Asthma Care Quality Improvement: A Resource Guide for State Action

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- Several members of AHRQ's Asthma Steering Committee provided valuable comments and recommendations on earlier drafts of this *Resource Guide*. They are: James Stout (University of Washington), Diana Schmidt (National Heart, Lung, and Blood Institute), Stephen Redd (Centers for Disease Control and Prevention), David Greenberg (Centers for Medicare & Medicaid Services), Ashok Patel (American Thoracic Society member), Maureen George (American Thoracic Society member), Kirsten Aired (Oregon Asthma Program), Amy Friedman (Allies Against Asthma), Katherine Pruitt (American Lung Association), Asua Ofosu (American Thoracic Society), Mary Tyrell (South Carolina State Budget and Control Board), Vi Naylor (Georgia Hospital Association), and Carolyn Turner (Florida Agency for Health Care Administration).
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Foreword

Asthma Care Quality Improvement: A Resource Guide for State Action and its accompanying *Workbook* were developed by Thomson Medstat and The Council of State Governments for the Agency for Healthcare Research and Quality (AHRQ) as learning tools for all State officials who want to improve the quality of health care for people with asthma in their States. Using State-level data on asthma care, this *Resource Guide* is designed to help States assess the quality of care in their States and fashion quality improvement strategies suited to State conditions. The States mentioned in this *Resource Guide* gave permission to use their data for illustrative and comparative purposes so that others could learn by their examples.

Many people for whom these learning tools were intended—State elected and appointed leaders as well as officials in State health departments, Asthma Prevention and Control Programs, Medicaid offices, and elsewhere—provided comments and feedback throughout the development and drafting process. From this process, we learned that they intend to use the *Resource Guide* and *Workbook* in many different ways: to assess their current structure and status, to create new quality improvement programs, to build on existing programs, to orient new staff, and to share with their partners such as the American Lung Association.

The *Resource Guide* and its complementary *Workbook* can serve as tools for those who work on quality improvement to use in sharing their expertise, ideas, knowledge, and solutions. The various modules are intended for different users. Senior leaders, for example, may want to focus on making the case for asthma quality improvement, incorporating a State-led framework into their improvement strategy, and taking action; program staff need to provide the measures and data necessary to implement the quality improvement plan. The goal is that everyone work as a team and, thereby, improve the quality of asthma care in their State.

If you have any comments or questions on this *Resource Guide*, please contact AHRQ's Center for Quality Improvement and Patient Safety, 540 Gaither Road, Suite 3000, Rockville, MD 20850 (phone: 301/427-1734; email: dwight.mcneill@ahrq.hhs.gov).

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Executive Summary

Health care in America is plagued by extensive gaps in quality. Too often care provided to patients does not match what the medical community has determined to be the most effective care. Abundant research has shown that these gaps in quality are responsible for increased costs, wasteful and ineffective care, preventable complications, avoidable hospitalizations, decreased quality of life, disability, and premature death.

The National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR), published annually by the Agency for Healthcare Research and Quality since 2003, provide both extensive research and data on the extent of health care quality gaps as well as national benchmarks for quality. This *Resource Guide* and its accompanying *Workbook* draw on the NHQR and the NHDR to support State-level efforts to improve the quality of asthma care.

This *Resource Guide* is designed to help State leaders identify measures of asthma care quality, assemble data on asthma care, assess areas of care most in need of improvement, and learn what other States have done to improve asthma care. Taken together, the *Resource Guide* and its companion *Workbook* can help State leaders to develop an asthma quality improvement action strategy.

Why Asthma?

Asthma is a chronic lung condition that impairs normal breathing. The disease affects a growing number of Americans. In 2003, nearly 30 million people had been diagnosed with asthma at some point in their lives and nearly 20 million people stated they currently had asthma (Centers for Disease Control and Prevention, 2002a). Asthma is also costly: total estimated costs in 2001 were $14 billion (American Lung Association, 2004).

For several reasons, asthma presents an opportune target for quality improvement:

- Increased prevalence, especially among children and adolescents
- Disparities between socioeconomic groups and between racial/ethnic groups in terms of diagnoses and quality of asthma care
- A range of interventions and treatment that can successfully control the disease and prevent attacks
- High health care costs of uncontrolled asthma and the potential for a positive return on investment for purchasers and the health care system as a whole through asthma quality improvement.

Improved quality of asthma care may help to cut costs, reduce disparities, and improve the quality of life for millions of people with asthma.

A State-Led Framework for Improving Asthma Quality of Care

The *Resource Guide* introduces a framework for improving health care quality at the State level. States have typically viewed their role in quality improvement from a public health perspective

or, more narrowly, as a buyer of health insurance for State employees. However, States can play a more comprehensive leadership role. Some States are already doing this, at least in part, with respect to asthma.

This approach envisions three central roles for States in quality improvement:

- **Provide leadership**, which entails providing a defining vision for change, setting goals, and providing an environment that fosters improvement.
- **Work in partnership**, which involves creating a committed partnership of stakeholders dedicated to identifying, proposing, and testing solutions and developing plans for improvement.
- **Implement improvement**, which means implementing changes, measuring and analyzing the results of changes, and applying successful improvements on a broader scale.

Learning From Current State Quality Improvement Efforts

Many States have already begun programs or demonstrations to improve the quality of asthma care. These actions can inform broader efforts within the State or the efforts of other States. This *Resource Guide* identifies a broad range of current asthma quality improvement activities, including public-private coalitions, cross-agency initiatives, data measurement and reporting projects, disease management training, and educational outreach programs for minority and rural populations.

Measuring the Quality of Asthma Care

Assessing State quality of care for asthma requires good data and useful measures. Useful quality measures include process measures, which reflect the quality of care delivered, and outcome measures, which reflect patient health status. The former can guide health care providers on how to change while the latter can gauge whether the changed processes have had the intended effect. The NHQR provides a starting point for accessing consensus-based measures. The NHQR provides estimates for asthma hospitalizations by State. In addition, this *Resource Guide* incorporates estimates from the Behavioral Risk Factor Surveillance System to assess asthma care quality by State. Although a consensus on a few key measures of asthma care quality has not yet evolved, an inventory of the many measures available is provided.

Data are also essential to improve quality. States need performance data on asthma care to assess their own performance against national benchmarks and to focus quality improvement efforts by identifying potential problem areas. A list of national, State, and local sources for estimates for asthma, asthma care, and other related information is also included.

Moving Ahead: Implications for State Action

Identifying measures and data sources is only a first step. As part of a systematic initiative to improve the quality of asthma care, States will need to bundle these resources into a comprehensive, State-specific picture of asthma care that identifies areas for improvement and provides a basis for planning among the partners. This picture may require collecting specific data on asthma care that focus on a State's health care systems. Doing so will enable States to identify specific quality problems in their own communities, tailor specific solutions, and assess the effectiveness of specific interventions

Contents

List of Text Tables and Figures

Figures

Text tables

Introduction

Improving the quality of health care in America remains a widely shared national objective. The ultimate goal of quality improvement is to close the gap between current practice and best practice as defined by the medical community. Closing this gap can contribute to improved health care in a number of ways: reduced costs, more efficient care delivery, fewer complications, and better quality of life for patients.

The National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR) published annually by the Agency for Healthcare Research and Quality (AHRQ) provide extensive research and data on the extent of health care quality gaps as well as national benchmarks for quality. This *Resource Guide* draws on the NHQR and the NHDR to support State-level efforts to improve the quality of care for asthma. It is the second *Resource Guide* and *Workbook* published by AHRQ; the first *Resource Guide* and *Workbook* addressed diabetes quality of care. This *Resource Guide* combines the data assembled for the NHQR and other sources with a variety of background, analysis, and policy information on asthma.

Why Should States Make Asthma a Priority?

Asthma is a chronic condition that affects the lungs and is characterized by episodes of wheezing, breathlessness, chest tightness, and coughing. During an asthma attack, the airways that carry oxygen to the lungs become inflamed and swollen; the muscles surrounding the airways tighten; and mucus collects, making it harder to push air in and out of the lungs. These episodes are usually the result of exposure to asthma "triggers." These include infections such as colds and bronchitis; irritants such as second-hand tobacco smoke, dust mites, air pollution, and cockroach debris; other allergens such as furry pets and mold; and other triggers such as stress, exercise, and abrupt changes in the weather.

The prevalence of asthma among Americans has nearly doubled in the past two decades. In 2003, nearly 30 million people had been diagnosed with asthma at some point in their lives and nearly 20 million people stated they currently had asthma (Centers for Disease Control and Prevention [CDC], 2002a). Asthma is also a costly disease: the estimated cost of asthma was $14 billion in 2001. The $14 billion is composed of direct costs—estimated at $9.4 billion from physician visits, hospital stays, and medications—and indirect costs—estimated at $4.6 billion from lost work days, school absenteeism, and lost earnings (American Lung Association [ALA], 2004).

For several years, asthma has been a target for quality improvement efforts by States and other health care entities because of the following:

- Increased prevalence of asthma, especially among children and adolescents.
- Disparities between socioeconomic groups and between racial/ethnic groups in terms of diagnoses and quality of asthma care.
- A range of interventions and treatments that can successfully manage the disease and prevent attacks.

- High health care cost of uncontrolled asthma and the potential for a positive return on investment for purchasers and the health care system as a whole through asthma quality improvement.

Data from the NHQR and NHDR demonstrate that there are wide variations in quality of care for asthma across States and across different socioeconomic strata and racial and ethnic groups.

Why and How To Use This Resource Guide

State leaders can play a central role in leading asthma care quality improvement. This *Resource Guide* is designed to equip them with information resources and a model for taking action.

Purpose of the *Resource Guide*

The purpose of this *Resource Guide* and companion *Workbook* is to assist State policymakers and others in planning and implementing a State-level quality improvement initiative for improving asthma care.

Specifically, the *Resource Guide*:

- Describes the need for improvement in quality of care for asthma and the potential for returns on State investments.
- Offers a model for how State leaders can lead efforts to improve asthma care quality, along with examples of State-level activities underway.
- Presents examples of current State-led efforts to improve asthma care.
- Presents the multiple dimensions within which health care quality for asthma can be measured, examines metrics for assessing State performance, and provides data from the NHQR and other data sources on asthma to help inform State decisionmaking.

Audiences for This *Resource Guide*

Quality health care is delivered by providers in clinical settings. Thus, quality improvement ultimately needs to influence what happens in a doctor's office, hospital, or clinic. Even so, State leaders and policymakers can have an enormous impact on health care:

- They can articulate a vision that inspires action and change.
- They can involve strategic partners and champions who can reach the front lines of health care.
- They can assemble information that focuses the attention of health care providers at the local level, just as the NHQR does at the national and State levels.
- They can enable health care improvement strategies to be tailored more skillfully for State and local health care markets.

As purchasers and regulators, States can supply incentives for providers to make the changes necessary to improve the quality of health care. Thus, the main audiences for this *Resource Guide* include:

- **State elected leaders** — Governors and legislators (and their staffs) who provide leadership on health policy.
- **State executive branch officials** — Executive office appointees and career staff charged with taking action on important health issues, such as State health department and State Medicaid officials.
- **Nongovernmental State and local health care leaders** — Members of professional societies, provider associations, quality improvement organizations, voluntary health organizations, health plans, hospital associations, business coalitions, community organizations, consumer groups, and others who want to stimulate action on health care quality improvement at the State level.

Organization of This *Resource Guide*

This *Resource Guide* is divided into five modules. To assist readers in finding the information they need, the beginning of each module previews the contents and highlights key ideas. Each module ends with a summary and synthesis to demonstrate how to use the module and how to move to the next step. Also, a resource list for further reading and a discussion of associated appendixes are included where applicable.

State leaders in different parts of State government have different roles in quality improvement. This *Resource Guide* is addressed to State leaders, who have key contributions to make to the quality improvement process. Users can skip to the sections that are most relevant and appropriate for them.

The modules are organized as follows:

- **Module 1: Making the Case for Asthma Care Quality Improvement** describes both the need and opportunity for quality improvement in asthma care. The module answers the following questions: What is asthma? What are current trends in the prevalence of asthma and the cost burden for people with asthma? What opportunities exist for improving care and outcomes for people with asthma and reducing the cost of asthma care?

- **Module 2: A Framework for State-Led Quality Improvement** presents an operational approach for leaders to use in their quality improvement efforts. Synthesized from existing models of health care quality improvement, the framework outlines a leadership role for States in setting goals for improvement, convening partners, designing interventions, and assessing their impact through careful measurement and data analysis.

- **Module 3: Learning From Curreng State Quality Improvement Efforts** examines current State efforts to improve the quality of care for asthma. This module summarizes various approaches to asthma quality improvement as they relate to championing quality, creating partnerships, planning for change, implementing the vision, evaluating effectiveness, and spreading success. It also highlights State activities underway at each stage of quality improvement.

- **Module 4: Measuring Quality of Care for Asthma** examines measures and data issues that affect asthma care quality and improvement. This module describes current measurement issues and current metrics for assessing asthma care quality and examines a variety of data sources that State leaders can use to assess the quality of care in their States. It provides specific benchmarks of process and outcome measures from the NHQR and the Behavioral Risk Factor Surveillance System (BRFSS) on asthma care. An analysis using BRFSS data from four States—Maryland, Michigan, New Jersey, and Vermont—presents concrete examples of how one can draw conclusions from the data that can spur local action. Finally, the module shows how to derive estimates from available data to fill data gaps for particular States. These include examples for estimating the direct and indirect costs of asthma, Medicaid spending for each State, and cost effectiveness of an asthma intervention for Medicaid primary care case management programs.

- **Module 5: Moving Ahead—Implications for State Action** describes how State leaders can initiate a public policy-focused quality improvement effort for asthma care. This module describes specific steps that States can take in each of the three basic areas of activity: lead, partner, and improve.

Supplementary information on data sources and other resources for State leaders as they address asthma care quality improvement are provided in the appendixes.

A complementary *Workbook* mirrors the five modules presented in this *Resource Guide* and provides a set of exercises and more detailed instructions on how State leaders can find and develop their own State data for asthma care quality improvement. Overall, this *Resource Guide* and its companion *Workbook* are designed to be a complete manual for State leaders at all levels interested in improving the quality of care for asthma in their States.

Module 1: Making the Case for Asthma Care Quality Improvement

Asthma is a serious chronic respiratory illness that affects a growing number of Americans. According to the National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics (NCHS), 20.3 million Americans had asthma in 2001, a substantial increase over the prior two decades (CDC, 2002a). It is also costly disease that can seriously impair normal functioning, and it erodes the quality of life for those who have it, as well as their caregivers (CDC, 2002a).

Key Ideas in Module 1:

- The number of Americans diagnosed with asthma has grown dramatically in recent years, especially among children and adolescents.
- The cost burden of uncontrolled asthma can be substantial.
- Asthma disproportionately affects African Americans, children, and low-income individuals.
- Quality of care received by people with asthma can vary widely across States and population groups.
- Interventions and treatment can successfully control the disease and prevent attacks.
- There is potential for return on investment for purchasers and the health care system as a whole through asthma quality improvement.

The Need for Asthma Care Quality Improvement

Many factors suggest that efforts to improve the quality of asthma care are warranted:

- Increased prevalence of asthma, especially among children and adolescents.
- The high health care cost of uncontrolled asthma.
- The disparities among various socioeconomic, racial, and ethnic groups in how carefully they are diagnosed and treated.
- Variation in interventions and treatment that can successfully manage the disease and prevent attacks.

These points are discussed in more detail in the following sections.

Increased Prevalence

Cases of asthma have increased dramatically in recent decades. The growth of asthma cases in the United States has been labeled an "epidemic" (RAND, 2002). Information gathered by the CDC from 1980 to 1996 shows that the number of Americans with self-reported asthma more than doubled during that time, from almost 7 million to over 14 million (CDC, 2002b).[1]

[1] Changes in survey design over time make it impossible to compare current data with data collected before 1996.

Especially troubling are the rates of increase among children: over that 16-year period, asthma prevalence among children under age 5 increased 115 percent. For children between 5 and 14, prevalence increased 81 percent (CDC, 2002b). Figure 1.1 shows the rising trend for children 0-17 and the same for all ages, until 1996. The CDC surveillance survey questions changed in 1997 and began to track asthma *attacks* in the past 12 months. This modification should reflect more closely changes in the quality of care and self-management practices of people with chronic asthma, especially when compared with the number of people who say they currently have asthma, a statistic which has been collected since 2001. Table 1.1 shows the increase in lifetime asthma prevalence by State between 2000 and 2003. Even in that short period, asthma prevalence increased fairly steadily for nearly all States.

What Is Asthma and How Is It Treated?

Asthma is a chronic inflammatory disorder of the airways. Such inflammation can cause recurring episodes of wheezing, breathlessness, chest tightness, and cough, particularly at night and in the early morning. During an asthma attack, the airways that carry oxygen to the lungs become inflamed and swollen, the muscles surrounding the airways tighten, and mucus collects, making it harder to push air out of the lungs. Although asthma triggers are not the cause of asthma itself, they may exacerbate an asthma attack. The most common triggers of asthma attacks are respiratory infections, especially colds. Other triggers include various irritants such as second-hand tobacco smoke, dust mites, air pollution, cockroaches, furry pets, mold, stress, exercise, and changes in the weather.

Treatment. The goal of asthma treatment is to reduce underlying inflammation and decrease the daily symptom burden by preventing asthma attacks from recurring. High quality asthma care minimizes the need for emergency care or hospitalization. There are several components of high quality asthma care recommended by the Clinical Guidelines of the National Asthma Education and Prevention Program of the National Heart, Lung, and Blood Institute (NHLBI):

- **Component 1: Measures of Assessment and Monitoring.** Initial assessment and diagnosis of asthma is extremely important to determine appropriate treatment based on the patient's level of asthma severity.
- **Component 2: Control Factors Contributing to Asthma Severity.** Controlling asthma triggers and reducing exposure to environmental allergens and irritants help limit asthma severity. Thus, treatment and prevention of co-occurring respiratory and other conditions (such as rhinitis, sinusitis, chronic obstructive pulmonary disease, and gastroesophageal reflux disease) should be considered.
- **Component 3: Pharmacologic Therapy.** Medications should be prescribed according to the severity of the patient's asthma, and medication use should be monitored. Two classes of drugs are involved: long-term drugs (inhaled corticosteroids [ICS]) to control the inflammatory process of persistent asthma and quick-relief medications (beta-agonists) to treat symptoms and attacks. The objective is to maintain control with ICS and to avoid attacks and the need for emergency treatment.
- **Component 4: Education for a Partnership in Asthma Care.** Patients and their families play an important role in their asthma care. They need to understand how to monitor their symptoms, what to do during an asthma attack, and how to use their medications appropriately. People with asthma must learn to "manage" their condition so as to avoid triggers and anticipate problems.

Source: National Heart, Lung, and Blood Institute, 1997.

How Is Asthma Diagnosed and Severity Assessed?

Diagnosing asthma and assessing asthma severity are important first steps to quality asthma care. Diagnosing asthma can be difficult and, as a result, it may at times be mislabeled as other problems. Below are steps recommended by NHLBI Clinical Guidelines to diagnose asthma and classify its severity.

Methods for diagnosing asthma. The first step in providing quality asthma care is to make a correct diagnosis. Clinical judgment is required because signs and symptoms vary widely from patient to patient as well as within each patient over time. To establish the diagnosis of asthma, the clinician must determine that: 1) episodic symptoms of airflow obstruction are present; 2) airflow obstruction is at least partially reversible; and 3) alternative diagnoses are excluded. No one test or set of tests is appropriate for every patient. Usually, a detailed medical history, a physical exam focusing on the upper respiratory tract, chest, and skin; and spirometry to demonstrate reversibility of airflow obstruction will enable a clinician to see a pattern of symptoms and history of recurrent episodes and rule out other conditions. Additional tests may be done to evaluate alternative diagnoses, identify triggers, assess severity, and investigate potential complications.

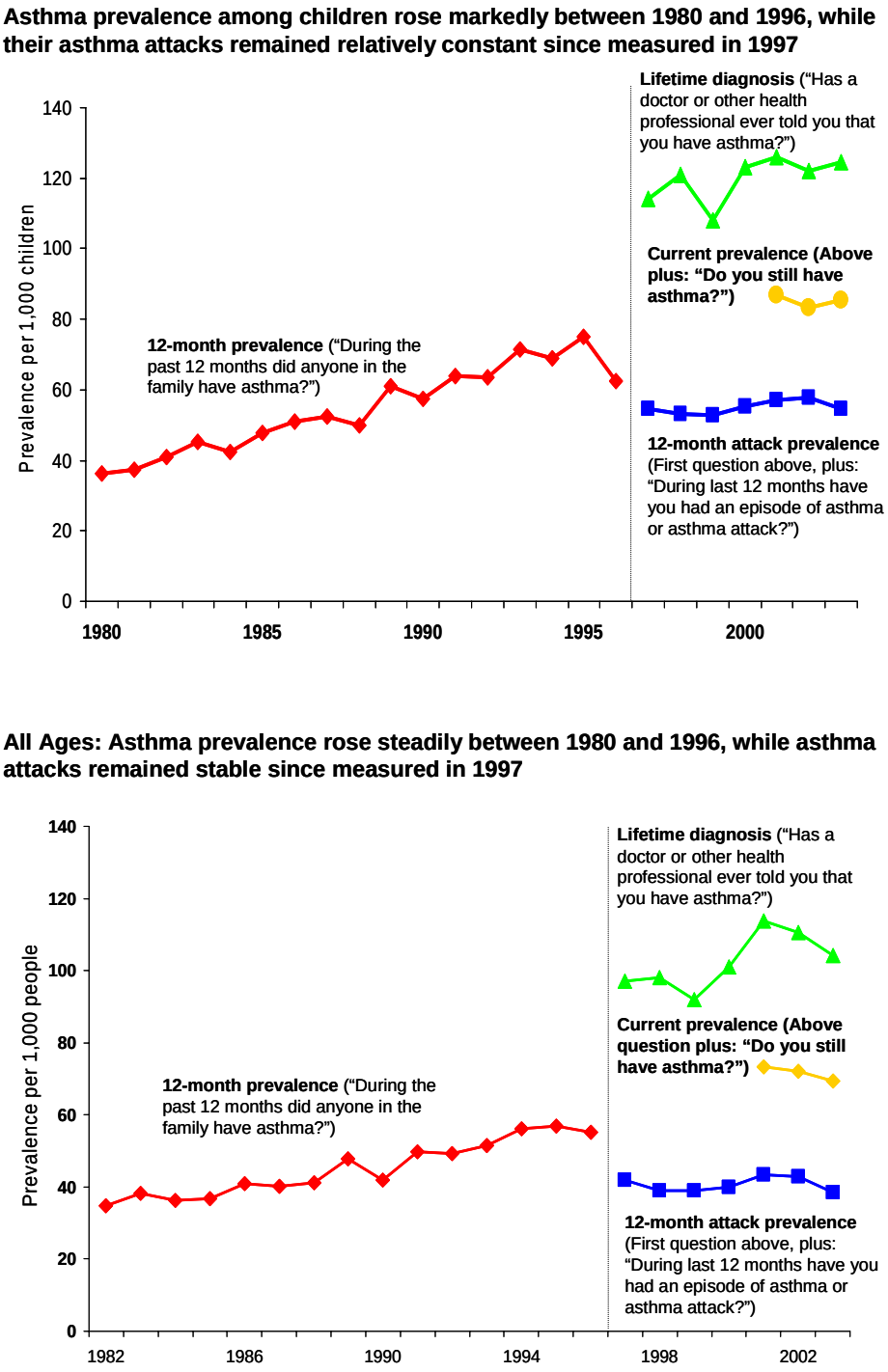
Classifying asthma severity. At the initial visit, the physician should assign the patient to a severity grade to help guide medication decisions. The severity classifications are based on the frequency of the patient's symptoms and his or her lung function measurements. The characteristics noted in the chart below are general and may overlap because asthma is highly variable. In addition, the patient's severity classification may change over time. The severity of the patient's asthma should be rechecked at every visit. Severity is currently divided into four levels, as shown in the following table:

Classification of asthma severity	**Days with symptoms**	**Nights with symptoms**	**FEV1* or PEF* percentage predicted normal**	**PEF variability between morning and night test**
Severe persistent	Continual	Frequent	$\leq$60%	>30%
Moderate persistent	Daily	>1 night per week	60%-80%	>30%
Mild persistent	>2 days per week but <1 time per day	>2 nights per month	$\geq$80%	20%-30%
Mild intermittent	$\leq$2 days per week	<2 nights per month	$\geq$80 %	<20%

*For adults and children over 5 years who can use a spirometer or peak flow meter, the percentage predicted values for forced expiratory volume in 1 second (FEV1) and percentage of personal best for peak expiratory flow (PEF) (NHLBI, 2003).

Barriers to diagnosis and severity assessment. Improving asthma care quality requires understanding how asthma is diagnosed and assessed. Asthma care depends on initial assessments and monitoring to determine appropriate care. Patients or their caregivers must be able to give detailed descriptions of frequency and severity of symptoms which are sometimes difficult to recognize. Also, diagnosing asthma in children is difficult because diagnosis may be unclear until recurrence of signs and symptoms is established (NHLBI, 2003). Thus, some patients who actually have asthma may be assessed as having other conditions and may remain untreated until diagnosed accurately. Access to quality lung function testing is often unavailable. These barriers must be addressed to improve asthma care quality.

Figure 1.1. Children (top) and all ages (bottom): Twelve-month asthma prevalence 1980-1996, lifetime diagnosis and 12-month attack prevalence 1997-2003, and current prevalence 2001-2003



Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey.
Note: Twelve-month asthma prevalence for all ages was collected from 1982 to 1996, a shorter period than for children only.

What is causing this upsurge in asthma cases? Because doctors are still unsure why some people develop asthma while others do not, further research is needed to identify the exact causes of asthma. Such research is underway at the Environmental Protection Agency, National Institutes of Health, Centers for Disease Control and Prevention, and elsewhere. Risk factors—including genetic predisposition and early exposure to irritants—may contribute, but are certainly not the only reasons for the increase. Even without pinpointing the cause, however, efforts to improve the quality of care for asthma can help control the severity of the condition.

High Cost

Uncontrolled asthma is costly to treat. In the most recent economic analysis of asthma commissioned by the American Lung Association, the estimated annual cost of asthma in 2004 was $16.1 billion. This analysis evaluated both direct costs including physician visits, hospital stays, and medications, as well as indirect costs such as lost work days, school absenteeism, and lost earnings ($11.5 billion direct and $4.6 billion indirect, respectively). Included in the 2004 estimate (ALA, 2005) were:

- 484,000 hospitalizations.
- 1.2 million hospital outpatient department visits.
- 1.9 million emergency room visits.
- 12.7 million doctor office visits.
- $1.5 million in lost school days.
- $1.4 million in loss of work.

The most expensive direct cost was hospitalizations ($3.6 billion) and the most expensive indirect cost was lost school days (almost $1.5 billion [ALA, 2005]). Although the per-person cost of asthma is not the highest among chronic diseases, asthma and chronic obstructive pulmonary disease together represent the fifth most costly disease for the population at $45 billion annually, or nearly 3 percent of all health care spending (Medical Expenditure Panel Survey [MEPS], 2002).

Much of this economic burden falls on people with asthma and their caregivers – one study found that the average family in the United States spends between 5.5 percent and 14.5 percent of its total income on treating an asthmatic child (HHS, 2003). In addition, payers also pick up a significant amount of the cost. A study published in February 2002 found that the cost to employers of treating someone with asthma was twice that of treating someone without asthma—$5,385 vs. $2,121 (HHS, 2003). Another study (Brodsky, 2002) found that families spend 2½ times more on children with asthma than on children without asthma—$618.42 vs. $248.67 (in 1996 dollars, inflated to 2003 dollars).

As a payer through State Medicaid and State employee health care programs, States have a financial stake in encouraging providers to provide high quality care to plan participants with asthma. Prevention of even a small number of hospitalizations through better management of the disease could affect expenditures significantly.

Children are more likely to be hospitalized for asthma than adults (189 per 100,000 children vs. 113 per 100,000 adults ages 18-64 (see Table 1.2). According to another study, asthma

admissions accounted for 7.4 percent of all hospital admissions for children and adolescents in 2000 (Owens et al., 2003).

Table 1.1. Lifetime asthma prevalence for adults (number of cases per 100 population), by State, 2000-2003

State	2000	2001	2002	2003
Nationwide	10.5	11.2	11.8	11.7
Alabama	9.1	9.7	11.0	11.6
Alaska	11.3	11.5	11.6	13.3
Arizona	11.1	12.4	13.9	12.5
Arkansas	9.9	10.6	12.1	11.3
California	11.5	12.4	12.7	13.4
Colorado	9.5	12.1	12.1	12.4
Connecticut	10.8	12.3	13.2	12.2
Delaware	10.4	12.0	11.8	11.7
District of Columbia	11.0	12.0	14.2	12.7
Florida	9.1	9.9	10.5	10.1
Georgia	9.6	11.0	11.7	11.8
Guam	--	7.5	12.0	10.3
Hawaii	11.4	12.2	13.4	11.6
Idaho	10.8	11.7	11.8	11.7
Illinois	10.5	11.3	10.7	11.1
Indiana	11.2	11.3	11.3	12.0
Iowa	8.5	9.7	9.0	10.3
Kansas	10.9	11.7	11.2	11.5
Kentucky	10.7	10.9	12.8	12.6
Louisiana	8.0	9.1	10.4	10.2
Maine	12.5	12.6	13.6	13.4
Maryland	10.6	11.1	12.7	12.3
Massachusetts	11.9	13.1	12.9	14.4
Michigan	10.3	12.4	12.8	13.6
Minnesota	9.5	10.1	11.3	10.5
Mississippi	9.8	9.2	10.6	10.9
Missouri	10.6	12.0	12.5	11.9
Montana	11.4	11.8	14.5	11.1
Nebraska	8.7	8.4	10.6	10.3
Nevada	13.4	13.3	12.4	11.4
New Hampshire	12.0	12.5	13.9	12.9
New Jersey	8.7	9.4	11.8	10.9
New Mexico	10.0	10.8	11.7	10.5
New York	10.7	11.1	11.5	11.7
North Carolina	10.1	10.1	10.9	11.3
North Dakota	9.2	9.1	10.3	10.1
Ohio	10.9	9.8	10.3	10.8
Oklahoma	9.2	10.1	11.2	11.8
Oregon	12.1	13.0	14.0	14.7
Pennsylvania	9.3	10.7	11.5	11.9
Puerto Rico	15.9	19.6	19.6	20.6
Rhode Island	11.7	12.1	12.8	14.4
South Carolina	10.4	10.8	10.0	10.1
South Dakota	8.0	7.7	8.6	10.7
Tennessee	10.4	9.3	12.2	11.8
Texas	10.5	9.6	11.6	11.3
Utah	10.3	10.7	12.3	11.3
Vermont	9.7	12.1	12.7	12.2
Virginia	10.5	11.4	12.1	12.1
Virgin Islands	--	9.2	9.4	9.2
Washington	11.9	12.0	14.3	13.8
West Virginia	11.7	12.5	12.8	11.8
Wisconsin	10.6	10.9	11.7	11.0
Wyoming	11.8	11.6	11.1	11.2

Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System, Prevalence Data, 2000-2003. http://apps.nccd.cdc.gov/brfss/index.asp

Table 1.2. Potential for improvement: Percent of asthma hospitalizations that would need to be reduced to achieve best-in-class performance, by State and age group, 2001

State	Hospital admissions for pediatric asthma per 100,000 population under age 18		Hospital admissions for adult asthma per 100,000 population ages 18-64		Hospital admissions for adult asthma per 100,000 population ages 65+	
	Adjusted rate	Percent to be reduced to achieve best-in-class	Adjusted rate	Percent to be reduced to achieve best-in-class	Adjusted rate	Percent to be reduced to achieve best-in-class
Total U.S.	188.601	--	112.842	--	170.640	--
Best in class[1]	72.300	--	60.236	--	118.238	--
Arizona	114.738	37.0%	83.521	27.9%	133.953	11.7%
California	149.063	51.5	84.342	28.6	156.833	24.6
Colorado	159.413	54.6	72.479	16.9	**128.170**	7.7
Connecticut	176.096	58.9	98.236	38.7	**127.568**	7.3
Florida	242.276	70.2	113.580	47.0	157.601	25.0
Georgia	176.636	59.1	104.199	42.2	170.351	30.6
Hawaii	125.625	42.4	108.158	44.3	215.131	45.0
Illinois	187.391	61.4	150.377	59.9	212.426	44.3
Iowa	106.256	32.0	87.880	31.5	**119.272**	0.9
Kansas	159.981	54.8	97.570	38.3	**131.663**	10.2
Kentucky	279.351	74.1	135.524	55.6	173.842	32.0
Maine	106.210	31.9	81.981	26.5	**124.889**	5.3
Maryland	215.772	66.5	106.566	43.5	158.142	25.2
Massachusetts	169.959	57.5	112.798	46.6	164.245	28.0
Michigan	221.439	67.3	121.201	50.3	155.207	23.8
Minnesota	129.228	44.1	89.547	32.7	151.976	22.2
Missouri	220.948	67.3	104.117	42.1	**119.085**	0.7
Nebraska	88.752	18.5	70.099	14.1	139.944	15.5
New Jersey	266.117	72.8	126.858	52.5	165.702	28.6
New York	315.306	77.1	162.367	62.9	229.554	48.5
North Carolina	188.597	61.7	111.983	46.2	179.210	34.0
Oregon	**66.304**	-9.0	**61.118**	1.4	**117.304**	-0.8
Pennsylvania	268.755	73.1	136.292	55.8	196.169	39.7
Rhode Island	195.887	63.1	107.551	44.0	159.814	26.0
South Carolina	274.802	73.7	123.468	51.2	183.610	35.6
Tennessee	199.400	63.7	109.064	44.8	168.632	29.9
Texas	192.289	62.4	96.236	37.4	179.766	34.2
Utah	**72.123**	-0.2	**53.298**	-13.0	**118.301**	0.1
Vermont	**81.211**	11.0	**61.625**	2.3	**123.848**	4.5
Virginia	223.643	67.7	109.548	45.0	181.404	34.8
Washington	134.869	46.4	70.923	15.1	**123.240**	4.1
West Virginia	215.682	66.5	122.903	51.0	187.267	36.9
Wisconsin	120.575	40.0	89.716	32.9	132.113	10.5

Source: Agency for Healthcare Research and Quality, Healthcare Cost and Utilization Project (AHRQ, 2004b).

Bold estimates are for States in, or within the range of, the best-in-class average (lowest rate of hospitalizations for asthma). Those within the range have a p-value greater than 0.05, meaning that the State rate is statistically no different from the average of the three (10 percent) best performing States.

[1]Best in class rate is calculated from the weighted average of the lowest 10 percent of States' hospitalization rates.

Racial, Ethnic, and Income Disparities

Asthma does not affect all groups equally. Asthma is more prevalent among minorities and low income persons, and asthma attack rates and mortality are higher among Blacks compared with Whites (AHRQ, 2003a). In addition, Black children in the United States are almost 3½ times as likely to be admitted to a hospital for asthma as White children (AHRQ, 2004a, Table 76a). Black adults age 18 to 64 are three times as likely to be hospitalized as White adults for asthma (AHRQ, 2004a, Table 77a).

A 2002 National Health Interview Survey (CDC, 2004) showed that:

- Current asthma prevalence is 80 percent higher for Puerto Ricans compared with non-Hispanic Whites. Non-Hispanic Blacks and American Indians had 30 percent higher current asthma prevalence compared to non-Hispanic Whites.
- In 2002, Puerto Ricans also had the highest rate of asthma attacks in the previous year, 100 percent higher than non-Hispanic Whites. Blacks had an asthma attack rate about 30 percent higher than non-Hispanic Whites. American Indians had about a 10 percent higher rate than non-Hispanic Whites.
- Blacks had an asthma hospitalization rate 225 percent higher than Whites.

Blacks were most likely to die from asthma and had an asthma death rate over 200 percent higher than Whites. Blacks also had a 160 percent higher asthma death rate than Hispanics.

There are also significant racial/ethnic disparities among children in asthma status and self-management practices. A study by Lieu et al. (2002) showed that Black and Hispanic children have more severe asthma based on number of symptom days, missed school days, and health status scores than White children with similar insurance and socioeconomic status. Black and Hispanic children were also less likely than White children to be using daily inhaled anti-inflammatory medications (28 percent and 22 percent, respectively, compared with 33 percent).

Income also plays a role. Children in poor families are more likely than other children to have been diagnosed with asthma (16 vs. 11 percent). And, although not all single-parent families are low income, children in single-mother families are more likely to have asthma (17 percent) than children from two-parent families (11 percent) or than children from single-father families (10 percent) (CDC, 2002c).

Another study looking into indoor and outdoor allergies among children with asthma found that Puerto Rican and Black children were at greater risk for multiple allergies. The study found that Puerto Rican children with asthma are up to three times more likely to be allergic to indoor and outdoor allergens than White children with asthma. The study also found that Black children with asthma are two to three times more likely to have allergic reactions to outdoor allergens (Celedón et al., 2004).

Intervention and Treatment Variation

Clinical guidelines for care—including developing an asthma management plan with physicians, eliminating or decreasing exposure to triggers, and proper use of medications—offer people with

asthma a way of minimizing its effects on daily living, avoiding hospitalizations, and reducing trips to the emergency room. Data gathered in national surveys, however, show that many people do not have control of their asthma:

- The 2004 NHQR reported that, according to national estimates from the National Committee for Quality Assurance Health Plan Employer Data and Information Set (HEDIS®), nearly a third of children and adults suffering from persistent asthma are not receiving inhaled corticosteroids to control their asthma (AHRQ, 2004b).
- The Medical Expenditure Panel Survey determined that only one-third of respondents with asthma in 2002 used a peak flow meter recommended at that time to self-monitor the severity of their asthma (MEPS, 2002).
- Despite the fact that most asthma deaths are preventable if care is received in time, 4,487 deaths were attributed to asthma in 2000 (CDC, 2002a).

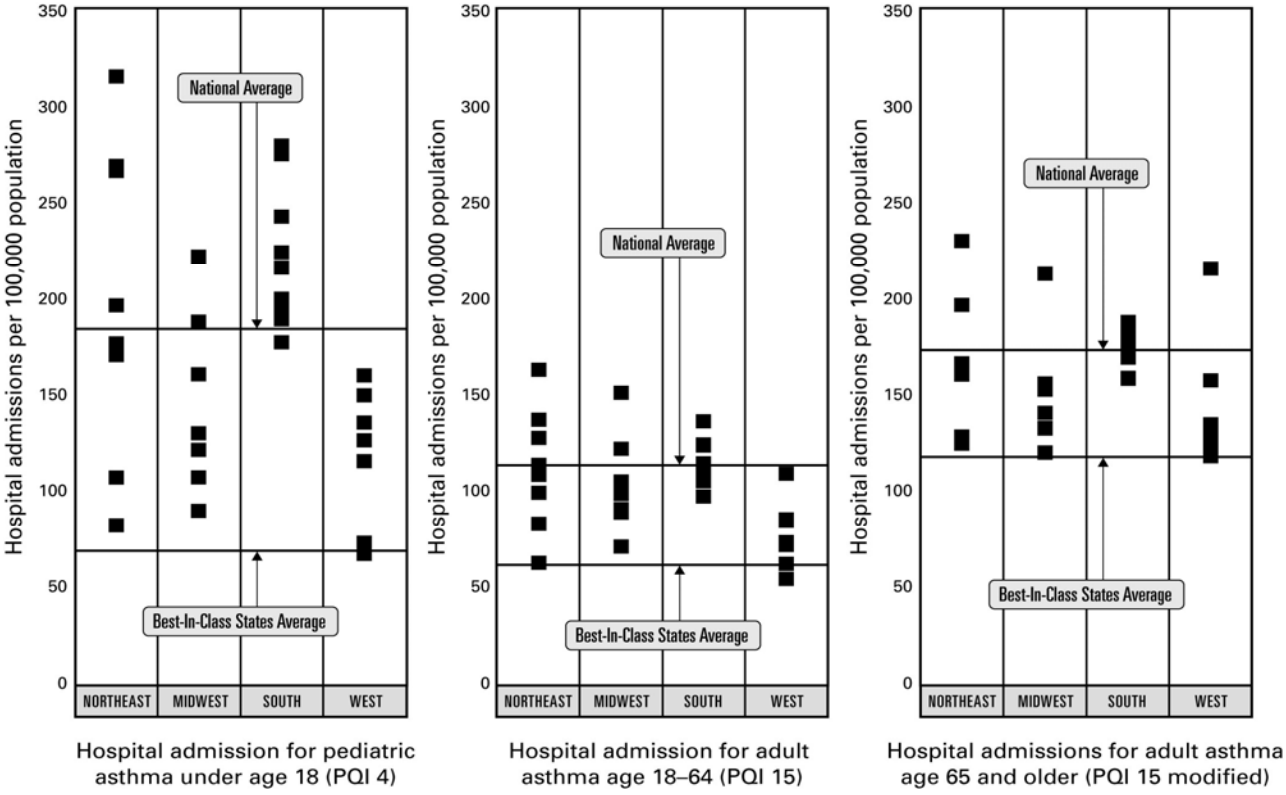
There is also considerable variation from State to State in the care received by people with asthma. The following chart and table show two of the asthma measures that are available nationwide—hospitalizations for asthma and use of inhaled corticosteroids—with data for States grouped by region to allow for regional comparisons.[2] Comparisons can also be made across all States to the national average and the best-in-class average (the 10 percent of States with the best value). The percentage of people receiving specific, recommended services and the percentage difference between the lowest and the highest performing State vary by service.[3]

The use of the most expensive service—inpatient care—varies three to five times across the States and shows variation within each region, especially for children (Figure 1.2 and Table 1.2). For every 100,000 State adult residents age 18 to 64, from 53 to 162 people will be admitted to the hospital with asthma. For every 100,000 State child residents, from 66 to 315 children will be admitted (HCUP, 2001). Little of the variation in hospitalizations is likely to be due to differences in asthma prevalence across States (see Table 1.1). Asthma prevalence rates only ranged from 10.1 to 14.7 percent across the States represented in the HCUP data. Thus, the top State in terms of prevalence has 45 percent more residents with asthma than the bottom State. Contrast that with the top State in terms of pediatric hospitalizations, which has 375 percent more children admitted to the hospital during a year than the State with the lowest hospitalization rate for children.

