and modifying humidity to prevent growth of mold, and ensuring ventilation and air circulation consistent with healthy indoor air quality.

Because of the potential for cleaning and disinfecting agents to both cause and trigger asthma, employers should consider safer alternatives, including eliminating or reducing the use of hazardous cleaning chemicals (e.g., careful planning of cleaning so use matches need; preventive measures such as doormats; use of safer substances where appropriate, isolating cleaning chemicals; use of personal protective equipment).<sup>70, 71</sup> The non-profit organization Green Seal has recently completed specifications for “green cleaners” which take into account potential to cause and trigger asthma.<sup>72</sup> Employers should also avoid the use of air fresheners or fragrances, which contain chemicals capable of exacerbating asthma.

2. **Workplace-specific steps to create asthma-friendly work environments** include minimizing exposure to chemical or biological agents, for example solvents used in industrial processes, or disinfecting agents used in health care. These can be more challenging, but a step-wise process of assessment and decision-making can often yield opportunities for improving workplace conditions at a reasonable cost. Steps to identify and prioritize these opportunities include: a) identifying substances used in the workplace

that have been linked to asthma; b) surveillance of potential exposures to asthma-related substances by department, job, task, and locations; c) review of exposure reduction opportunities and safer alternatives; and d) decision-making about steps to replace uses, reduce exposure and/or accommodate workers with asthma.

- a. **Identifying substances used in the workplace that have been linked to asthma.** The Association of Occupational and Environmental Clinics maintains a database of astmagens--substances known to have caused asthma in workers previously free of the disease. Earlier reports have based a “Master List of Asthma-Related Substances” on this AOEC list combined with reviews conducted by three additional entities which also characterize the strength of the evidence of hazard.<sup>73</sup> The Master List includes 336 biological and chemical agents capable of causing or exacerbating asthma, or both, many of which are found in workplaces. The first step is to identify substances on this list that are used in the particular workplace setting. To the extent that the hazard of a given chemical has been characterized, this information can be taken into account, but in general, little is known about what might be called the relative “potency” of different substances with regard to their ability to cause or exacerbate asthma.
- b. **Examining facility-specific information about asthma and potential asthma-related exposures.** The extent of harm that substances used in the workplace will cause depends not only on the toxicity of a particular substance, but also on how conditions of exposure intersect with individual factors to determine a given person’s response. Exposure assessment is complex, and requiring detailed exposure information before decisions can be made is often neither realistic nor appropriate. Nonetheless, for the purposes of prioritizing action on asthma-related substances, proxies for exposure can be helpful (e.g., identifying jobs, departments, tasks and locations where exposures



are likely, estimating numbers of people potentially exposed, and the typical duration of potential exposure). Reviewing data on the prevalence of asthma across these same categories (job titles, departments, etc.) can shed light on exposures of particular concern.

c. **Review of safer alternatives and exposure reduction opportunities.** A priority goal in developing strategies for reducing use of and exposure to asthma-related substances is the elimination of the job hazard, especially if there are safer alternatives. To eliminate the hazard, a first step is to examine functions of asthma-related substances. Where substances have explicit functions in the workplace, such as disinfectants used in health care, there may be opportunities for substitution with substances that are not associated with asthma that perform an identical or nearly identical function. This step should be considered carefully, taking into account other health hazards of potential substitutes. Other steps include exploring engineering changes, such as “closed loop” systems for some chemicals, process changes using substances not associated with asthma, restricting entry of workers to certain areas, or, where none of these steps is possible, requiring personal protective equipment. Costs of reducing or eliminating exposures are of course relevant information in decision-making.

d. **Decision-making about reducing uses of, or exposures to, asthma-related substances.** A plan for reducing uses or exposures to asthma-related substances should take into account the information gathered above. In determining priorities for action, employers should involve health and safety committees or other entities that give employees the opportunity to contribute their expertise and experience to decision-making. Taking all these factors into consideration, top priority opportunities would be to substitute chemicals on the Master List for which the evidence of hazard is strong, to which many people are exposed, and for which a safer alternative is available at little additional cost. Lowest priorities would be those substances for which the evidence of hazard is limited or conflicting, to which few people are exposed, and for which no alternatives are available.<sup>74</sup>

e. **Consideration of individual employees with asthma.** Employers should also consider the needs of individual employees with asthma. For individual employees, an American College of Chest Physicians 2008 consensus statement makes 12 suggestions for the diagnosis and management of work-related asthma, including that workers with occupational asthma induced by sensitizers be removed from further exposure.<sup>75</sup> In contrast, workers with irritant-induced asthma may be able to stay in their jobs, if the exposure conditions that caused their asthma can be avoided (e.g., a single high-level exposure that will not recur), and if steps are taken to prevent future exacerbations, via engineering controls or personal protective equipment. The Chest Physicians’ consensus statement also makes a strong case for considering an individual’s adult-onset asthma a sentinel event that should stimulate a survey or other assessment of the population of workers to identify other cases and consider strategies—such as those discussed above—for preventing further exposure to the population. As implied above, though reducing the risk of asthma exacerbation by moving the worker away from the offending substance may be a necessary step in the short term, it should not be considered a primary strategy in creating an asthma-friendly work environment, because the hazard remains for other workers—both for those who already have asthma, and those who may develop it as a result of the exposure.

# Appendix C

## Additional Evidence on Costs of Asthma Education & Home-Based Environmental Interventions

The majority of studies that have examined the health effects and cost implications of asthma programs have focused either on asthma education or home-based environmental interventions, but not both. However, Jowers and colleagues in 2000 examined the health and cost impacts of a comprehensive disease management program targeting both children (ages 12 and older) and adults with medium to high risk asthma that combined both interventions (see Table 1).

As discussed earlier, the NAEPP Expert Panel’s review of asthma education programs led to this 2007 recommendation: “that asthma self-management education, provided by trained health professionals, be considered for policies and reimbursements as an integral part of effective asthma care.”<sup>76</sup> Indeed, a number of randomized control trials and observational studies demonstrate that effective asthma education programs delivered by a range of providers (nurse, physician, respiratory therapist, medical social worker, health educator) and targeted to high risk patients are likely to result in health care cost savings, as high risk patients tend to use health services most frequently (see Table 2). The literature also suggests that programs targeting patients whose rates of health service utilization are lower may or may not generate net cost savings, but will

result in improved health outcomes, such as better quality of life, and for a cost per symptom-free day gained that is comparable to the cost of accepted and widely used pharmacotherapy.

In 2008, the CDC’s Task Force on Community Preventive Services reviewed over a dozen home-based environmental intervention programs.<sup>77</sup> Although not all studies conducted comprehensive cost evaluations, the most rigorous evaluations do demonstrate cost-effectiveness when programs are targeted to high risk children (see Table 3).

The Task force concluded that costs ranged from \$12–\$57 for each symptom-free day gained for home-based environmental interventions.<sup>78</sup> These costs are comparable to what health care payers and purchasers have been willing to pay for pharmacotherapy interventions (\$7.50 for each symptom-free day gained as a result of standard pharmacotherapy interventions in adults with mild to moderate asthma;<sup>79</sup> and \$11.30 for each symptom-free day gained in patients 5–66 years old with mild persistent asthma (for budesonide)).<sup>80</sup> These costs are far less than the \$523 per symptom-free day associated with the use of Xolair (omalizumab), which is prescribed for people with moderate-severe, uncontrolled allergic asthma.<sup>81</sup>

**TABLE 1 Combining Asthma Education and Home-Based Environmental Interventions in Disease Management Program: Example Evidence of Positive Return on Investment**

Source	Study Type	Program Description	Program Cost per Patient*	Health Improvement Results	Savings*
Jowers JR, et. al 2000 <sup>82</sup>	Pre-Post Intervention	Targeted medium to high-risk children (over 12 years) and adults with asthma. Provided 4-6 phone-based case management and education calls delivered by Respiratory Nurse and 2 home-based education/environmental intervention visits delivered by a home health care agency	\$303	12 months after baseline: fewer hospital days (37%); fewer ER visits (76%); fewer ICU admissions (67%); fewer unscheduled Dr. visits (66%); reduced use of rescue medications (50%); fewer missed work days (99%); fewer missed school days (77%)	Saved \$4.64 in health care costs and lost work days/school days for every \$1 spent on the program

\*Costs/savings are noted as reported in the study at the time of publication.