[2] U.S. Census regions are: Northeast=CT, ME, MA, NH, RI, VT, NJ, NY, PA); Midwest=IN, IL, MI, OH, WI, IA, KS, MN, MO, NE, ND, SD; South=DE, DC, FL, GA, MD, NC, SC, VA, WV, AL, KY, MS, TN, AR, LA, OK, TX; West=AZ, CO, ID, NM, MT, UT, NV, WY, AK, CA, HI, OR, WA.

[3] For example, BRFSS data for 2003 show that receipt of flu shots among adults with asthma varied by State from 32 percent to 56 percent, a difference of 24 percentage points, while the proportion of adults who had an emergency room visit for asthma ranged from 13 percent to 27 percent, a difference of 12 percentage points. Regional and State variation is discussed further in Module 4: Measuring Quality of Care for Asthma.

Figure 1.2. Asthma hospitalizations per 100,000 population, 2001



Source: Agency for Healthcare Research and Quality, Healthcare Cost and Utilization Project, 2001.

Use of inhaled corticosteroids by people with persistent asthma—measured from health plan claims across regions—varied from 2001 to 2003 as shown below:

Use of inhaled corticosteroid medications by people with asthma, by U.S. Census region

	2003			2001		
Region	**No. of plans**	**Mean %**	**Standard error**	**No. of plans**	**Mean %**	**Standard error**
National average	408	69.7	16.6	417	65.0	14.6
Best-in-class average	190	72.1				
Northeast	89	73.1	17.6	91	66.9	23.8
South	101	71.2	24.9	128	63.9	20.1
Midwest	109	70.6	32.2	119	68.4	17.9
West	103	66.3	33.4	85	63.1	40.3
None reported	6	43.0	208.9	4	36.8	210.5

Note: All means are weighted by the eligible populations of the plans.
Source: National Committee for Quality Assurance, HEDIS data from *The State of Healthcare Quality*, 2004.

This variation suggests possible bias in terms of which plans report fully or which are regional versus national plans. Because of the large difference between reporting and non-reporting plans, full reporting might change the above regional estimates significantly. These regional HEDIS averages compare with the national average of 69.7 percent from BRFSS and the best-in-class State average of 72.1 percent for use of this important type of medication.

Regardless of data sources (State-run surveys, claims for payment, or hospital discharges) and regardless of differences in asthma prevalence, there is considerable variation in asthma care. These figures illustrate this variation across States and regions for asthma measures. This variation suggests room for improvement for many States. The States with the best rates on the asthma measures—the best-in-class States—provide examples of quality performance that is achievable. However, even the best results may leave room for improvement.

Implications for State Policy

Disparities in the prevalence and management of asthma and in quality of care have important implications for States and the public sector more generally. Care for low income individuals who are hospitalized is often financed by public sources such as Medicaid and uncompensated care funds. Ensuring effective care can help people with asthma remain healthy and productive, prevent attacks, and reduce health care costs.

These differences are important for two reasons as States undertake asthma quality improvement initiatives. First, the racial, ethnic, and socioeconomic makeup of a given State influences the prevalence of asthma in the State. Second, improvement in quality of care may require targeted efforts to minority and low income groups in order to be successful.

The Quality Improvement Opportunity

Despite this gloomy picture of asthma's care quality and cost burdens, significant opportunities for improvement exist. There is potential for high returns on investment made by purchasers and the health care system as a whole through asthma care quality improvement.

Availability of Asthma Management Guidelines

Great strides in the care and treatment of people with asthma have occurred over the last 15 years. Although there is no cure for asthma, the disease can be managed and the severity and frequency of asthma attacks can be controlled through appropriate monitoring, effective use of medications, and eliminating or decreasing exposure to triggers.

In 1997, *Guidelines for the Diagnosis and Management of Asthma* was published by the National Asthma Education and Prevention Program (NAEPP), coordinated by NHLBI. These *Guidelines* (updated in 2002) represent a science-based strategy for the diagnosis and management of asthma and ask patients, families, and providers to work together to control the condition. In addition the NAEPP has published *Key Clinical Activities for Quality Asthma Care: Recommendations of the National Asthma Education and Prevention Program*, which identifies four components of care and recommends a core set of 10 key clinical activities for ensuring quality asthma care, as follows:

Components of asthma care	Key associated clinical activities
Assessment and monitoring	1. Establish asthma diagnosis.
	2. Classify severity of asthma.
	3. Schedule routine followup care.
	4. Assess for referral to specialty care.
Control of factors contributing to asthma severity	5. Recommend measures to control asthma triggers.
	6. Treat or prevent comorbid conditions.
Pharmacotherapy	7. Prescribe medications according to severity.
	8. Monitor use of beta-2-agonist drugs.
Education for partnership in care	9. Develop a written asthma management plan.
	10. Provide routine education on patient self-management.

Source: National Heart, Lung and Blood Institute, 2003.

More information on steps associated with these key clinical activities and updates to the *Guidelines* is available at: http://www.nhlbi.nih.gov/health/prof/lung/asthma/asthmacare.pdf.

By applying these guidelines, health care professionals can provide the best care available for their patients. In the future, guidelines could change. And, to provide the best treatment possible for their patients, clinicians must keep abreast of changes in the best practices.

Much remains to be done in improving the scientific basis for clinical practice across all of medical care, and asthma is no exception. An AHRQ-supported Evidence-based Practice Center conducted a systematic review of interventions for the management of asthma in 2001. The report (BCBS Technology Evaluation Center, 2001) examined five types of asthma interventions and concluded the following:

- Chronic use of inhaled corticosteroids (ICS) for children with mild-to-moderate asthma improves their long-term outcomes; however, studies had insufficient follow-up time or patient numbers to assess the cumulative effects of using ICS.
- Evidence is insufficient for showing that early initiation of ICS prevents asthma progression.
- Limited evidence suggests that ICS dosage may be reduced without diminishing asthma control.
- Limited evidence also suggests that there is no benefit to using antibiotics routinely in addition to ICS.
- There is insufficient evidence to determine whether the use of a written asthma action plan, including a peak-flowmeter-based vs. a symptom-based plan, improves outcomes.

These inconclusive findings illustrate the early stage of research on asthma care quality. Nevertheless, the expert judgment of clinical specialists, assembled by the NAEPP, establishes the best practice today for helping patients and providers achieve optimal asthma care.

Potential for Positive Return on Investment

State government officials want programs that improve the health of their residents; but at the same time, they must weigh the cost of those programs against all of the competing demands of society. Therefore, for State officials to wear the mantel of quality improvement, such programs must result in enough savings to offset their expense, at the very least.

Research suggests that investing in asthma prevention and control initiatives can improve health outcomes and reduce health care costs. Just as clinical research on effective asthma care is new and emerging, so is research on the return on investment for asthma quality improvement. A systematic review of return on investment for asthma suggests positive potential financial savings (Goetzel et al., 2005).[4] In that review, $2.72 was saved for every dollar spent on asthma disease management programs, on average, across six studies that provided sufficient data to calculate per-participant cost savings relative to program costs. The average program cost was $269 and the average cost saving was $729 per participant. Thus, while it is early to draw definitive conclusions, the results are quite promising.

One of the reviewed studies evaluated an asthma intervention, the Virginia Health Outcomes Partnership (VHOP), targeted to reduce emergency visits by low-income asthma patients in a Medicaid primary care case management program (Rossiter et al., 2000). About 20 percent of Medicaid asthma-related claims in Virginia were for emergency department visits (Rossiter, 2005). The VHOP invited physicians in one community to participate in training to improve their management of patients with asthma, including patient education, medication use, and need for emergency care. The VHOP also provided feedback reports to participating physicians on their patients' use of services. One-third of about 200 physicians invited actually participated. These physicians reduced their patients' use of emergency services by 41 percent from the same quarter a year earlier, compared to only an 18-percent reduction for a comparison group that was not invited to participate. All of the 200 physicians invited to participate (counting those not trained) reduced their patients' use of emergency services by 6 percent more than the non-intervention group. At the same time, physicians in the participating community dispensed more asthma medications. The increased drug costs were more than offset by lower emergency care costs. The projected direct savings to Medicaid was $3 to $4 for every dollar spent on training for participating physicians.

More recent studies also support the conclusion that disease management programs for asthma can save money. Patients of physicians who participated in another asthma education program were less likely to be admitted to an emergency room or a hospital to treat their asthma than patients whose physicians did not participate (Brown et al., 2004). An asthma disease management program implemented by Colorado Medicaid from 2002 to 2003 showed that the program saved $203,000 in health care expenditures beyond the cost of the program, compared to the pre-program costs of treating asthma (National Jewish Medical and Research Center, 2004). Not only did emergency room visits decline, but missed work days also declined.

[4] This review found 12 studies. However, only 6 provided sufficient data for a return on investment calculation, and some of those studies were limited by small numbers of cases, incomplete patient care costs, and study designs that did not control for rising health care costs and other shifting external factors.

These interventions can deliver substantial cost savings if they reduce the number of repeat hospitalizations and emergency visits. A study using 1997 data found that each hospitalization increased annual expenditures for asthma significantly—from $305 for someone not hospitalized, to $1,690 for someone hospitalized once, to $5,987 for someone hospitalized twice (Atherly et al., 2003).

Thus, not only can health care professionals improve asthma care to help their patients achieve better control of asthma symptoms and improve their lives, they can also reduce the use of expensive health care services and, thereby, cut the cost of asthma care. These consequences of quality improvement would benefit not only consumers of health care, but also the two other groups that bear the cost—third-party payers (public and private) who incur the cost of asthma care and employers who incur the cost of health insurance and lost productivity for their workers with asthma.

Estimating the Costs of Asthma Care and Potential Savings From Quality Improvement

To bring the potential of quality improvement home, State officials will want to know what the potential cost savings are in their State. For example, what could be saved in Medicaid costs? Medicaid recipients are an important focus since they include people with low incomes and children who have higher prevalence and hospitalization rates for asthma (CDC, 2002a; CDC, 2002c).

This section estimates the cost of asthma care from three perspectives: (1) the cost of asthma care statewide, (2) the cost for Medicaid, and (3) the cost of excess hospitalizations for asthma. Next, this section guides State analysts through the steps they could take to estimate the potential savings in the State while implementing a Medicaid disease management program in asthma like the one in Virginia. (Those savings were not calculated here because the number of physicians participating in Medicaid in each State was not available.)

A caveat about estimating costs. Data on the cost of asthma care are not available uniformly across States. Some States may have tallied the costs for their Medicaid recipients, but probably few States have estimated the costs of asthma for their entire population. The numbers in this section simply apply various national averages from published research to State data to estimate what the cost might be in each State. Where possible the national averages are age or race specific. To assume that the cost for every State by age and racial subgroup will equal the national subgroup is unrealistic.[5] Therefore, AHRQ urges State analysts to use local data to develop better estimates of the cost of asthma for their State. The numbers presented are intended to help State and local officials think about the scale of problem and of the impact that they might be able to make with quality improvement initiatives for asthma.

[5] Several other factors are not accounted for in these estimates: First, changes in the typical services used between 1994 and 2003 are excluded, despite that fact that medication costs have risen (Sullivan et al., 1996), and inpatient stays have declined (Mannino et al., 1998). Second, differences in use of services by age are not always included, despite the fact that from 1985 to 1994 the estimated real direct cost of asthma care actually declined per affected child, but increased per adult (Weiss et al., 2000). Third, differences in the age distribution across racial/ethnicity groups is not factored into the State-level estimates. Finally, the asthma cost calculated here is not net of health care cost without chronic disease because it was not available; subtracting the cost of those without chronic illness from those with asthma would indicate how much a State spends for asthma care alone. Thus, the State-level estimates in this section could overestimate or under estimate of today's true cost of asthma to States and their residents.

Cost of Asthma Care Statewide

A statewide view of asthma costs is provided to encourage States to stimulate quality improvement on a statewide basis, not only in Medicaid. Three sources were combined to calculate the direct cost of medical care on a statewide basis: Weiss et al. (2000) for national expenditure data, the U.S. Census for State population estimates, and the Behavioral Risk Factor Surveillance System for State-level asthma prevalence. Direct costs include medical expenditures for hospital care, physician services, and medications. The Weiss study, which provides expense per person with asthma, is for the year 1994 and was updated to 2003 here, using the medical care component of the Consumer Price Index. The total cost for asthma care in the State was calculated by multiplying the per-person cost by the number of people with asthma in the State.

Table 1.3 shows the calculated estimates by State. Across all the States, spending on asthma care totaled to over $13 billion, according to these estimates. This sum is higher than the most recently published estimate of $9.4 billion in 2001 dollars (ALA, 2004); when inflated to 2003 dollars, the amount totals $10.2 billion. The higher summed State estimate points out the imprecision of the method here, noted above. Thus, State analysts should attempt to develop these estimates with their own data.

Expenditures on asthma in the top four States in asthma costs—California, Texas, New York, and Florida—together were estimated at over $7 billion. Improving asthma care and reducing avoidable admissions and emergency care might save health care systems in States substantial dollars.

Cost of Asthma Care for Medicaid

Three components were used to estimate the cost of asthma care for Medicaid:

- National asthma prevalence separately by age and by race/ethnicity.
- State Medicaid populations separately by age and by race/ethnicity.
- Estimated national expenditures per person with asthma.

Data sources for each of these components are listed below:

Components needed to estimate Medicaid costs of asthma	**Source of information**
National asthma prevalence separately by age and by race/ethnicity	CDC Asthma Data on Demand Web site available at: http://209.217.72.34/asthma/ReportFolders/DirPageInfo.asp?CS_referer=&CS_ChosenLang=en
State Medicaid populations separately by age and by race/ethnicity	Centers for Medicare & Medicaid Services (CMS) Web site available at: http://www.cms.hhs.gov/medicaid/msis/tables2002.asp
Estimated national expenditures per person with asthma	Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. *J Allergy Clin Immunol*. September 2000; 106(3):493-99.

Note: See Appendix Figure B.1 for more information on the flow of data, assumptions, and calculations made to derive Medicaid spending for asthma by State and Appendix Tables B.1-B.6 for subgroups eligible for Medicaid in each State by age and race/ethnicity.

Table 1.3. Estimate of indirect, direct and total cost burden of asthma, by State, for 50 States, District of Columbia, and Puerto Rico, 2003

State	Population estimate[1]	Percent of population with asthma[2]	Asthma prevalence	Indirect asthma costs for State[3]	Direct asthma costs for State[3]	Total asthma costs for State
Nationwide	290,788,976	7.6	22,099,962	$9,967,966,940	$13,383,958,093	$23,351,925,033
Alabama	4,503,726	7.5	337,779	152,352,043	204,562,613	356,914,656
Alaska	648,280	9.1	58,993	26,608,419	35,727,041	62,335,461
Arizona	5,579,222	8.3	463,075	208,865,540	280,443,109	489,308,649
Arkansas	2,727,774	7.3	199,128	89,814,469	120,593,606	210,408,075
California	35,462,712	8.4	2,978,868	1,343,588,536	1,804,032,133	3,147,620,669
Colorado	4,547,633	8.3	377,454	170,246,644	228,589,638	398,836,282
Connecticut	3,486,960	8.3	289,418	130,538,950	175,274,241	305,813,192
Delaware	818,166	7.5	61,362	27,676,919	37,161,713	64,838,633
District of Columbia	557,620	7.8	43,494	19,617,696	26,340,619	45,958,315
Florida	16,999,181	6.1	1,036,950	467,705,946	627,987,314	1,095,693,261
Georgia	8,676,460	7.0	607,352	273,940,136	367,818,566	641,758,702
Hawaii	1,248,755	5.6	69,930	31,541,353	42,350,477	73,891,830
Idaho	1,367,034	7.9	107,996	48,710,374	65,403,267	114,113,642
Illinois	12,649,087	7.4	936,032	422,188,071	566,870,605	989,058,676
Indiana	6,199,571	8.1	502,165	226,496,615	304,116,298	530,612,912
Iowa	2,941,976	6.2	182,403	82,270,829	110,464,785	192,735,614
Kansas	2,724,786	7.5	204,359	92,174,061	123,761,824	215,935,885
Kentucky	4,118,189	9.8	403,583	182,031,861	244,413,611	426,445,472
Louisiana	4,493,665	6.2	278,607	125,663,005	168,727,325	294,390,330
Maine	1,309,205	9.9	129,611	58,459,878	78,493,896	136,953,775
Maryland	5,512,310	7.8	429,960	193,929,240	260,388,185	454,317,424
Massachusetts	6,420,357	9.9	635,615	286,687,944	384,935,008	671,622,952
Michigan	10,082,364	9.3	937,660	422,922,100	567,856,183	990,778,283
Minnesota	5,064,172	6.8	344,364	155,321,801	208,550,098	363,871,899
Mississippi	2,882,594	6.9	198,899	89,711,399	120,455,215	210,166,614
Missouri	5,719,204	8.0	457,536	206,367,182	277,088,571	483,455,753
Montana	918,157	7.9	72,534	32,715,917	43,927,560	76,643,477
Nebraska	1,737,475	7.1	123,361	55,640,621	74,708,489	130,349,110
Nevada	2,242,207	6.6	147,986	66,747,453	89,621,597	156,369,050
New Hampshire	1,288,705	8.5	109,540	49,406,888	66,338,474	115,745,362
New Jersey	8,642,412	7.1	613,611	276,763,219	371,609,110	648,372,329
New Mexico	1,878,562	6.7	125,864	56,769,543	76,224,287	132,993,830
New York	19,212,425	7.6	1,460,144	658,583,485	884,277,990	1,542,861,475
North Carolina	8,421,190	7.1	597,904	269,678,841	362,096,938	631,775,779
North Dakota	633,400	7.0	44,338	19,998,212	26,851,536	46,849,748
Ohio	11,437,680	7.1	812,075	366,278,434	491,800,910	858,079,345
Oklahoma	3,506,469	7.6	266,492	120,198,391	161,390,005	281,588,396
Oregon	3,564,330	9.3	331,483	149,511,952	200,749,232	350,261,184
Pennsylvania	12,370,761	8.3	1,026,773	463,115,767	621,824,095	1,084,939,863
Puerto Rico	3,877,881	10.8	418,811	188,900,580	253,636,219	442,536,800
Rhode Island	1,076,084	9.6	103,304	46,594,265	62,561,974	109,156,239
South Carolina	4,148,744	6.1	253,073	114,146,219	153,263,772	267,409,991
South Dakota	764,905	7.3	55,838	25,185,201	33,816,091	59,001,291
Tennessee	5,845,208	7.9	461,771	208,277,387	279,653,397	487,930,784
Texas	22,103,374	6.9	1,525,133	687,895,901	923,635,679	1,611,531,579
Utah	2,352,119	7.4	174,057	78,506,582	105,410,542	183,917,124
Vermont	619,343	8.4	52,025	23,465,271	31,506,746	54,972,018
Virginia	7,365,284	7.6	559,762	252,474,865	338,997,213	591,472,078
Washington	6,131,298	9.1	557,948	251,656,919	337,898,960	589,555,879
West Virginia	1,811,440	8.1	146,727	66,179,584	88,859,120	155,038,704
Wisconsin	5,509,026	7.5	413,177	186,359,332	250,224,093	436,583,424
Wyoming	506,529	7.5	37,990	17,134,863	23,006,927	40,141,790

[1] U.S. Census annual estimates of the population for the United States and States, and for Puerto Rico: April 1, 2000 to July1, 2004.
[2] Prevalence based on most recent estimates (BRFSS 2003). Accessed at: http://apps.nccd.cdc.gov/brfss/list.asp?cat=AS&yr=2003&qkey=4416&state=All.
[3] Calculations based on Weiss, Sullivan, Lyttle, 2000 inflated to 2003 dollars (Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9).

Table 1.4 shows the *estimated* expenditures likely to occur by State Medicaid agency, based on the above calculations. Nationally, Medicaid programs spent, according to these estimates, over $4 billion dollars on asthma alone. The States with the highest expenditures (California, Texas, New York, and Florida) spent well over $1.5 billion for asthma care for their Medicaid enrollees.

Table 1.4. Medicaid eligible population and estimated asthma prevalence and expenditures for medical care for age groups 0-18, 19-64, and 65 and over, by State, 2003

State	Medicaid population age 0-18 with asthma[1]	Estimated Medicaid expense for age 0-18 with asthma[2]	Medicaid population age 19-64 with asthma[1]	Estimated Medicaid expense for age 19-64 with asthma[2]	Mediciad population age 65 and over with asthma[1]	Estimated Medicaid expense for age 65 and over with asthma[2]	Total estimated Medicaid spending on asthma[3]
Total US	2,234,609	$2,361,199,292	1,362,264	$1,439,435,844	330,403	$349,120,091	$4,149,755,227
Alabama	6,770	7,153,840	2,432	2,569,294	425	449,198	10,172,332
Alaska	36,646	38,721,787	20,454	21,612,820	7,178	7,584,236	67,918,843
Arizona	29,239	30,895,502	13,995	14,787,299	3,795	4,009,739	49,692,540
Arkansas	46,246	48,866,133	31,357	33,133,013	3,477	3,674,444	85,673,591
California	320,813	338,987,094	327,683	346,246,056	49,363	52,159,867	737,393,017
Colorado	21,458	22,673,459	9,616	10,160,615	2,903	3,067,629	35,901,703
Connecticut	20,987	22,175,798	12,416	13,119,625	3,739	3,950,473	39,245,896
Delaware	6,024	6,365,303	4,516	4,771,723	673	711,304	11,848,330
District of Columbia	8,326	8,798,059	6,051	6,393,598	1,183	1,250,330	16,441,987
Florida	124,172	131,206,825	61,203	64,669,899	21,072	22,265,776	218,142,500
Georgia	77,782	82,188,576	28,742	30,369,852	8,051	8,506,619	121,065,046
Hawaii	7,996	8,448,678	5,696	6,018,859	1,169	1,234,834	15,702,371
Idaho	11,211	11,846,082	3,641	3,847,192	763	806,151	16,499,424
Illinois	95,675	101,095,472	44,129	46,628,592	19,012	20,089,142	167,813,207
Indiana	46,051	48,659,576	18,304	19,340,896	4,709	4,975,618	72,976,090
Iowa	16,242	17,162,593	8,771	9,268,254	2,498	2,639,687	29,070,534
Kansas	15,492	16,369,355	6,265	6,620,423	1,992	2,105,036	25,094,814
Kentucky	34,653	36,616,374	18,673	19,730,455	5,619	5,937,547	62,284,376
Louisiana	53,485	56,514,412	17,978	18,995,927	6,289	6,645,521	82,155,860
Maine	9,515	10,053,810	10,917	11,535,116	4,567	4,825,849	26,414,775
Maryland	37,376	39,492,972	17,100	18,068,435	4,039	4,268,041	61,829,449
Massachusetts	42,517	44,925,818	38,807	41,005,737	8,584	9,070,433	95,001,988
Michigan	74,311	78,520,937	36,446	38,510,767	7,824	8,267,160	125,298,864
Minnesota	29,002	30,644,983	17,234	18,209,808	5,474	5,784,603	54,639,394
Mississippi	34,851	36,825,469	14,218	15,023,446	5,662	5,982,630	57,831,544
Missouri	50,411	53,267,187	28,191	29,787,505	6,010	6,350,802	89,405,495
Montana	4,868	5,143,722	2,641	2,790,925	659	696,779	8,631,426
Nebraska	13,689	14,464,978	5,309	5,609,862	1,428	1,509,038	21,583,877
Nevada	9,448	9,983,373	4,968	5,249,548	1,243	1,313,277	16,546,198
New Hampshire	5,932	6,267,543	2,316	2,447,648	757	800,321	9,515,512
New Jersey	43,510	45,974,871	22,976	24,277,665	8,422	8,898,728	79,151,263
New Mexico	32,828	34,687,649	12,083	12,767,988	2,389	2,524,475	49,980,112
New York	142,336	150,399,653	127,326	134,538,891	29,291	30,949,882	315,888,426
North Carolina	63,422	67,015,066	32,716	34,569,721	10,715	11,321,520	112,906,306
North Dakota	2,895	3,058,675	1,909	2,017,466	602	636,017	5,712,158
Ohio	82,286	86,947,760	44,574	47,099,279	8,753	9,249,179	143,296,217
Oklahoma	37,958	40,107,933	11,710	12,373,163	3,856	4,074,956	56,556,052
Oregon	23,126	24,436,452	22,051	23,299,919	2,782	2,939,377	50,675,748
Pennsylvania	73,672	77,845,832	43,962	46,452,154	12,680	13,398,318	137,696,303
Rhode Island	8,493	8,973,914	5,638	5,957,185	1,417	1,496,885	16,427,985
South Carolina	42,357	44,756,632	22,214	23,472,637	4,707	4,974,170	73,203,439
South Dakota	6,067	6,411,155	2,136	2,257,081	724	765,117	9,433,353
Tennessee	61,894	65,400,305	56,363	59,555,557	9,461	9,997,471	134,953,333
Texas	170,381	180,033,486	57,056	60,288,734	23,049	24,354,282	264,676,503
Utah	12,241	12,934,335	5,336	5,637,826	768	811,129	19,383,289
Vermont	35,196	37,190,046	14,819	15,658,657	6,080	6,423,957	59,272,660
Virginia	5,916	6,251,655	4,596	4,856,628	1,262	1,333,935	12,442,218
Washington	54,297	57,372,417	26,970	28,498,087	4,747	5,015,916	90,886,421
West Virginia	22,962	24,262,314	13,079	13,819,820	2,781	2,939,010	41,021,144
Wisconsin	32,133	33,953,655	19,773	20,893,145	6,816	7,201,873	62,048,673
Wyoming	3,659	3,866,659	1,500	1,584,872	318	335,859	5,787,390

[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp and A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf for 2003 projections.

[2] Calculations of prevalence rates based on national prevalence rates for 0-17 years, weighted average with US Census population estimates for 2002 of 18-44 years and 45-64 years, and 65+ years. Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey, 1999-2003. Table Asthma Prevalence by Age, Gender, Race/Ethnicity, and Geographic Region/Division 1999-2003. http://209.217.72.34/asthma/ReportFolders/DirPageInfo.asp?CS_referer=&CS_ChosenLang=en

[3] Calculations of direct cost per person based on Weiss et al 1994 direct cost estimates inflated by medical care component of CPI to 2003 dollars. Indirect cost person based on Weiss et al 1994 direct cost estimates inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994.
J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, 65+, while NHIS prevalence rates are for age groups 0-17, 18-64, and 65+.

Note: Projections to 2003 Medicaid eligibles based on A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf

Improving asthma care by reducing emergency room visits and avoidable hospitalizations (i.e., hospital admissions that might have been avoided with high quality ambulatory care) should have a substantial impact on Medicaid spending.

Estimating potential Medicaid savings from asthma disease management—a Virginia example. Below are steps for estimating the Medicaid savings from training physicians in the Virginia Health Outcomes Partnership program described earlier. Estimates for Virginia are below. Using these steps together with State data, it is possible for a State to develop a "ballpark" estimate of how much might be saved in Medicaid costs with a similar asthma disease management intervention.

Steps for Estimating Potential Medicaid Savings From an Asthma Disease Management Program

Step	Virginia
1. Total annual spending for emergency department visits for asthma pre-intervention for Medicaid recipients	$5,056,020
2. Total annual number of Medicaid claims for emergency department visits	9,363
3. Payment per claim: Divide step 1 by step 2 (5,056,020/9,363)	$540
4. Emergency visit reduction factor: Adjusted to four quarters and to exclude added costs per physician and added drug prescribing (both included below; see steps 7 and 8)	0.06
5. Emergency care visit annual saving after training physicians: Multiply step 1 by step 4 (5,056,020 X 0.06)	$303,361
6. Number of physicians participating in primary care case management who might accept training in asthma management	200
7. Asthma drug cost: Multiply step 6 by $180 per physician per year (200 X 180)	$36,000
8. Program training costs: Multiply step 6 by $235 per physician (200 X 235)	$47,000
9. Total drug and training costs: Add steps 7 and 8 (36,000 + 47,000)	$83,000
10. Total Medicaid savings: Subtract step 9 from step 5 (303,361 − 83,000)	$220,361
11. Savings per Medicaid claim: Divide step 10 by step 2 (220,361/9,363)	$23.54

Source: Estimates derived from Rossiter et al., 2000.
Note: See Rossiter et al. for further detail on derivation of the emergency visit reduction factor, asthma drug cost, and program training cost. Based on the VHOP experience, step 6 assumed that one-third of Medicaid participating physicians in any disease management program would accept training in asthma management.

People with asthma who have poor asthma management have a high number of repeat ED visits. Data from the National Medical Expenditure Survey show that only about 20 percent of all asthma patients account for about 80 percent of the total costs of asthma (Weiss et al., 2001; Smith et al., 1997). A recent study showed that from a group of more than 3,000 patients, asthma patients with 6 or more ED visits accounted for 68 percent of total ED visits (Griswold, 2005).

If these asthma patients with multiple ED visits can be identified with State Medicaid data, then States can estimate potential cost savings from reducing the number of patients with repeat emergency room visits. Multiplying the number of patients who have different numbers of visits by the average cost per visit for each group gives an estimate of total ED costs for patients with asthma who have frequent ED visits for each group. These costs represent a potential target for reducing health care costs for patients with asthma and compare the cost of moderate emergency use to high emergency department use for asthma.

Cost of Excess Hospitalizations

Rates of avoidable hospitalizations have been developed as indicators of the quality of ambulatory care, including care for asthma. Hospitalizations occur because of exacerbations of asthma symptoms such as an asthma attack, where a patient cannot breathe and could die without medical attention. Some asthma hospitalizations could be avoided with planned care, patient education, proper use of long-term controller medications for people with persistent asthma, and patient awareness and avoidance of asthma triggers. However, even for patients and physicians who comply with the best practices, asthma attacks beyond their control may still occur and hospitalization may be necessary for survival. It is the wide variation in asthma admissions rates across the country (see Table 1.2) that suggests considerable improvement can be made in ambulatory care and self-management that results in reduced hospitalizations and, thus, lower costs for asthma care.

A recent study found that about half of admissions for children with asthma in one hospital may have been preventable. In a Massachusetts inner-city hospital, 26 percent of parents thought their child's hospitalization for asthma could have been avoided, 38 percent of primary care physicians thought an admission could have been avoided, and 43 percent of the inpatient attending physicians who saw a child with asthma in the hospital had that view (Flores et al., 2005). These assessments were independent of each other. The one group without a personal stake in the assessment of the chronic care of the children was the inpatient physicians with the highest assessment of avoidable admissions. Of all admissions for children with asthma, 54 percent of admissions were assessed as preventable by any of the three sources.

Estimating potential cost savings from reducing excess hospitalizations for pediatric asthma—a Massachusetts validation. By comparing the Massachusetts hospitalization rate with the average for States with the lowest rate of hospitalization for children with asthma, the apparent excess (or percent to be reduced in order to achieve best-in-class performance) in Massachusetts is 57.5 percent (Table 1.2). This potential for reduction of pediatric asthma hospitalizations for Massachusetts is similar to the 54-percent estimate of hospitalizations that might have been prevented, based on the judgment of parents, physicians or attending physicians at the Boston hospital described above. This supports the use of hospitalization rates above and beyond the best-in-class States average rate as a metric to evaluate how much States could save with better quality of asthma care. Using Massachusetts as an example, the steps in the following calculation show how a State may develop a ballpark estimate of the potential cost savings from reducing excess hospital admissions for pediatric asthma. Note that the cost of implementing a quality improvement program to reduce hospitalizations is *not* included in the calculation.

Steps for Estimating Potential Savings From Reducing Excess Pediatric Asthma Hospitalizations

Step	Massachusetts
1. Hospital admission rate for pediatric asthma per 100,000 population under age 18 (Table 1.2)	169.96
2. Estimated population under age 18 in State (U.S. Census, 2000; see http://www.census.gov/popest/states/asrh/SC-est2004-02.html)	1,500,064
3. Number of pediatric asthma hospital admissions: Multiply step 1 by step 2 (169.96 X 1,500,064)	2,549.51
4. Percent of pediatric asthma hospital admissions to be reduced to achieve best-in-class (Table 1.2)	57.5%
5. Number of hospital admissions for pediatric asthma to reduce (excess hospitalizations): Multiply step 3 by step 4 (2,549.51 X 0.575)	1,465.97
6. Mean cost for pediatric asthma hospitalization*	$2,590.72
7. Total cost of all pediatric asthma hospitalizations in State: Multiply step 3 by step 6 (2,549.51 X $2,590.72)	$6,605,066.50
8. Total cost of excess pediatric asthma hospitalizations in State: Multiply step 5 by step 6 (1,465.97 X $2,590.72)	$3,797,917.70
9. Potential cost savings from reducing excess hospitalizations: Subtract step 8 from step 7 ($6,605,066.50 − $3,797,917.70)	$2,807,148.80

***** Step 6 was calculated by multiplying the national mean charge per pediatric asthma hospitalization ($5,888) by the national cost-to-charge ratio for these hospitalizations (0.44) using data from the 2001 HCUP Nationwide Inpatient Sample. (Information on HCUP data and tools is available on the HCUP Web site at http://www.hcup-us.ahrq.gov or via email at hcup@ahrq.gov.)

Summary and Synthesis

This module provides background on asthma as a disease, its prevalence, complications, and associated costs. This module also examines the evidence from both the NHQR and NHDR regarding the substantial variation in quality of care for asthma that exists across the Nation, between States, and across population subgroups.

Evidence from research indicates that quality improvement can enhance health outcomes, reduce disparities across States and population groups, and provide a return on the investment. The return includes both cost savings and improved quality of life for people with asthma and their caregivers.

Resources for Further Reading

- American Lung Association *Trends in Asthma Morbidity and Mortality*; available at: http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=33347
- National Asthma Education and Prevention Program-- http://www.nhlbi.nih.gov/about/naepp/
- Institute for Healthcare Improvement Web resources, available at: http://www.ihi.org/IHI/Topics/ChronicConditions/Asthma/

- Institute of Medicine's *Crossing the Quality Chasm: A New Health Care System for the 21st Century*, available at: http://www.iom.edu/report.asp?id=5432
- Institute of Medicine's *Fostering Rapid Advances in Health Care: Learning from System Demonstrations*, available at: http://www.iom.edu/report.asp?id=4294
- *National Healthcare Quality Report* and *National Healthcare Disparities Report*, available at: http://www.qualitytools.ahrq.gov
- National Heart, Lung, and Blood Institute's *Morbidity and Mortality: 2004 Chartbook on Cardiovascular, Lung, and Blood Diseases*; available at: http://www.nhlbi.nih.gov/resources/docs/04_chtbk.pdf
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Associated Appendixes for Use With This Module

Appendix A: List of Acronyms

Appendix A lists acronyms of organizations, data sources, and other resources used in this *Resource Guide*.

Appendix B: Estimates of Medicaid Costs by State

Appendix B includes data tables with the cost estimates for racial/ethnic subgroups of Medicaid eligibles with asthma by State and a flow chart of the methodology used to derive the estimates.

Module 2: A Framework for State-Led Quality Improvement

States can play a central role in improving the quality of health care for their residents. This module presents a framework to help States play this role.

Key Ideas in Module 2:

- States can play a strategic role in designing, implementing, and assessing health care quality improvement.
- Existing models for quality improvement can be adapted to enable States to play a leadership role.
- The State-led framework is adapted from quality improvement models in other industries and incorporates a Plan-Do-Assess approach..
- The State-led quality improvement framework contains three stages:
  1. **Provide leadership** to create a vision.
  2. **Work in partnership** with key stakeholders.
  3. **Implement improvement** by creating interventions and assessing their impact.

Quality Health Care and the Quality Improvement Movement

Health care quality has been defined as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Institute of Medicine [IOM], 1990). Increased attention to quality of care in recent years has highlighted the gap between optimal health care and the care that Americans typically receive. While producing unrivaled innovation and new medical treatments, the U.S. health care system struggles to deliver high quality care consistently. Researchers estimate, for example, that nearly 100,000 people die annually in the United Stqtes because of medical errors (IOM, 1999). And even when fatal errors are not involved, people receive appropriate treatment only about half of the time (McGlynn et al., 2003).

Compared with other industries in the United States, health care has been slow to embrace quality improvement (Chassin, 1998). By contrast, some manufacturing- and service-based industries have implemented sophisticated and rigorous quality improvement processes, such as the Six Sigma movement adopted by large firms including Motorola and General Electric. This movement is named for its goal, "six sigma," which refers to a measure of extremely low tolerance for mistakes. Specifically, six sigma represents 3.4 defects per million events (Spanyi and Wurtzel, 2003). The Six Sigma approach thus sets a very ambitious goal for reducing error. Health care processes typically operate at a considerably higher tolerance for error—500,000 defects per million opportunities (based on the conclusion of McGlynn et al., 2003)—or less than two sigma rather than six.

One of the obstacles to quality improvement in health care has been a lack of rigorous measures and data to drive improvement. To help address this gap, the Agency for Healthcare Research and Quality (AHRQ) released the first National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR) designed to establish a baseline of quality measures for tracking health care quality in the United States in 2003. The second NHQR and NHDR were released in 2004 and began to track health care quality. The 2004 NHQR concluded that quality is improving in many areas, but change takes time, the gap between the best possible care and actual care remains large, and further improvement in health care is possible (AHRQ, 2004b).

In addition, AHRQ has begun to develop resource guides and workbooks aimed toward helping States take action to improve quality of care for specific chronic conditions (e.g., diabetes and asthma). These and other resources from AHRQ and other Federal agencies designed to stimulated quality improvement are listed at the end of this module.

A Strategic Role for States

Improving quality of care requires active involvement from many participants—providers, patients, payers, policymakers, and the public. Among all of these stakeholders, however, State governments have a unique leadership role to play. Small networks of providers have developed around quality improvement, but strong leadership at the State level is needed to help these develop, coalesce, and survive. States also have a span of control over a network of providers that they license and can help integrate the efforts of the various networks. Furthermore, they have the ability to lead providers in developing a quality improvement process and can muster a statewide impetus behind small efforts that might otherwise die for lack of energy. Some parts of State government stand to benefit from quality improvement in terms of improved services and lower costs. These include Medicaid agencies and mental health and substance abuse agencies that also control payments to providers.

To lead a quality improvement effort, States need a model of how to improve quality and a way to target areas for improvement These are discussed in more detail below.

Developing a Framework for State-Led Quality Improvement

None of the current models for quality improvement used on the front lines of medical care addresses a strategic role for State governments. Therefore, this *Resource Guide* proposes a State-led quality improvement approach that combines general models from product manufacturing with specific models developed for health care services. Advocates of quality improvement have argued that a quality improvement model adapted from manufacturing can work just as well in service industries (Harry 1998, as cited in Chassin 1998). Various quality improvement models used in different circumstances are discussed below; then a State-led framework, built by borrowing from other models, is presented.

General Models

General models of quality improvement are based on the "Plan-Do-Check-Act" or the "Plan-Do-Study-Act" (PDSA) model (Langley et al., 1996). Within a production process, these models convey the importance of the following:

- Planning—Identifying the problem and potential solution.
- Doing—Actually testing out the proposed solution.
- Studying—Measuring to see if the solution worked.
- Acting—Implementing the successful solution.

Two key features of this model are measurement and the continuousness of the process. Organizations measure the effect of a change to know whether the solution is working. A familiar mantra in quality circles is: "Without measurement, there can be no improvement." If the test solution did not work, the group starts again to plan a better approach, do another test, and assess its effect. Businesses apply this continuous process of planning, doing, and assessing until they know they have solved a problem. Then they implement the solution company wide.

Although this model has stood the test of time in manufacturing circles, it requires special application in health care. Unlike centrally controlled manufacturing processes, health care delivery is decentralized and resistant to top-down directives from government, corporate decisionmakers, or professional organizations. Health care quality improvement happens in clinical settings, often one patient at a time. The decentralized nature of health care delivery thus creates a substantial obstacle to implementing large-scale quality improvement programs. In light of this fact, the components of the process must be carefully adapted to the health care setting.

Three components in particular that need special attention are the composition of the team, the plan for measurement and assessment, and the implementation process. First, the quality improvement team is as crucial to success as the process. This is true in companies that compose their teams of knowledgeable and empowered employees, but more so within complex systems of disconnected entrepreneurs, such as in medicine. Highly effective teams are committed to the process, champion the cause, apply their energy to implement solutions, and continue the quality improvement cycle by moving on to the next problem. Achieving this in health care can be particularly challenging. A State's leadership can influence the composition of the team.

Second, the plan for measuring and assessing which proposed solutions are likely to work requires data collection, careful analysis, and skillful interpretation. While the quality improvement objective should be paramount and data and analysis should not paralyze the quality improvement team, the complexity of the health care system will present challenges to measurement and assessment. Fragmentation of the health care system, financial incentives that can discourage change, busy practitioners who may believe they have little time for quality improvement, and solo practice or employment arrangements that promote practitioner independence are special challenges to instituting change. A State's experience around data collection can be an important asset to the team

Finally, while implementation within the walls of a manufacturing plant may be straightforward, implementation in a complex health care environment may not be. Thus, the plan-do-study part of the cycle may be needed to help implement change – plan the change, measure its spread, and assess its impact on the goal. A State's involvement may be essential to advertising and assessing the effect of specific interventions statewide.

Existing Clinical Models

The general PDSA model has been applied successfully to the delivery of health care services. These applications have focused primarily on clinical processes—i.e., how health care teams of physicians, nurses, technicians, managers, and others change specific processes to improve the outcome of their service and the health of their consumers, the patients. These applications have generally focused on one clinical condition (e.g., diabetes) or one set of procedures (e.g., anesthesia services) at a time. The clinical condition or procedure focus is an aspect of clinical models that will likely be reflected in State-led quality improvement circles. Furthermore, the clinical quality improvement process may be used within the State-led quality improvement initiative.

Institute for Healthcare Improvement. One approach to quality improvement with relevance for State-led efforts was developed by the Institute for Healthcare Improvement (IHI). The IHI has been working with teams of clinicians from around the country for several years on improving systems of care to enhance care processes and outcomes. IHI has developed a two-part model to spur improvement in clinical settings (see box).

Chronic Care Model. Another model of quality improvement in the clinical setting is the Chronic Care Model. Dr. Edward Wagner and his team at Group Health Cooperative in Seattle, with support from the Robert Wood Johnson Foundation, developed the Chronic Care Model (see box). The U.S. health care system is oriented more toward care for acute episodes of disease rather than prevention and management of chronic conditions. Thus, the Chronic Care Model emphasizes a collaborative approach among health care teams, involved patients, and supportive communities to develop new and better clinical procedures and systems that support treatment and management of chronic illness over time. More information is provided below on involvement of State health departments in Diabetes Collaboratives that use the Chronic Care Model to achieve rapid advancement in diabetes care at community health centers. More information on the Chronic Care Model is available on the Improving Chronic Illness Care (ICIC) Web site at: http://improvingchroniccare.org.

Federal models. None of these models speaks directly to the Federal role in promoting quality improvement. To fill the need for such a model, the Centers for Medicare & Medicaid Services (CMS) published its own quality roadmap—a strategy for how CMS plans to lead quality improvement at the clinical level for its beneficiaries (CMS, 2005).

The CMS Quality Improvement Roadmap vision is: “The right care for every person every time.” Its goals are to: “Make care safe, effective, efficient, patient-centered, timely, and equitable.” The strategy, in brief, is to:

- Work with partnerships to achieve quality goals.
- Support quality measurement and information.
- Create the right incentives by paying for quality, not ineffective, health care.
- Assist practitioners to improve quality.
- Drive better use of effective health care technologies.

The Center for Medicaid and State Operations (CMSO) announced a quality initiative for Medicaid and the State Children's Health Insurance Program (SCHIP) in August 2005 that is committed to the vision of the CMS Quality Improvement Roadmap for Medicaid and SCHIP beneficiaries. The initiative stresses the importance of working in partnership with States and external organizations, such as AHRQ, to promote innovation as a strategy for obtaining the best value for health care resources invested. The Medicaid SCHIP quality initiative includes a series of projects in five key areas: namely (1) evidence-based care and quality measurement, (2) pay for performance, (3) health information technology, (4) partnerships, and (5) information dissemination. CMSO plans to work with States to encourage Medicaid and SCHIP providers to adopt well accepted clinical guidelines with demonstrated effectiveness in improving quality and reducing costs for specific conditions in priority areas.

This initiative has direct implications for States to align quality improvement and incentives to provide effective care for beneficiaries. In order to meet the objectives of the Quality Improvement Roadmap, it will be necessary for States to implement quality improvement strategies for effective care for chronic conditions such as asthma.

The IHI Methodology

Part 1

- **Forming the team**: This step involves identifying the key players and addressing three specific questions as shown below
  - **Setting the aims:** What are the goals?
  - **Establishing measures:** How can teams measure whether a change is an improvement?
  - **Selecting changes:** What changes can teams make that will result in improvement?

Part 2

- **Testing changes:** This step draws from the Plan-Do-Study-Act cycle. PDSA is a way of testing a change in a real work setting—by planning it, trying it, observing the results, and acting on them.
- **Implementing changes:** After testing changes on a small scale, learning from the tests, and refining the change through several PDSA cycles, the team can implement the change on a broader scale—for example, for an entire pilot population.
- **Spreading changes:** After implementation of a change for a pilot population, the team can spread change to other parts of the organization or to other organizations.

For more information, see http://www.ihi.org/IHI/Topics/Improvement/ImprovementMethods/HowTo Improve/.

Chronic Care Model—The Six Core Components

- **Community** - Mobilizing all the available community resources to meet the needs of people with chronic illnesses.
- **Health system** – Creating organizational cultures, systems and mechanisms that promote safe, high quality care throughout the health care system.
- **Self-management support** – Empowering and preparing active patients to manage their health and navigate the health care system.
- **Delivery system design** – Assuring the delivery of effective, efficient clinical care and self-management support through appropriate design of the delivery system.
- **Decision support** – Promoting appropriate clinical care consistent with scientific evidence and patient preferences.
- **Clinical information systems** – Organizing patient and population data to facilitate efficient and effective care for people with chronic illnesses.

Source: Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, Part 2. Journal of the American Medical Association. 2002;288(15): 1909–1914.

A New Framework for State-Led Quality Improvement

This *Resource Guide* proposes a new tool for State leadership in quality improvement. The State-led framework draws elements from the models described above. It overlays the PDSA model, which here is shortened to Plan-Do-Assess for States because they are not in a position of actually changing clinical practice but rather of leading others to improve. States can play a central role at three different stages of quality improvement: leading, partnering, and implementing improvement. Each stage follows the Plan-Do-Assess cycle with an emphasis on measurement and information which States may be in a unique position to support. Each stage is described in more detail below.

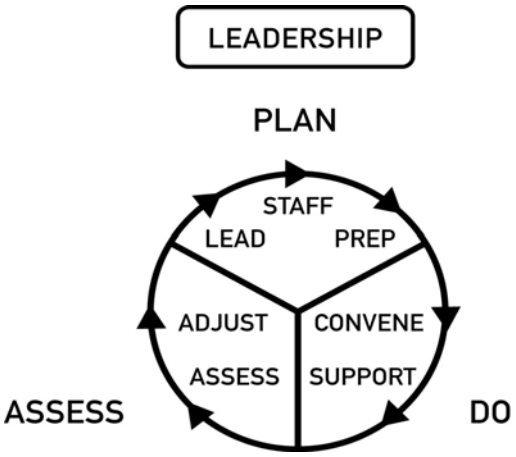
Stage 1: Provide leadership. Figure 2.1 depicts the first stage of quality improvement—leadership. State government is the principal player at this stage. The State's leadership role can be built with the aid of the Plan-Do-Assess tool. For example:

Specific leadership tasks can be addressed with this framework. For example, an early question will be how a State official would initiate a quality improvement project. With the PDA tool, the State official would:

- **Plan**—A State official *leads* the process by assigning high-level *staff* who identify partners from among stakeholders and *prepare* for a kickoff meeting by collecting and assembling data—the case for quality improvement, potential targets for improvement, readily available data across clinical conditions or settings of care.
- **Do**—Staff *convene* partners, a high-profile State official kicks off the meeting, and staff *support* the partners in a planning process.
- **Assess**—Staff *assess* the partnership (for example, who is attending and contributing at meetings) and *adjust* the partner membership, if necessary.

A key component of State government leadership at this stage is championing the need for quality improvement. It also is critical to State efforts to identify one or more high placed champions from the health care community who can muster support and provide a vision for change.

Figure 2.1. State-led quality improvement—Stage 1



Stage 2: Work in partnership. Figure 2.2 adds the second stage of State-led quality improvement, as a ring surrounding the first circle (see Figure 2.1). The second ring focuses on the partnership activities, encompasses the core of the improvement process, and relies heavily on the partnership to define activities, plan solutions, and assess them before any implementation campaigns are undertaken. Many issues will be decided during this stage, usually during a series of group meetings. Again, the Plan-Do-Assess tool can be used for each major decision, which at this stage might include, for example:

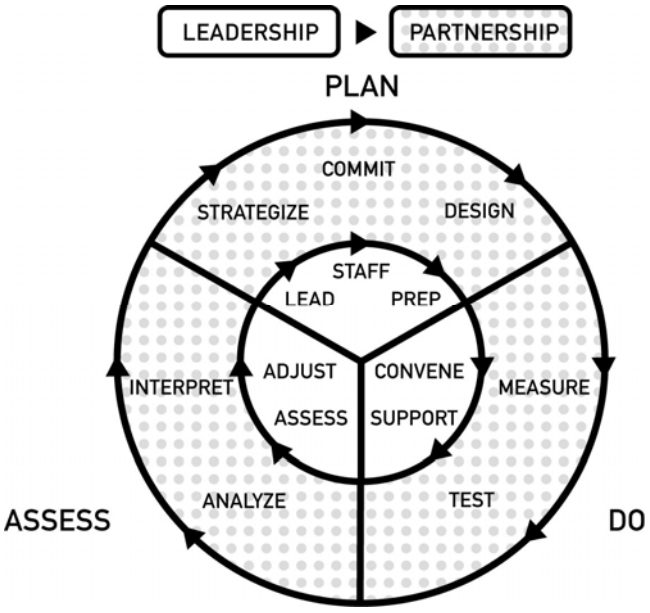
- **Plan**—The new partnership will develop a strategy about how the group will function (perhaps through consensus) and what clinical condition(s) and/or settings of care will be the focus of quality improvement, *commit* to both the group process and the focus, and *design* a plan for quality improvement and specific solutions for the condition(s) and/or settings selected.
- **Do**—Team members will *test* proposed intervention(s) through study of the literature and/or a pilot study at a health plan or facility; and during the study or test, they will *measure* and quantify the effect of the intervention(s).
- **Assess**—Team members will *analyze* and *interpret* the results of the intervention(s) and present the results to the partnership.

Depending on the results, the cycle may begin again with modification of the idea or generation of new ones and with the test, measure, analyze, and interpret steps again. Or, the group may be ready to move to implementation of the initial idea(s).

These activities rely on a vibrant, committed partnership of stakeholders in the industry (the State being one stakeholder/partner) to identify health care problems, propose and test solutions,

measure and analyze results of the test, and assess the promise of statewide implementation for improving quality. The solutions will undoubtedly include private-sector and public-sector solutions.

Figure 2.2. State-led quality improvement—Stages 1 (inner circle) and 2 (outer ring)

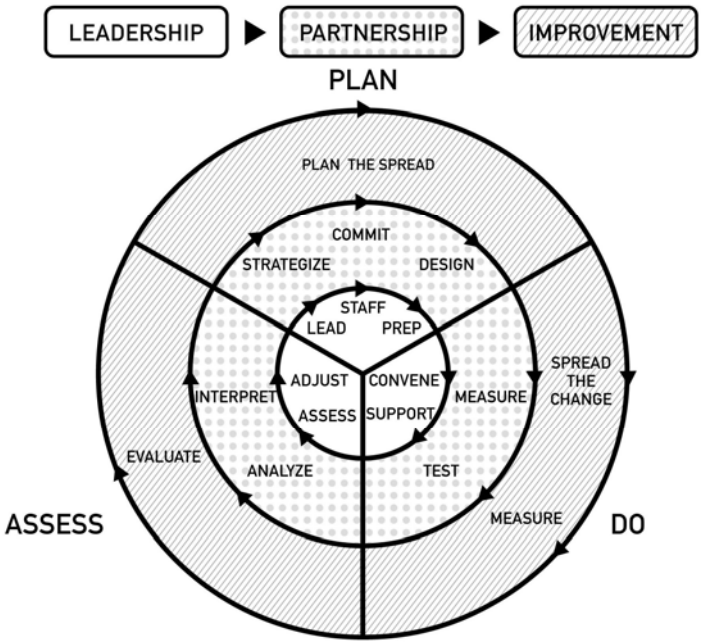


Stage 3: Implement improvement. Figure 2.3 completes the quality improvement process by adding the third and final ring—implementing improvement. This stage is essential for spreading success. Because this is where complex partnerships might falter, this ring also uses the Plan-Do-Assess process for implementation. The activities might include:

- **Plan**—A written *plan* to spread ideas for change in public and private programs might encompass an advertisement campaign and/or new financial incentives or award mechanisms for quality improvement. The plan should specify how each partner will contribute to the process of bringing about change. A written plan is important to test and coalesce the group's commitment, which will be essential for successful implementation.
- **Do**—The implementation begins as the group sets about to *spread the change* and *measure* the impact of the effort to spread change. The group could falter here by assuming the work of the group is finished. However, the measurement step at this point is key to determining whether the groups' ideas are effective, continue to be implemented, and have the desired effect.
- **Assess**—The group should reconvene periodically to *evaluate* and discuss the spread of change and its outcome—successes and failures. It may be necessary to modify the plan and try new approaches, continuing to measure and evaluate the modifications. Or, the group may be ready to tackle the next area for improvement.

Here, the continuous cycle of quality improvement is apparent. The team identifies areas in need of improvement, designs a solution, tests it, and plans how to move the solution beyond a specific demonstration setting and into the broader practice of health care. The team also measures the spread and uptake of the solution in practice, assesses whether the spread has been successful and tackles the next problem area. An effective team is committed to ongoing quality improvement.

Figure 2.3. Complete State-led quality improvement framework—Stages 1 (inner circle), 2 (middle ring), and 3 (outer ring)



The complete framework. The process of quality improvement may take more than a single turn around the circles before results are seen. Furthermore, it will require continuous application of the framework to specific quality problems to improve health care quality statewide. This means that commitment, leadership, continuity, and the right incentives are essential. States, as health care purchasers and leaders in health policy, are well positioned to provide these characteristics.

In this framework, the State is the supporting structure that brings the partnership together and nourishes it. State leadership provides energy, facilitates group processes, supplies data when available and may collect new data, disseminates evidence-based information (or asks another partner to assume that role), and stimulates the group to improve health care quality. The State provides an environment for competitors to come together and improve their professional services.

As noted earlier in the discussion of general models, many local and regional quality improvement efforts already exist among disconnected groups, and thus a critical aspect of the State role will be outreach and education to coordinate and harmonize these diverse efforts.

Selecting Targets for Improvement

Improving any process requires targeting specific areas or problems. In health care, specific conditions or treatments are usually the place to start. Deciding which health conditions or procedures to select for improvement is the first challenge facing State leaders and their partners. Finding candidates for improvement will be relatively easy; narrowing the list will be difficult.

Various criteria can be used to identify targets. Answers to a series of questions can help determine a priority list of targets for quality improvement. The quality improvement team may want to add to or subtract from these:

- Is there clinical or quality improvement evidence that specific changes will improve health care outcomes?
- What measures of quality health care exist for this targeted area?
- Are there benchmarks for high quality care?
- Is there variation across geographic areas, vulnerable subpopulations, or individual providers in the quality of care delivered? Is the variation excessive compared to that in underlying clinical conditions that clinicians must treat in different ways?
- Is there a way to assess how a State or smaller geographic area performs in a targeted area?
- How many lives are affected by the condition or treatment (i.e., prevalence, morbidity, and mortality related to the condition)?
- What is the cost of care and the potential for a return on (or saving from) investment in quality improvement?

Most of these questions take considerable effort to answer. For this reason, AHRQ has begun to assemble a set of resources targeted to helping States implement quality improvement initiatives.

Information Resources for Quality Improvement

AHRQ-Sponsored Resources for States

AHRQ provides a number of resources for information and measures on health care quality. AHRQ supports research programs and publications intended to provide scientific evidence for quality improvement. Other important Federal resources on asthma are noted below also.

NHQR and NHDR. Two valuable resources are the National Healthcare Quality Report and the National Healthcare Disparities Report mentioned above. The former offers benchmarks for tracking U.S. health care quality nationally and by State; the latter looks at quality of care and access to care for vulnerable subpopulations, such as racial/ethnic minority groups and low income groups. The reports, mandated by Congress, were first published in 2003 and are produced annually; to date, reports for 2003, 2004, and 2005 are available. All releases of the NHQR and NHDR can be accessed at: www.qualitytools.ahrq.gov.

State resources for selected measures from the NHQR. Measures at the State level from the 2005 NHQR are available as a user-friendly, interactive Web resource for examining the performance of each State and the District of Columbia across various dimensions of quality.

These dimensions include types of care (preventive, acute, and chronic), settings of care (hospital, ambulatory, nursing home, and home health), and total quality (a summary of all State-level measures in the NHQR). Also included are breakdowns of the measures that go into creating each summary measure. Users can also find quality measures available for specific clinical conditions in downloadable tables. These State resources are available at: www.qualitytools.ahrq.gov/qualityreport/2005/state. (State resources based on the 2004 NHQR are also available; see: www.qualitytools.ahrq.gov/qualityreport/2004/state.)

HCUP and statewide discharge data systems. Another source for State-level data is the statewide discharge data developed within States by State governments, hospital associations, and other private data organizations. The Healthcare Cost and Utilization Project is a public-private partnership sponsored by AHRQ with 33 participating statewide data organizations that accounted for about 90 percent of U.S. discharges in the United States in 2001. As noted in Module 1, HCUP provides asthma hospitalization rates for participating States. More information on HCUP is available at: http://www.hcup-us.ahrq.gov.

Evidence reports. AHRQ-sponsored Evidence-based Practice Centers (EPCs) review all relevant scientific literature on clinical, behavioral, and organization and financing topics to produce evidence reports and technology assessments. These products are used for informing and developing coverage decisions, quality measures, educational materials and tools, guidelines, and research agendas. EPCs also conduct research on methods of quality improvement. Topics are chosen for their relevance to clinical, social science/behavioral, economic, and other health care organization and delivery issues—specifically those that are common, expensive, and/or significant for the Medicare and Medicaid populations. There are over 120 evidence reports assessing various clinical issues (including asthma) and other topics, such as approaches for closing the gap in health care quality. A list of these reports is available at: http://www.ahrq.gov/clinic/epcix.htm.

Quality improvement tools. AHRQ also publishes resources for quality improvement for specific chronic illnesses. This *Resource Guide* is the second published by AHRQ to focus on a specific chronic illness for States. *Diabetes Care Quality Improvement: A Resource Guide for State Action* and *Diabetes Care Quality Improvement: A Workbook for State Action* were published in 2004. These resources provide measures and benchmarks for States to develop their own quality improvement goals and strategies in addition to the ones provided in the National Healthcare Quality and Disparities Reports. Copies of the diabetes *Resource Guide* and companion *Workbook* can be downloaded at http://www.ahrq.gov/qual/diabqualoc.htm .

National Quality Measures Clearinghouse™ (NQMC). AHRQ sponsors the National Quality Measures Clearinghouse™. This online clearinghouse is a database and Web site for information on specific evidence-based health care quality measures and measure sets. It provides practitioners, health care providers, health plans, integrated delivery systems, purchasers, and others a way to get detailed information on quality measures for quality improvement. The NQMC is available at: http://www.qualitymeasures.ahrq.gov/.

Other Federal Data Resources for States

Data sources that can be found within States may include disease registries, hospital discharge data programs, etc. After seeking asthma data within the State, States will need to look for national asthma data to use for benchmarking their progress.

Behavioral Risk Factor Surveillance System. BRFSS is a national data source that provides data at the State level. Currently, it provides the richest source of asthma data nationwide and by State. BRFSS data are based on telephone surveys developed by the CDC but administered by each State independently. The survey consists of a core set of questions developed by CDC, additional questions developed by the States, and separate, optional modules for States to use. The asthma module, which contains the quality-of-care questions, is optional for State use. More information about the BRFSS data and methods as well as interactive databases with some State and local level asthma data are available at: http://www.cdc.gov/brfss/.

National Asthma Control Program (NACP). The Centers for Disease Control and Prevention also supports a number of Federal programs for States including the National Asthma Control Program. (See Appendix C for a list of State interventions for asthma.) This program funds States to provide surveillance on asthma and other interventions. Information about the NACP can be found at http://www.cdc.gov/asthma/NACP.htm.

National Asthma Survey (NAS). States should also note that the National Asthma Survey has been developed by CDC and other partners as a model for States to use to collect information on asthma prevalence and care. The NAS data set includes the BRFSS asthma measures in addition to nearly 70 other measures for asthma. (NAS measures are discussed more fully in Module 4 and in Appendix D.) A pilot data release of NAS data for four States is available at: http://www.cdc.gov/nchs/about/major/slaits/nsa.htm.

National Asthma Education and Prevention Program (NAEPP). Another Federal program for States, the NAEPP works with intermediaries including major medical associations, voluntary health organizations, and community programs to educate patients, health professionals, and the public. NAEPP is coordinated by the National Heart, Lung, and Blood Institute. Part of the National Institutes of Health (NIH), NHLBI develops clinical guidelines for diagnosis and treatment of asthma. Information about NAEPP can be found at http://www.nhlbi.nih.gov/about/naepp/.

Summary and Synthesis

States have typically viewed their role in quality improvement from the perspective of the guardian of public health, a manager of health care for the poor or disabled, or a buyer of health insurance for State employees. However, States can play a more comprehensive leadership role, and indeed some States are already doing this, at least in part, with respect to asthma.

The framework described in Module 2 envisions three roles for States in quality improvement:

1. **Provide leadership**, which entails providing a defining vision for change, identifying partners to set goals, and providing an environment that fosters improvement.

2. **Work in partnership**, which involves creating a committed partnership of stakeholders dedicated to identifying and proposing and testing solutions and developing plans for improvement.
3. **Implement improvement**, which means creating interventions within a strong partnership, measuring and analyzing the results of changes, and applying successful improvements on a broader scale. The solutions will undoubtedly include those from both the private and public sectors.

Module 3: Learning From Current State Quality Improvement Efforts

States are currently involved in many efforts to improve the quality of asthma care. These actions can inform other State efforts. This module provides examples of current State efforts to improve the quality of asthma care within the context of a State-led model of quality improvement.

Key Ideas in Module 3:

- A variety of quality improvement initiatives at the State level are sparking change in health systems across the Nation.
- States can use this module to identify examples and resources for asthma care quality improvement.

The Introduction to this *Resource Guide* described a new, strategic role for States in leading quality improvement for asthma. A State-led quality improvement framework that States could use in playing this role was described in Module 2. Building on lessons from industrial and clinical models for quality improvement, it adapted the Plan-Do-Study-Act cycle of quality improvement for the policymaking context to a Plan-Do-Assess approach illustrated in Figures 2.1- 2.3.

This framework identifies the three stages in which States can play a key role—provide leadership, work in partnership, and implement improvement. Many States are already active in these areas, so Module 3 also provides specific examples of what States are doing currently at each of the three stages presented above.

Current State Efforts To Improve the Quality of Asthma Care

States have typically viewed their role in quality improvement from a public health perspective or, more narrowly, as a buyer of health insurance for state employees. However, as outlined in the introduction, States can play a broader and more strategic role. Some States are already doing this, at least in part, with respect to asthma.

States have undertaken a variety of asthma initiatives over the years. Many of these have been funded by the Centers for Disease Control and Prevention. States have used CDC funding to establish creative programs to address asthma prevention and control. As attention to health care quality has increased, State asthma programs have also adopted quality improvement aims. States also initiate other programs. States have established asthma disease management programs in Medicaid and have partnered with the private sector on quality improvement for asthma care. Many States also have tried to integrate CDC-funded efforts with private sector and Medicaid efforts.

Appendix C lists over 100 separate programs in 48 States that target improvement in some aspect of asthma care and include efforts at the Federal and State/local levels, joint private/public efforts, and efforts by private national organizations with Internet links to more information.

A significant number of these programs are targeted to specific populations—such as children, minority communities, or Medicaid recipients—or on public health approaches toward asthma mitigation. However, it is difficult to generalize about these programs, given their diversity and heterogeneity. Therefore these programs are divided into 12 categories that relate their relevance to some of the important aspects of quality improvement:

- Advisory bodies and councils.
- Coalitions.
- Collaboratives.
- Cross-agency work.
- Data measurement and reporting.
- Developing and enforcing guidelines.
- Disease management.
- Minority and rural outreach.
- Public service/education efforts.
- Self-management (of asthma).
- Provider training.
- Use of technology.

Note that these categories cut across the three stages of activity highlighted in the State-led model. The number and range of State activities make it difficult to present all instances. Therefore this module presents some examples of specific programs in States that fit these stages. In stage 1, States are *providing leadership* by championing quality, convening partnerships, and providing support. In stage 2, States are *working in partnership* on various activities—planning for quality improvement, developing and complying with asthma guidelines, and supporting measurement and data collection. In stage 3, States are *implementing improvement* by supporting activities that implement asthma care quality interventions of various types, evaluating their effectiveness, and spreading success.

Most of the information provided below and in Appendix C was derived from a review of State health department Web sites, CDC resources, Internet research, and in-person interviews with State agency officials. Examples below provide a sampling of State efforts that reflect regional, size, and funding differences among States. Although not an exhaustive list, it demonstrates a range of State efforts related to asthma quality improvement.

Stage 1: Provide Leadership

A Champion for Quality

Having a champion for quality improvement is critical to the success of any asthma quality improvement initiative. Champions provide consistent leadership, give greater visibility to

issues, and spur others toward greater strides in quality improvement. In some cases, asthma quality improvement initiatives have received recognition and support from the highest leaders of State government. The involvement of an influential, recognizable leader, such as a governor or other high-level elected official, can enhance stakeholder engagement in the process and heighten the attention given to quality improvement initiatives in the media and within the public and private sectors.

In other cases, dedicated staff within an executive agency, such as the asthma control program staff in the State's health department, are instrumental in providing the leadership needed to pull together diverse stakeholders and influential elected officials to promote quality. For example:

- In **New York**, Governor George Pataki has championed improving asthma care. Following his 1999 State-of-the-State speech, New York launched an aggressive asthma prevention and control agenda. New York has developed clinical treatment guidelines for asthma, provided funding to regional coalitions to improve asthma care, and implemented a Medicaid disease management and quality improvement initiative related to asthma.

- Staff in **Oregon's** Asthma Program was established a Workgroup on Improving Asthma Care with representatives from health plans, health care providers, medical professional groups, and advocates. Through a consensus process, the workgroup developed guidelines for asthma care in the State based on NHLBI guidelines that were then published and distributed by Oregon's Asthma Program to providers, medical professionals, and others.

Convene Partners and Develop Support

Quality improvement leaders cannot accomplish their task alone. Creating networks of support has been critical for State programs that address asthma quality improvement. States have used various methods to convene parties interested in improving asthma care, including creating or assembling broad coalitions or networks of multiple stakeholders as well as using advisory bodies, councils, or State workgroups that are smaller and authorized by statute or regulation.

State advisory bodies, councils, and workgroups. A number of States have established through legislation or executive action, advisory boards, councils, or workgroups on asthma that assist with statewide asthma planning and quality improvement efforts. Advisory bodies, councils, and workgroups are generally led by State officials and typically include a variety of experts and stakeholder groups from the public and private sectors, such as the American Lung Association, State health professional associations, hospital associations, and provider organizations. Other stakeholders may include large businesses, employer groups, and other community leaders. These advisory bodies, usually housed within the State's health department, are often supported through CDC Asthma Prevention and Control Programs.

- The **Minnesota** Department of Health developed the Commissioner's Asthma Advisory Workgroup to provide direction and assistance in forming a statewide plan to address the rising health and economic burden of asthma in Minnesota.

- **Connecticut** established its Asthma Advisory Council in 2004 to assist in the implementation of the State asthma plan. The council consists of 15 members appointed by the State Commissioner of the Department of Public Health.

Coalitions and networks. Coalitions and networks are broad-based, voluntary efforts, in contrast to advisory bodies or other State-sanctioned entities. These groups are generally formed by private initiative; elected State officials or executive agency staff may participate. Coalitions and networks bring together a broad variety of stakeholders in a State to work together to identify areas of strength, common objectives, and gaps in services. They also develop plans to assure that the essential treatment and educational services for managing asthma are in place in a community.

Coalitions may also include community representatives and nontraditional partners such as the corner grocery store owner, faith communities, health organizations, social service agencies, and more. Coalitions and networks can be important allies in quality improvement efforts in the State because of their broad membership and natural interest in improving the quality of care for asthma. For example:

- **Ohio's** Asthma Coalition is an association of medical and public health professionals, business leaders, various government agencies, community activists, and others dedicated to improving the quality of life for people with asthma through information sharing, networking, and advocacy.

- The **Colorado** Asthma Coalition is a group of health care professionals and community members committed to working together to improve public awareness and education, data collection and research, and provider education.

Stage 2: Work in Partnership

Planning for Quality Improvement

Convening a State advisory body or a coalition of stakeholders or both is just the first step in the improvement process. The group must then develop a strategy and plan of action for asthma quality improvement.

In many States, the State's asthma plan will be the guiding document for group action. A State asthma plan is required by the CDC for States that receive funding from its National Asthma Control Program. These plans provide an overview of the asthma prevention and control issues within the State that need to be addressed. The plan also articulates goals and identifies strategies the State will use to achieve the goals. Thirty-five States received fiscal year 2004 funding from CDC for asthma prevention and control. (More information on State asthma plans is available on the CDC Web site at www.cdc.gov/asthma. The CDC Web site provides links to State asthma programs and their State plans.)

State asthma plans generally include most of the traditional public health activities such as education and awareness, data collection, disease surveillance, and partnership activities with

State and community groups. Some State asthma plans also include improving the quality of care for asthma, although this varies. States have used the State asthma plan process to develop evidence-based asthma treatment guidelines, collect data on quality of care measures, improve asthma self-management education and practice, and train providers on asthma management training.

In other cases, asthma quality improvement initiatives may develop apart from the State's asthma program, such as with Medicaid disease management or pay-for-performance initiatives. Provided below are examples of different ways that States have worked in partnership with others to develop and implement asthma quality improvement plans.

Developing and Complying With Asthma Guidelines

To help translate research-based evidence into practice, several States are promoting the use of evidence-based clinical guidelines for asthma care. Like Oregon, many States have adopted guidelines established by the National Heart, Lung, and Blood Institute, while others have worked through the process of developing State-specific asthma treatment guidelines.

- **New York** released its Clinical Guidelines for the Diagnosis, Management, and Evaluation of Adults and Children with Asthma – 2003 along with a call to action to the State's health care professionals to participate in regional conferences for physician education.

- **Missouri's** Center for Asthma Treatment at Children's Mercy Hospital has worked to fully implement the 1997 NHLBI guidelines for diagnosis and management of asthma by creating an integrated program for asthma treatment and standardizing the education and medical treatment of people with asthma.

- The **Texas** Medicaid Managed Care Asthma Project is a pediatric asthma pilot program for Medicaid enrollees. The program provides standardized patient and family asthma management education and supplies best practice guidelines to providers.

Quality Measurement and Data Collection

The development of quality measures and data collection and analysis are fundamental steps in quality improvement. States have used CDC asthma program funding to improve data collection, including information about prevalence, death rates, and other statistics. Other data sources include managed care plan or Medicaid program data. (More information on identifying and using asthma data sources for quality improvement plans is presented in Module 4.)

- The **Colorado** Asthma Program is developing a statewide surveillance data system to determine the prevalence, mortality, and morbidity of asthma in the State and to assess any associated morbidity and mortality.

- **Wisconsin's** Asthma Plan includes objectives to use (by 2007) the NHLBI guidelines for diagnosis and management of asthma statewide and to build the capacity of health care organizations in the State to monitor and measure asthma care quality.

Partnerships Beyond Health Care

Effective asthma interventions can leverage partnerships beyond the health care setting. Asthma interventions can involve leaders in businesses, employer groups, schools and day care centers, and organizations of caretakers, social workers, and others. Comprehensive asthma interventions should address environmental issues that affect people with asthma and support self-management for patients in the context of their communities and daily lives.

- The **National Cooperative Inner-City Asthma Study Intervention** is a social-worker-based education program that focuses on environmental control. Social workers are trained as asthma counselors and work with the child's caretaker to improve communications between family and physician (Sullivan et al., 2002).

Stage 3: Implement Improvement

Implementing Asthma Care Quality Interventions

States use a variety of interventions to affect asthma care. Some examples of ways that States seek to improve the quality of care for asthma are listed below.

Self-management/patient education. Patient self-management is critical for good asthma outcomes. Patient education programs can be conducted in a variety of settings that are accessible to target populations, including: churches, neighborhood associations, schools, and community-based organizations that are well recognized in a community. These programs can be conducted in small groups, or one-on-one, based on the identified needs of the population.

- **Alabama's** Inner-City Asthma Intervention program at the University of Alabama at Birmingham provides patients with individualized treatment plans and education based on evaluation from physicians, nurses, and educators to improve self-management skills.

- In **North Carolina**, the Inner-City Asthma Intervention program provides individualized and group educational sessions on asthma for children. The sessions provide a basic understanding of asthma, its triggers, environmental control, warning signs, and medications.

Collaboratives. Improving the quality of care for asthma is a systemic issue. The entire health care system and all its actors need to be mobilized to improve the quality of care received by persons with asthma. Building on the successes of the Health Disparities Collaboratives funded by the Health Resources and Services Administration (HRSA), a number of States have started or participated in collaboratives that bring together teams of practitioners to develop quality improvement strategies for clinical settings. Collaboratives typically use a PDSA model to bring together teams over a period of time, develop an improvement idea, test it on a limited basis, study the effect, and then implement the change more broadly.

- **California** Medi-Cal officials and a group of health plans, providers and community-based organizations that serve the Medi-Cal population have participated in the Plan/Practice Improvement Partnership, a quality improvement effort aimed at developing clinical and administrative approaches to improve asthma care. The collaborative is funded through the Center for Health Care Strategies Best Clinical and Administrative Practices program.

- The **New York** State Medicaid Asthma Disease Management and Quality Improvement Initiative promotes disease management interventions in the treatment of asthma. Community Health Centers in the greater NYC region provide patient education to improve health outcomes for Medicaid recipients.

Provider training. Because health care providers are a key element in improving asthma quality care, many States have actively sought their involvement in developing programs. In addition, States are providing outreach, training, and support to health care professionals as they seek to implement new evidence-based care guidelines.

- **Arkansas Asthma Coalition** offers primary care physicians, health care providers, school nurses, and physician office staff training that spotlights diagnosis, evaluation, and treatment of asthma as well as skills for managing, educating, and communicating with asthma patients. In addition, approximately 1,200 staff of public schools receive the American Lung Association's Asthma In-Service Training.

State disease management programs. Because States are looking for ways to control Medicaid costs while maintaining or improving quality, 38 States are implementing disease management programs, many of them targeting asthma. Medicaid disease management programs seek to increase patient knowledge and self-management skills, improve provider adherence to clinical guidelines, and implement computer technology to track patients more effectively in clinical settings for provider awareness and for system-wide evaluations of the effectiveness of the intervention. Improved care management for asthma helps patients get their asthma under control and ensures that care provided meets accepted standards.

- The **Virginia** Health Outcomes Partnership established a training program for physicians in the Medicaid Primary Care Case Management program that focused on reducing emergency care for asthma through better education for physicians on disease management and communication skills. The program resulted in overall savings for Medicaid, even when the training costs and higher drug costs were factored in.

- The **Florida** Agency for Health Care Administration’s Medicaid Disease Management Program has contracted with experienced disease management organizations to provide disease management services to Medicaid recipients who have been diagnosed with asthma.

- The **Indiana** Chronic Disease Management Program (ICDMP) was developed after legislation required the Office of Medicaid Policy and Planning to implement a disease management program for people with asthma and other chronic diseases. The ICDMP provides information on asthma for Medicaid recipients as well as all other patients.

- The **Missouri** State Medicaid Disease Management program is targeted toward patients enrolled in the fee-for-service Medicaid program. This program focuses on disease management tactics for asthma patients determined to be at high risk for adverse outcomes. The goal is to slow the progression of asthma and avoid medical crises.

Pay-for-performance initiatives. Quality improvement experts have long recognized that providers have little incentive to improve health care quality in an environment where every health care organization is paid for quantity of services rather than quality. While the effectiveness of pay-for-performance on quality improvement is still being studied, an increasing number of private and public payers are exploring use of financial incentives to spur quality improvement (Dudley, 2005). CMS is conducting a number of Medicare demonstration projects that include pay-for-performance. As of January 2006, CMS has a new voluntary program on quality measure reporting to help providers assess their performance in anticipation of the trend to implement pay-for-performance in both the public and private sector. Some private insurers have already begun implementing pay-for-performance to improve quality, including Blue Cross/Blue Shield, Wellpoint Health Networks, and others. (More information can be found at The Leapfrog Group Web site at http://www.leapfroggroup.org/leapfrog_compendium.)

States, too, are implementing pay-for-performance initiatives, particularly through Medicaid managed care contracts. Pay-for-performance initiatives are still in early stages of development. Currently, most pay-for-performance initiatives have a broad focus and use quality measures for several chronic conditions including asthma.

- **Iowa** and **Massachusetts** have included financial incentives to contractors that deliver behavioral health services. One study found that the contractors involved in pay-for-performance initiatives showed improvement in the specific areas where financial incentives were provided (Dyer et al., 2002).

- Medical groups in **California** have agreed to use common data and performance measures for their quality improvement incentives. The pay-for-performance initiative is a collaboration of seven California health plans which use the same survey instrument for patient satisfaction and some HEDIS® measures for cancer screening, asthma, diabetes, coronary artery disease, and immunizations. More information on this initiative can be found at http://www.iha.org.

Evaluating Effectiveness

Interventions to improve quality of care need to be evaluated for clinical effectiveness as well as cost effectiveness. State leaders, however, need a clear definition of success. Demonstrating real cost savings in a short time frame can be difficult. What may be more readily demonstrated is improved quality of care, cost avoidance, and improved quality of life for patients. With diligence, careful planning, and longer time to evaluate a program, States can also evaluate the cost effectiveness of quality improvement efforts.

One study (Rossiter et al., 2000) offers a good example of how to design and evaluate an asthma intervention program. The Virginia Health Outcomes Partnership targeted low income asthma

patients in a Medicaid primary case-management program. The program aimed to reduce the rate of emergency care visits for asthma. An intervention group and a control group were used to assess the effectiveness of the intervention in a real world setting where other factors can be expected to change. The study provided statistics on the reduction in emergency care visits as well as the projected direct savings to Medicaid that accounted for the cost of the physician training and the costs of increased prescribing of drugs to control the asthma symptoms. (See Module 1 for information about estimating potential cost savings from quality improvement.)

Spreading Success

The experience of success should not be isolated to a single program or clinic. Successful programs and strategies need to be disseminated in order for quality of care to be improved overall. It is important to adapt existing models for quality improvement and to spread their success to other communities and health care settings.

- The federally sponsored **Health Disparities Collaboratives**, developed by HRSA with the Institute for Healthcare Improvement, aim to transform the delivery of care in community health centers. The program improves the care for certain chronic conditions by targeting providers, patients, and communities to support provider-patient partnerships. Participants in the Health Disparities Collaboratives have worked to improve care for their patients with asthma and spread the changes and improvements throughout their health center.

- Organizations such as the **National Initiative for Children's Healthcare Quality (NICHQ)** have formed other learning collaboratives to spread success in asthma care improvement as well (http://www.nichq.org/nichq). States can use this model with other programs to spread the success of these programs.

- In **North Carolina** the Center for Children's Healthcare Improvement (CCHI) has worked with the State's Division of Medical Administration and Area Health Education Centers (AHECs) on a variety of quality improvement projects aimed at improving the care for asthma among the Medicaid population. Building on its past successes working with clinical practices, CCHI plans a multi-tiered policy, community, and clinical approach to spread quality improvement statewide, beginning first in two AHEC regions.

Summary and Synthesis

Successful programs of current asthma quality improvement activities provide State leaders with examples, useful resources, lessons learned, and approaches for enhancing initiatives and partnerships. State programs have been successful in improving asthma care. Even so, much remains to be done. States have a unique role to play in championing improvement for asthma care, forging partnerships to address approaches to change, and implementing those approaches to help providers deliver the best care and to help people with asthma enjoy optimal quality of life. Whether a State is building the infrastructure for improving asthma care or already has a well developed set of partnerships in place, there are a variety of approaches in place that can inform State efforts.