**TABLE 2 Asthma Education: Example Evidence of Positive Return on Investment**

Source	Study Type	Program Description	Program Cost per Patient*	Health Improvement Results	Savings*
Bolton MB, et al. 1991 <sup>83</sup>	Randomized Controlled Trial	Delivered by a Registered Nurse (with specialized asthma training) to high risk adult asthma patients during 3, 1-hour group sessions in the clinic	\$85	59% fewer ED visits	Saved \$22.50 in health care costs for every \$1 spent on the program
Castro M, et al. 2003 <sup>84</sup>	Randomized Controlled Trial	Delivered by an Asthma Nurse Specialist to high-risk adult asthma patients in the clinic, by phone & at home as needed	\$186	54% fewer hospital readmissions; 34% fewer ED visits; 8% greater improvement in overall Quality of Life; 76% fewer lost work/school days	Saved \$36 in health care costs and lost work days for every \$1 spent on the program
Clark NM, et al. 1986 <sup>85</sup>	Randomized Controlled Trial	Delivered by a health educator to high risk children with asthma during 6, 1- hour individual sessions in the clinic	\$1558	58% fewer hospitalizations and 59% fewer ED visits among cases with 1 or more baseline hospitalizations	Saved \$11.22 in health care costs for every \$1 spent on the program for children hospitalized the previous year for asthma
Greineder DK, et al. 1999 <sup>86</sup>	Randomized Controlled Trial	Comprehensive asthma case management services for high-risk children with asthma, including education delivered by an asthma Case Manager	\$190	57% fewer ED visits; 75% fewer hospitalizations	Saved \$7.69–\$11.67 for every \$1 spent on a case-manager’s salary
Trautner C, et al. 1993 <sup>87</sup>	Pre-Post Intervention	Delivered by a Specialized Nurse Educator to high-risk adult asthma patients while in the hospital	\$233	Average reduction 3-yrs after intervention in: hospital days (51%); missed work days (44%); physician visits (70%); asthma attacks (79%); average improvements in lung function (8.5%)	Saved \$3 in health care costs and lost work days for every \$1 spent on the program

\*Costs/savings are noted as reported in each study at the time of publication.

**TABLE 3 Home-based Environmental Interventions for Asthma: Example Evidence of Cost-Effectiveness**

Source	Study Type	Program Description	Program Cost per Patient*	Health Improvement Results	Cost-Effectiveness*
Kattan M, et al. 2005 <sup>88</sup>	Randomized Controlled Trial	5 home-visits targeting high-risk children with asthma delivered by two Environmental Counselors	\$1469	19% reduction in unscheduled Dr. visits per year; 13% reduction in B-agonist inhaler use per year; 37.8 (7%) additional symptom free days	Cost \$28 for each symptom-free day gained (\$16 per symptom-free day gained if just 1 Environmental Counselor administers the intervention)
Krieger J, et al. 2005 <sup>89</sup>	Randomized Controlled Trial	5–9 home visits targeting medium to high-risk children with asthma delivered by a Community Health Worker	\$1124	10% reduction in days with symptoms/2wks; 17% improvement in care giver quality of life; 45% reduction in urgent health service use/2mo; 13% fewer days with limited activity/2wks	Cost \$23 for each symptom-free day gained. <sup>90</sup>

\*Costs are noted as reported in each study at the time of publication.



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Widely accepted clinical best practices make it possible for people with asthma to control their disease, and live healthy, active lives. Yet thousands of adults and children suffer with asthma symptoms that are out of control, resulting in high utilization of costly urgent care, missed school and work days, and in some cases, long-term disability or death. The gap between *knowledge* about interventions that effectively manage asthma and *access* to needed services and supplies is an opportunity for individuals and for organizations with a stake in healthy people. *Asthma: A Business Case for Employers and Health Care Purchasers* focuses on opportunities for employers and other institutional purchasers of healthcare to cost-effectively reduce asthma symptoms in their employee populations. The report recommends three strategies for reducing asthma symptoms and improving productivity among employees. The strategies are grounded in national best practice guidelines for asthma, and in the most recent evidence on cost-effective interventions.



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