Resources for Further Reading

- Institute for Healthcare Improvement stories for asthma; available at: http://www.ihi.org/IHI/Topics/ChronicConditions/Asthma/ImprovementStories/.

- Rossiter LF et al. The impact of disease management on outcomes and cost of care: A study of low-income asthma patients, Inquiry. 2000;37:188-202.

- Rust GS, Murray V, Octaviani H, et al. Asthma care in community health centers: A study by the Southeast regional clinicians' network. Journal of the National Medical Association. 1999;91(7):398-403.

- Stanton MW, Dougherty D, Rutherford MK. Chronic care for low-income children with asthma: strategies for improvement. Rockville, MD: Agency for Healthcare Research and Quality; 2005. Research in Action Issue 18. AHRQ Pub. No. 05-0073.

Associated Appendix for Use With This Module

Appendix C: National and State Asthma Programs

Appendix C lists asthma quality improvement programs by State and Web site links for further information.

Module 4: Measuring Quality of Care for Asthma

This module discusses the basic building blocks of quality improvement—measures and data. The module describes the asthma-related data available in the NHQR and NHDR and from other sources that States can use. Each State has a cadre of health statisticians and analysts who should be recruited as part of any quality improvement project aimed at the health care system in the State because they will be familiar with local health data and because they know how to use and interpret data.

Key Ideas in Module 4:

- Quality improvement begins with measurement, which requires good measures and data for measuring quality of care.
- Process and outcome measures should be considered together to assess asthma care quality.
- The NHQR is a starting point for accessing consensus-based measures. Although a consensus on a small core of key asthma measures has not yet evolved, this *Resource Guide* identifies measures that are available for local quality improvement programs.
- Before undertaking any extensive data collection, State agencies should identify the questions to be answered and the data available to answer them. There are national and local data sources that can provide relevant data for creating estimates of State performance.
- State-level baseline estimates for asthma care afford State leaders a broad view of asthma care quality in their State.
- Analysis of data can answer some key questions for States:
  - What measures should be used to set goals for quality asthma care?
  - What goals should be set as targets for specific measures?
  - What factors influence a State's position among other States?

Quality Measurement

This section reviews the concept of quality measurement, available asthma-related measures in the NHQR and other sources, and the importance of using multi-dimensional measure sets. All of this is examined from the perspective of States and their role in initiating quality improvement programs.

The Concept of Quality Measurement

The Institute of Medicine defines health care quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (IOM, 2001). That definition suggests a distinction between quality measures and guidelines for quality care:

- **Quality measures** relate to *populations*. They include rates that indicate how many members of a population achieved a goal (for example, low emergency room visits for asthma nationwide) relative to a population base (for example, all people with asthma in the United States).

- **Guidelines** for quality care are recommendations devised via consensus processes of clinical experts that describe standards of care for *individual* patients. In general, guidelines for individual patient care prescribe what clinicians can do to improve the care that they deliver to their patients with a specific disease or condition. These guidelines also are used as the basis for developing population-based measures that enable analysts to assess and track change in the treatment of a population.

With a specific population in mind, a quality improvement program should consider the dimensions to be measured before embarking on data collection. What is to be measured? What change will be instituted? What quality measure will track the spread of that change? What is the ultimate outcome to be improved and how is that changed measured? What special populations are to be targeted and how will their improvement be documented?

Types of Quality Measures

Quality measures cover a large range, from crude measures (for example, unadjusted mortality rates) to more refined measures (for example, percent using asthma medications to achieve better asthma control). Although a full range of measures is essential for a complete picture of health care quality, specific process measures are needed to guide a health care team in improving quality of care. For example, the number of deaths related to asthma at a hospital can suggest poor quality of treatment at that hospital and in the community, but knowing the number of deaths does not tell the hospital staff or community providers *how* to improve. Metrics that measure processes of care that reduce deaths or improve other medical outcomes help medical staff know how to change care so that they provide better care.

Most quality improvement efforts focus on two types[1] of measures—process and outcome:

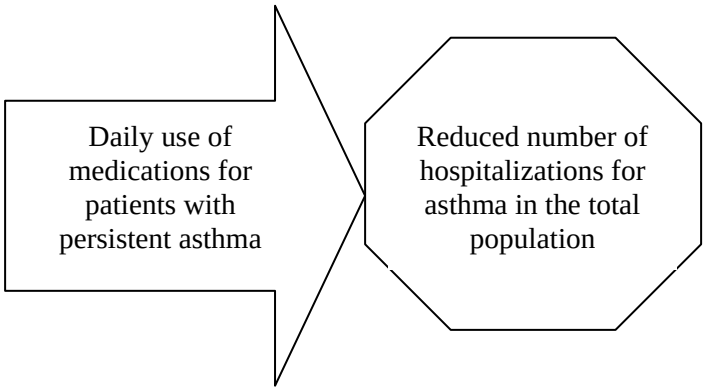
- **Process measures** often reflect evidence-based guidelines of care for specific conditions. Process measures are generally considered to be within the control of the provider and, therefore, are performance indicators. They also are more likely to reveal actions that can be taken to improve quality (for example, whether a necessary test or medication is given).
- **Outcome measures** frequently relate to patient health status. Better outcomes are the ultimate objective of quality improvement—for example, lower mortality, lower hospitalization rates, or better test results.

Ideally, improvements in processes yield improvements in associated outcomes, and measures should reflect that. However, the connections may not be that direct. For example, the asthma process measure for inhaled corticosteroid use is included in the NHQR because the evidence-based NHLBI clinical guidelines for asthma care recommend daily use of such medications for asthma patients with persistent asthma. Use of such asthma medications can help control and prevent asthma attacks and thus prevent the need for emergency care and hospitalizations. The NHQR also monitors the outcome measure of hospitalizations for asthma. In this case,

[1] A third type of measure is less directly related to quality of care. *Structural* measures reflect aspects of the health care infrastructure that generally are broad in scope, system wide, and difficult to link to short-term quality improvement (for example, a hospital's staff-to-bed ratio). The NHQR does not use structural measures.

improvement in the process of prescribing inhaled corticosteroids and proper use by patients is expected to decrease the number of such hospitalizations, as diagrammed below. However, other factors (discussed more fully later in this module) are also important. Effective provider and patient education and self-management are crucial components. Without these, improved outcomes might never occur.

Relationship of Process Improvements to Outcomes



Selection of Quality Measures for the NHQR

The selection of quality measures for the NHQR was based on criteria that include the clinical significance of the measure, reliability of available data, and consensus of the experts. The first NHQR, published in 2003, used a consensus process for determining which measures to include in the national tracking of health care quality. That process included issuing a public call for measures and assembled an interagency task force that reviewed and selected measures according to criteria developed by the Institute of Medicine and adopted by the Interagency Work Group for the NHQR (see box).

Other Sources of Asthma Measures

The NHQR currently includes only a few asthma measures, but others are available. Some of the major developers of asthma measures are:

- The National Asthma Survey, funded by CDC and tested in 2003, is a 15-minute survey that States can use to provide a comprehensive assessment of asthma in the State. The NAS includes questions found in the BRFSS asthma supplement as well as a more comprehensive set of questions on asthma care. (More information is available at http://www.cdc.gov/nchs/about/major/slaits/nsa.htm).
- The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Disease-Specific Care Certification Program provides an implementation guide for asthma performance measures for hospitals. A module for children's hospitalizations for asthma is in development. (More information is available at http://www.jcaho.org.)
- The HRSA Bureau of Primary Health Care supports Health Disparities Collaboratives for disease-specific conditions, including asthma, for primary health care centers to participate in

learning networks to improve quality of care. These learning collaboratives maintain a registry of asthma patients and monitor care for asthma patients on a monthly basis. (More information is available at http://www.healthdisparities.net.)

- The National Initiative for Children's Healthcare Quality also develops learning collaboratives for asthma care for children based on the chronic care model for quality improvement.

Criteria for Selecting Asthma Measures:

Importance

- Impact on health: What is the impact on the patient?
- Meaningfulness: Are providers and patients concerned about this area?
- Susceptibility to influence by the health care system: Can the health care system meaningfully address this aspect or problem?

Scientific soundness

- Validity: Does the measure actually measure what it is intended to measure?
- Reliability: Does the measure provide stable results across various populations and circumstances?
- Explicitness of evidence: Is scientific evidence available to support the measure?

Feasibility and usefulness

- Existence of prototypes: Is the measure in use?
- Availability of required data across the system: Can information needed for the measure be collected in the scale and time frame required?
- Cost or burden of measurement: How much will it cost to collect the data needed for the measure?
- Capacity of data and measure to support subgroup analyses: Can the measure be used to compare different groups of the population?

Source: Adapted from Institute of Medicine, *Envisioning the National Health Care Quality Report*, 2001.

Multiple Dimensions of Quality for Asthma Care

One challenge of initiating quality improvement for asthma care from the perspective of a State or local quality improvement team is selecting from measures that assess the process and outcomes of improved care. There are many measures that could be used to assess different aspects of asthma care. Table 4.1 shows important dimensions of asthma quality of care and the measures that have been developed to assess these dimensions for improving care for asthma. The dimensions include provider processes of care, patient self-care processes, and outcomes of care such as quality-of-life factors. In addition, insurance coverage and prevalence and severity of asthma among the population are important factors that will influence the various measures of asthma care quality in any population.

Appendix D lists over 100 measures that are used throughout the country to measure asthma care quality and shows that different organizations evaluate different dimensions of asthma and define measures in different ways. Such variability in measurement makes it difficult, if not impossible, to compare across organizations, settings, and geography. CDC's National Asthma Survey addresses nearly all of the dimensions of quality asthma care, and the Behavioral Risk Factor Surveillance System surveys address the questions of influenza vaccination and smoking cessation counseling. Only a measure of whether the physician assessed the patient's asthma severity appropriately is missing. As noted earlier, the NAS was implemented in 2003 and tested

in a few States. It has been adapted for use as a call-back survey in the BRFSS; the call-back data will be merged with the BRFSS core data so that all the measures in BRFSS will be available for analysis with the asthma-specific data. States can use Table 4.1 as a guide to understand how the measures can be used to assess asthma care quality.

Table 4.1. Dimensions of asthma care measurement

Category	Measure description	Importance
Provider Care (Process Measures)		
A.1. Asthma severity assessment	Asthma severity is assessed by health professional during a patient visit.	Treatment strategies for asthma involve a stepwise approach in which the level of therapy increases with the asthma severity (see Module 1 for severity classifications). An adequate assessment of severity is thus a key step in determining appropriate management and treatment plans for patients with asthma (JCAHO, 2004). Asthma severity can be assessed by a health professional using a spirometer and taking a history of symptoms. Assessments are important for adjusting appropriate therapy and medication for long-term control of asthma.
A.2. Asthma medications	Use of anti-inflammatory medications (such as inhaled corticosteroids) to control asthma for patients with persistent asthma.	There are two types of medications used for asthma: Anti-inflammatory long-term controller medication and quick-acting relief medication for asthma attacks (bronchodilators). Daily anti-inflammatory medications (or long-term controller medications) can prevent exacerbations and chronic symptoms for patients with persistent asthma. Inhaled corticosteroids are the most effective anti-inflammatory medication available for treating the underlying inflammation of persistent asthma (CDC & NHLBI, 2003). They do not have the serious side effects of oral steroids, especially when properly inhaled. Use of specific asthma medication and frequency of use are measures that show what percentage of asthma patients use medication and how well they understand how to use their medication. However, measures of medication use should be interpreted with knowledge of the severity level.
A.3. Asthma management plans	Patients with asthma who are given a written/documented asthma management plan.	The management goals for controlling asthma can vary for different asthma patients. This is especially important for patients with persistent asthma. Therefore, it is important for providers and patients to discuss goals and how to control asthma. Writing a management plan helps clarify expectations for treatment and provides patients with an easy reference for remembering how to manage their asthma (CDC & NHLBI, 2003).
A.4. Self-management support or patient education	Patients and their families have discussed with their doctors how to manage their asthma and avoid asthma triggers.	Patient education is a key component of asthma care. Because management of asthma generally occurs outside of the doctor's office after assessment and acute care, it is important for asthma patients and their caregivers to be informed about their asthma. The aim is to help patients manage their asthma in the context of their daily lives. Patients and their families should know how to recognize symptoms, how to avoid triggers, when and how to use asthma medication and delivery devices, and when to seek care. At a minimum, competent asthma education enlists and encourages family support, includes instructions on self-management skills, and is integrated with routine ongoing care (CDC & NHLBI, 2003).

A.5. Planned care for asthma	Planned care visits for asthma are completed at least every 6 months, or more frequently for more severely ill patients or those with comorbidities.	Patients with asthma should seek care at least every 1-6 months depending on asthma severity and ability to control symptoms. Patients with asthma may experience varying symptoms and severity, which may require adjustments in therapy. Because of the nature of asthma, variable exposure to allergens and irritants, or insufficient adherence to a medication regimen, regular followup is recommended (CDC & NHLBI, 2003). During planned care visits, persons with asthma may require preventive care for other common conditions since they are more vulnerable to other health complications due to their condition. Flu vaccination is recommended for persons with asthma to prevent asthma exacerbation due to influenza. Smoking is also a trigger for many asthma patients since smoke (first- or second-hand) can exacerbate difficulty breathing.
	Asthma patients are given influenza vaccines.	
	Asthma patients are given smoking cessation counseling.	
Patient/Parent Self-Care (Process Measures)		
B.1. Environmental modifications	Percent of asthma population that has been advised by a health professional to change things in home, school, or work to reduce asthma triggers.	Environmental and occupational factors contribute to illness and disability from asthma. Decreases in lung function and a worsening of asthma have been associated with exposure to allergens, indoor pollutants (for example, tobacco smoke), and ambient air pollutants (for example, ozone, sulfur dioxide, nitrogen dioxide, acid aerosols, and particulate matter). The patient's or caregiver's awareness of environmental triggers is an important part of their ability to manage their asthma and prevent asthma attacks. There are numerous ways to reduce asthma attacks by making changes in the home, school or work such as reducing exposure to dust by removing carpeting or using special linens in the bedroom, removing pets, not smoking, etc. However, the extent to which these changes can be made depends on the patient's ability to control these environments. Because not all changes are feasible, health providers must understand their patients' environments and circumstances to give advice.
	Percent of asthma population exposed to environmental tobacco smoke.	
Outcome Measures		
C.1. Daily symptom burden	Number of days in the past month with limited activity due to asthma.	Asthma attacks and symptoms are indicators of the ineffectiveness of treatment and management of the disease. Also, asthma attacks or symptoms can have a significant impact on a person's ability to participate in normal daily activities. Sensitivity to environmental triggers can keep a person with asthma from going to work or school. Assessing the number of days with limited activity helps to evaluate the burden of the disease on the population. Also, frequent use of beta-agonists for relief of asthma attacks is an indicator of ineffective long-term control of asthma. By monitoring the frequency of asthma attacks, symptoms, and use of quick-relief medications, access to and effectiveness of treatment can be assessed across the population diagnosed with asthma.
	Number of school/work days missed in the past month due to asthma.	
	Number of days with sleeping difficulty in the past month due to asthma.	
	Number of days with (or free of) asthma symptoms in the past month.	
	Frequency of use of beta-agonists for people with asthma.	
C.2. Acute avoidable events due to asthma (exacerbations)	Rate of asthma hospitalizations in the State.	Hospitalization for asthma can often be prevented when the condition is properly managed. Hospitalizations, emergency department visits, or urgent care visits may reflect poor asthma management by patients and their health care providers. Hospitalizations are also highly disruptive to patients and families and increase the cost of asthma care for State Medicaid agencies and State employee benefits programs. Avoidable hospitalization measures are shown in Module 1, Table 1.2.
	Rate of emergency or urgent care visits for asthma in the State.	

Enabling Factor		
D.1. Access to care	People with asthma who have health insurance coverage in the State.	Health insurance coverage influences the propensity of patients to seek health care in the management of a chronic disease. Without health insurance, families are likely to cut down on routine medications and/or doctor visits for monitoring the condition and to have poorer results in managing it.
Other Factors		
D.2. Prevalence	Percent of population that has ever been told they have asthma by a doctor or health professional.	Though not modifiable (i.e., primary prevention of asthma is poorly understood), prevalence information provides an indication of the burden of disease on the population and health system.
	Percent of population that currently has asthma.	
	Percent of population that has had asthma attack in past 12 months.	

Data Sources for Asthma Quality of Care

Once States have identified the appropriate measures, the next step is locating sources of data for assessing the health system's performance in delivering quality care for asthma. This section describes three data sources for assessing asthma quality of care: the NHQR, the Behavioral Risk Factor Surveillance System (BRFSS), and local data sources.

Asthma-Related Data in the NHQR: Avoidable Hospitalizations

The NHQR asthma-related measures are primarily national or regional in geographic scope. At the State level, one asthma measure for outcomes of three age groups (under 18, 18-64, and 65 and over) appears in the NHQR—avoidable hospitalizations related to asthma. As shown in Module 1, Table 1.2 lists that measure by age group, available for 33 States that have statewide hospital discharge data systems and participated in the Healthcare Cost and Utilization Project (HCUP) in 2001. HCUP is a Federal-State-Industry partnership, sponsored by AHRQ, which standardizes data across States. Table 1.2 shows:

- The State's hospitalization rate adjusted for age and sex differences among the States.
- The difference between the State's rate and the average of the "best-in-class" States—the 10 percent of States that have the lowest admission rates.

By examining the State rate and the difference from the best-in-class rate, a State can determine how far it has to go to reduce hospitalizations to become a top performer.

Hospitalization rates are affected by demographic characteristics of the population such as age, socioeconomic status and race/ethnicity. Although quality improvement efforts do not modify these characteristics, quality improvement initiatives can target subgroups that experience disparities to improve their asthma care quality and improve outcomes such as reducing hospitalizations for asthma.

The NHQR contains State-level rates only for this outcome measure of avoidable hospital admissions. The NHQR currently excludes State-level asthma process measures because no national consensus has, as yet, established the key asthma measures out of the many that have been developed and used by various organizations. As noted previously, over 100 measures for approximately 50 topics related to asthma care quality are listed in Appendix D. Also, results from the new National Asthma Survey, designed by the CDC to overcome limitations in the BRFSS asthma supplement, were not available in 2003 and 2004 for the first two releases of the NHQR and NHDR. Future releases are expected to include asthma measures from the NAS when available nationwide.

Six Asthma Measures in CDC's Behavioral Risk Factor Surveillance System

Currently, the richest source of asthma data nationwide by State is CDC's Behavioral Risk Factor Surveillance System. However, data from BRFSS should be interpreted with care. Due to sample size limitations, estimates may have large standard errors. The estimates reported here are from the most recent data year, but several years of data could be pooled together for more reliable estimates. Despite limitations, BRFSS asthma data are a valuable starting point for viewing the national landscape of asthma quality care by State.

Table 4.2 summarizes estimates for six measures derived from BRFSS listed in Table 4.1. Each measure is displayed with the three estimates—the national average (reporting States weighted to a national average), the best-in-class average (the 10 percent of States with the best value), and the poorest performing average (the 10 percent of States with the poorest values).

Table 4.2. Six quality measures for asthma: National average, best-in-class average, and poorest performing average, 2003

Measure Category (as described in Table 4.1)		National Average		Best-in-class average		Poorest performing average		Number of States reporting
	Measure description	Percent of people	Standard Error	Percent of people	Standard Error	Percent of people	Standard Error	
Process Measures								
A.2	Medications (in the past month)	71.1	0.9	75.3	1.8	62.1	2.8	19
A.5	Planned care visits (2 or more in the past 12 months)	28.3	0.9	40.4	3.0	17.4	1.9	19
A.5	Smoking (counseling in the past 12 months)	82.2	1.6	87.9	3.0	75.8	4.1	15
	Flu shots (in the past 12 months)	40.3	0.6	53.3	1.5	27.9	1.8	54
Outcome Measures								
C.2	Urgent care visits (in the past 12 months)	28.1	0.9	19.4	2.0	35.5	1.9	19
	Emergency room visits (in the past 12 months)	17.7	0.8	12.2	1.5	22.3	2.1	19

Source: Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System, 2003.

Table 4.2 shows that the gap between the best-performing and poorest-performing States varies by type of measure.[2] Process measures are practices that clinicians can directly influence. For the four process-of-care measures, for example, the largest gap is for planned care visits in the past year—a measure that reflects whether the asthma is being monitored routinely by the respondent's health care provider. The difference between the best- and poorest-performing States on planned care visits is more than double. The gap for provision of flu shots is also nearly twofold. By contrast, the spread for the two other care processes—medication use and smoking cessation counseling—is small, about 15 to 20 percent. Thus, these latter two activities are more uniformly applied across the country than are planned care visits and flu shots.

Outcome measures are necessary for State programs and policymakers to assess the effects of changes in processes of care on the outcome of patients with asthma, and thus on the success of the quality improvement program. For outcome measures, the proportion of people using urgent and emergency services for acute crises for asthma is 80 percent higher in the worst performing States than in the best. The variation in the outcomes of care for people with asthma is probably influenced by the variation in the quality of care they receive.

Local Data Sources

Finding appropriate data can be a challenge for quality improvement programs. To stimulate interest and start the quality improvement process, States can develop an inventory of local data sources. (See Appendix F for a summary of asthma-related data sources.)

Local data (whether by State, county, municipality, or individual health care provider) are essential for quality improvement programs to have a local impact. Local leaders and health care professionals must see their own data compared with those from other providers and with State, regional, and national benchmarks in order to appreciate the importance of their work. By developing a complete inventory of data systems available at the State and local level, States can avoid duplicate data collection and reduce data-related costs. Also, a review of local data in the context of national data should clarify where existing local surveys or data systems could be improved.

Some possible local data sources to consider are listed below. These data sources may or may not be health care specific, but they may afford important opportunities for collaborations with various State or local agencies. It may be possible to add questions to ongoing local surveys to inform quality improvement activities for asthma.

Children and Youth:

- State school health surveys, administered before entering public schools to assess youth health risk behavior, may include questions about asthma prevalence, activity limitations due to asthma, etc.

[2] As shown in Table 4.2, the number of States (including DC and U.S. territories) reporting on each measure varies. For more detail on BRFSS estimates and individual State estimates of BRFSS measures, see Appendix E.

- The Youth Tobacco Survey, administered by State health departments, may include questions on asthma prevalence to assess health risks and health behavior related to tobacco use.
- The Youth Risk Behavior Surveillance System, administered by CDC and State and local health and education agencies, monitors health-risk behaviors that contribute to unintentional injuries and violence, tobacco use, alcohol and other drug use, unintended pregnancy and sexually transmitted diseases, unhealthy dietary behaviors, and physical inactivity.

Adults:

- Occupational health surveys may provide data on work environment and triggers for asthma, activity limitation, and number of work days missed due to asthma.

Community/Environmental Assessment:

- Community surveys may provide local data on environmental factors that affect asthma and may compare asthma prevalence and outcomes by county, city, or neighborhood levels.

Most States also have ongoing surveys or health data systems that collect data at the State, county, and sometimes provider level. Some of those data systems include:

- State-level BRFSS data, available through the State health department.
- Statewide inpatient hospital discharge systems that collect data on individual discharges from hospitals and can provide county-level and, sometimes, hospital-level data. National benchmarks are available for these types of data through the NHQR.
- State vital statistics include mortality rates by cause of death and race/ethnicity. The National Vital Statistics System, which compiles these State data, can provide uniform national estimates and State estimates.
- Special disease registries focused on asthma may exist within the State, and these provide a rich source of patient-level information on severity and adherence to tracked treatments.
- Other special data collection of State departments of health statistics and other State programs may be modified to address asthma.

Specific data systems for populations that the State supports are also available in most States. These include:

- Medicaid information systems based on health care provider claims for Medicaid reimbursement.
- State employee health benefit claims for reimbursement.
- Patient records from State- or county-operated programs, such as mental health and substance abuse programs, public assistance, or justice systems.

Examples of State-level data sources are available at the National Association of Health Data Organizations Web site at: http://www.nahdo.org/soa/soalist1.asp?Category=State%20Agency.

Other Federal or national asthma surveillance systems compile data that describe State and local populations or health resources. These include:

- NHLBI Web site, a valuable starting place to identify data and become familiar with the network of organizations and individuals associated with asthma data collection on the State and national level (http://www.nhlbi.nih.gov).
- Census population data by State, maintained by the U.S. Bureau of the Census. These data are helpful for describing the demographic characteristics and wealth of local areas (http://eire.census.gov/popest/data/states.php).
- The Area Resource File, a county-level database of health care resources from several surveys and data sources, compiled by the Health Resources and Services Administration. This resource might be helpful in analyzing the health resources available on a county level.
- Quality of care in managed care organizations, provided through the National Committee for Quality Assurance (see: http://www.ncqa.org/index.asp). Local managed care organizations can be an important source of local data on health care quality.
- The Henry J. Kaiser Family Foundation Web site (http://kff.org/statepolicy/index.cfm), a rich source of health and other information at the State-level compiled from many public databases and published studies. This may help identify differences among State environments that would explain asthma prevalence or treatment differences across States.
- American Lung Association Web site, which contains patient education materials and tools as well as research on asthma (http://www.lungusa.org).

Using Benchmarks To Develop State Performance Estimates

Once States have identified measures and acquired relevant data, analysts must develop estimates that gauge State performance.

Benchmarks

Benchmarks are external markers or values against which States can measure performance. The benchmark can represent the national average or best performers. How the State fares depends on where the State estimate falls compared with the benchmark. The NHQR provides a national set of estimates and State estimates that can be used as benchmarks for quality improvement.

Several types of metrics or benchmarks can be used for assessing a State. From more to less stringent, they include:

- The **theoretic limit** of 100 percent achievement (or 0 percent occurrence for avoidable events), which is an ideal, but often impractical or even impossible goal.
- A **best-in-class estimate** of the top State or top tier of States that shows what has been achieved (e.g., the top 10 percent of States is used in this *Resource Guide*).

- A **national consensus-based goal**, such as Healthy People 2010, set by a consensus of experts; such goals may be set more or less stringently than other benchmarks.
- A **national average** over all States, which shows the norm of practice nationwide but, being an average estimate, will represent a weaker goal than the best-in-class estimate.
- A **regional average**, which a State can use to compare itself to other States that are more likely to face similar environments; but, as a goal, it may be less aggressive than the best-in-class goal.
- An **individual State rate**, which itself can be used as a baseline against which to evaluate State-level interventions and progress over time within the State or to offer as a norm for local provider comparisons.

Some of these benchmarks can be found in the NHQR—the national and regional averages. The best-in-class estimate, not reported in the NHQR, can be derived from data in it. See Appendix G for details on the best-in-class estimate and other benchmarks that can be derived from the NHQR. Appendix H describes how to conduct statistical significance testing to determine whether or not comparisons of estimates show significant differences.

Asthma Benchmarks for States

A focused and limited set of measures for tracking quality nationally on an ongoing basis has not yet been specified for asthma. Thus, the NHQR has not yet settled on a complete set of consensus-based measures for asthma. As noted above, the National Asthma Survey is expected to inform that process in the future.

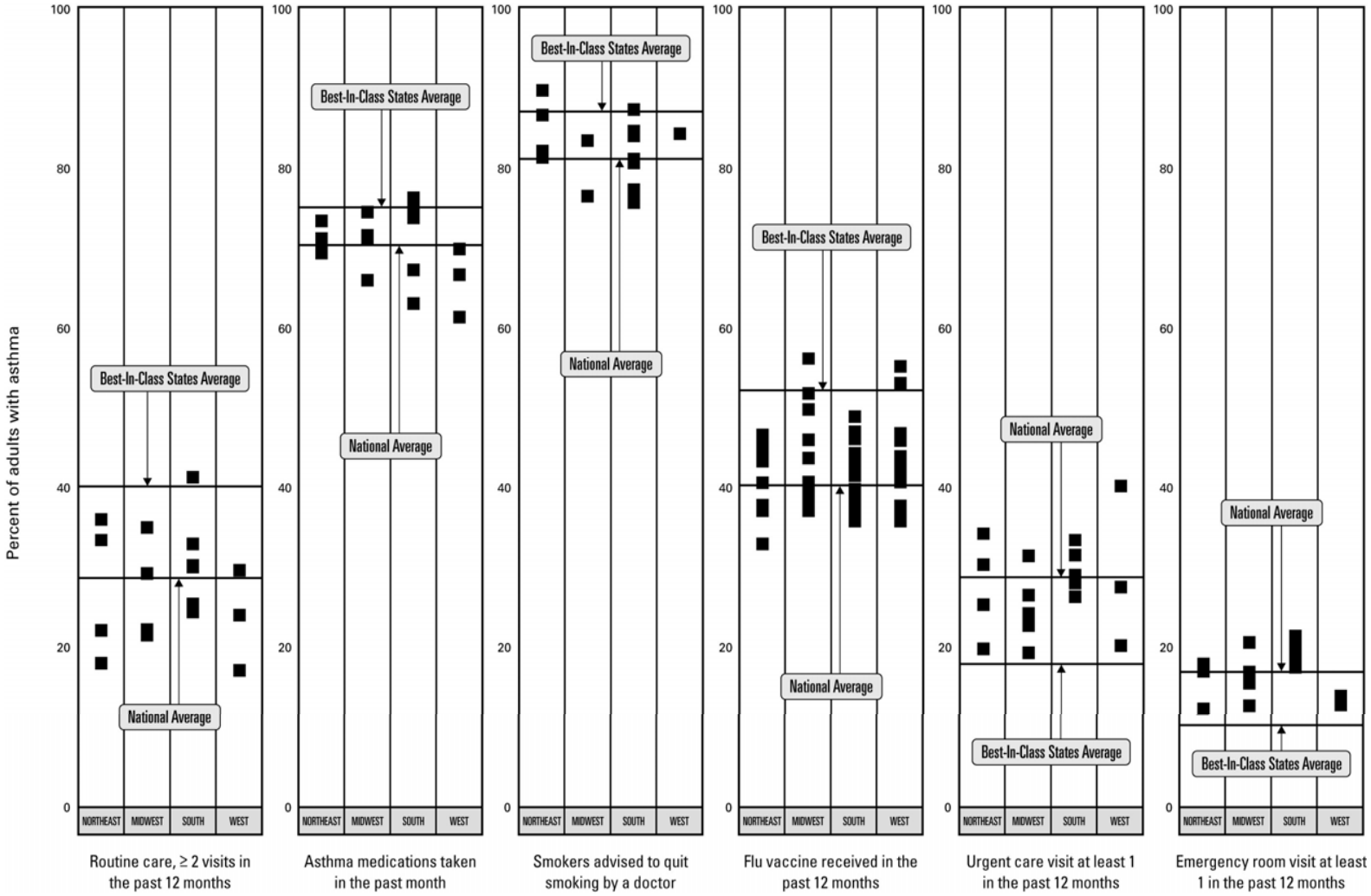
For this *Resource Guide,* benchmarks were calculated for asthma measures that were chosen based on availability of BRFSS data at the State level, current clinical guidelines, advice from an expert steering committee, and measures that will have a direct link to State budgets. They include:

- Process measures—services important for controlling asthma and preventing complications:
  - Routine checkups for patients with asthma (two or more planned doctor visits in the past 12 months).
  - Medications (use of medication to control asthma).
  - Advice to quit smoking (for asthma patients who smoke).
  - Flu shots (recommended for patients with asthma).
- Outcome measures—avoidable health care use:
  - Urgent care visits for asthma.
  - Emergency room visits for asthma.

Table 4.2 includes benchmarks—the national and best-in-class averages—for these measures. Figure 4.1 shows regional variations and the extent of the spread between States for each measure. The State analyses which follow illustrate four of these measures in more detail.

BRFSS has limitations for establishing benchmarks for State performance, including limited questions on asthma and other technical issues. These are discussed further in Appendix E.

Figure 4.1. Six quality measures for asthma: national average, best-in-class average, and State variation, by region, 2003



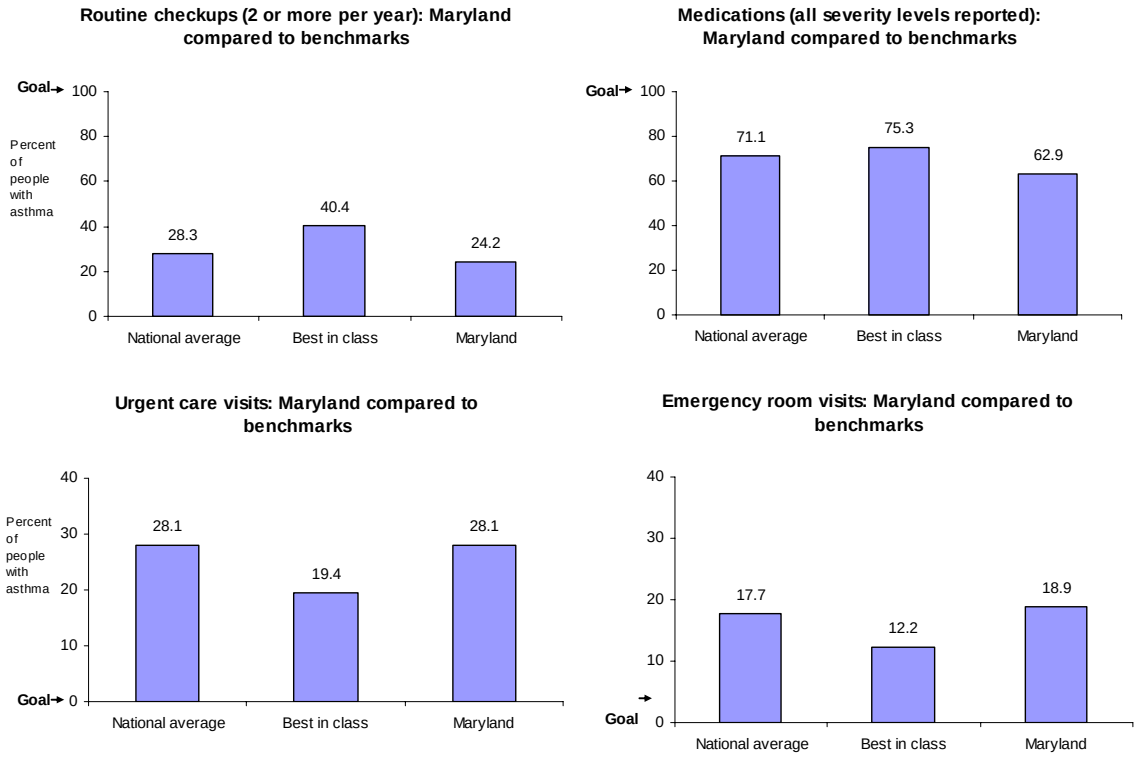
Source: Calculated from BRFSS data, 2003; see Appendix Table E.1. For State estimates for adults by age group, see Appendix E as follows: urgent care visit, Table E.5; emergency room visit, Table E.6; routine care, Table E.10; medications, Table E.12; smoking cessation counseling, Table E.15; flu shot, Table E.16.

Studying Individual States Against Benchmarks

This section compares four States, as examples, to the key benchmarks for the asthma measures. The four States were chosen because they show variation across the measures in how States rank against the benchmarks. In Figures 4.2-4.5, States are compared to a national average and a best-in-class State average for each measure.

Though the theoretic limit may be difficult to achieve for many valid reasons, some States have already achieved the best-in-class estimate. Although the average over all States is often used to assess a State's performance, aiming for it means the State aims to be average rather than the best. Also, in some cases, a quality improvement team may set goals higher than the best-performing States because they may view all States as poor performers.

Figure 4.2. Percent of adults with asthma with routine checkups, medications, urgent care visits, and emergency room visits, 2003: Maryland compared to benchmarks



Source: Calculated from BRFSS 2003 data.

Maryland. Figure 4.2 reveals the following about asthma care in Maryland compared with national benchmarks and based on statistical tests. The marked "goal" on the vertical axis indicates the direction of improvement rather than an achievable value.

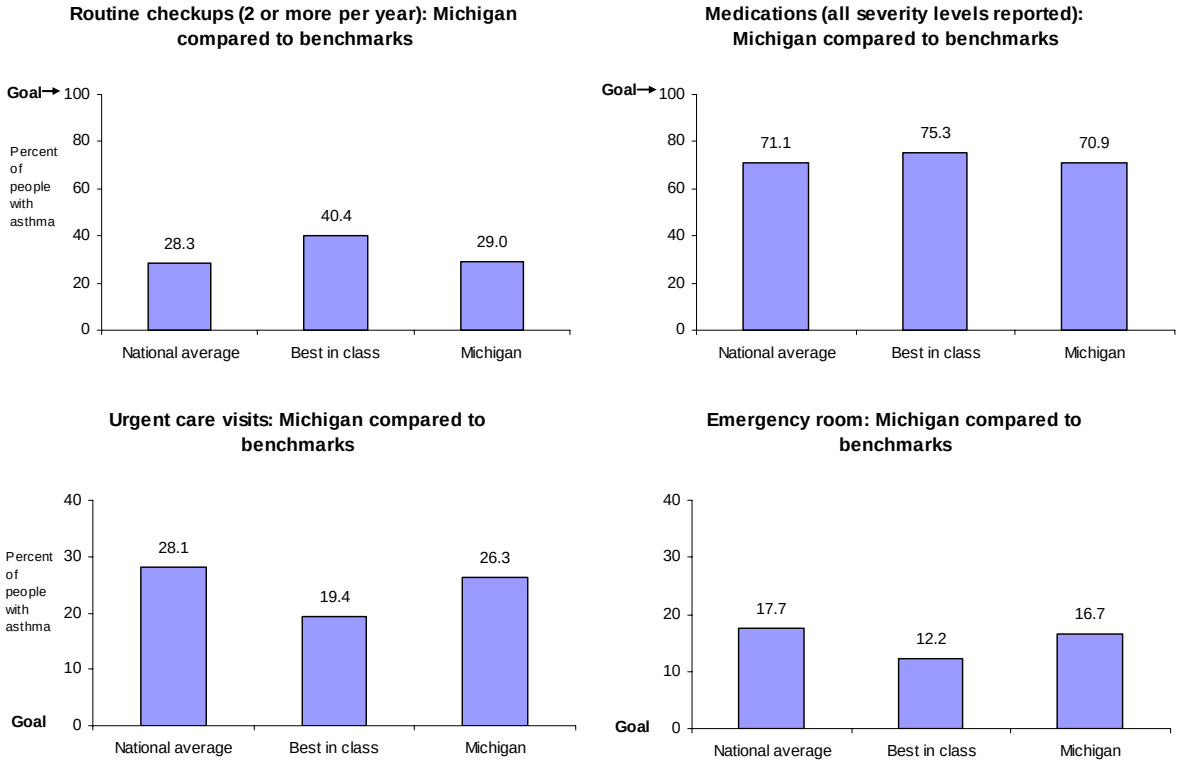
- Maryland is close to the national average benchmark on two measures of asthma care quality—routine checkups and urgent care visits. Maryland has room for improvement on these dimensions to become a best-performing State.
- Maryland is below the national average for percentage of asthma patients who take medications for asthma. Given the importance of medication use to control asthma

symptoms and prevent asthma attacks and their position on this measure, Maryland may want to investigate asthma drug therapy within the State, determine the locales or subpopulations for which such therapy is lacking, and develop a targeted program to improve the use of prescription drugs in the State for residents with asthma.

- Maryland appears to be statistically no different from the national average and the best-in-class average for emergency room visits. Small samples interfere with the ability of the data to distinguish between average and best-in-class in this case. Because of the weakness of this test and because the percent of people with emergency visits is higher in Maryland than nationally, Maryland might want to determine this rate more precisely. Maryland statewide hospital emergency department data system may want to address this issue.

Maryland can improve the treatment of asthma in the community and reduce the number of expensive emergency services in the State. Also Maryland has an opportunity to reduce its hospitalizations of patients with asthma for all age groups (see Table 1.2).

Figure 4.3. Percent of adults with asthma with routine checkups, medications, urgent care visits, and emergency room visits, 2003: Michigan compared to benchmarks



Source: Calculated from BRFSS 2003 data.

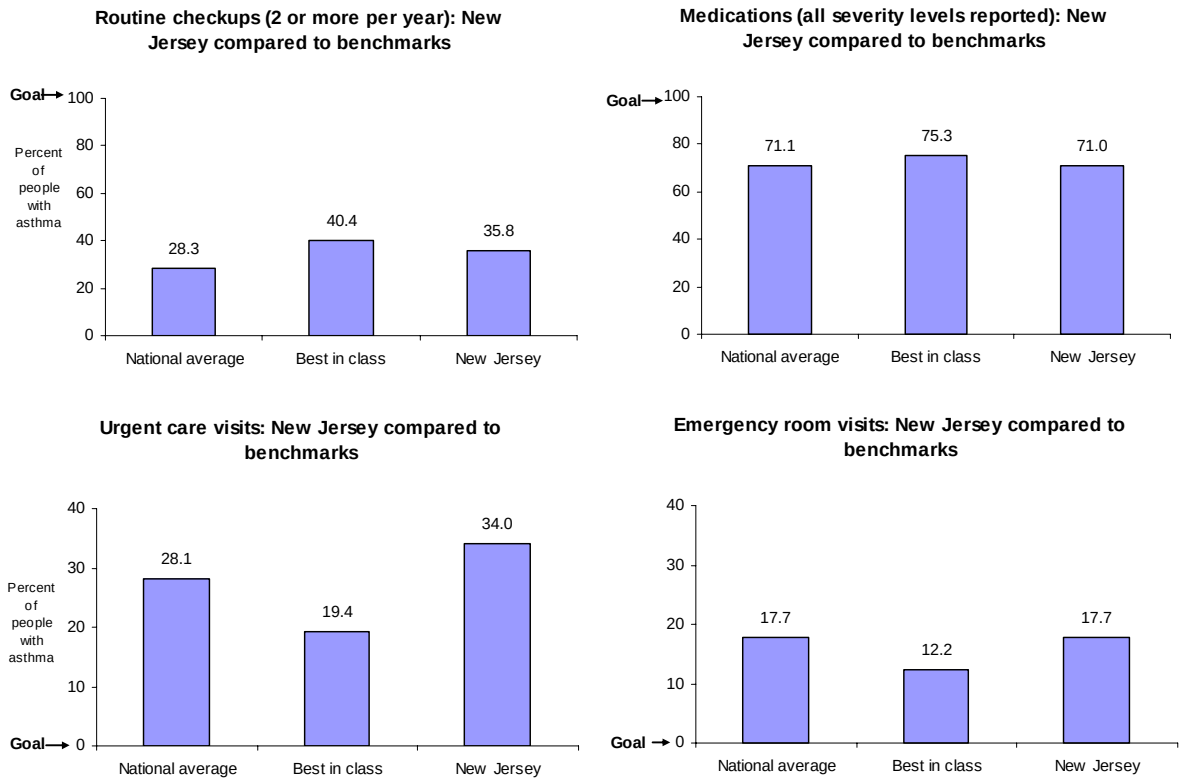
Michigan. Figure 4.3 reveals that:

- Michigan is at the national average benchmark for two measures—routine checkups and urgent care visits. Thus, Michigan has room for improvement on these dimensions to become a best-performing State.

- Michigan appears to be statistically no different from the national and best-in-class averages for the other two measures—use of asthma medications and emergency room visits. Small samples impede a robust test between average and best-in-class for these important measures, which points out the need for better assessment methods. Larger samples for BRFSS may be a relatively inexpensive solution for better statistics.
- Michigan was not among the below-average States for any of these four asthma measures. This suggests that Michigan's efforts toward disease prevention and control may have contributed to this positive result. Michigan also is helped by its average sociodemographic characteristics, especially an average poverty rate.

Thus, Michigan may want to improve its strategy for measuring asthma care quality and currently could justify focusing attention on improving the frequency of checkups for people with asthma in order to become a best-performing State. If that strategy is done well, it could reduce the cost of expensive urgent/emergency care. Also, by improving outpatient care Michigan has the opportunity to in turn reduce costly hospitalizations related to asthma (see Table 1.2).

Figure 4.4. Percent of adults with asthma with routine checkups, medications, urgent care visits, and emergency room visits, 2003: New Jersey compared to benchmarks



Source: Calculated from BRFSS 2003 data.

New Jersey. Figure 4.4 shows that:

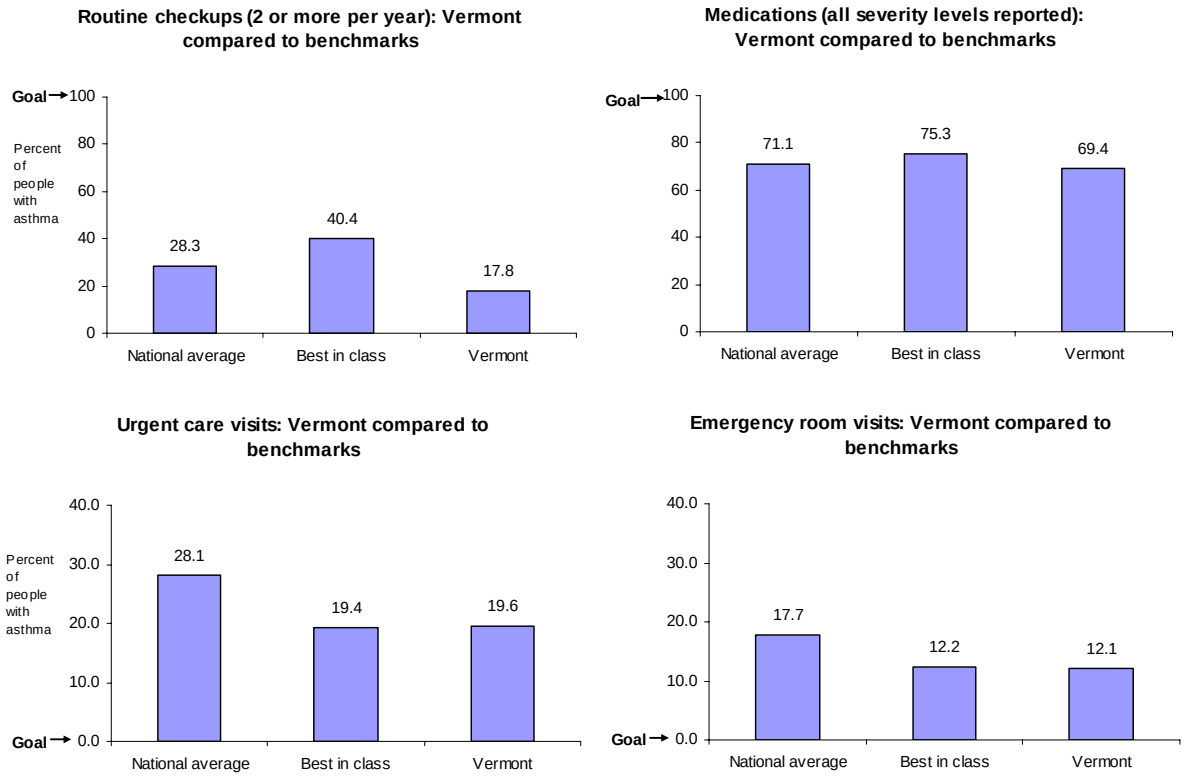
- New Jersey is among the best-in-class States for routine checkups for people with asthma. Although this is excellent performance among all States, the best performers only

reach the 40-percent mark for the percent of people with asthma who have planned care visits two or more times per year. Thus, New Jersey may want to aim for higher checkup rates for its population with asthma.

- New Jersey's estimate for asthma medication use is statistically no different from the national average or best-in-class average. Again, the small samples blur the ability to make the distinction, but the value of the estimate is closer to the all-States average than the best-in-class States estimate. Another factor with this measure is that the spread of the values across the States is very narrow, suggesting that medication use in asthma care is relatively uniform across the States.
- New Jersey is worse than or at the national average on the use of urgent and emergency care, respectively.

Despite New Jersey's excellent performance on checkups and reasonable performance on medication therapy, its poorer performance on use of expensive urgent care services raises a question. How effective are community-based checkups for people with asthma if they use a high level of urgent care services? New Jersey may want to explore the nature of checkups for people with asthma and determine whether health care providers are using the best asthma management practices (see Module 1) with their patients.

Figure 4.5. Percent of adults with asthma with routine checkups, medications, urgent care visits, and emergency room visits, 2003: Vermont compared to benchmarks



Source: Calculated from BRFSS 2003 data.

Vermont. Figure 4.5 shows that:

- Vermont is among the poorest-performing-States for routine checkups for people with asthma.
- Vermont appears to be statistically no different than the national average and best-in-class average for use of asthma medications. Again this distinction cannot be made definitely due to small sample size.
- Vermont is among the best-in-class States for the two outcome measures related to expensive emergency medical care. Vermont has low rates of urgent care visits and emergency department visits for asthma.

This result—reasonable outcomes for emergency services use, but poor processes for checkups and medication, which appear to be inconsistent with each other—suggests that these measures by themselves are not the strongest determinants of patient outcomes and that other underlying factors are at work. The next section discusses some of the external factors that can affect the quality of care in communities.

Factors That Affect Quality of Asthma Care

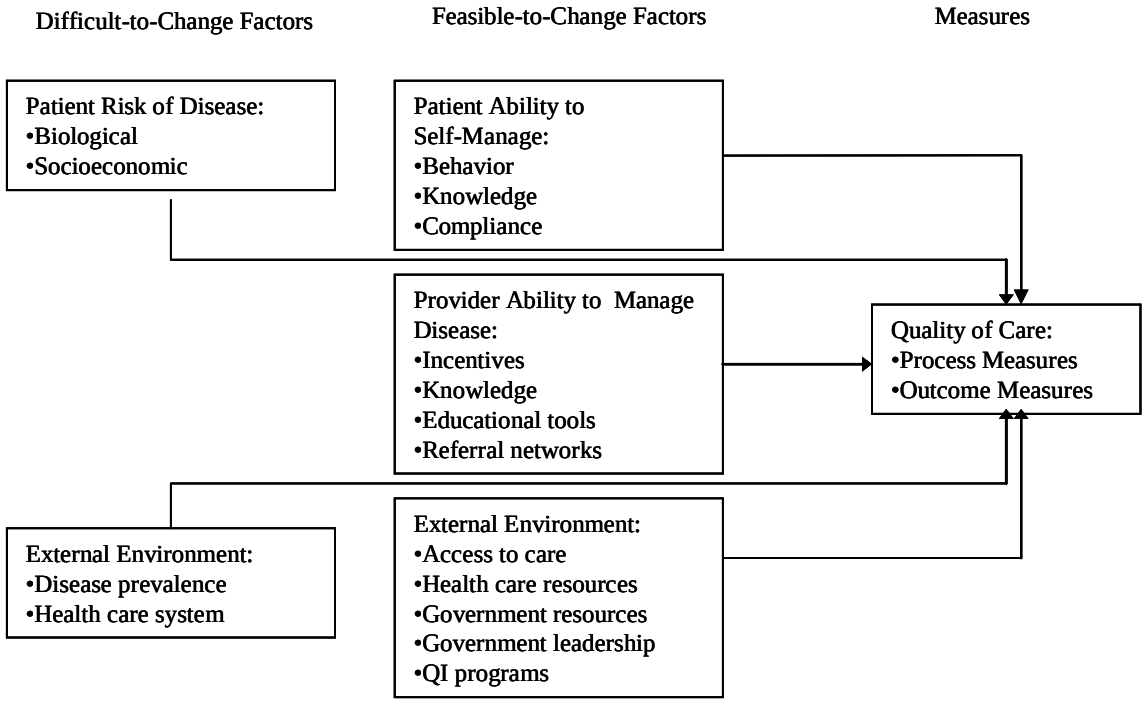
The State data presented above raise several questions for anyone involved in quality improvement. What does a State's position on the continuum of quality measures mean? What factors influence that position and the variability among the States? What factors can be influenced through State policy change and local efforts?

A number of factors influence quality and outcomes of health care for any disease, as Figure 4.6 shows. Some factors may be difficult to change, such as biologically inherited traits; income, education, and social status; and general population characteristics. Others may be changeable in the medium or long term, but not in the short term, such as the supply of health care professionals, the makeup and mission of health care organizations, and the disease prevalence of the population (which represents ingrained patterns of personal behaviors and health system effectiveness). All of these factors influence the process and outcome of health care.

Although State government and community leaders do not have control over all factors, State actions can influence some important factors to promote positive change. These include educating people with asthma about the risks of uncontrolled asthma, raising awareness among professionals about health care processes that can improve outcomes for people with asthma, raising awareness in schools and communities about mitigating risk factors that can trigger asthma attacks, and creating financial incentives to encourage providers to manage diseases with their patients. Some States, for example, target programs to affect patient self-management and other external causes toward minority populations that are disproportionately affected by asthma.

To better understand what influences a State's position and how it compares with other States, some of the factors presented in Figure 4.6 are discussed in more detail below.

Figure 4.6. Factors that affect disease process and outcome measures



Racial, Ethnic, and Socioeconomic Factors

The socioeconomic makeup of a State will likely play a role in how it compares to national norms on process and outcome measures. States with a higher proportion of individuals living in poverty, lower average education, and a more diverse racial and ethnic population, for instance, will likely find poorer outcomes for their population compared to the national population (IOM, 2003).

The NHDR (AHRQ, 2003a; 2004a) summarizes the racial, ethnic, and socioeconomic differences in asthma across the Nation (but not by State). Nationwide, minority or lower socioeconomic status is associated with higher asthma prevalence, higher asthma death rates, higher rates of serious asthma complications, and poorer asthma outcomes. (Blacks, for example, are much more likely than Whites to be hospitalized for asthma; see Table 4.3).

The socioeconomic makeup of a State, thus, should play a role in the strategies that the State uses to improve asthma care quality. For instance, States that target efforts to improve asthma care at population groups particularly at risk for asthma complications should also be able to improve their overall performance on asthma care quality.

Table 4.3. Asthma hospitalizations by race/ethnicity and community income, United States, 2001

Race/ethnicity & Income[1]	Pediatric admissions per 100,000 population less than 18 years PQI 4 Estimate	Standard error	P-value	Adult admissions per 100,000 population age 18 and over PQI 15 Estimate	Standard error	P-value	Adult admissions per 100,000 population age 65 and over PQI 15 Estimate	Standard error	P-value
All Income									
Total	197.213	13.937		113.221	3.384		164.407	5.254	
White Non Hispanic	138.531	8.417		86.794	2.234		134.421	4.770	
Black Non Hispanic	450.500	52.994	0.000	289.492	22.208	0.000	350.680	30.096	0.000
Hispanic	187.549	23.640	0.051	131.084	14.294	0.002	269.780	31.601	0.000
Asian and Pacific Islander	82.070	11.078	0.000	81.168	11.327	0.626	265.633	41.565	0.002
Other	479.712	54.078	0.000	287.163	29.021	0.000	570.597	61.084	0.000
Less than $25,000									
Total	320.780	61.432		247.247	34.825		259.808	32.743	
White Non Hispanic	168.288	18.127		140.991	11.653		155.496	18.086	
Black Non Hispanic	491.382	96.659	0.001	471.882	86.934	0.000	471.283	90.216	0.001
Hispanic	295.895	115.834	0.276	213.124	70.749	0.314	360.829	94.130	0.032
Asian and Pacific Islander	32.194	14.549	0.000	70.704	26.821	0.016	169.517	91.263	0.88
Other	222.329	54.795	0.349	240.679	62.787	0.119	369.948	114.972	0.065
$25,000-$34,999									
Total	263.164	21.849		149.112	6.753		194.038	9.592	
White Non Hispanic	180.069	11.659		115.857	4.911		161.635	9.042	
Black Non Hispanic	535.166	72.011	0.000	318.593	28.612	0.000	350.476	35.187	0.000
Hispanic	222.134	33.903	0.241	156.160	23.101	0.088	336.245	60.625	0.004
Asian and Pacific Islander	72.055	12.197	0.000	65.869	12.952	0.000	206.572	50.218	0.378
Other	353.319	58.711	0.004	219.008	30.510	0.001	428.836	81.411	0.001
$35,000-$44,999									
Total	190.585	15.653		110.463	4.773		155.947	7.552	
White Non Hispanic	138.866	10.679		87.823	3.895		128.315	6.663	
Black Non Hispanic	433.132	61.370	0.000	263.376	23.811	0.000	331.170	36.243	0.000
Hispanic	157.770	21.546	0.432	116.240	14.537	0.059	253.628	34.592	0.000
Asian and Pacific Islander	59.070	11.869	0.000	81.666	18.631	0.746	290.330	65.565	0.014
Other	529.759	71.266	0.000	298.926	50.589	0.000	693.164	134.304	0.000
$45,000 or more									
Total	152.433	13.900		85.672	3.920		158.891	8.595	
White Non Hispanic	120.982	10.700		72.609	3.354		136.513	7.994	
Black Non Hispanic	359.443	45.173	0.000	208.308	20.511	0.000	330.666	43.173	0.000
Hispanic	158.914	25.643	0.172	107.003	11.603	0.004	248.074	31.343	0.001
Asian and Pacific Islander	92.105	15.234	0.121	84.922	14.822	0.418	321.229	63.161	0.004
Other	818.261	128.185	0.000	370.707	40.786	0.000	869.244	119.059	0.000

[1] Median household income is based on ZIP Code data obtained from Claritas linked to patient ZIP Code in the HCUP database.
P values to test race category compared to white category.
Denominators were obtained from ZIP-Code-level population counts by age, gender, race, and ethnicity based on U.S. censuses for 2000 and 1990 and Claritas methods to deal with race/ethnicity coding changes between those years.
Source: Agency for Healthcare Research and Quality, Healthcare Cost and Utilization Project, State Inpatient Databases, disparities analysis file, 2001. This file is designed to provide national estimates on disparities using weighted records from a sample of hospitals from the following 22 states: AZ, CA, CO, CT, FL, GA, HI, KS, MD, MA, MI, MO, NJ, NY, PA, RI, SC, TN, TX, VA, VT, and WI.

Biological and Behavioral Factors

Understanding biological and behavioral influences on asthma should help in developing assessment tools and interventions for preventing or reducing the burden of asthma. Risk factors for asthma include (King et al., 2004):

- Parental history of asthma.
- Early-life stressors and infections.
- Obesity.
- Exposure to indoor allergens, tobacco smoke, and outdoor pollutants.
- Work-related exposures.

Socioeconomic factors may be related to underlying biological factors or behavioral factors. The accumulated stress of poverty, low levels of control in jobs and relationships, low job and life satisfaction, and societal discrimination against minority groups can influence health status (Williams, 1999).

Physical Environment

The physical environment in which asthma patients live is an important contributor to their asthma severity. The presence of poor air quality, dust, pets, cockroaches, and other allergens can affect how well a patient is able to control his or her asthma. A recent study released by the National Institutes of Health shows the connection between decayed bacteria in bedrooms and other rooms of a house and asthma prevalence (Thorne et al., 2005).

External Environment

In addition to individual characteristics (some of which are amenable to change with personal motivation), each State has a different infrastructure and different environmental factors over which policymakers may or may not have control. These factors include the collective health status of the population, the distribution of health care services within locales, the distribution of wealth and tax resources among communities, and government programs and leadership.

State leaders will face different health care system challenges, including:

- **Health system infrastructure—**Availability of health professionals, emergency rooms, and hospitals beds.
- **Uninsured populations—**Presence of vulnerable and uninsured populations and the need for special State programs to cover the cost of health care for them.
- **Safety net infrastructure—**Availability of a safety net of health care providers as a last resort for those who cannot afford health insurance and private health care.
- **Provider knowledge—**Providers who have sufficient state-of-the-art knowledge to manage asthma effectively and to educate their patients in asthma self-management.

- **Public education—**Public education programs that raise patient awareness of the warning signs of the disease, its potential complications, the importance of diet and exercise, and the effectiveness of personal self-management, including knowing when to consult a doctor.
- **Government resources**—Funds, in a time of tight State budgets, to stimulate quality improvement activities related to asthma care.
- **Leaders to champion quality improvement—**Leaders who can draw attention to the problems associated with asthma and harness the commitment of health professionals to change practices and monitor results.
- **Knowledge of what to do—**Identification of effective quality improvement programs that are based on scientific evidence.
- **Adequate data systems to assess progress—**Availability of data systems that can provide comparable measures across providers, communities, and States.

The inter-relationship among all of the factors in Figure 4.6, then, affects how a State compares with other States on measures of asthma care quality.

It is difficult to measure all of these factors at the State level. An attempt was made to analyze the BRFSS measures in Table 4.2 against individual State-level environmental factors—prevalence of asthma, emphysema and chronic bronchitis in the population, the percent of the population below poverty level, racial/ethnic makeup of the population, the HMO penetration rate, the supply of hospital beds, and air quality in the State. The findings were not consistent enough across measures and factors to be believable. Again, the small sample sizes and imprecision of the asthma estimates themselves may be the limiting factor. Moreover, survey averages (e.g., percent having planned care visits) related to State aggregates from other sources (e.g., percent of the population that is uninsured) do not provide a direct test of these relationships.

With large databases, it is possible to assess asthma care quality at not only the State but also local levels for some measures. For example, HCUP data and the statewide discharge data systems that are the source of HCUP data (with its hundreds of thousands of discharge records per State per year) support analyses at the county or other market areas. County-level data related to health care resources are generally available, although county data on health risk behaviors of the population generally are not. State analysts could use their county-level databases to compare asthma outcome measures based on HCUP data—e.g., asthma hospitalizations—or on data from their statewide data organization with other county characteristics. AHRQ's Prevention Quality Indicator software can be applied to a State's discharge data to produce county-level statistics.

Summary and Synthesis

Local leaders and health care professionals must see their own data in comparison with other provider data and with State, regional, and national benchmarks in order to appreciate the importance of their work. Assessing State quality of care for asthma begins with identifying quality measures. These fall into two main groups: *process measures*, which reflect the quality of care delivered, and *outcome* measures, which reflect patient health status. The former are needed to guide health care providers on how to change, the latter are needed to know whether

the changed processes have had the intended effect. Data (whether State, county, municipal, or individual health care provider data) are essential for quality improvement programs to have an impact locally. Ideally, improvements in particular processes yield improvements in the associated outcomes.

The NHQR provides a starting point for accessing consensus-based measures. The NHQR provides estimates for asthma hospitalizations by State. In addition, BRFSS estimates are used to assess asthma care quality by State. Although consensus on a few key measures of asthma care quality has not yet evolved, this *Resource Guide* provides an inventory of some measures.

Data are essential to improve quality. States need performance data on asthma care to gauge their own performance against national benchmarks and to focus quality improvement efforts by identifying potential problem areas. This *Resource Guide* provides a list of national, State, and local sources for estimates for asthma, asthma care, and other related information.

This module also shows how data can be analyzed and interpreted to answer the global question: How does my State compare with other States and national benchmarks on health care quality for asthma? State-level baseline estimates across all conditions studied in the NHQR afford State leaders a broad view of health care quality in their State. More refined questions about areas within the State will require local data and analysis.

Resources for Further Reading

Data and Data Tools on the Internet

Many data resources are available on the Internet, including many sources used in the NHQR and NHDR. Some Web sites allow users to manipulate the data to produce tables and other useful outputs. Such resources include:

- **HCUPnet**
  http://www.ahrq.gov/data/hcup/hcupnet.htm
  HCUPnet allows users to select national statistics, or detailed statistics for certain States, for various conditions and procedures. The interactive program also allows users to compare types of patients and types of hospitals. These statistics are based on data received from Statewide hospital discharge data programs for inclusion in HCUP.

- **HCUP User Support (HCUP-US)**
  http://www.hcup-us.ahrq.gov/home.jsp
  This Web site is designed to answer HCUP-related questions; provide detailed information on HCUP databases, tools, and products; and offer assistance to HCUP users.

- **AHRQ Quality Indicators**
  http://www.qualityindicators.ahrq.gov/
  The AHRQ Quality Indicators are measures of health care quality that make use of readily available hospital inpatient administrative data. Asthma measures can be found in the Prevention Quality Indicators module.

- **MEPSnet**
  http://www.meps.ahrq.gov/MEPSNet/IC/MEPSnetIC.asp
  This Web site offers users statistics and trends about health care expenditures, utilization, and health insurance, including national and regional health insurance estimates.

- **BRFSS – Annual Survey**
  http://www.cdc.gov/brfss/technical_infodata/index.htm
  This Web site has detailed technical information about the survey in addition to downloadable data sets in ASCII and SAS formats.

- **BRFSS**
  http://www.cdc.gov/brfss/
  This Web site provides useful background information about the BRFSS implementation, technical information, and documentation.

- **CDC Faststats – Asthma**
  http://www.cdc.gov/nchs/fastats/asthma.htm
  The Faststats Web site provides easy access to statistics on topics of public health importance. The asthma page has a general overview of asthma statistics and links to specific data sources for more information on national data for asthma.

Asthma Registries

Some additional Web sites offer links to useful tools and information to facilitate data collection at the local level. Two Web sites that offer instruction for implementing asthma registries to track the treatments given to people with asthma are:

- http://www.healthdisparities.net/training_manuals_and_tools.html
  This Web site, associated with the HRSA Health Disparities Collaboratives, offers a number of useful tools, including helpful information for creating and assessing computer registries.

- http://www.improvingchroniccare.org/improvement/docs/ICIC_Registry_Comparison_October02.xls
  This Web site offers a comparison of asthma registries.

Other Useful Web Sites

Agency for Healthcare Research and Quality — http://www.ahrq.gov/

National Asthma Control Program —http://www.cdc.gov/asthma/NACP.htm

National Committee for Quality Assurance — http://www.ncqa.org/index.asp

National Asthma Quality Improvement Alliance — http://www.nationalasthmaalliance.org/

National Quality Forum — http://www.qualityforum.org/

National Guideline Clearinghouse — http://www.guidelines.gov/

National Asthma Education and Prevention Program— http://www.nhlbi.nih.gov/about/naepp/

Associated Appendixes for Use With This Module

Appendix D: Asthma Measures

Appendix D is an inventory of available national (Table D.1) and local (Table D.2) asthma measures and sources. Measures are categorized by topics related to asthma care.

Appendix E: BRFSS Measures, Data, and Benchmarks

Appendix E provides the results of significance tests for BRFSS State estimates compared to the national average of each measure and compared to the best-in-class estimates for each measure. P-values less than 0.05 are considered statistically significant. State estimates that have p-value less than 0.05 are statistically different from the comparison estimate (national average or best-in-class). State estimates that have p-value greater than 0.05 are not statistically different from the comparison estimate.

Appendix F: Other Data Sources

Appendix F summarizes data sources used in this *Resource Guide* other than BRFSS data. This appendix includes descriptions and tables, where available, of national data sources (HCUP, HEDIS®, MEPS, and NHDS) and local data sources available from some States.

Appendix G: Benchmarks From the NHQR

Appendix G provides additional detail on benchmarks that can be derived from the NHQR and explains how they were developed and defined for this *Resource Guide*. This appendix discusses the best benchmarks for stimulating quality improvement, emphasizing that methods used to generate the benchmarks must be understood to ensure they are compatible with a State's estimates.

Appendix H: Information on Statistical Significance

Appendix H shows how to compare State estimates to benchmarks using statistical significance and p-values that take into account the expected random variation in estimates. This appendix also shows how to calculate p-values when estimates and standard errors are provided.

Module 5: Moving Ahead – Implications for State Action

This module draws implications for States to move forward with their own asthma care quality improvement initiatives. States need to go beyond generic resources and tailor efforts to their individual needs; specifically, they need to gather more localized data and involve key partners.

Asthma is a chronic condition that presents a compelling case for quality improvement:

- Asthma is becoming more prevalent. Estimates show that the number of Americans with asthma nearly doubled between 1980 and 1996. In 2001, more than 30 million Americans reported suffering from asthma at some time in their lives.
- Substantial disparities exist in diagnoses and quality of asthma care. Data from the NHQR and NHDR show wide variations in quality for asthma across States and also across different socioeconomic, racial, and ethnic groups.
- Asthma cannot be cured but is highly treatable. It can be controlled and managed through a range of interventions and treatments that prevent attacks and allow people with asthma to function normally. Often the disease can be self managed, allowing people with asthma to avoid costly hospitalizations or procedures.
- Asthma is costly to treat. Families with an asthmatic child reported spending nearly three times as much annually on health care as families with a non-asthmatic child. In 2001, asthma's total estimated cost for the total burden of the illness (including health care services and other lost abilities) was about $14 billion.

Thus, there is potential for a substantial return on investment for purchasers and the health care system as a whole through asthma quality improvement.

Essential Elements in State-Led Quality Improvement

This *Resource Guide* offers a model for States to undertake a systematic effort to improve the quality of asthma care within their jurisdictions. State leaders can contribute essential elements to the process of asthma care quality improvement. These elements include the following

- **Providing leadership and vision.** Quality improvement requires leadership. Whether initiatives are developing locally, statewide or nationally, effective leadership is essential to quality improvement. It will not emerge without a champion who can provide leadership to help organizations and individuals develop a shared vision and common goals for health care quality. Leadership must be a catalyst for others to become involved in developing shared vision and goals for improving health care quality.

- **Forming partnerships and collaborations.** In addition to leadership and vision, partnerships and collaborations are vital to improving quality. Health care quality is the product of many different parts of the health care system but ultimately must affect what happens in the community, the patient environment, and the clinical setting. Thus, all groups that affect patient care should participate in quality improvement efforts. Health care

professionals and providers need to establish systems that deliver appropriate, quality care consistently; patients need to demand and participate in the best available care; and purchasers must demand and pay for the highest quality, most cost-effective delivery of care. Consumer groups with interest in asthma can be powerful allies for change and a source of expertise. State health department staff and other asthma care experts from private-sector organizations can provide support and expertise for State initiatives.

- **Initiating measurement and reporting.** A key step for State action is measuring quality. This step involves defining quality standards, identifying measures of those standards, finding available benchmarks, locating data that pertain to the State, perhaps collecting new data, and using data to track how well the health care system is performing and how well pilot interventions are working. Benchmarks and comparison data provide a mechanism for assessing how well the State is doing and how well any given health plan or provider is doing in a selected area of care.

  In order to improve, the health care system must have data robust enough to estimate a given set of measures of health care quality. As part of a systematic improvement initiative, States will need to go beyond generic resources and develop a comprehensive, State-specific picture of asthma care. Doing so will enable States to identify specific quality problems in their own communities and tailor specific solutions. Results then must be made available to enable purchasers and consumers to make meaningful decisions based on the performance of various providers.

- **Assisting planning and goal setting.** State quality improvement initiatives should involve development of an action plan with specific goals for quality improvement in the State. The action plan must include timelines for specific steps and deliverables to help ensure that all partners move together. The plan should include specific responsibilities and benefits for as many project partners as possible to ensure commitment and continued involvement.

- **Assuring evaluation and accountability.** After establishing partnerships with committed leaders and a common vision and goals, developing measures, collecting and analyzing data, and setting goals, there also is a need for evaluation of both health system performance and accountability for health care quality. Evaluation allows partners to identify the most troublesome areas and devote resources and attention to those areas where improvement is needed. Evaluation also enables recognition of areas where there is solid performance or conduct improvement over time. It may require some technical input and expertise, but it is an important component of the quality improvement process. Without evaluation, impact of the program will be unknown and future direction for the program will be haphazard.

- **Creating incentives.** Although reporting data on performance is often enough to spur low performers toward improvement, tying rewards to high performance is also needed. The American health care system typically pays providers for the level, not the quality, of services delivered. However, States—as large health care purchasers—are in a position to offer financial incentives for providers to deliver quality care. For example, State programs can include bonuses and rewards for physicians who follow evidence-based guidelines in delivering asthma care.

- **Spreading the change statewide.** It is important for States to develop and implement ways to spread quality improvement in asthma statewide. This involves planning an effective tracking system, collecting and analyzing data, and drawing conclusions. State leaders must differentiate between sound conclusions and inconclusive findings and use this information to further the asthma quality improvement effort and to address other health care issues.

States Have a Way Forward—A Final Note

This *Resource Guide* has attempted to demonstrate for State leaders the need for quality improvement in asthma. Much has been done, but data from the NHQR show that much remains to be done to achieve quality care for all people with asthma.

By reviewing and analyzing the information in this *Resource Guide*, assessing the local context, and designing an asthma quality improvement strategy, State leaders can identify opportunities to make a difference in the quality of care their constituents receive. The experiences of States that have implemented quality improvement for asthma care provide valuable insights into what can be accomplished through innovative, visionary efforts by State leaders.

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Appendix A: Acronyms Used in This Resource Guide

AHRQ = Agency for Healthcare Research and Quality

ALA = American Lung Association

AMA-PCPI = American Medical Association Physicians Consortium for Performance Improvement

BRFSS = Behavioral Risk Factor Surveillance System

CASI = Chicago Asthma Surveillance Initiative

CDC = Centers for Disease Control and Prevention

CMS = Centers for Medicare and Medicaid Services

ED = Emergency department

EPA = Environmental Protection Agency

HHS = U.S. Department of Health and Human Services

HCUP = Healthcare Cost and Utilization Project

HEDIS® = Health Plan Employer Data and Information Set

HRSA = Health Resources and Services Administration

IOM = Institute of Medicine

JCAHO = Joint Commission on Accreditation of Healthcare Organizations

JCAHO-APMIG = Joint Commission on Accreditation of Healthcare Organizations, Asthma Performance Measurement Implementation Guide

MEPS = Medical Expenditure Panel Survey

MQIC = Michigan Quality Improvement Initiative Guideline

NACP = National Asthma Control Program

NAEPP = National Asthma Education and Prevention Program

NAS = National Asthma Survey

NICHQ = National Initiative for Children's Healthcare Quality

NCHS = National Center for Health Statistics

NCQA = National Committee for Quality Assurance

NHDR = National Healthcare Disparities Report

NHIS = National Health Interview Survey

NHLBI = National Heart, Lung, and Blood Institute

NHQR = National Healthcare Quality Report

NIH = National Institutes of Health

NQF = National Quality Forum

NYCCAI = New York City Childhood Asthma Initiative

PDSA = Plan-Do-Study-Act

SAMHSA = Substance Abuse and Mental Health Services Administration

SCHIP = State Children's Health Insurance Program

VHOP = Virginia Health Outcomes Partnership

YRBSS = Youth Risk Behavior Surveillance System

Appendix B: Medicaid Spending on Asthma by State

Table B.1. Medicaid: White eligibles by State and age group and estimated spending, 2003

State	White Medicaid eligibles 2003[1]	White Medicaid eligibles 0-18 with asthma[1, 2]	White Mediciad eligibles 19-64 with asthma[1, 2]	White Medicaid eligibles 65+ with asthma[1, 2]	Estimated Medicaid spending on asthma for White eligibles[3]
Total US	22,701,341	905,503	628,876	144,054	$1,773,516,649
Alabama	52,494	2,694	1,102	182	4,203,511
Alaska	390,559	15,584	9,909	3,284	30,407,709
Arizona	382,262	16,916	9,224	2,362	30,115,828
Arkansas	389,480	15,732	12,152	1,273	30,807,735
California	2,158,045	68,237	79,403	11,297	167,939,872
Colorado	205,897	9,268	4,731	1,349	16,217,833
Connecticut	229,485	9,082	6,121	1,741	17,903,805
Delaware	64,562	2,431	2,076	292	5,071,376
District of Columbia	3,198	120	99	18	250,200
Florida	1,025,871	43,552	24,455	7,952	80,262,621
Georgia	601,570	29,499	12,418	3,285	47,763,132
Hawaii	41,581	1,563	1,269	246	3,252,530
Idaho	160,519	8,431	3,120	617	12,857,672
Illinois	845,443	35,852	18,839	7,665	65,888,417
Indiana	615,960	29,596	13,402	3,256	48,874,374
Iowa	263,902	10,992	6,763	1,819	20,682,943
Kansas	203,229	9,495	4,375	1,314	16,044,371
Kentucky	633,173	26,228	16,100	4,576	49,561,289
Louisiana	349,746	17,382	6,656	2,199	27,723,546
Maine	337,986	8,541	11,165	4,411	25,483,521
Maryland	256,981	11,751	6,125	1,366	20,332,490
Massachusetts	598,052	19,428	20,202	4,220	46,335,517
Michigan	872,297	39,047	21,817	4,423	68,986,122
Minnesota	417,376	16,366	11,079	3,324	32,511,398
Mississippi	244,342	11,068	5,144	1,935	19,175,111
Missouri	780,751	32,970	21,004	4,229	61,500,747
Montana	79,485	3,352	2,072	489	6,247,087
Nebraska	182,149	8,618	3,808	967	14,152,135
Nevada	115,861	4,956	2,969	701	9,115,153
New Hampshire	107,956	5,100	2,269	701	8,527,540
New Jersey	346,068	14,100	8,483	2,936	26,964,964
New Mexico	117,937	5,953	2,496	466	9,421,091
New York	1,262,842	39,950	40,713	8,845	94,579,159
North Carolina	613,633	25,674	15,088	4,667	48,001,670
North Dakota	54,556	2,029	1,525	454	4,234,852
Ohio	1,154,160	49,814	30,741	5,702	91,143,667
Oklahoma	425,416	21,923	7,705	2,397	33,839,063
Oregon	473,718	15,823	17,187	2,048	37,043,782
Pennsylvania	1,031,052	40,852	27,771	7,565	80,504,753
Rhode Island	93,912	3,584	2,710	643	7,330,424
South Carolina	362,941	15,791	9,435	1,888	28,649,907
South Dakota	69,319	3,397	1,363	436	5,490,238
Tennessee	1,132,878	37,946	39,367	6,241	88,287,686
Texas	863,652	42,286	16,132	6,155	68,231,736
Utah	165,232	7,983	3,964	539	13,192,476
Vermont	337,070	15,000	7,195	2,788	26,398,676
Virginia	93,460	3,240	2,868	744	7,240,497
Washington	716,287	32,393	18,331	3,047	56,817,714
West Virginia	338,437	14,172	9,197	1,847	26,644,736
Wisconsin	382,666	14,569	10,213	3,325	29,700,163
Wyoming	55,890	2,696	1,259	252	4,445,604

[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp were projected to 2003, using a rate of increase for Medicaid enrollment published in A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf.

[2] Calculations of prevalence rates based on national prevalence rates from the Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey 1999-2003 accessed at http://209.217.72.34/hdaa/ReportFolders/ReportFolders.aspx, applied to weighted average population estimates for each State from US Census for 2003 accessed at http://www.census.gov/popest/counties/CO-EST2005-01.html.

[3] Calculations of direct cost per person, are based on Weiss et al. (1994), inflated by medical care component of CPI to 2003 dollars. Indirect cost per person, are based on Weiss et al. (1994) inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, and 65+ years, while NHIS prevalence rates are 0-17, 18-64, and 65+ years.

Table B.2. Medicaid: Black eligibles by State and age group and estimated spending, 2003

State	Black Medicaid eligibles 2003[1]	Black Medicaid eligibles 0-18 with asthma[1, 2]	Black Medicaid eligibles 19-64 with asthma[1, 2]	Black Medicaid eligibles 65+ with asthma[1, 2]	Estimated Medicaid spending on asthma for Black eligibles[3]
Total US	12,404,969	776,656	367,509	81,385	$1,294,977,870
Alabama	6,338	511	142	23	713,818
Alaska	418,059	26,183	11,344	3,635	43,493,286
Arizona	196,087	13,620	5,060	1,253	21,061,666
Arkansas	62,707	3,976	2,092	212	6,635,453
California	952,618	47,279	37,484	5,156	95,013,418
Colorado	32,235	2,277	792	218	3,474,304
Connecticut	109,760	6,818	3,131	861	11,422,282
Delaware	63,970	3,781	2,200	299	6,636,004
District of Columbia	182,772	10,725	6,050	1,080	18,865,945
Florida	816,028	54,377	20,804	6,540	86,350,426
Georgia	743,095	57,196	16,405	4,195	82,203,158
Hawaii	3,003	177	98	18	310,194
Idaho	1,562	129	32	6	176,995
Illinois	787,269	52,402	18,761	7,380	82,991,693
Indiana	199,882	15,075	4,651	1,092	21,997,566
Iowa	28,273	1,848	775	201	2,984,812
Kansas	51,659	3,789	1,189	345	5,624,690
Kentucky	98,325	6,393	2,674	735	10,356,629
Louisiana	580,108	45,253	11,807	3,771	64,277,453
Maine	5,182	206	183	70	484,547
Maryland	401,392	28,810	10,231	2,207	43,584,276
Massachusetts	128,515	6,553	4,643	938	12,820,957
Michigan	525,261	36,906	14,050	2,754	56,751,877
Minnesota	106,521	6,556	3,024	877	11,049,201
Mississippi	428,730	30,483	9,653	3,510	46,118,170
Missouri	286,330	18,979	8,238	1,604	30,452,958
Montana	737	49	21	5	78,234
Nebraska	33,129	2,460	741	182	3,574,530
Nevada	38,034	2,554	1,042	238	4,051,209
New Hampshire	2,052	152	46	14	224,118
New Jersey	309,887	19,818	8,123	2,719	32,396,836
New Mexico	10,488	831	237	43	1,174,223
New York	907,734	45,073	31,297	6,574	87,642,841
North Carolina	575,275	37,779	15,127	4,523	60,682,486
North Dakota	1,381	81	41	12	141,323
Ohio	534,784	36,229	15,233	2,731	57,264,105
Oklahoma	113,018	9,142	2,189	658	12,668,399
Oregon	27,560	1,445	1,069	123	2,786,817
Pennsylvania	474,799	29,528	13,677	3,602	49,458,519
Rhode Island	18,177	1,089	561	129	1,879,295
South Carolina	485,752	33,173	13,504	2,613	52,081,919
South Dakota	2,369	182	50	15	261,510
Tennessee	475,787	25,015	17,681	2,710	47,978,362
Texas	612,626	47,082	12,238	4,514	67,449,808
Utah	4,863	369	125	16	538,825
Vermont	338,641	23,655	7,731	2,896	36,223,030
Virginia	1,033	56	34	9	104,229
Washington	69,439	4,929	1,900	305	7,539,128
West Virginia	18,761	1,233	545	106	1,990,949
Wisconsin	131,634	7,867	3,757	1,183	13,531,945
Wyoming	1,328	101	32	6	146,617

[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp were projected to 2003, using a rate of increase for Medicaid enrollment published in A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf.

[2] Calculations of prevalence rates based on national prevalence rates from the Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey 1999-2003 accessed at http://209.217.72.34/hdaa/ReportFolders/ReportFolders.aspx, applied to weighted average population estimates for each State from US Census for 2003 accessed at http://www.census.gov/popest/counties/CO-EST2005-01.html.

[3] Calculations of direct cost per person, are based on Weiss et al. (1994), inflated by medical care component of CPI to 2003 dollars. Indirect cost per person, are based on Weiss et al. (1994) inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, and 65+ years, while NHIS prevalence rates are 0-17, 18-64, and 65+ years.

Table B.3. Medicaid: American Indian/Alaska Native eligibles by State and age group and estimated spending, 2003

State	American Indian/ Alaska Native Medicaid eligibles 2003[1]	American Indian/Alaska Native Medicaid eligibles age 0-18 with asthma[1, 2]	American Indian/Alaska Native Medicaid eligibles age 19-64 with asthma[1, 2]	American Indian/Alaska Native Medicaid eligibles age 65+ with asthma[1, 2]	Estimated Medicaid spending on asthma for American Indian/Alaska Native eligibles[3]
Total US	751,396	296,410	26,019	--	$340,695,223
Alabama	44,832	148	1,177	--	1,399,399
Alaska	2,226	9,152	71	--	9,745,459
Arizona	4,892	4,527	148	--	4,939,895
Arkansas	138,602	1,709	5,405	--	7,517,339
California	43,745	23,966	2,012	--	27,449,563
Colorado	3,308	721	95	--	862,260
Connecticut	955	2,506	32	--	2,681,107
Delaware	291	1,675	12	--	1,782,261
District of Columbia	25	4,573	1	--	4,833,019
Florida	1,284	17,859	38	--	18,910,665
Georgia	1,095	16,266	28	--	17,217,454
Hawaii	474	75	18	--	97,816
Idaho	5,133	34	125	--	168,196
Illinois	3,790	16,087	106	--	17,109,339
Indiana	585	4,519	16	--	4,791,460
Iowa	1,893	653	61	--	753,621
Kansas	4,114	1,124	111	--	1,304,231
Kentucky	300	2,240	10	--	2,376,498
Louisiana	1,798	11,865	43	--	12,582,248
Maine	3,035	94	125	--	231,267
Maryland	1,297	9,460	39	--	10,036,644
Massachusetts	2,672	3,050	113	--	3,341,752
Michigan	7,857	12,717	246	--	13,696,808
Minnesota	27,795	2,397	922	--	3,507,774
Mississippi	2,930	8,841	77	--	9,423,814
Missouri	2,226	7,034	75	--	7,511,730
Montana	24,215	18	789	--	852,194
Nebraska	9,411	709	246	--	1,008,572
Nevada	3,396	902	109	--	1,067,513
New Hampshire	96	44	3	--	49,234
New Jersey	3,296	6,692	101	--	7,178,188
New Mexico	87,910	242	2,326	--	2,713,929
New York	52,913	20,020	2,132	--	23,406,887
North Carolina	24,093	12,797	740	--	14,304,669
North Dakota	16,066	31	561	--	625,854
Ohio	1,806	13,294	60	--	14,111,083
Oklahoma	88,214	2,281	1,997	--	4,520,590
Oregon	14,303	722	649	--	1,448,536
Pennsylvania	1,981	10,957	67	--	11,648,562
Rhode Island	330	433	12	--	470,030
South Carolina	1,307	11,880	42	--	12,598,073
South Dakota	40,391	49	992	--	1,100,759
Tennessee	3,641	11,975	158	--	12,820,952
Texas	11,718	12,116	274	--	13,091,593
Utah	10,336	122	310	--	456,313
Vermont	1,136	6,956	30	--	7,382,571
Virginia	246	24	9	--	35,107
Washington	29,925	1,738	957	--	2,847,833
West Virginia	182	462	6	--	494,329
Wisconsin	11,820	2,893	394	--	3,473,168
Wyoming	5,511	31	155	--	196,938

[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp were projected to 2003, using a rate of increase for Medicaid enrollment published in A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf.

[2] Calculations of prevalence rates based on national prevalence rates from the Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey 1999-2003 accessed at http://209.217.72.34/hdaa/ReportFolders/ReportFolders.aspx, applied to weighted average population estimates for each State from US Census for 2003 accessed at http://www.census.gov/popest/counties/CO-EST2005-01.html.

[3] Calculations of direct cost per person, are based on Weiss et al. (1994), inflated by medical care component of CPI to 2003 dollars. Indirect cost per person, are based on Weiss et al. (1994) inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, and 65+ years, while NHIS prevalence rates are 0-17, 18-64, and 65+ years.

Table B.4. Medicaid: Asian eligibles by State and age group and estimated spending, 2003

State	Asian Medicaid eligibles 2003[1]	Asian Medicaid eligibles 0-18 with asthma[1, 2]	Asian Medicaid eligibles age 19-64 with asthma[1, 2]	Asian Medicaid eligibles age 65+ with asthma[1, 2]	Estimated Medicaid spending on asthma for Asian eligibles[3]
Total US	1,234,931	35,541	14,729	8,235	$61,819,532
Alabama	5,752	213	52	21	302,136
Alaska	3,688	106	40	33	189,172
Arizona	5,203	166	54	34	268,323
Arkansas	12,303	359	165	42	598,122
California	464,610	10,600	7,360	2,556	21,677,971
Colorado	4,307	140	43	30	224,147
Connecticut	10,650	304	122	85	540,296
Delaware	2,062	56	29	10	99,747
District of Columbia	1,584	43	21	10	77,488
Florida	13,926	427	143	113	721,624
Georgia	13,722	485	122	79	725,070
Hawaii	57,698	1,565	758	359	2,833,813
Idaho	870	33	7	4	46,226
Illinois	51,435	1,574	493	490	2,702,151
Indiana	3,205	111	30	18	167,929
Iowa	3,539	106	39	26	180,732
Kansas	2,723	92	25	18	143,208
Kentucky	1,932	58	21	15	98,874
Louisiana	3,459	124	28	23	185,174
Maine	2,297	42	33	32	112,052
Maryland	20,757	685	213	116	1,071,235
Massachusetts	39,429	924	573	292	1,891,487
Michigan	22,363	722	241	119	1,143,593
Minnesota	44,958	1,272	514	376	2,284,450
Mississippi	2,814	92	26	23	148,867
Missouri	7,097	216	82	40	358,049
Montana	439	13	5	3	22,333
Nebraska	2,873	98	26	16	147,924
Nevada	6,794	210	75	43	346,458
New Hampshire	840	29	8	6	44,360
New Jersey	20,667	608	218	184	1,067,145
New Mexico	2,653	97	24	11	139,308
New York	156,054	3,562	2,166	1,149	7,266,339
North Carolina	12,603	380	133	101	649,398
North Dakota	297	8	4	3	14,939
Ohio	8,489	264	97	44	428,767
Oklahoma	6,033	224	47	36	324,465
Oregon	17,539	423	274	80	820,297
Pennsylvania	32,557	931	378	251	1,647,679
Rhode Island	5,096	140	63	37	253,954
South Carolina	1,775	56	20	10	90,101
South Dakota	658	23	6	4	35,040
Tennessee	11,901	288	178	69	564,851
Texas	41,827	1,478	336	313	2,247,778
Utah	9,775	341	101	33	502,094
Vermont	18,787	603	173	163	992,390
Virginia	429	11	6	4	21,133
Washington	52,943	1,728	583	237	2,691,899
West Virginia	726	22	8	4	36,563
Wisconsin	20,523	564	236	187	1,042,941
Wyoming	270	9	3	1	14,032

[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp were projected to 2003, using a rate of increase for Medicaid enrollment published in A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf.

[2] Calculations of prevalence rates based on national prevalence rates from the Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey 1999-2003 accessed at http://209.217.72.34/hdaa/ReportFolders/ReportFolders.aspx, applied to weighted average population estimates for each State from US Census for 2003 accessed at http://www.census.gov/popest/counties/CO-EST2005-01.html.

[3] Calculations of direct cost per person, are based on Weiss et al. (1994), inflated by medical care component of CPI to 2003 dollars. Indirect cost per person, are based on Weiss et al. (1994) inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, and 65+ years, while NHIS prevalence rates are 0-17, 18-64, and 65+ years.

Table B.5. Medicaid: Hispanic eligibles by State and age group and estimated spending, 2003

State	Hispanic or Latino Medicaid eligibles 2003[1]	Hispanic or Latino Medicaid eligibles age 0-17 with asthma[1, 2]	Hispanic or Latino Medicaid eligibles age 18-64 with asthma[1, 2]	Hispanic or Latino Medicaid eligibles age 65+ with asthma[1, 2]	Estimated Medicaid spending on asthma for Hispanic eligibles[3]
Total US	10,801,183	381,752	1,598,946	60,408	$2,156,734,295
Alabama	4,493	204	382	14	634,228
Alaska	13,702	484	1,701	102	2,417,058
Arizona	21,371	838	2,400	116	3,544,421
Arkansas	440,646	15,771	82,743	1,269	105,435,515
California	4,920,033	137,847	1,284,846	22,700	1,527,273,821
Colorado	165,526	6,602	16,861	956	25,802,310
Connecticut	141,820	4,973	19,464	948	26,823,676
Delaware	17,353	579	3,462	69	4,342,576
District of Columbia	11,978	397	2,213	60	2,821,562
Florida	558,278	21,001	61,199	3,814	90,886,344
Georgia	12,802	556	1,052	62	1,764,785
Hawaii	5,941	198	1,067	31	1,369,474
Idaho	30,080	1,400	2,191	102	3,902,616
Illinois	387,338	14,554	37,098	3,095	57,849,264
Indiana	61,476	2,617	5,614	286	9,000,024
Iowa	8,486	313	1,075	52	1,521,275
Kansas	36,768	1,522	3,287	209	5,302,943
Kentucky	11,986	440	1,495	76	2,125,154
Louisiana	5,594	246	391	31	706,073
Maine	1,413	32	297	16	364,865
Maryland	51,725	2,096	5,668	242	8,459,697
Massachusetts	189,959	5,468	41,814	1,182	51,208,930
Michigan	80,763	3,203	9,746	361	14,064,103
Minnesota	2,161	75	294	15	405,789
Mississippi	5,092	204	435	36	713,595
Missouri	355	13	49	2	68,103
Montana	2,359	88	309	13	433,403
Nebraska	96	4	8	0	13,272
Nevada	41,199	1,562	5,218	220	7,396,383
New Hampshire	3,375	141	288	19	473,695
New Jersey	202,015	7,293	23,413	1,511	34,041,772
New Mexico	238,835	10,683	20,644	832	33,980,107
New York	655,432	18,372	131,411	4,046	162,543,979
North Carolina	95,923	3,556	11,186	643	16,257,062
North Dakota	0	0	0	0	0
Ohio	51,827	1,982	7,093	226	9,827,228
Oklahoma	51,885	2,369	3,283	258	6,244,762
Oregon	103,128	3,052	26,187	393	31,311,009
Pennsylvania	130,864	4,594	18,314	846	25,100,644
Rhode Island	37,469	1,267	6,020	226	7,939,106
South Carolina	13,447	518	1,753	62	2,465,091
South Dakota	2,141	93	160	12	279,412
Tennessee	37,292	1,107	8,686	181	10,539,438
Texas	1,667,224	72,331	112,215	10,472	206,065,722
Utah	41,953	1,796	4,658	121	6,946,577
Vermont	37,711	1,487	3,315	275	5,364,307
Virginia	305	9	55	2	70,705
Washington	149,602	5,995	18,900	561	26,898,176
West Virginia	709	26	101	3	138,119
Wisconsin	42,284	1,426	5,811	324	7,989,138
Wyoming	6,970	298	682	28	1,065,015

[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp were projected to 2003, using a rate of increase for Medicaid enrollment published in A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf.

[2] Calculations of prevalence rates based on national prevalence rates from the Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey 1999-2003 accessed at http://209.217.72.34/hdaa/ReportFolders/ReportFolders.aspx, applied to weighted average population estimates for each State from US Census for 2003 accessed at http://www.census.gov/popest/counties/CO-EST2005-01.html.

[3] Calculations of direct cost per person, are based on Weiss et al. (1994), inflated by medical care component of CPI to 2003 dollars. Indirect cost per person, are based on Weiss et al. (1994) inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, and 65+ years, while NHIS prevalence rates are 0-17, 18-64, and 65+ years.

Table B.6. Medicaid: Other eligibles by State and age group and estimated spending, 2003

State	Other Medicaid eligibles 2003[1]	Other Medicaid eligibles age 0-18 with asthma[1, 2]	Other Medicaid eligibles age 19-64 with asthma[1, 2]	Other Medicaid eligibles age 65+ with asthma[1, 2]	Estimated Medicaid spending on asthma for Other eligibles[3]
Total US	3,397,257	228,135	58,820	19,000	$323,286,711
Alabama	5,896	509	77	18	639,094
Alaska	25,343	1,702	402	188	2,421,989
Arizona	0	0	0	0	0
Arkansas	20,400	1,387	398	59	1,948,204
California	349,105	18,584	8,028	1,611	29,821,517
Colorado	31,405	2,380	451	181	3,182,905
Connecticut	198	13	3	1	18,822
Delaware	327	21	7	1	30,249
District of Columbia	3,900	245	75	20	359,800
Florida	303,030	21,658	4,515	2,070	29,843,607
Georgia	101,943	8,416	1,315	491	10,801,002
Hawaii	11,469	726	219	60	1,061,371
Idaho	0	0	0	0	0
Illinois	21,633	1,544	301	173	2,132,951
Indiana	9,655	781	131	45	1,011,482
Iowa	45,239	3,172	725	275	4,408,080
Kansas	8,526	671	115	49	881,228
Kentucky	31,809	2,218	506	203	3,092,177
Louisiana	59,011	4,937	702	327	6,304,430
Maine	0	0	0	0	0
Maryland	27,240	2,097	406	128	2,779,468
Massachusetts	257,727	14,096	5,441	1,603	22,337,478
Michigan	34,363	2,590	537	154	3,466,237
Minnesota	35,466	2,341	588	249	3,358,611
Mississippi	31,157	2,376	410	217	3,173,668
Missouri	32,288	2,295	543	154	3,162,008
Montana	56	4	1	0	5,441
Nebraska	5,204	414	68	24	535,544
Nevada	0	0	0	0	0
New Hampshire	2,352	187	31	13	244,572
New Jersey	110,570	7,584	1,694	827	10,677,712
New Mexico	9,684	823	128	34	1,040,620
New York	1,146,321	61,052	23,098	7,077	96,394,222
North Carolina	81,824	5,763	1,257	548	7,998,152
North Dakota	0	0	0	0	0
Ohio	20,857	1,515	347	91	2,064,162
Oklahoma	0	0	0	0	0
Oregon	6,825	384	155	26	596,494
Pennsylvania	29,985	2,000	505	194	2,851,708
Rhode Island	51,852	3,331	935	313	4,839,131
South Carolina	39,599	2,901	643	182	3,936,545
South Dakota	186	15	2	1	19,703
Tennessee	55,889	3,152	1,214	271	4,899,550
Texas	37,146	3,062	434	233	3,940,151
Utah	3,328	271	50	10	348,840
Vermont	1,716	129	23	13	173,255
Virginia	63,053	3,681	1,209	442	5,634,250
Washington	93,866	7,147	1,501	352	9,509,846
West Virginia	7,072	499	120	34	689,684
Wisconsin	182,211	11,679	3,040	1,395	17,027,225
Wyoming	531	43	7	2	55,726

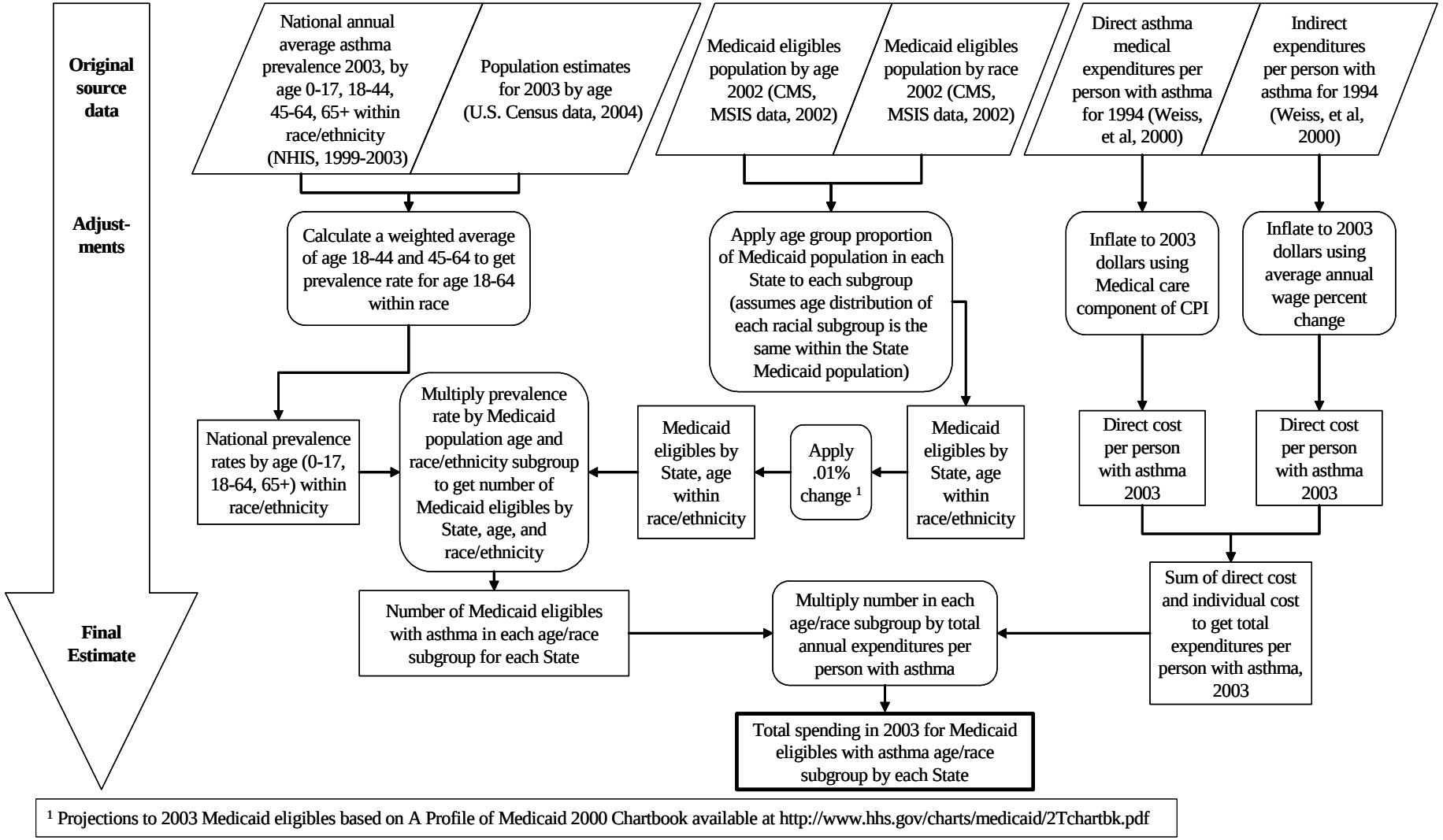
[1] Centers for Medicare & Medicaid Services, MSIS State Summary FY 2002. http://www.cms.hhs.gov/medicaid/msis/tables2002.asp were projected to 2003, using a rate of increase for Medicaid enrollment published in A Profile of Medicaid 2000 Chartbook available at http://www.cms.hhs.gov/charts/medicaid/2Tchartbk.pdf.

[2] Calculations of prevalence rates based on national prevalence rates from the Centers for Disease Control and Prevention, National Center for Health Statistics, Asthma on Demand. National Health Interview Survey 1999-2003 accessed at http://209.217.72.34/hdaa/ReportFolders/ReportFolders.aspx, applied to weighted average population estimates for each State from US Census for 2003 accessed at http://www.census.gov/popest/counties/CO-EST2005-01.html.

[3] Calculations of direct cost per person, are based on Weiss et al. (1994), inflated by medical care component of CPI to 2003 dollars. Indirect cost per person, are based on Weiss et al. (1994) inflated by average annual wage percent change to 2003. Weiss KB, Sullivan SD, Lyttle CS. Trends in the cost of illness for asthma in the United States, 1985-1994. J Allergy Clin Immunol. 2000 Sep;106(3):493-9.

Note: Age groups differ slightly depending on source. Population age groups for Medicaid eligibles are 0-18, 19-64, and 65+ years, while NHIS prevalence rates are 0-17, 18-64, and 65+ years.

Figure B.1. Methods for deriving Medicaid spending for asthma by State, age, and race/ethnicity, 2003



[1] Projections to 2003 Medicaid eligibles based on A Profile of Medicaid 2000 Chartbook available at http://www.hhs.gov/charts/medicaid/2Tchartbk.pdf

Appendix C: National and State Asthma Programs

This appendix lists State asthma programs in existence in the spring of 2005. Program information can be obtained from the Web linkages provided in the table. The programs are classified by the following typology:

- Advisory Bodies and Councils
- Coalitions
- Collaboratives
- Cross-Agency Work
- Data Measurement and Reporting
- Developing and Enforcing Guidelines
- Disease Management
- Minority and Rural Outreach
- Public Service/Education Efforts
- Self-Management
- Provider Training
- Use of Technology

Location	Program	Classification & Year Begun	For More Information
National	American Lung Association	Education 1904	www.lungusa.org
	Association of Asthma Educators	Provider Training 2002	www.asthmaeducators.org
	Asthma and Allergy Foundation of America	Education 1953	http://aafa.org/index.cfm
	National Asthma Education and Prevention Program	Developing Guidelines March 1989	www.nhlbi.nih.gov
	National Asthma Education Certification Board	Provider Training 2000	http://www.naecb.org/
	National Respiratory Training Center	Provider Training 2002	http://www.nrtc-usa.org/
Alabama	Asthma Indicator Screenings	Disease Management	http://www.lungusa2.org/alabama/programs.html#one
	Inner-City Asthma Intervention – University of Alabama at Birmingham, School of Medicine (CDC funded)	Self-Management April 2001	http://www.health.uab.edu/show.asp?durki=10597
Alaska	Assessing Alaska's Asthma Burden (CDC funded)	Coalition October 2003	http://www.aklung.org/asthmacoalition.htm
	Statewide Asthma Education Programs (CDC funded)	Self-Management Patient Education October 2003	http://aafa.org/display.cfm?id=10&sub=88&cont=201
Arizona	Inner-City Asthma Intervention – St. Joseph's Hospital and Medical Center (CDC funded)	Self-Management April 2001	lparrar@chw.edu
	Inner-City Asthma Intervention – El Rio Health Center (CDC funded)	Self-Management April 2001	http://www.elrio.org/ http://www.elrio.org/initiatives/asthma.htm
Arkansas	Arkansas Asthma Coalition – Arkansas Children's Hospital Research Institute	Coalition Minority and Rural Outreach 1997	http://achri.ach.uams.edu/ http://hp2010.nhlbihin.net/ast_maps/arkansas.html
California	Better Asthma Care for California Kids	Education Provider Training 2005	http://www.betterasthmacare.org/ http://www.dhs.ca.gov/ps/cdic/caphi/

Location	Program	Classification & Year Begun	For More Information
	Inner-City Asthma Intervention – Children's Asthma Consortium (CDC funded)	Self-Management April 2001	http://www.mssm.edu/peds
	California Breathing – California Department of Health Services	Coalition Self-Management Patient Education	http://www.dhs.ca.gov/cdic/caphi/default.htm http://www.californiabreathing.org/
	Mobile Asthma Care – Children's Hospital Central California (CDC funded)	Self-Management Patient Education August 2002	http://www.cdc.gov/asthma/contacts/ca.htm
	Replication and Implementation of Scientifically Proven Asthma Interventions – Chula Vista Elementary School District (CDC funded)	Self-Management Disease Management April 2001	http://www.cvesd.k12.ca.us
	Controlling Asthma in American Cities – University of California, Berkeley (CDC funded)	Collaboratives September 2001	http://www.berkeley.edu
	CalAsthma	Disease Management February 2001	http://www.calasthma.org/
	California Statewide Collaborative for Achieving Better Care for Asthma (Medicaid contract)	Coalition Collaborative 1995	Center for Health Care Strategies http://www.chcs.org/
Colorado	The Colorado Asthma Program (CDC funded)	Collaboratives Disease Management Self-Management Data Measurement and Reporting September 2001	cdphe.psdrequests@state.co.us http://www.cdphe.state.co.us/ps/asthma/asthmahom.asp
	Colorado Asthma Coalition	Coalition October 2000	asthmacoalition@alacolo.org http://www.asthmacolorado.org/
	National Jewish Pilot Disease Management Program (Medicaid contract)	Disease Management February 2004	http://www.nationaljewish.org/news/health-news/y2004/medicaid-co-results.aspx
Connecticut	Addressing Asthma from a Public Health Perspective – Connecticut Department of Public Health and Addiction Services (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://www.dph.state.ct.us/BCH/new_asthma/asthma_task_force.htm

Location	Program	Classification & Year Begun	For More Information
Delaware	No programs found		
Florida	Inner-City Asthma Intervention Health Choice Network (CDC funded)	Self-Management April 2001	http://www.cdc.gov/asthma/contacts/fl.htm
	Population-Based Models To Establish Surveillance for Asthma Incidence in Defined Geographic Areas – Miami-Dade County Health Department (CDC funded)	Data Measurement /Reporting Disease Management September 2001	http://www.dadehealth.org/
	Medicaid Disease Management Programs (Medicaid funded)	Disease Management	http://www.fdhc.state.fl.us/Medicaid/Disease_Management/index.shtml
Georgia	Asthma in Older Women – Kaiser Permanente Georgia (CDC funded)	Data Measurement /Reporting October 2000	http://www.cdc.gov/asthma/contacts/ga.htm
	Addressing Asthma from a Public Health Perspective – Georgia Department of Human Resources (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://health.state.ga.us/pdfs/epi/cdiee/burdenofasthma.03.pdf http://health.state.ga.us/pdfs/epi/cdiee/AsthmaStrategicPlan_2004.pdf
	Viruses and Asthma – Emory University School of Medicine (CDC funded)	Coalition September 2003	http://medicine.emory.edu/ http://www.sph.emory.edu/zapasthma/overview.htm
Hawaii	Assessment of Health Effects Associated with Volcanic Emissions – The Hawaii State Department of Health (CDC funded)	Data Measurement /Reporting Disease Management September 1998	http://www.state.hi.us/doh/
	Addressing Asthma from a Public Health Perspective – The Hawaii State Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2002	http://www.state.hi.us/doh/
	Childhood Rural Asthma Project, Phase 2 – The Hawaii State Department of Health (CDC funded)	Minority and Rural Outreach September 2003	http://www.state.hi.us/doh/

Location	Program	Classification & Year Begun	For More Information
Idaho	Addressing Asthma from a Public Health Perspective – Idaho Department of Health and Welfare (CDC funded) Other programs: • Healthy Homes, Head Start • School Asthma Management Model for Idaho (SAMMI)	Cross-Agency Work Data Measurement September 2001	http://www2.state.id.us/dhw/asthma/home.htm
Illinois	Addressing Asthma in Illinois-Statewide program	Coalition Developing Guidelines July 2000	http://www.idph.state.il.us/pdf/addressing_asthma.pdf
	Chicago Asthma Consortium	Coalition 1996	http://www.chicagoasthma.org/
	Replication and Implementation of Scientifically Proven Asthma Interventions American Lung Association of Metropolitan Chicago (CDC funded)	Disease Management Self-Management September 2001	http://www.lungchicago.org/
	Inner-City Asthma Intervention – Cook County Hospital, Department of Pediatrics, Pediatric Allergy Division Office (CDC funded)	Self-Management April 2001	http://www.bronx-leb.org
	Replication and Implementation of Scientifically Proven Asthma Interventions – PCC Community Wellness Center (CDC funded)	Disease Management Self-Management September 2002	http://www.cdc.gov/asthma/contacts/il.htm http://www.pccwellness.org/contact.htm
	Replication and Implementation of Scientifically Proven Asthma Interventions – Southern Illinois Healthcare Foundation (CDC funded)	Disease Management Self-Management September 2002	http://www.cdc.gov/asthma/contacts/il.htm
	Controlling Asthma in American Cities – University of Illinois (CDC funded)	Collaborative September 2001	http://www.uic.edu/
Indiana	Addressing Asthma from a Public Health Perspective – Indiana State Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2002	http://www.state.in.us/isdh/index.htm

Location	Program	Classification & Year Begun	For More Information
	Indiana Chronic Disease Management Program	Disease Management Early 2004	http://www.indianacdmprogram.com/ http://www.indianacdmprogram.com/Member/asthma.htm
Iowa	Addressing Asthma from a Public Health Perspective – Iowa Department of Public Health (CDC funded)	Coalition Data Measurement August 2000	http://www.idph.state.ia.us/hpcdp/common/pdf/asthma/asthma_surveillance_plan.pdf
Kansas	American Lung Association of Kansas	Disease Management	http://www.kslung.org/programs/asthmaprog.html
Kentucky	Good Health Kentucky Asthma Resource – Good Samaritan Foundation	Public Service/ Education Efforts	http://www.goodhealthky.org/asthma.html
	The Metropolitan Asthma Coalition (MAC) – American Lung Association, Louisville, Kentucky	Developing and Enforcing Guidelines	http://www.kylung.org/mac.html
Louisiana	American Lung Association of Louisiana	Public Service and Education Efforts	http://www.louisianalung.org/
Maine	Addressing Asthma from a Public Health Perspective – Maine Asthma Prevention and Control Program (CDC funded)	Cross-Agency Work Data Measurement August 2000	http://www.maine.gov/dhhs/bohdcfh/mat/
Maryland	Maryland Childhood Asthma Program, Dept. of Health and Mental Hygiene	Cross-Agency Work Data Measurement	http://www.fha.state.md.us/mch/asthma/
	Addressing Asthma from a Public Health Perspective (CDC funded)	Developing Guidelines September 2001	http://www.fha.state.md.us/mch/pdf/Asthma_in_Maryland_2003.pdf
Massachusetts	Baystate Medical Center – Inner-City Asthma Intervention (CDC funded)	Self-Management April 2001	http://www.baystatehealth.com/bmc/
	Massachusetts Department of Public Health Addressing Asthma from a Public Health Perspective (CDC funded)	Cross-Agency Work Data Measurement September 2003	http://www.state.ma.us/dph/
Michigan	Addressing Asthma from a Public Health Perspective – Michigan Department of Community Health (CDC funded)	Cross-Agency Work Data Measurement August 2000	http://www.GetAsthmaHelp.org/
	Asthma Surveillance and Interventions in Hospital Emergency Departments Program (CDC funded)	Collaborative August 2001	http://www.msu.edu/
	Enhanced Surveillance of Asthma Deaths Michigan Department of Community Health (CDC funded)	Collaborative September 2000	http://www.GetAsthmaHelp.org/

Location	Program	Classification & Year Begun	For More Information
Minnesota	Controlling Asthma in American Cities American Lung Association of Minnesota (CDC funded)	Collaborative April 2001	http://www.alamn.org/InfoCenter/default.asp http://www.alamn.org/InfoCenter/ProviderDefault.asp
	Inner-City Asthma Intervention – American Lung Association of Minnesota (CDC funded)	Self-Management April 2001	http://www.alamn.org/InfoCenter/default.asp http://www.alamn.org/InfoCenter/ProviderDefault.asp
	Addressing Asthma from a Public Health Perspective – Minnesota Department of Health (CDC funded)	Advisory Board. Cross-Agency Work Data Measurement September 1999	http://www.health.state.mn.us/divs/hpcd/cdee/asthma/
Mississippi	Inner-City Asthma Intervention – Jackson-Hinds Comprehensive Health Center	Self-Management April 2001	(601) 362-5321
	Addressing Asthma from a Public Health Perspective – Mississippi Department of Health	Cross-Agency Work Data Measurement September 2003	http://www.msdh.state.ms.us/msdhsite/index.cfm
Missouri	Inner-City Asthma Intervention Children's Mercy Hospitals and Clinics	Self-Management April 2001	http://www.childrensmercy.org
	Inner-City Asthma Intervention – Washington University School of Medicine	Self-Management April 2001	http://medicine.wustl.edu/
	Addressing Asthma from a Public Health Perspective – Missouri Department of Health and Senior Services (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://www.dhss.mo.gov/asthma/asthmastateplan.pdf
	Controlling Asthma in American Cities – St. Louis Regional Asthma Consortium (CDC funded)	Collaborative Fall 2000	http://www.asthma-stlouis.org/
	Missouri State Medicaid Disease Management Program (Medicaid funded)	Disease Management November 2002	http://www.heritage-info.com/mocaidrx/files/dm/Provider_Handbook.doc
Montana	Montana Environmental Public Health Tracking Program -- Montana Department of Public Health and Human Services (CDC National EPHT Program)	Data Measurement and Reporting	http://www.dphhs.mt.gov/epht/asthma.shtml
Nebraska	Addressing Asthma from a Public Health Perspective – Nebraska Health and Human Services System (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://www.hhs.state.ne.us/epi/asthma.htm

Location	Program	Classification & Year Begun	For More Information
Nevada	American Lung Association of Nevada	Public service and education effort	http://www.lungs.org/
New Hampshire	Addressing Asthma from a Public Health Perspective – New Hampshire Department of Health and Human Services (CDC funded)	Cross-Agency Work Data Measurement	http://www.dhhs.nh.gov/DHHS/CDPC/asthma.htm
New Jersey	Interdepartmental Report and Strategic Plan for Asthma – New Jersey Department of Health and Senior Services and others	Collaborative/ Coalition Minority and rural outreach	http://www.state.nj.us/health/commiss/omh/asthma/asthmastrategicplan.pdf
	Replication and Implementation of Scientifically Proven Asthma Interventions – Babyland Family Services (CDC funded)	Self-Management Disease Management September 2001	http://www.nccic.org/ccpartnerships/profiles/babyland.htm
	Inner-City Asthma Intervention – Children's Hospital of New Jersey at Newark Beth Israel Medical Center, Saint Barnabas Health Care System (CDC funded)	Self-Management Rural and Minority outreach April 2001	http://www.sbhcs.com/hospitals/newark_beth_israel/
	Replication and Implementation of Scientifically Proven Asthma Interventions – PBI Regional Medical Center (CDC funded)	Self-Management Disease Management September 2002	http://www.cdc.gov/asthma/contacts/nj.htm http://www.pbih.org
	Addressing Asthma from a Public Health Perspective – New Jersey Department of Health and Senior Services (CDC funded)	Cross-Agency Work Data Measurement	http://www.state.nj.us/health/fhs/asthma.shtml
New Mexico	Addressing Asthma from a Public Health Perspective – New Mexico Department of Health (CDC funded)	Cross-Agency Work Data Measurement August 2000	http://www.health.state.nm.us/
New York	New York's Action Against Asthma: • Regional Asthma Coalitions • Healthy Neighborhoods Program • Minority Asthma Partnerships • Medicaid • Child Health Plus • Family Health Plus • School Based Health Centers	Cross-Agency Work Data Measurement Coalition Public Service and Education	http://www.health.state.ny.us/ http://www.health.state.ny.us/nysdoh/asthma/ny_action.htm http://www.health.state.ny.us/nysdoh/asthma/pdf/4850.pdf

Location	Program	Classification & Year Begun	For More Information
	Replication and Implementation of Scientifically Proven Asthma Intervention – Bronx-Lebanon Hospital Center (CDC funded)	Self-Management Disease Management September 2001	http://www.bronx-leb.org/ http://www.bronx-leb.org/Centers_of_Excellence/Asthma.asp
	Controlling Asthma in American Cities – Columbia University (CDC funded)	Collaborative September 2001	http://www.columbia.edu/ http://www.cumc.columbia.edu/dept/pulmonary/4ClinicalPage/Clinical%20Centers/Website/main.htm
	Inner-City Asthma Intervention – Mount Sinai School of Medicine Department of Pediatrics (CDC funded)	Self-Management April 2001	http://www.mssm.edu/peds/
	Inner-City Asthma Intervention – University at Buffalo, SUNY (CDC funded)	Self-Management April 2001	http://www.smbs.buffalo.edu/fam-med/
North Carolina	Inner-City Asthma Intervention – WakeMed (CDC funded)	Self-Management April 2001	http://www.wakemed.org
	Assessing Asthma-Related School and Work Absences – University of North Carolina-Chapel Hill, School of Public Health (CDC funded)	Data Measurement and Reporting October 2001	http://www.hpdp.unc.edu/Research/AccessingAsthma.pdf?CFID=50420&CFTOKEN=52829508
North Dakota	No programs listed		
Ohio	Inner-City Asthma Intervention Rainbow Babies and Children's Hospital (CDC funded)	Self-Management April 2001	http://www.uhrainbow.com/
	The Ohio Asthma Coalition	Coalition	http://www.ohiolung.org/ohio-asthma-coalition.htm
Oklahoma	Addressing Asthma from a Public Health Perspective – Oklahoma State Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2002	http://www.health.state.ok.us/
Oregon	Oregon Asthma Program – Oregon DHS	Coalition	http://www.dhs.state.or.us/publichealth/asthma/index.cfm
	Oregon Asthma Network	Self-Management Public Service and Education 2000	http://www.dhs.state.or.us/publichealth/asthma/plan/provider.cfm http://oregon.gov/DHS/ph/asthma/guideor.shtml
	Inner-City Asthma Intervention – CareOregon (CDC funded)	Self-Management April 2001	http://www.careoregon.org/member/masthma.html

Location	Program	Classification & Year Begun	For More Information
	Addressing Asthma from a Public Health Perspective – Oregon Department of Human Services (CDC funded)	Cross-Agency Work Data Measurement October 1999	http://oregon.gov/DHS/ph/asthma/index.shtml
	Asthma in Older Women – Kaiser Northwest/Kaiser Colorado	Data Masurement and Reporting	http://www.cdc.gov/asthma/contacts/or.htm
	Incidence of Occupational Asthma within the Northwest Division of Kaiser Permanente – Kaiser Foundation Research Institute	Data Measurement and Reporting	http://www.cdc.gov/asthma/contacts/or.htm (503) 335-6755
	Population-Based Models To Establish Surveillance for Asthma Incidence in Defined Geographic Areas – Kaiser Foundation Research Institute	Developing and Enforcing Guidelines	http://www.cdc.gov/asthma/contacts/or.htm (503) 335-6755
Pennsylvania	Controlling Asthma in American Cities – Children's Hospital of Philadelphia (CDC funded)	Collaborative	http://www.chop.edu/consumer/index.jsp
	Addressing Asthma from a Public Health Perspective – Pennsylvania Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://webserver.health.state.pa.us/health/site/
	Replication and Implementation of Scientifically Proven Asthma Interventions – Philadelphia Department of Public Health	Self-Management Disease Management September 2003	http://www.phila.gov/health/
	National Jewish Medical and Research Center	Disease Management	http://www.nationaljewish.org/disease-info/diseases/asthma/index.aspx
Rhode Island	Rhode Island Asthma Control Program – Rhode Island Department of Health (CDC funded)	Developing and Enforcing Guidelines September 1999	http://www.health.state.ri.us/disease/asthma/index.php
South Carolina	Asthma Surveillance and Interventions in Hospital Emergency Departments Program – University of South Carolina (CDC funded)	Coalition Public Service and Education Data Measurement and Reporting September 2000	http://www.sc.edu/
South Dakota	No programs listed		

Location	Program	Classification & Year Begun	For More Information
Tennessee	Asthma Care Management Program – Tennessee Department of Finance & Administration	Public Service and Education Self-Management Disease Management	http://www.state.tn.us/tenncare/
Texas	The Asthma Coalition of Texas	Coalition	http://www.texasasthma.org/
	Replication and Implementation of Scientifically Proven Asthma Interventions – Harris County Hospital District (CDC funded)	Self-Management Disease Management September 2001	http://www.hchdonline.com/
	Inner-City Asthma Intervention – University of Texas Health Science Center at San Antonio (CDC funded)	Self-Management April 2001	http://www.uthscsa.edu
	Addressing Asthma from a Public Health Perspective – Texas Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://www.dshs.state.tx.us/ http://www.dshs.state.tx.us/chronic/pdf/TAR.pdf
	Texas Medicaid Managed Care Asthma Project	Self-Management Disease Management	http://www.hhsc.state.tx.us/medicaid/mc/proj/asthma/asthma.html
Utah	Addressing Asthma from a Public Health Perspective – Utah Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://health.utah.gov/asthma/
Vermont	Addressing Asthma from a Public Health Perspective – Vermont Dept. of Health Asthma Program (CDC funded)	Cross-Agency Work Data Measurement August 2000	http://healthvermont.gov/prevent/asthma/index.aspx
Virginia	Controlling Asthma in Richmond Metropolitan Area (CARMA) (CDC funded)	Collaborative September 2001	http://www.carmakids.org/
	Addressing Asthma from a Public Health Perspective – Virginia Department of Health (CDC funded)	Cross-Agency Work Data Measurement September 2001	http://www.vahealth.org/asthma/
Washington	Replication and Implementation of Scientifically Proven Asthma Interventions – Asthma and Allergy Foundation of America Washington State Chapter (CDC funded)	Self-Management Disease Management	http://www.aafawa.org/
	Addressing Asthma from a Public Health Perspective – Washington Department of Health (CDC funded)	Cross-Agency Work Data Measurement	http://www.alaw.org/asthma/washington_asthma_initiative/

Location	Program	Classification & Year Begun	For More Information
	Breathe Easy Washington Program – Washington Department of Health	Public Service and Education	http://www.alaw.org/air_quality/breathe_easy_network/
West Virginia	Addressing Asthma from a Public Health Perspective – West Virginia Department of Health and Human Resources	Cross-Agency Work Data Measurement	http://www.wv.gov/offsite.aspx?u=http://www.wvdhhr.org/bph
Wisconsin	Addressing Asthma from a Public Health Perspective – Wisconsin Department of Health and Family Services (CDC funded)	Cross-Agency Work Data Measurement	http://www.dhfs.state.wi.us/
Wyoming	Wyoming Department of Health General list of asthma resources	Public Service and Education	http://wdh.state.wy.us/asthma/index.asp

Appendix D: Asthma Measures

Table D.1. Inventory and comparison of asthma measures from 12 national sources,[1] grouped by type of measure

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Provider Care (Process)				
Severity Assessment	Asthma severity classification done during asthma visit.	Children	National	NICHQ
	Percent of patients with severity assessment for asthma at last visit.	All	National	HRSA
	Rate of asthma patients with a documented asthma severity level.	All	Hospitals	JCAHO-APMIG
	Percentage of patients who were evaluated during at least one office visit for the frequency (numeric) of daytime and nocturnal asthma symptoms.	All	National	AMA PCPI (NQF approved)
Severity Assessment -	Spirometer measurements used in diagnosis.	All	Hospitals	JCAHO
Severity Assessment - peak flow	Establishment of a personal best peak flow measurement.	All	Hospitals	JCAHO
	Percent of moderate and severe persistent asthma population older than five years who have established a personal best Peak Flow through multiple readings.	All	National	HRSA
	Percent of asthma population that uses a peak flow meter at home.	All	National	MEPS
Medications - timing	Time since last asthma medication taken.	All	State/National	NAS
Medications	Percent of asthma population that takes any prescription medication for asthma.	All	National	MEPS
	Percentage of all patients with mild, moderate, or severe persistent asthma who were prescribed either the preferred long-term control medication (inhaled corticosteroid) or an acceptable alternative treatment.	All	National	AMA PCPI (NQF approved)
Medications - NSAIDS	Use of anti-inflammatory medications to control asthma.	Children	National	NICHQ
		All	Hospitals	JCAHO-ORYX
	Percent of asthma patients who use asthma medications.	All	National	HRSA
	Rate of medications use for those with a severity assessment of having persistent asthma.	All	Hospitals	JCAHO-APMIG
Medications - corticosteroids	Use of systemic corticosteroids in patients with an acute exacerbation.	All	Hospitals	JCAHO
	Percent of asthma patients who use corticosteroids for long-term control of asthma.	All	National	HEDIS
	Percent of asthma patients who use corticosteroids In inpatient hospital setting.	Children	Hospitals	JCAHO-ORYX
Medications - frequency	Frequency of use of asthma medication in the past 30 days.	Adults	State/National	BRFSS
Medications - inhaler	Number of puffs taken each time.	All	State/National	NAS
	Number of times per week.	All	State/National	NAS
	Percent of asthma population that has ever use a prescription inhaler.	All	State/National	NAS
	Number of full canisters used in the past 3 months.	All	State/National	NAS
	Use before exercising.	All	State/National	NAS
	Use any steriod inhalers for asthma.	All	National	MEPS
	Percent of population that has had a health professional show them how to use an inhaler.	All	State/National	NAS
Medications - specific type	Percent of asthma population that takes [NAME OF MEDICATION] for their asthma (self assessment).	All	State/National	NAS
Medications - nebulizer	Percent of asthma population that uses a nebulizer with their asthma medication.	All	State/National	NAS
Medications - OTC	Percent of asthma population that has ever used over-the-counter medication for asthma.	All	State/National	NAS
Medications - forms	Percent of asthma population taking asthma medications in pill form.	All	State/National	NAS
	Percent of asthma population taking asthma medications in syrup form.	All	State/National	NAS
	Length of time used fpr each medication.	All	State/National	NAS
Medications - relievers	Use of relievers for inpatient childhood asthma.	Children	Hospitals	JCAHO-ORYX
Documented asthma management plan	Rate of asthma patients with a documented self-management plan.	All	Hospitals	JCAHO-APMIG
	Percent that has taken a class on how to manage asthma.	All	State/National	NAS
	Asthma management plan given to family.	Children	National	NICHQ
	Asthma management plan is discussed with and understood by patient/family.	Children	Hospitals	JCAHO-ORYX
	Percent with a printed asthma management plan.	All	State/National	NAS
	Patients with self-management goals during asthma visit.	Children	National	NICHQ
	Percent with self-management goal at last visit.	All	National	HRSA

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Patient education	Health professional discussed how to better control asthma at time of hospital discharge.	All	State/National	NAS
	Rate of asthma patients who have been educated on asthma triggers and avoidance.	All	Hospitals	JCAHO-APMIG
	Percent of asthma population whose doctor or health professional taught them what to do during an asthma attack.	All	State/National	NAS
	Percent of asthma population whose doctor or health professional taught them how to use a peak flow meter.	All	State/National	NAS
	Percent of asthma population whose doctor or health professional taught them how to recognize early signs or symptoms of an asthma episode.	All	State/National	NAS
Routine checkups	Percent of patients with planned care visits.	Children	National	NICHQ
	Average number of doctor visits for routine checkup for asthma.	Adults	State/National	BRFSS
		All	State/National	NAS
Doctor visits	Time since last talked to a doctor or other health professional about your asthma.	All	State/National	NAS
Prevention - depression	Percent of asthma population screened for depression.	All	National	HRSA
Prevention - flu	Percent of asthma population that has had a flu shot in the past 12 months.	Adults	State/National	BRFSS
	One dose of flu vaccine administered in past 15 months.	All		HRSA
Prevention smoking cessation counseling	Percent of asthma population that has been advised by a health professional to quit smoking.	Adults	State/National	BRFSS
	Rate of smoking cessation advice/counseling with caregivers of children with asthma.	Children	Hospitals	JCAHO-APMIG
Patient satisfaction	Patients satisfaction with asthma care.	Children	National	NICHQ
Patient/Parent Self-Care (Process)				
Behavior - environmental assessment	Percent of asthma population exposed to environmental tobacco smoke.	All	National	HRSA
	Percent of asthma population evaluated on triggers other than environmental tobacco smoke (dust, mites, cats, dogs, molds/fungi, cockroaches).	All	National	HRSA
	Percent of asthma population whose work environment worsens their asthma.	All	State/National	NAS
	Percent of asthma population that has seen cockroaches in the home.	All	State/National	NAS
	Percent of asthma population with mold or musty odor inside home in the past 30 days.	All	State/National	NAS
	Percent of asthma population that uses gas for cooking.	All	State/National	NAS
	Percent of asthma population with unvented gas logs or gas fireplace or gas stove in the home.	All	State/National	NAS
	Percent of asthma population that has smoking in the home in the past week.	All	State/National	NAS
	Percent of asthma population that has a wood burning stove in the home.	All	State/National	NAS
Behavior - environmental modification devices	Percent of asthma population that uses air cleaner or purifier inside the home.	All	State/National	NAS
	Uses a bathroom fan that vents to the outside.	All	State/National	NAS
	Uses a dehumidifier to reduce moisture inside the home.	All	State/National	NAS
	Uses an exhaust fan when cooking.	All	State/National	NAS
Behavior - environmental modification	Percent of asthma population that has been advised by a health professional to change things in home, school or work to improve asthma.	All	State/National	NAS
	Percent of asthma population that have carpeting or rugs in the bedroom.	All	State/National	NAS
	Percent of asthma population that use mattress covers made for controlling dust mites.	All	State/National	NAS
	Percent of asthma population that use pillow covers made for controlling dust mites.	All	State/National	NAS
	Percent of asthma population with indoor pets.	All	State/National	NAS
	Percent of asthma population that allows pets in the bedroom.	All	State/National	NAS
	Percent of asthma population that washes sheets and pillowcases in hot water.	All	State/National	NAS
Behavior - smoking	Percent of asthma population that has smoked at least 100 cigarettes in their entire life.	All	State/National	NAS
	Percent of asthma population that now smokes every day, some days or not at all.	All	State/National	NAS

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Daily Symptom Burden (Outcome)				
Activity limitation days	Number of days unable to work or carry out usual activities due to asthma in the past 12 months.	All	State/National	NAS
		Adults	State/National	BRFSS
	Number of school/work days missed.	All	State/National	NAS
	Average number of days lost at work or school in the past 30 days.	All	National	HRSA
	Average number of missed school days in the past two months.	Children	National	NICHQ
	Percent of asthma population that experiences limitation in usual activities due to asthma.	All	State/National	NAS
Symptom - frequency	Percent of people with asthma who have had an episode of asthma or an asthma attack during the past 12 months.	All	State/National	NAS
		Adults	State/National	BRFSS
		All	National	MEPS
		All	National	NHIS
	Number of days with symptoms of asthma in the past 30 days.	All	State/National	NAS
		Adults	State/National	BRFSS
	Number of asthma attacks in the past 3 months.	All	State/National	NAS
	Percent of people with asthma who have symptoms all the time.	All	State/National	NAS
	Time since last had symptoms of asthma.	All	State/National	NAS
Symptom - duration	Duration of most recent asthma attack.	All	State/National	NAS
	Percent of people with asthma who had a longer/shorter recent attack compared to last attack.	All	State/National	NAS
Symptom - free	Number of symptom-free days in the past two weeks.	All	State/National	NAS
		All	National	HRSA
	Number of symptom-free days among patients with persistent asthma.	Children	National	NICHQ
Symptom - sleep	Number of days when symptoms of asthma make it difficult to stay asleep in the past 30 days.	All	State/National	NAS
		Adults	State/National	BRFSS
Avoidable Events				
Emergency/Urgent care	Number of visits for urgent treatment of worsening asthma symptoms or an asthma episode or attack besides ED or urgent care.	All	State/National	NAS
		Adults	State/National	BRFSS
	Percent of children with asthma who have had an acute asthma visit in the past two months.	Children	National	NICHQ
	Return to hospital with same asthma diagnosis within 7 days following emergency department visit or observation stay.	Children	Hospitals	JCAHO-ORYX
	Percent of asthma patients who have had a visit to an ED/Urgent care office for asthma in the past 6 months.	Children	National	NICHQ
		All	National	HRSA
		All	National	HRSA
	Number of emergency department visits in the past 12 months.	All	State/National	NAS
		Adults	State/National	BRFSS
Hospitalizations	Return to hospital with same asthma diagnosis within 7 days following inpatient discharge.	Children	Hospitals	JCAHO-ORYX
	Return to hospital with same asthma diagnosis with 30 days following inpatient discharge.	Children	Hospitals	JCAHO-ORYX
	Return to hospital with same asthma diagnosis within 30 days following emergency department visit or observation stay.	Children	Hospitals	JCAHO-ORYX
	Average length of stay for discharges from short-stay hospitals for asthma.	All	National	NHDS
	Risk-adjusted length of stay (LOS) for childhood asthma patients.	Children	Hospitals	JCAHO-ORYX
	Have stayed overnight in a hospital due to asthma in the past 12 months.	All	State/National	NAS
	Hospital admissions for asthma per 100,000 population.	Children	State/National	HCUP
		Adults	State/National	HCUP
	Percent of children with asthma who have had a hospitalization for asthma in the past six months.	Children	National	NICHQ
	Rate of discharge from short-stay hospitals for asthma.	All	National	NHDS

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Other Dimensions (Prevalence)				
Prevalence - lifetime	Percent of population that has ever been told they have asthma by a doctor or health professional.	Children	State/National	BRFSS
		Adults	State/National	BRFSS
		All	State/National	NAS
		All	National	MEPS
		All	National	NHIS
	Age at diagnosis.	Adults	State/National	BRFSS
Prevalence - current	Percent of people that has ever been told they have asthma by a doctor or health professional that still have asthma.	Children	State/National	BRFSS
		Adults	State/National	BRFSS
		All	State/National	NAS
Prevalence - registry	Number of asthma patients in the registry.	Children	National	NICHQ
		All	National	HRSA
Prevalence - family history	Percent of asthma population with a parent who has ever been told he or she has asthma.	All	State/National	NAS
	With a sibling who has ever been told he or he has asthma.	All	State/National	NAS
	With a grandparent who has ever been told he or she has asthma.	All	State/National	NAS
Other Dimensions (Demographic)				
Demographics	Highest level of school completed.	All	State/National	NAS
	Zip code.	All	State/National	NAS
	Total combined income in household.	All	State/National	NAS
	Height.	All	State/National	NAS
	Weight.	All	State/National	NAS
	Birth weight.	All	State/National	NAS
	Percent of asthma population with low birth weight.	All	State/National	NAS
	Percent of asthma population of Hispanic or Latino origin.	All	State/National	NAS
	Percent of asthma population that is white, black, American Indian/Alaska Native, or Asian/Pacific Islander.	All	State/National	NAS
	Percent of asthma population whose household has been without telephone service for 1 week or more in the past 12 months.	All	State/National	NAS
Access	Percent of people with asthma that have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare.	All	State/National	NAS
	Percent of people with asthma that did not have any health insurance or coverage.	All	State/National	NAS
Employment	Percent of asthma population that is currently employed/unemployed.	All	State/National	NAS
	Percent of asthma population unable to work for health reasons/disabled.	All	State/National	NAS

[1]Sources:
AMA PCPI = American Medical Association Physician Consortium for Performance Improvement, NQF Ambulatory Care Measures, 2005
NICHQ = National Initiative for Children's Health Care Quality monthly measures for children with asthma for practices participating in initiative
HRSA = Health Resources and Services Administration, Bureau of Primary Health Care, Disparities Collaboratives - Asthma
JCAHO-APMIG = Joint Commission on Accrediation of Healthcare Organizations, Asthma Performance Measurement Implementation Guide
NAS = National Asthma Survey, CDC, 2003
JCAHO-ORYX = JCAHO ORYX initiative on hospital performance for implementation in 2006
BRFSS = Behavioral Risk Factor Surveillance Survey, CDC, 2003
HEDIS = Healthplan Employer Data and Information Set, National Committee for Quality Assurance, 2003
HCUP = Health Care Utilization Project, Agency for Healthcare Research and Quality, 2001
NHDS = National Hospital Discharge Survey, CDC, 2001
MEPS = Medical Expenditure Panel Survey, Agency for Healthcare Research and Quality, 2000
NHIS = National Health Interview Survey, CDC, 2001

Table D.2. State and local asthma measures: four selected quality improvement initiatives

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Provider Care (Process)				
Severity Assessment - spirometry	Patients with newly diagnosed asthma (moderate or severe) reported to have spirometry as part of their evaluation	All	City	CASI
	Physicians monitoring spirometry or peak flow during office visits	All	City	CASI
	Percent of people with asthma who have had a spirometry measurement.	All	State	Oregon
Severity Assessment - spirometry access	Physicians reporting access to spirometry - Spirometer in office - Referral to an asthma specialist who performs spirometry - No access to spirometry	All	City	CASI
	For specialists: Patients with newly diagnosed asthma (moderate or severe) reported to have selected diagnostic techniques as part of their evaluation (percents). Techniques listed: spirometry, chest radiograph, skin testing or radioallergosorbent testing, sinus radiographs, trial of daily peak flow monitoring, sputum examination and stain for eosinophilia	All	City	CASI
Severity Assessment - peak flow et al.	Patients with newly diagnosed asthma (moderate or severe) reported to have daily peak flow as part of their evaluation	All	City	CASI
	Peak flow measurement at ED discharge	All	City	CASI
	Physicians monitoring: Techniques listed: spirometry or peak flow during office visits, frequency of wheeze/cough, frequency of beta 2-agonist use, activity levels, frequency of disturbed sleep due to asthma symptoms, loss of work/school days due to asthma, spirometry or peak flow, direct observation of inhaler technique, peak flow diary review			
	Percent of physicians using peak flow or PFTI - Acutely symptomatic patient (never, rarely, sometime, often) - Asymptomatic patient (never, rarely, sometimes, often)			
	Patients with newly diagnosed asthma (moderate or severe) reported to have selected diagnostic techniques as part of their evaluation. Techniques listed: spirometry, chest radiograph, skin testing or radioallergosorbent testing, sinus radiographs, trial of daily peak flow monitoring, sputum examination and stain for eosinophilia, sinus radiographs, CT of the sinuses, MRI of the sinuses, nasal speculum examination, rhinolaryngoscopy, upper GI for gastroesophagel reflux disease (GERD), esophogeal pH testing for GERD	All	City	CASI
Doctor visit	Percent of people with persistent asthma who have been seen by a medical practitioner for asthma in the last 12 months	All	State	Oregon
	Percent of members with persistent asthma who have at least one preventive/ambulatory visit with a primary care physician, pulmonologist, or allergist	All	State health plans	MQIC

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Medications - corticosteroids	Physicians prescribing inhaled steroid (for patients <5 years old, for patients > 5 years old) for patients with moderate persistent symptoms	All	City	CASI
	Others listed: - Oral beta-agonist (for patients <5 years old, for patients > 5 years old) - Inhaled beta-agonist (for patients <5 years old, for patients > 5 years old) - Theophylline (for patients <5 years old, for patients > 5 years old) - Systemic steroid (for patients <5 years old, for patients > 5 years old) - Inhaled steroid (for patients <5 years old, for patients > 5 years old) - Cromolyn or nedocromil (for patients <5 years old, for patients > 5 years old)	All	City	CASI
Medications after ED visit	After ED visit percentage of patients given: - Prescription for systemic steroids - Prescription for inhaled steroids/cromolyn - Prescription for antibiotics	All	City	CASI
Medications - inhaler	Patients with moderate or severe asthma prescribed a corticosteroid inhaler	All	City	CASI
	Patients with asthma for whom any type of metered-dose inhaler is prescribed	All	City	CASI
	During ED visit, formal training in use of metered-dose inhaler, spacer	All	City	CASI
	Percent of people with persistent asthma who have at least one filled prescription for a daily inhaled anti-inflammatory medication	All	State	Oregon
	Percent of people with persistent asthma who use more than one canister of a short-acting inhaled bronchodilator every two months for one year.	All	State	Oregon
Written asthma plans	Patients with moderate or severe persistent asthma for whom written treatment plans are routinely developed	All	City	CASI
	Percent of people with asthma who have a written asthma action plan	All	State	Oregon
Asthma education	Percent of people with asthma who have documentation of asthma education	All	State	Oregon
	Physicians' approach to asthma education. Techniques listed: form education program, informal education delivered by nurse or physician, other, do not provide asthma education	All	City	CASI
	During ED visit: - Formal asthma education by physician or nurse - Written asthma educational material	All	City	CASI
	Percent of people with persistent asthma who have received education about their triggers and how to reduce their exposure to them	All	State	Oregon

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
NAEPP guidelines	Physicians and NAEPP guidelines - Heard of NAEPP guidelines (yes/no) - Think NAEPP guidelines are useful (extremely useful, somewhat useful, not very useful, no use at all)	All	City	CASI
Consultation with asthma specialist	Physician's likelihood of initiating a consultation with an asthma specialist based on the following event or criteria: hospitalization for asthma, an emergency department visit for asthma, multiple medications with continued symptoms, a life-threatening asthma episode, all patients with mild persistent asthma, all patients with moderate persistent asthma, all patients with severe persistent asthma, atypical signs or symptoms, for a diagnosis in child < 3 years old	All	City	CASI
	Percent of people hospitalized for asthma who are seen by an asthma specialist within one month of the hospital discharge date	All	State	Oregon
Acute exacerbations	Patients who call practice for an acute (not life-threatening) exacerbation are usually: - Told to go to the emergency department - Provided with a same-day office appointment - Scheduled for an appointment within the week - Other	All	City	CASI
Preventive care - flu vaccine	Percent of people with persistent asthma who have received an influenza immunization in the last 12 months	All	State	Oregon
Preventive care - allergen testing	Percent of people with persistent non-seasonal asthma who have received allergen testing	All	State	Oregon
Hospital Care (Process)				
Standards of care - hospital	Whether a hospital is using the following hospital-wide: - Currently using NAEPP guidelines - Currently using critical pathways	All	City	CASI
Standards of care - ICU	Whether the hospital is using the following in ICU: - Currently using guidelines - Currently using critical pathways	All	City	CASI
Standards of care - bedside	Whether care at bedside includes: nebulization, peak flow monitoring, peak flow instruction, evaluation of inhaler technique, inhaled anti-inflammatories, asthma education	All	City	CASI
Community-based care at hospitals	Percent of hospitals that have: 1. Formal asthma education in outpatient setting 2. Utilization review for asthma 3. Clinical case management program for asthma 4. Home visits as part of asthma management 5. Community-based asthma screening 6. Community-based adult asthma education programs 7. Community-based pediatric asthma education programs 8. School-based asthma education programs	All	City	CASI
Emergency Department Care (Process)				
Assessment in ED	Whether assessment in the ED includes: 1. PEFR measurement as part of initial assessment 2. PEFR measurement to document improvement after treatment 3. Pulse oximetry as part of initial assessment 4. Pulse oximetry to document improvement after treatment 5. Arterial blood gas as part of initial assessment 6. Arterial blood gas as part of assessment of severe cases 7. Chest radiograph for patients wheezing for the first time 8. Chest radiograph for patients with wheezing and fever 9. Chest radiograph when diagnosis of asthma is in doubt	All	City	CASI
Treatment in ED	1. Average time asthma patients spent in ED 2. Average time asthma patients spent in ED before disposition 3. Percentage of patients receiving: - IV or po steroids used within the first hour - IV or po steroids used at any time during ED care - Theophylline therapy at any time during ED care - Supplemental oxygen at any time during ED care - Treatment for >4 hours 4. Percentage of EDs reporting: - Availability of respiratory therapy, both day and night - The first medication given for asthma attack (beta-agonist by nebulizer, beta-agonist by metered-dose inhaler)	All	City	CASI

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Follow up after ED visit	Percent of patients given a specific follow up appointment	All	City	CASI
	Percent of people with one emergency department visit for asthma who are seen by a medical practitioner within one month of the emergency department visit date	All	State	Oregon
	Percent of people with two emergency department visits for asthma in 12 months who are seen by an asthma specialist within one month of the most recent emergency department visit	All	State	Oregon
Managed Care Organizations (Enabling factors)				
Management	1. MCOs offering an asthma education program 2. MCOs offering an asthma case management program 3. MCOs offering an asthma disease management program	All	City	CASI
Benefits	Asthma-specific covered benefits - Medications - Spacer devices - Peak flow meters - Nebulizers - Asthma education - Pillow/mattress covers - Smoking cessation programs - Smoking cessation medication - HEPA filter/cleaner - Dehumidifier - Home assessment	All	City	CASI
Patient Care - Process				
Asthma knowledge	Reported as percentage sampled who answered the question correctly 1. Asthma cannot be cured 2. Vaporizer is good treatment 3. Asthma limits exercise 4. Need for asymptomatic asthma visits 5. Common reason for school absences 6. Asthma runs in families 7. Asthma is mainly an emotional illness 8. Asthma resolves if attacks stop 9. Where to go for treatment 10. Asthma onset always in childhood 11. Signs: shortness of breath 12. Signs: chest tightness 13. Signs: severe headaches 14. Signs: nocturnal cough 15. Signs: wheezing with exercise 16. Triggers: furry pets 17. Triggers: mosquito bites 18. Triggers: dampness 19. Triggers: cockroaches 20. Triggers: poor diet 21. Triggers pollen 22. Hospitalizations are preventable 23. Symptoms are preventable 24. Adequacy of OTC medications 25. Asthma is a serious disease 26. Asthma care is expensive 27. See doctor immediately for attack 28. Appropriateness of ED for treatment 29. Addiction to asthma medicines 30. Overprotective mothers and asthma			
	Percent of people with asthma who has knowledge of asthma medication use and what do in case of an exacerbation.	All	State	Oregon
	Percent of people with asthma who affirm receipt of information about asthma and treatment techniques.	All	State	Oregon
	Percent of people with asthma who report high levels of confidence in understanding and using this information.	All	State	Oregon
	Percent of people with asthma who report behavior consistent with having received and understood this information.	All	State	Oregon

Type of measure	Variants of the measure definition	Age group	Geographic scope	Source[1]
Environmental triggers	Percent of people with persistent asthma with documentation they have been asked at least once about home and occupational exposures to: - Dust-mites - Animal allergens - Tobacco smoke - Exercise-induced bronchospasm	All	State	Oregon
Mortality (Outcome)				
Mortality rates	Mortality rates - By age and gender - By borough	Children	City	NYCCAI
Avoidable events (Outcome)				
Emergency/Urgent care	Emergency department visits per 1000 members with asthma.	All	State health plans	MQIC
Relapse rate	Percentage of asthma patients estimated to relapse within 7 days.	All	City	CASI
Hospitalizations	Hospitalization rates - By age - Comparison of New York City to New York State - Trends 1990-2000 - Distribution by age group - Leading causes of hospitalizations in children 0-14 - By age and gender - By income (ZIP code areas) - Distribution by payer - Total charges by payer - Average length of stay - By borough - By neighborhood - By ZIP code - By month and age	Children	City	NYCCAI
Other dimensions (Prevalence)				
Prevalence	Self-reported lifetime prevalence for adults age 18 and over - By age - By race/ethnicity - By borough - By neighborhood	Children	City	NYCCAI
	School-based prevalence - By gender - By income (ZIP code areas) - By borough - By neighborhood	Children	City	NYCCAI
Other dimensions (Behavior)				
Smoking	Percent of people with asthma who currently do not smoke cigarettes.	All	State	Oregon
	Percent of non-smokers with asthma who are not exposed to tobacco smoke in the home.	All	State	Oregon

Key to Sources:
CASI = Chicago Asthma Surveillance Initiative (Weiss KB, Grant EN. The Chicago Asthma Surveillance Initiative: As
Oregon = Guide to Improving Asthma Care in Oregon (Oregon Health Division, 2005; http://www.dhs.state.or.us/publichealth/asthma/guideor.cfm)
MQIC = Michigan Quality Improvement Initiative Guideline: Management of Persistent Asthma (MQIC, 2005; http://www.mqic.org/meas.htm)
NYCCAI = New York City Childhood Asthma Initiative (Garg et al, 2003)

Appendix E: BRFSS Measures, Data, and Benchmarks

In 2003, asthma data were collected under the Behavioral Risk Factor Surveillance System for 5 process measures, 7 outcome measures, and 3 prevalence measures. Those measures for adults with asthma include asthma history, routine check ups, doctor visits for asthma, limited activity due to asthma, medications for asthma, asthma symptoms, asthma episodes, emergency department visits, urgent care visits, and sleep difficulty due to asthma. The number of entities reporting varied from 15 to 54 depending on the measure. All 50 States, DC, and 3 U.S. Territories collected data on receipt of influenza vaccination in the past year. In our analysis, adult smokers with asthma were studied to determine the prevalence of smoking and asthma.

The BRFSS data are based on telephone surveys developed by the CDC but administered by each State independently. The survey consists of a core set of questions developed by CDC, additional questions developed by the States, and separate, optional modules for States to use. The asthma module, which contains the quality-of-care questions, is optional for State use. More information about the BRFSS data and methods as well as interactive databases with some State and local level asthma data are available at: http://www.cdc.gov/brfss/.

Limitations of BRFSS Data

Every data source has limitations that can relate to the population represented, methods used to collect the data, definitions, and analytic approaches. These factors affect the estimates generated from a data set. When similar measures from two data sets differ, the cause can usually be traced to the limitations of the data sets. By understanding the limitation of a data set, the strengths and weakness of estimates from the data set can be assessed and the estimates can be used more responsibly.

Limitations of BRFSS data include the following:

- BRFSS samples are kept small to minimize survey costs for States. The State BRFSS samples for the year 2001 range from 1,888 to 8,628 respondents (see: http://www.cdc.gov/brfss/technical_infodata/surveydata/2003.htm). Small samples increase the variance of estimates and decrease the size of the difference between two subpopulations that can be detected through the survey responses. In fact, among the asthma measures, the small sample sizes impeded statistical tests of differences, as discussed below.
- The BRFSS survey excludes people without a residential phone and people who are institutionalized. This means that the total population of interest—all people with asthma—will not be represented in the estimates that come from the survey.[1] This weakness can be dealt with by carefully discussing BRFSS results in relation to the population it represents.
- BRFSS data are self-reported and reflect the perceptions of respondents. An advantage

[1] See: Nelson D, Holtzman D, Bolen J, Stanwyck C, Mack K. Reliability and validity of measures from the behavioral risk factor surveillance system (BRFSS). Sozial un Praventivmedizin. 2001;46(Supp 1):S3-42.

of self-reports is that they can reveal information that cannot be obtained from other sources; for example, the receipt of flu vaccinations for people who do not see a doctor during the year. A disadvantage of self-report data is that respondents may have difficulty recalling events, understanding or interpreting questions, or responding truthfully to questions such as about compliance with advice. Furthermore, cultural and language barriers and limited health knowledge can affect the quality of self-reported data.[2] These problems may occur with different propensity for different subgroups.

BRFSS data, like most surveys, are limited by budget constraints. Because BRFSS is funded by States which vary considerably in resources allocated to health surveys, these fiscal disparities may affect the quality of the data across States. Such data quality shortcomings can include bias from differential response rates, varying followup periods, and variations in interviewer protocols or skills (for example, extent of probing for answers).

Small Sample Size in BRFSS

Table E.1 shows that small sample sizes in the BRFSS supplemental asthma survey result in tests that are unreliable. For example for *smoking cessation counseling*, 15 of 15 reporting States could not be distinguished from the average of the top 2 States (or top10 percent of States). This is partly because smoking cessation counseling is commonly provided across all States (the distribution of percent counseled is narrow), in combination with the small numbers of individuals interviewed in BRFSS. The smaller the difference to be detected, the greater the sample needed. The same issues are apparent for the measure "average number of symptom-free days in the past 2 weeks." Fourteen of 19 estimates are indistinguishable from the top decile, again a problem of small sample size.

By contrast, "flu shots in the past 12 months" is a measure collected from the core BRFSS survey and thus more reliable estimates result. Eleven of 54 entities represent States comparable to the best-in-class average of 5 States in the top 10 percent.

The issue of sample size is the main reason that the NHQR, which produces annual estimates, did not include State-level BRFSS data. For State estimates, multiple years of BRFSS should be used.

Estimates for individual BRFSS measures by State (including the District of Columbia and U.S. Territories) are presented in Tables E.2-E.16.

[2] Ibid.

Table E.1. Selected quality measures for asthma by State, District of Columbia, and U.S. Territory, 2003

	Process Measures								Outcome Measures- Daily life						Outcome Measures- Avoidable health care use			
	Routine care (in the past 12 months)		Smoking (counseling in the past 12 months)		Flu shots (in the past 12 months)		Medications (in the past month)		Limited activity days (in the past 12 months)		Sleep difficulty (none in the past month)		Symptom-free (in the past 2 weeks)		Urgent care visits (in the past 12 months)		Emergency room visits (in the past 12 months)	
	Percent	SE	Percent	SE	Percent	SE	Percent	SE	Average	SE	Percent	SE	Average	SE	Percent	SE	Percent	SE
Total US average	28.3	0.861	82.2	1.613	40.3	0.635	71.1	0.867	10.9	0.903	53.9	1.126	9.7	0.096	28.1	0.888	17.7	0.754
Best-in-class average	40.4	2.964	87.9	3.005	53.3	1.547	75.3	1.844	3.3	0.857	63.6	2.486	10.5	0.295	19.4	1.952	12.2	1.464
Worst performing States average	17.4	1.910	75.8	4.069	27.9	1.804	62.1	2.782	18.2	2.028	39.6	2.549	9.0	0.197	35.5	1.863	22.3	2.107
Number of States reporting	19		15		54		19		19		19		19		19		19	
Alabama					41.3	3.741												
Alaska					45.7 †	4.699												
Arizona					42.5	4.371												
Arkansas			75.5 †	5.771	46.8 †	3.142												
California					36.8	2.853												
Colorado			83.6 †	5.261	43.7	3.079												
Connecticut	33.2 †	2.691	89.6 †	4.633	45.3	2.648	73.2 †	2.413	16.1 −	2.063	58.8 †	3.292	10.2 †	0.274	30.1	2.579	17.3	2.037
Delaware	41.1 †	3.666			39.6	3.519	74.2 †	3.121	8.1 †	2.661	64.4 †	4.001	10.1 †	0.359	33.2	3.517	18.8	2.984
District of Columbia	38.9 †	5.035			31.8	4.370	69.2 †	4.504	18.4	5.484	42.0	5.731	10.5 †	0.485	27.6 †	4.500	26.5	4.737
Florida					41.6	4.027												
Georgia	32.7 †	3.166			36.0	3.503	76.1 †	2.895	11.2	3.472	44.0 −	4.194	9.9 †	0.368	26.1	2.778	20.8	2.577
Hawaii	29.4 +	3.543			43.4	3.929	69.7 †	3.851	4.1 †	0.881	45.7	4.838	10.4 †	0.372	40.0 −	4.044	13.2 †	2.544
Idaho					37.5	2.930												
Illinois					37.6	2.678												
Indiana	34.8 †	2.506			40.0	2.521	74.3 †	2.404	8.0	1.881	48.9	2.920	9.1 −	0.287	31.2	2.402	20.4	2.099
Iowa	22.0 −	2.661	83.3 †	6.397	40.5	3.244	74.3 †	3.108	6.8 †	3.242	58.2 †	3.880	9.1	0.364	24.0 †	3.003	12.5 †	2.035
Kansas					37.4	2.980												
Kentucky			81.0 †	4.532	37.5	2.522												
Louisiana			77.1 †	6.601	43.1	3.208												
Maine					46.4 †	3.691												
Maryland	24.2	3.103			43.7	3.540	62.9 −	3.712	13.7	3.117	55.0 †	4.787	10.1 †	0.399	28.1	3.259	18.9 †	3.289
Massachusetts					43.1	2.312												
Michigan	29.0	2.888			39.5	3.062	70.9 †	2.990	9.9 †	4.138	61.4 †	3.579	9.3	0.323	26.3 †	2.955	16.7 †	2.511
Minnesota	21.3 −	2.987			45.8 †	3.640	71.4 †	3.366	3.0 †	1.112	59.8 †	4.413	9.8 †	0.356	19.1 †	3.154	15.3 †	2.914
Mississippi					35.6	3.286												
Missouri					38.9	3.557												
Montana					52.9 †	3.677												
Nebraska			76.3 †	5.698	51.6 †	3.004												
Nevada					32.7	4.415												
New Hampshire	21.9 −	2.234	81.2 †	7.810	43.3	2.751	69.2 †	2.739	11.3	2.001	63.0 †	3.163	10.0 †	0.264	25.1 †	2.466	16.8 †	2.271
New Jersey	35.8 †	2.088	82.0 †	4.411	37.6	2.004	71.0 †	2.018	18.2 −	2.174	52.0	2.714	10.3 †	0.205	34.0	2.086	17.7	1.771
New Mexico	23.8	2.806			46.6 †	3.085	66.5	3.110	14.1	3.056	59.2 †	3.699	9.7 †	0.357	20.0 †	2.336	13.7 †	2.193
New York					44.3	2.689												
North Carolina			84.5 †	5.238	41.3	2.813												
North Dakota					49.6 †	3.749												
Ohio					36.9	3.446												
Oklahoma	30.0	2.300	87.2 †	3.822	44.1	2.472	74.5 †	2.328	10.4	2.599	39.1 −	2.849	9.0 −	0.269	27.8	2.241	21.2	2.349
Oregon					40.5	2.904												
Pennsylvania					40.4	3.289												
Rhode Island			86.5 †	6.718	46.1	2.938												
South Carolina					48.7 †	3.000												
South Dakota					56.0 †	3.603												
Tennessee					37.1	3.736												
Texas	25.2	2.783	83.9 †	4.479	38.0	2.848	73.6 †	2.631	8.6	2.149	53.3	3.385	9.6	0.289	31.3	2.994	17.3 †	2.378
Utah	16.9 −	3.199			35.6	3.474	61.2 −	4.150	8.8 †	3.809	51.4	4.600	10.0 †	0.401	27.3 †	4.046	12.6 †	2.450
Vermont	17.8 −	2.199			36.9	3.055	69.4 †	3.006	3.5 †	1.257	57.4 †	3.782	9.7 †	0.321	19.6 †	2.460	12.1 †	2.096
Virginia	29.8	2.947	80.5 †	6.180	39.4	3.391	67.1	2.908	17.2	3.099	55.8	3.562	9.7 †	0.376	28.8	2.817	20.0	2.814
Washington					41.7	1.465												
West Virginia			76.3 †	5.923	45.9	3.225												
Wisconsin	23.6	2.958			43.5	3.377	65.8	3.533	8.7 †	4.640	56.0 †	4.086	9.9 †	0.364	22.5 †	2.915	15.7 †	2.651
Wyoming					55.0 †	3.198												
Guam					31.3	6.900												
Puerto Rico					25.6 −	2.482												
Virgin Islands					18.8 −	6.433												

Source: BRFSS, CDC, 2003.

† Indicates that the State estimate is **not** significantly different from the best in class average (P>0.05).
+ Indicates that the State estimate is statistically better than the national average (P<0.05).
− Indicates that the State estimate is statistically worse than the national average (P<0.05).
No symbol indicates that State estimate is no different than the national average.

Table E.2. Lifetime asthma prevalence: Percent of people who were ever told by a health professional that they have asthma by State, District of Columbia, and U. S. Territory, 2003

	All Adults						Adults Age 18-64			Adults Age 65+		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	257312	11.9		0.121			200657	12.3	0.138	54666	10.03	0.238
Top decile average	21099	10.1		0.270			12935	10.2	0.350	3861	7.2	0.452
Bottom decile average	38392	14.8		0.232			30176	15.6	0.266	3788	13.3	0.728
Alabama	3339	11.6		0.688	0.626	0.048	2568	11.9	0.796	742	10.31	1.274
Alaska	2658	13.3		0.942	0.143	0.001	2357	12.9	0.991	278	15.58	3.063
Arizona	3233	12.5		0.845	0.497	0.007	2369	12.4	0.980	833	13.01	1.616
Arkansas	4199	11.3		0.569	0.336	0.049	3210	12.3	0.672	961	7.67	0.936
California	4475	13.4	-	0.606	**0.016**	0.000	3580	13.6	0.678	880	12.36	1.268
Colorado	4064	12.4		0.621	0.402	0.001	3360	12.4	0.675	681	12.62	1.614
Connecticut	5310	12.2		0.512	0.608	0.000	4143	13.3	0.600	1068	7.69	0.918
Delaware	4038	11.7		0.668	0.814	0.023	3212	12.2	0.762	797	9.27	1.310
District of Columbia	2038	12.7		0.925	0.368	0.006	1661	13.5	1.047	333	9.57	2.071
Florida	5034	10.1	‡	0.644	**0.006**	**1.000**	3552	10.4	0.764	1431	9.19	1.191
Georgia	7633	11.8		0.580	0.919	0.007	6138	12.1	0.654	1429	10.36	1.033
Hawaii	4332	11.6		0.609	0.595	0.027	3423	12.5	0.710	882	7.67	1.044
Idaho	4992	11.7		0.551	0.710	0.010	3944	12	0.629	1020	10.06	1.020
Illinois	5264	11.1		0.492	0.129	**0.066**	4261	11.5	0.552	999	8.81	0.992
Indiana	5474	12.0		0.495	0.844	0.001	4344	12.5	0.563	1104	9.83	0.977
Iowa	4999	10.3	‡	0.556	**0.004**	**0.808**	3707	10.9	0.666	1269	7.82	0.857
Kansas	4613	11.5		0.582	0.545	0.025	3535	12.4	0.687	1038	7.9	0.907
Kentucky	7622	12.6		0.582	0.267	0.000	5690	12.6	0.673	1900	12.48	1.016
Louisiana	5072	10.2	‡	0.508	**0.001**	**0.848**	4064	10.4	0.576	984	9.18	1.019
Maine	2384	13.4		0.814	0.068	0.000	1881	14.1	0.955	477	10.55	1.435
Maryland	4433	12.3		0.660	0.531	0.002	3587	12.7	0.746	775	10.44	1.317
Massachusetts	7569	14.4	-	0.532	**0.000**	0.000	6059	15.3	0.610	1372	10.67	1.095
Michigan	3546	13.6		0.678	**0.015**	0.000	2703	14.2	0.779	824	10.6	1.173
Minnesota	3874	10.5	‡	0.596	**0.024**	**0.511**	3042	11.2	0.691	832	6.97	0.897
Mississippi	4416	10.9	‡	0.569	0.089	**0.198**	3434	11.2	0.651	951	9.4	1.060
Missouri	4250	11.9		0.712	0.978	0.019	3130	12.9	0.846	1083	7.91	1.075
Montana	4018	11.1		0.670	0.217	**0.184**	3104	11.2	0.762	882	10.5	1.405
Nebraska	4970	10.3	‡	0.507	**0.002**	**0.702**	3720	10.6	0.588	1225	9.39	0.929
Nevada	2969	11.4		0.825	0.573	**0.125**	2365	12	0.941	599	8.24	1.374
New Hampshire	5036	12.9		0.567	0.094	0.000	4041	13.7	0.655	921	8.92	1.004
New Jersey	11293	10.9	‡	0.365	**0.009**	**0.078**	8621	11.5	0.426	2479	8.57	0.653
New Mexico	5490	10.5	‡	0.495	**0.005**	**0.500**	4245	10.6	0.561	1224	9.83	1.005
New York	5535	11.7		0.507	0.687	0.006	4350	12.4	0.588	1113	8.39	0.920
North Carolina	9446	11.3		0.524	0.281	0.038	7166	11.3	0.600	2210	11.26	0.981
North Dakota	3021	10.1	‡	0.618	**0.004**	**0.965**	2264	10.2	0.716	730	9.66	1.207
Ohio	3821	10.8		0.641	0.104	**0.287**	3049	11.4	0.731	733	8.22	1.309
Oklahoma	7624	11.8		0.458	0.816	0.001	5670	12.5	0.538	1918	8.54	0.721
Oregon	4010	14.7	-	0.633	**0.000**	0.000	3112	15.2	0.727	873	12.14	1.181
Pennsylvania	3665	11.9		0.616	0.987	0.007	2807	12.2	0.710	827	10.85	1.223
Rhode Island	4042	14.4		0.690	**0.000**	0.000	3161	15.9	0.821	830	8.22	1.017
South Carolina	5921	10.2	‡	0.473	**0.000**	**0.927**	4651	10.1	0.529	1213	10.41	1.077
South Dakota	5257	10.7	‡	0.572	**0.035**	**0.368**	3826	10.7	0.677	1397	10.56	0.959
Tennessee	2586	11.8		0.804	0.941	0.040	2064	12.2	0.912	511	9.59	1.411
Texas	6022	11.3		0.491	0.206	0.038	4891	11.4	0.550	1083	10.18	1.020
Utah	4048	11.3	‡	0.692	0.377	**0.112**	3326	11.4	0.768	703	10.25	1.373
Vermont	4243	12.2		0.605	0.638	0.002	3308	13.2	0.707	910	7.14	0.890
Virginia	5435	12.1		0.606	0.722	0.002	4379	12.1	0.666	1018	12.88	1.471
Washington	18605	13.9	-	0.325	**0.000**	0.000	14661	14.3	0.368	3920	11.58	0.624
West Virginia	3346	11.8		0.623	0.900	0.011	2533	12.1	0.727	801	10.68	1.147
Wisconsin	4049	11.0	‡	0.623	0.143	**0.200**	3217	11.3	0.710	802	9.63	1.262
Wyoming	3999	11.3	‡	0.572	0.266	**0.069**	3172	11	0.639	801	12.24	1.265
Guam	805	10.3	‡	1.153	0.170	**0.859**	733	10.2	1.210	65	12.24	4.061
Puerto Rico	4166	20.7	-	0.849	**0.000**	0.000	3183	22	0.979	978	13.72	1.300
Virgin Islands	2051	9.2	‡	0.964	**0.006**	**0.385**	1735	10	1.098	276	4.92	1.515

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

DNC=Data Not Collected

DNS=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.3. Current asthma prevalence: Percent of people who were ever told they have asthma who still have asthma by State, District of Columbia, and U.S. Territory, 2003

	All Adults						Adults Age 18-64			Adults Age 65+		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	256651	7.7		0.099			200105	7.8	0.112	54562	7.2	0.200
Top decile average	22299	5.9		0.207			17387	5.9	0.233	3960	4.6	0.362
Bottom decile average	25719	10.0		0.247			19921	10.3	0.284	4815	10.1	0.577
Alabama	3337	7.5		0.543	0.717	0.006	2567	7.6	0.620	741	7.3	1.108
Alaska	2653	9.1		0.826	0.092	0.000	2353	8.7	0.870	277	12.0	2.667
Arizona	3223	8.3		0.724	0.412	0.001	2364	8.1	0.834	828	9.4	1.440
Arkansas	4189	7.3		0.449	0.384	0.005	3202	7.8	0.523	959	5.4	0.823
California	4469	8.4		0.497	0.167	0.000	3575	8.3	0.556	879	8.6	1.059
Colorado	4054	8.3		0.504	0.243	0.000	3350	8.4	0.561	681	7.2	1.036
Connecticut	5290	8.3		0.430	0.174	0.000	4128	9.0	0.503	1063	5.1	0.779
Delaware	4033	7.5		0.531	0.711	0.005	3208	7.8	0.602	796	6.1	1.100
District of Columbia	2035	7.8		0.720	0.891	0.011	1658	8.1	0.802	333	6.8	1.796
Florida	5020	6.1	‡	0.502	**0.002**	**0.713**	3540	6.1	0.597	1429	6.0	0.924
Georgia	7610	7.0		0.470	0.145	0.032	6119	7.1	0.530	1425	6.5	0.854
Hawaii	4328	5.6	‡	0.439	**0.000**	**0.537**	3419	6.1	0.517	882	3.9	0.687
Idaho	4974	7.9		0.468	0.676	0.000	3927	8.0	0.531	1019	7.5	0.914
Illinois	5254	7.4		0.396	0.462	0.001	4253	7.4	0.437	997	7.1	0.916
Indiana	5461	8.1		0.401	0.333	0.000	4334	8.3	0.453	1101	6.9	0.834
Iowa	4996	6.2	‡	0.418	**0.000**	**0.520**	3704	6.5	0.495	1269	5.3	0.702
Kansas	4606	7.5		0.455	0.668	0.001	3530	7.8	0.528	1036	6.2	0.829
Kentucky	7600	9.8		0.507	**0.000**	0.000	5674	9.6	0.582	1894	10.8	0.952
Louisiana	5066	6.2	‡	0.398	**0.000**	**0.504**	4059	6.2	0.446	983	6.6	0.869
Maine	2375	9.9	-	0.700	**0.002**	0.000	1873	10.1	0.815	476	9.0	1.322
Maryland	4420	7.8		0.537	0.855	0.001	3575	8.0	0.610	774	7.2	1.038
Massachusetts	7548	9.9	-	0.442	**0.000**	0.000	6041	10.4	0.510	1369	7.7	0.864
Michigan	3538	9.3	-	0.566	**0.005**	0.000	2695	9.4	0.645	824	8.2	1.062
Minnesota	3852	6.8	‡	0.479	0.066	**0.085**	3022	7.2	0.552	830	5.0	0.782
Mississippi	4405	6.9	‡	0.468	0.094	**0.051**	3424	7.0	0.536	950	6.6	0.901
Missouri	4242	8.0		0.582	0.611	0.001	3125	8.6	0.693	1080	5.5	0.865
Montana	4009	7.9		0.562	0.726	0.001	3095	7.8	0.628	882	8.6	1.276
Nebraska	4958	7.1		0.411	0.156	0.009	3710	7.1	0.470	1223	7.2	0.829
Nevada	2954	6.6	‡	0.638	0.088	**0.297**	2351	6.8	0.724	598	5.6	1.155
New Hampshire	5014	8.5		0.457	0.087	0.000	4024	8.8	0.522	917	7.0	0.913
New Jersey	11257	7.1		0.292	0.052	0.001	8592	7.3	0.337	2473	6.1	0.562
New Mexico	5486	6.7	‡	0.408	**0.017**	**0.080**	4242	6.8	0.461	1223	6.7	0.849
New York	5518	7.6		0.413	0.814	0.000	4337	8.1	0.477	1110	5.8	0.768
North Carolina	9433	7.1		0.400	0.145	0.008	7156	6.7	0.448	2207	8.6	0.872
North Dakota	3016	7.0		0.511	0.179	0.046	2262	6.7	0.580	727	8.0	1.097
Ohio	3813	7.1		0.507	0.245	0.028	3043	7.2	0.571	731	6.4	1.120
Oklahoma	7607	7.6		0.368	0.793	0.000	5659	7.9	0.432	1912	6.1	0.583
Oregon	3999	9.3	-	0.524	**0.003**	0.000	3103	9.5	0.598	871	8.4	1.015
Pennsylvania	3652	8.3		0.533	0.268	0.000	2796	8.3	0.607	825	8.6	1.134
Rhode Island	4030	9.6	-	0.549	**0.001**	0.000	3150	10.4	0.651	830	6.0	0.862
South Carolina	5913	6.1	‡	0.359	**0.000**	**0.629**	4643	5.8	0.387	1213	7.8	0.960
South Dakota	5246	7.3		0.491	0.425	0.009	3816	7.1	0.578	1396	8.3	0.859
Tennessee	2580	7.9		0.641	0.758	0.003	2058	8.0	0.720	511	7.7	1.309
Texas	6009	6.9		0.401	0.053	0.027	4880	6.8	0.446	1081	7.0	0.866
Utah	4040	7.4		0.578	0.609	0.015	3322	7.4	0.641	699	6.5	1.130
Vermont	4233	8.4		0.523	0.188	0.000	3299	9.0	0.612	909	5.2	0.781
Virginia	5411	7.6		0.497	0.844	0.002	4357	7.4	0.543	1016	9.3	1.261
Washington	18529	9.1	-	0.266	**0.000**	0.000	14595	9.2	0.299	3911	8.1	0.541
West Virginia	3341	8.1		0.509	0.440	0.000	2529	8.1	0.586	800	8.0	1.005
Wisconsin	4039	7.5		0.503	0.696	0.003	3207	7.5	0.564	802	7.4	1.129
Wyoming	3986	7.5		0.469	0.676	0.002	3160	7.0	0.513	800	9.7	1.164
Guam	803	6.5	‡	0.950	0.209	**0.537**	731	6.6	1.009	65	6.4	2.896
Puerto Rico	4166	10.8	-	0.619	**0.000**	0.000	3183	11.3	0.715	978	8.1	0.985
Virgin Islands	2042	4.5	‡	0.761	**0.000**	**0.076**	1726	4.8	0.873	276	2.4	0.979

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

DNC=Data Not Collected

DNS=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.4. Age at asthma diagnosis: Percent of adults with asthma who were diagnosed before age 10 by State, District of Columbia, and U.S. Territory, 2003

	Diagnosed at age < 10 years					
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**
Total U.S.	10695	38.5		0.798		
Top decile average	1423	47.0		1.872		
Bottom decile average	1062	31.0		1.702		
Alabama	N/C	N/C		N/C	--	--
Alaska	N/C	N/C		N/C	--	--
Arizona	N/C	N/C		N/C	--	--
Arkansas	N/C	N/C		N/C	--	--
California	N/C	N/C		N/C	--	--
Colorado	N/C	N/C		N/C	--	--
Connecticut	612	32.1	‡	2.238	**0.007**	**0.699**
Delaware	461	39.0		3.098	0.883	0.024
District of Columbia	227	42.2		4.024	0.370	0.011
Florida	N/C	N/C		N/C	--	--
Georgia	791	46.7	+	2.748	**0.004**	0.000
Hawaii	465	44.7	+	2.880	**0.039**	0.000
Idaho	N/C	N/C		N/C	--	--
Illinois	N/C	N/C		N/C	--	--
Indiana	617	35.7	‡	2.249	0.235	**0.098**
Iowa	455	42.0		3.014	0.259	0.001
Kansas	N/C	N/C		N/C	--	--
Kentucky	N/C	N/C		N/C	--	--
Louisiana	N/C	N/C		N/C	--	--
Maine	N/C	N/C		N/C	--	--
Maryland	477	33.9	‡	2.926	0.129	**0.392**
Massachusetts	N/C	N/C		N/C	--	--
Michigan	450	29.5	‡	2.624	**0.001**	**0.636**
Minnesota	378	33.5	‡	3.054	0.114	**0.474**
Mississippi	N/C	N/C		N/C	--	--
Missouri	N/C	N/C		N/C	--	--
Montana	N/C	N/C		N/C	--	--
Nebraska	N/C	N/C		N/C	--	--
Nevada	N/C	N/C		N/C	--	--
New Hampshire	604	32.1	‡	2.490	**0.015**	**0.703**
New Jersey	1130	33.0	‡	1.861	**0.007**	**0.428**
New Mexico	571	33.8	‡	2.538	0.076	**0.363**
New York	N/C	N/C		N/C	--	--
North Carolina	N/C	N/C		N/C	--	--
North Dakota	N/C	N/C		N/C	--	--
Ohio	N/C	N/C		N/C	--	--
Oklahoma	821	45.4	+	2.159	**0.003**	0.000
Oregon	N/C	N/C		N/C	--	--
Pennsylvania	N/C	N/C		N/C	--	--
Rhode Island	N/C	N/C		N/C	--	--
South Carolina	N/C	N/C		N/C	--	--
South Dakota	N/C	N/C		N/C	--	--
Tennessee	N/C	N/C		N/C	--	--
Texas	632	47.4		2.438	**0.001**	0.000
Utah	460	33.7	‡	3.133	0.139	**0.445**
Vermont	473	35.8	‡	2.686	0.340	**0.129**
Virginia	625	39.7		2.775	0.667	0.007
Washington	N/C	N/C		N/C	--	--
West Virginia	N/C	N/C		N/C	--	--
Wisconsin	446	33.8	‡	2.999	0.129	**0.418**
Wyoming	N/C	N/C		N/C	--	--
Guam	N/C	N/C		N/C	--	--
Puerto Rico	N/C	N/C		N/C	--	--
Virgin Islands	N/C	N/C		N/C	--	--

Source: Medstat calculations from Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.5. Urgent care visits: Percent of adults currently with asthma who had at least one urgent care visit for asthma with their provider in the past 12 months by State, District of Columbia and U.S. Territory, 2003

	All Adults						Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	7239	28.1		0.888			5923	29.2	1.012	1263	21.9	1.685
Top decile average	586	19.4		1.952	**0.000**		579	19.6	1.843	123	16.2	3.371
Bottom decile average	1028	35.5		1.863			828	36.5	2.089	173	33.6	4.503
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	431	30.1		2.579	0.463	0.001	374	30.2	2.744	52	29.1	7.851
Delaware	322	33.2		3.517	0.160	0.001	265	33.2	3.811	54	33.2	9.334
District of Columbia	153	27.6	‡	4.500	0.913	**0.095**	130	28.8	4.941	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	525	26.1		2.778	0.493	0.048	432	25.7	3.060	89	26.6	6.110
Hawaii	255	40.0	-	4.044	**0.004**	0.000	215	40.3	4.430	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	447	31.2		2.402	0.226	0.000	372	32.8	2.702	74	20.2	5.224
Iowa	299	24.0	‡	3.003	0.190	**0.199**	230	25.0	3.478	68	19.0	5.306
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	320	28.1		3.259	1.000	0.022	260	29.6	3.634	58	18.3	6.791
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	321	26.3	‡	2.955	0.560	**0.051**	255	28.0	3.347	63	17.0	4.886
Minnesota	256	19.1	‡	3.154	**0.006**	**0.936**	212	21.1	3.535	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	430	25.1	‡	2.466	0.252	**0.070**	361	26.7	2.762	60	15.3	4.669
New Jersey	773	34.0		2.086	**0.009**	0.000	613	35.1	2.356	149	27.6	4.576
New Mexico	368	20.0	‡	2.336	**0.001**	**0.844**	295	18.6	2.532	73	27.4	5.925
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	559	27.8		2.241	0.901	0.005	439	26.6	2.459	119	33.8	5.021
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	401	31.3		2.994	0.306	0.001	325	33.1	3.436	73	21.0	4.874
Utah	305	27.3	‡	4.046	0.847	**0.079**	252	27.8	4.434	50	24.9	7.728
Vermont	330	19.6	‡	2.460	**0.001**	**0.949**	284	20.6	2.687	**N/S**	**N/S**	**N/S**
Virginia	425	28.8		2.817	0.813	0.006	344	31.2	3.566	80	18.5	5.164
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	319	22.5	‡	2.915	0.066	**0.377**	265	21.3	3.010	53	28.5	8.202
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.6. Emergency room visits: Percent of adults with asthma who have had at least one visit to the emergency room for asthma in the past 12 months by states, District of Columbia and U.S. Territory, 2003

	All Adults					Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	7290	17.7		0.754			5955	18.7	0.854	1281	12.4	1.356
Top decile average	635	12.2		1.464	**0.001**		536	12.1	1.712	127	7.0	2.497
Bottom decile average	712	22.3		2.107			482	22.8	2.668	145	22.2	4.637
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	437	17.3		2.037	0.838	0.044	377	17.5	2.170	55	16.8	6.615
Delaware	322	18.8		2.984	0.725	0.048	265	21.0	3.412	54	7.8	4.239
District of Columbia	155	26.5		4.737	0.067	0.004	131	25.3	4.865	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	539	20.8		2.577	0.252	0.004	441	20.2	2.877	94	22.2	5.952
Hawaii	258	13.2	‡	2.544	0.093	**0.722**	218	13.2	2.777	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	446	20.4		2.099	0.226	0.001	370	21.5	2.338	75	14.5	4.653
Iowa	301	12.5	‡	2.035	**0.016**	**0.918**	230	13.4	2.445	70	8.0	3.550
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	321	18.9	‡	3.289	0.729	**0.064**	261	20.5	3.705	58	8.1	3.470
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	324	16.7	‡	2.511	0.697	**0.123**	258	17.1	2.806	63	14.7	5.325
Minnesota	257	15.3	‡	2.914	0.423	**0.344**	212	16.0	3.247	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	433	16.8	‡	2.271	0.717	**0.086**	362	16.7	2.493	62	18.8	5.854
New Jersey	776	17.7		1.771	0.989	0.017	615	19.1	2.043	150	10.4	3.194
New Mexico	370	13.7	‡	2.193	0.082	**0.580**	297	14.2	2.448	73	10.8	4.601
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	557	21.2		2.349	0.160	0.001	439	21.6	2.662	117	19.0	4.026
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	403	17.3	‡	2.378	0.876	**0.067**	327	19.5	2.757	73	6.4	3.030
Utah	304	12.6	‡	2.450	**0.046**	**0.894**	250	11.5	2.565	51	22.1	7.392
Vermont	334	12.1	‡	2.096	**0.011**	**0.957**	286	12.7	2.300	**N/S**	**N/S**	**N/S**
Virginia	433	20.0		2.814	0.425	0.014	351	21.9	3.185	81	11.7	3.709
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	320	15.7	‡	2.651	0.462	**0.251**	265	16.2	2.834	53	13.4	7.056
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.7. Asthma attacks/episodes: Percent of adults with asthma who had an asthma episode in the past 12 months by State, District of Columbia and U.S. Territory, 2003

	Adults- total						Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent with Asthma Episode		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent with Asthma Episode	Standard Error	Sample Size	Percent with Asthma Episode	Standard Error
Total U.S.	7292	56.0		0.945			5958	58.9	1.046	1280	39.2	2.078
Top decile average	761	49.3		2.402			795	52.4	2.775	108	27.6	5.067
Bottom decile average	972	63.4		1.846			773	66.1	2.050	185	52.2	4.023
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	434	54.6	‡	2.765	0.633	**0.148**	375	57.5	2.971	54	31.8	7.329
Delaware	321	54.7	‡	3.564	0.717	**0.212**	264	60.5	3.829	54	23.3	7.020
District of Columbia	156	54.7	‡	4.860	0.792	**0.320**	131	54.6	5.225	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	541	53.3	‡	3.519	0.465	**0.343**	445	53.8	3.898	92	48.5	6.883
Hawaii	258	56.2	‡	4.014	0.970	**0.143**	218	58.4	4.377	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	447	56.6		2.614	0.829	0.040	371	60.4	2.855	75	34.4	6.047
Iowa	300	53.2	‡	3.325	0.420	**0.340**	229	57.4	3.855	70	33.1	6.630
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	317	55.7	‡	3.688	0.937	**0.146**	257	57.8	4.094	58	41.6	7.638
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	323	53.1	‡	3.210	0.380	**0.348**	257	55.9	3.560	63	38.4	6.767
Minnesota	255	60.1		3.543	0.260	0.011	211	64.6	3.823	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	434	56.0	‡	2.816	0.989	**0.069**	362	56.9	3.097	63	49.3	6.915
New Jersey	777	52.3	‡	2.187	0.118	**0.359**	619	55.5	2.440	147	33.8	4.630
New Mexico	370	52.6	‡	3.261	0.323	**0.409**	297	54.5	3.642	73	42.7	6.852
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	567	64.1	-	2.426	**0.002**	0.000	444	66.0	2.722	122	53.8	4.961
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	405	62.3	-	2.847	**0.036**	0.000	329	66.1	3.119	73	41.5	6.376
Utah	306	58.0	‡	4.165	0.633	**0.069**	251	60.8	4.576	52	39.5	8.696
Vermont	329	51.6	‡	3.346	0.209	**0.572**	283	55.7	3.579	**N/S**	**N/S**	**N/S**
Virginia	432	47.6	‡	3.378	**0.016**	**0.674**	350	50.6	3.900	81	34.2	7.050
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	320	56.2	‡	3.583	0.954	**0.109**	265	58.2	3.960	53	45.4	8.227
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.8. Limited activity due to asthma: Average number of days adults with asthma were unable to work or carry out usual activities in the past 12 months by State, District of Columbia and U.S. Territory, 2003

	All Adults						Adults Age 18-64			Adults age 65 and over		
	Sample Size	Average Number of Days		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Average Number of Days	Standard Error	Sample Size	Average Number of Days	Standard Error
Total U.S.	7063	10.9		0.903			5814	10.1	0.925	1200	15.8	3.082
Top decile average	572	3.3		0.857	**0.000**		424	2.8	0.555	132	5.7	2.492
Bottom decile average	913	18.2		2.028			734	18.5	2.232	128	28.3	8.891
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	432	16.1	-	2.063	**0.021**	0.000	375	15.7	2.147	53	20.5	7.161
Delaware	312	8.1	‡	2.661	0.316	**0.087**	258	6.5	2.340	51	19.2	12.991
District of Columbia	153	18.4		5.484	0.179	0.007	130	20.0	6.302	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	500	11.2		3.472	0.936	0.027	416	10.7	3.888	80	12.9	5.988
Hawaii	253	4.1	‡	0.881	**0.000**	**0.537**	214	3.7	0.897	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	431	8.0		1.881	0.163	0.023	359	8.2	2.107	71	7.0	3.800
Iowa	289	6.8	‡	3.242	0.219	**0.302**	227	7.2	3.782	61	4.2	3.109
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	316	13.7		3.117	0.386	0.001	260	14.6	3.506	54	7.3	3.866
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	314	9.9	‡	4.138	0.811	**0.119**	253	9.7	4.652	58	11.5	7.315
Minnesota	252	3.0	‡	1.112	**0.000**	**0.850**	210	1.9	0.645	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	416	11.3		2.001	0.864	0.000	351	9.2	1.794	57	27.5	10.076
New Jersey	760	18.2	-	2.174	**0.002**	0.000	604	18.1	2.351	147	19.2	5.902
New Mexico	364	14.1		3.056	0.312	0.001	293	11.3	2.460	71	29.0	13.906
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	543	10.4		2.599	0.861	0.009	427	9.8	2.833	115	14.1	6.921
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	384	8.6		2.149	0.330	0.021	316	6.8	1.872	65	20.0	9.854
Utah	301	8.8	‡	3.809	0.598	**0.156**	250	9.7	4.263	**N/S**	**N/S**	**N/S**
Vermont	320	3.5	‡	1.257	**0.000**	**0.878**	278	3.8	1.384	**N/S**	**N/S**	**N/S**
Virginia	406	17.2		3.099	0.050	0.000	330	17.0	3.345	75	18.5	7.539
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	317	8.7	‡	4.640	0.643	**0.252**	263	4.8	1.891	53	27.2	23.898
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.9. No sleep difficulty due to asthma: Percent of adults with asthma who had no difficulty sleeping due to asthma during the past month by State, District of Columbia and U.S. Territory, 2003

	All Adults						Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	5286	53.9		1.126			4331	52.0	1.263	912	64.2	2.300
Top decile average	544	63.6		2.486	**0.000**		457	62.8	2.737	115	72.7	4.436
Bottom decile average	528	39.6		2.549			675	40.0	2.793	154	51.8	4.799
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	298	58.8	‡	3.292	0.156	**0.248**	257	58.6	3.542	**N/S**	**N/S**	**N/S**
Delaware	229	64.4	‡	4.001	**0.012**	**0.872**	191	62.6	4.434	**N/S**	**N/S**	**N/S**
District of Columbia	103	42.0		5.731	**0.041**	0.001	83	45.9	6.435	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	407	44.0	-	4.194	**0.023**	0.000	338	43.6	4.587	66	46.0	8.124
Hawaii	173	45.7		4.838	0.098	0.001	143	43.9	5.545	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	362	48.9		2.920	0.110	0.000	305	46.5	3.198	57	63.6	6.898
Iowa	240	58.2	‡	3.880	0.283	**0.245**	181	54.9	4.471	59	74.7	6.378
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	208	55.0	‡	4.787	0.828	**0.109**	167	56.8	5.291	**N/S**	**N/S**	**N/S**
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	255	61.4	‡	3.579	**0.047**	**0.608**	200	60.0	4.016	52	67.5	6.933
Minnesota	181	59.8	‡	4.413	0.195	**0.454**	148	57.9	4.895	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	315	63.0	‡	3.163	**0.007**	**0.880**	266	63.0	3.467	**N/S**	**N/S**	**N/S**
New Jersey	506	52.0		2.714	0.527	0.002	401	50.4	3.051	96	61.0	5.840
New Mexico	258	59.2	‡	3.699	0.167	**0.329**	208	58.9	4.137	50	61.0	8.156
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	425	39.1	-	2.849	**0.000**	0.000	337	36.3	3.178	88	56.1	5.778
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	307	53.3		3.385	0.859	0.014	248	49.5	3.789	56	70.6	6.198
Utah	238	51.4		4.600	0.592	0.019	193	49.6	5.250	**N/S**	**N/S**	**N/S**
Vermont	246	57.4	‡	3.782	0.372	**0.172**	220	56.1	4.012	**N/S**	**N/S**	**N/S**
Virginia	304	55.8		3.562	0.612	**0.072**	254	51.9	4.301	**N/S**	**N/S**	**N/S**
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	231	56.0	‡	4.086	0.615	**0.113**	191	54.7	4.494	**N/S**	**N/S**	**N/S**
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.10. Routine care for asthma: Percent of adults with asthma who had 2 or more planned care visits for asthma during the past 12 months by State, District of Columbia and U.S. Territory, 2003

	All Adults					Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	7194	28.3		0.861			5903	26.0	0.946	1238	41.7	2.123
Top decile average	473	40.4		2.964	**0.000**		393	37.0	3.149	197	59.6	4.212
Bottom decile average	634	17.4		1.910			535	16.1	2.016	128	34.5	4.544
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	431	33.2	‡	2.691	0.082	**0.072**	372	31.8	2.865	54	40.5	7.918
Delaware	320	41.1	‡	3.666	**0.001**	**0.888**	263	37.8	3.926	54	63.7	8.358
District of Columbia	153	38.9	‡	5.035	**0.039**	**0.792**	130	35.3	5.265	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	521	32.7	‡	3.166	0.182	**0.075**	431	30.0	3.404	86	54.7	7.183
Hawaii	255	29.4	+	3.543	0.759	0.017	215	28.1	3.844	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	441	34.8	‡	2.506	**0.014**	**0.150**	369	33.4	2.735	71	43.7	6.446
Iowa	296	22.0	-	2.661	**0.024**	0.000	226	19.4	2.947	69	33.6	6.214
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	319	24.2		3.103	0.199	0.000	259	22.3	3.362	58	37.1	7.559
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	322	29.0		2.888	0.816	0.006	257	26.7	3.162	62	41.7	6.776
Minnesota	255	21.3	-	2.987	**0.024**	0.000	212	20.7	3.269	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	430	21.9	-	2.234	**0.008**	0.000	362	20.1	2.370	59	35.6	6.716
New Jersey	759	35.8	‡	2.088	**0.001**	**0.209**	605	31.7	2.263	143	58.0	4.881
New Mexico	366	23.8		2.806	0.122	0.000	295	20.9	2.960	71	38.8	7.146
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	558	30.0		2.300	0.479	0.006	440	28.1	2.511	117	42.5	5.066
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	397	25.2		2.783	0.284	0.000	325	23.1	3.101	69	38.4	6.386
Utah	303	16.9	-	3.199	**0.001**	0.000	251	15.1	3.401	**N/S**	**N/S**	**N/S**
Vermont	331	17.8	-	2.199	**0.000**	0.000	284	16.9	2.325	**N/S**	**N/S**	**N/S**
Virginia	420	29.8		2.947	0.627	0.011	343	27.8	3.423	76	39.1	7.936
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	317	23.6		2.958	0.125	0.000	264	20.9	2.964	52	36.6	8.337
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.11. Doctors visits for asthma: Percent of adults with asthma who had a physician visit for asthma in the past 12 months by State, District of Columbia and U.S. Territory, 2003

	All Adults					Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	7294	61.4		0.953			5958	60.8	1.061	1283	64.7	2.038
Top decile average	1212	71.1		1.510			992	69.6	1.692	204	80.1	2.998
Bottom decile average	871	56.1		2.719			548	55.3	2.861	131	53.0	4.983
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	435	68.7	‡	2.477	**0.006**	**0.402**	376	67.5	2.686	54	74.7	6.498
Delaware	322	68.4		3.460	0.051	**0.476**	265	66.0	3.894	54	81.9	5.068
District of Columbia	154	66.6		4.593	0.272	**0.347**	130	64.2	5.051	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	538	56.6		3.890	0.232	0.001	442	55.6	4.194	92	62.7	6.819
Hawaii	258	63.3	‡	3.926	0.647	**0.062**	218	63.1	4.299	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	448	64.9		2.508	0.191	0.034	372	65.1	2.748	75	63.4	6.131
Iowa	300	63.7	‡	3.500	0.532	**0.051**	230	62.1	3.953	69	71.4	7.062
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	321	61.5		3.534	0.987	0.012	261	63.4	3.892	58	48.9	7.748
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	323	60.8		3.178	0.866	0.004	257	58.6	3.557	63	72.5	5.998
Minnesota	256	61.7		3.511	0.929	0.014	212	63.0	3.835	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	433	61.4		2.814	0.997	0.002	362	61.1	3.096	62	63.9	6.988
New Jersey	777	72.5	‡	1.904	**0.000**	**0.567**	616	70.9	2.177	150	79.4	3.655
New Mexico	368	56.9		3.281	0.184	0.000	295	55.2	3.651	73	65.8	6.241
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	570	58.9		2.570	0.355	0.000	446	57.2	2.893	123	68.2	4.480
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	402	59.4		2.934	0.507	0.000	326	60.2	3.263	73	56.2	6.510
Utah	307	57.1		4.097	0.308	0.001	253	55.5	4.512	51	67.6	7.922
Vermont	333	55.4		3.335	0.081	0.000	285	55.9	3.602	**N/S**	**N/S**	**N/S**
Virginia	429	58.5		3.515	0.422	0.001	347	57.1	4.026	81	64.5	6.699
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	320	58.1		3.579	0.378	0.001	265	56.6	3.978	54	65.5	7.249
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.12. Medications for asthma: Percent of adults with asthma who took asthma medication in the past month by State, District of Columbia and U.S. Territory, 2003

	All Adults					Adults Age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	7202	71.1		0.867			5885	68.9	0.986	1264	84.1	1.463
Top decile average	1093	75.3		1.844	**0.039**		800	75.9	2.024	116	93.6	2.135
Bottom decile average	615	62.1		2.782			501	59.5	3.084	164	72.7	4.825
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	425	73.2	‡	2.413	0.402	**0.499**	367	71.4	2.640	53	85.1	5.646
Delaware	320	74.2	‡	3.121	0.338	**0.763**	264	71.0	3.560	53	90.9	3.500
District of Columbia	155	69.2	‡	4.504	0.683	**0.212**	130	65.5	5.028	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	527	76.1	‡	2.895	0.096	**0.808**	433	77.4	3.007	90	70.0	7.409
Hawaii	251	69.7	‡	3.851	0.730	**0.193**	214	68.2	4.203	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	442	74.3	‡	2.404	0.209	**0.744**	367	74.2	2.625	74	76.1	5.791
Iowa	301	74.3	‡	3.108	0.318	**0.786**	230	72.4	3.539	70	83.9	6.690
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	307	62.9	-	3.712	**0.031**	0.003	248	60.5	4.126	57	79.6	6.330
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	322	70.9	‡	2.990	0.952	**0.212**	256	66.6	3.403	63	95.9	2.596
Minnesota	254	71.4	‡	3.366	0.925	**0.313**	209	70.1	3.728	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	426	69.2	‡	2.739	0.499	**0.063**	358	66.5	3.052	59	85.5	5.031
New Jersey	766	71.0	‡	2.018	0.947	**0.112**	607	67.7	2.329	148	86.3	2.788
New Mexico	367	66.5		3.110	0.158	0.015	295	64.3	3.537	72	78.3	5.212
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	566	74.5	‡	2.328	0.167	**0.795**	444	72.4	2.646	121	87.2	3.047
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	396	73.6	‡	2.631	0.367	**0.597**	322	71.9	3.001	71	84.4	4.302
Utah	308	61.2	-	4.150	**0.020**	0.002	253	58.5	4.582	52	83.9	5.858
Vermont	330	69.4	‡	3.006	0.590	**0.095**	283	68.5	3.258	**N/S**	**N/S**	**N/S**
Virginia	421	67.1		2.908	0.191	0.018	341	63.9	3.647	79	80.7	5.353
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	318	65.8		3.533	0.143	0.017	264	60.7	3.954	53	89.8	4.315
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.13. Asthma symptom-free days: Average number of days adults with asthma were free of asthma symptoms in past 2 weeks by State, District of Columbia and U.S. Territory, 2003

	All Adults						Adults age 18-64			Adults age 65 and over		
	Sample Size	Average		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Average	Standard Error	Sample Size	Average	Standard Error
Total U.S.	7135	9.7		0.096			5858	9.9	0.104	1225	8.3	0.248
Top decile average	398	10.5		0.295	**0.014**		339	10.8	0.313	139	9.6	0.522
Bottom decile average	999	9.0		0.197			808	9.3	0.212	129	6.3	0.561
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	423	10.2	‡	0.274	0.081	**0.466**	366	10.5	0.278	52	8.4	0.968
Delaware	314	10.1	‡	0.359	0.323	**0.351**	262	10.4	0.368	**N/S**	**N/S**	**N/S**
District of Columbia	152	10.5	‡	0.485	0.090	**0.945**	129	11.1	0.513	**N/S**	**N/S**	**N/S**
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	521	9.9	‡	0.368	0.570	**0.216**	434	9.9	0.405	83	9.8	0.688
Hawaii	246	10.4	‡	0.372	0.061	**0.866**	210	10.6	0.395	**N/S**	**N/S**	**N/S**
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	441	9.1	-	0.287	**0.046**	0.001	368	9.2	0.304	72	8.1	0.798
Iowa	297	9.1		0.364	0.115	0.003	228	9.7	0.382	68	5.9	0.797
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	308	10.1	‡	0.399	0.352	**0.399**	250	10.2	0.447	56	9.2	0.805
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	318	9.3		0.323	0.182	0.004	254	9.6	0.349	61	6.7	0.790
Minnesota	257	9.8	‡	0.356	0.755	**0.139**	212	10.0	0.385	**N/S**	**N/S**	**N/S**
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	418	10.0	‡	0.264	0.288	**0.205**	352	10.4	0.270	58	7.7	0.842
New Jersey	757	10.3	‡	0.205	**0.015**	**0.487**	605	10.6	0.216	141	8.6	0.592
New Mexico	363	9.7	‡	0.357	0.894	**0.067**	293	9.9	0.389	70	8.2	0.870
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	558	9.0	-	0.269	**0.014**	0.000	440	9.3	0.294	117	7.2	0.619
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	397	9.6		0.289	0.810	0.034	321	9.8	0.313	73	8.7	0.748
Utah	303	10.0	‡	0.401	0.540	**0.272**	248	10.1	0.436	52	8.5	0.994
Vermont	327	9.7	‡	0.321	0.960	**0.061**	282	9.6	0.343	**N/S**	**N/S**	**N/S**
Virginia	418	9.7	‡	0.376	0.904	**0.077**	340	9.8	0.404	77	8.9	0.822
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	317	9.9	‡	0.364	0.610	**0.194**	264	10.1	0.386	52	8.9	0.941
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness and phlegm production when you do not have a cold or respiratory infection.

Number of symptom-free days:

Symptoms Less than once a week = 13 Free Days
1 or 2 times per week = 11 Free Days
More than 2 Times per week = 6 Free Days
Everyday, not all the time = 0 Free Days
Everyday, all the time = 0 Free Days

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.14. Asthma symptoms: Percent of adults with asthma who experienced asthma symptoms every day in past 2 weeks by State, District of Columbia, and U.S. Territory, 2003

	All Adults						Adults age 18-64			Adults age 65 and over		
	Sample Size	Percent		Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	257659	0.4		0.018			200858	0.4	0.020	54799	0.6	0.045
Top decile average	13347	0.9		0.092			5092	0.7	0.141	1795	0.9	0.214
Bottom decile average	9032	1.8		0.150			7055	1.6	0.162	1845	2.7	0.443
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Connecticut	5317	1.2	‡	0.168	**0.000**	**0.100**	4147	1.2	0.182	1070	1.4	0.436
Delaware	4042	1.2	‡	0.203	**0.000**	**0.224**	3215	1.1	0.208	797	1.8	0.627
District of Columbia	2042	0.8	‡	0.261	0.108	**0.773**	1663	0.7	0.293	334	1.6	0.643
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	7651	1.1	‡	0.199	**0.000**	**0.331**	6152	1.1	0.227	1433	1.2	0.291
Hawaii	4339	0.7	‡	0.136	**0.039**	**0.186**	3429	0.7	0.154	883	0.8	0.301
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	5481	1.7	-	0.188	**0.000**	0.000	4348	1.7	0.202	1107	2.1	0.507
Iowa	5003	1.4	-	0.184	**0.000**	0.018	3710	1.2	0.196	1270	2.2	0.485
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Louisiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	4435	1.3	‡	0.235	**0.000**	**0.092**	3589	1.3	0.268	775	1.5	0.415
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	3551	1.8	-	0.246	**0.000**	0.000	2707	1.6	0.269	825	3.0	0.636
Minnesota	3883	1.1	‡	0.185	**0.000**	**0.350**	3048	1.0	0.203	835	1.5	0.449
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nebraska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	5042	1.4	-	0.168	**0.000**	0.012	4045	1.2	0.175	923	2.2	0.492
New Jersey	11305	0.9	‡	0.098	**0.000**	**1.000**	8630	0.8	0.102	2481	1.6	0.294
New Mexico	5494	1.4		0.191	**0.000**	0.029	4246	1.2	0.209	1227	2.0	0.479
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	7633	1.6	-	0.165	**0.000**	0.000	5674	1.5	0.188	1922	2.1	0.343
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	6035	1.0	‡	0.140	**0.000**	**0.477**	4899	0.9	0.146	1086	1.9	0.448
Utah	4054	1.2	‡	0.213	**0.000**	**0.233**	3329	1.1	0.230	706	1.7	0.582
Vermont	4250	1.4	-	0.207	**0.000**	0.034	3313	1.5	0.243	912	0.9	0.305
Virginia	5442	1.4	-	0.199	**0.000**	0.034	4382	1.2	0.208	1020	2.5	0.615
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wisconsin	4054	1.3	‡	0.210	**0.000**	**0.068**	3219	1.2	0.223	805	1.9	0.589
Wyoming	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness and phlegm production when you do not have a cold or respiratory infection.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.15. Smoking cessation counseling: Percent of adults with asthma who were advised to quit smoking by a health professional by State, District of Columbia, and U.S. Territory, 2003

	Adults-Current Smokers						Current Smokers age 18-64			Current Smokers age 65 and over		
	Sample Size	Percent		Standard error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard error	Sample Size	Percent	Standard error
Total U.S.	1483	82.2		1.613			1316	82.1	1.708	167	84.0	4.374
Top decile average	175	87.9		3.005	0.095		161	87.9	3.101	--	--	--
Bottom decile average	143	75.8		4.069			128	74.7	4.340	--	--	--
Alabama	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Alaska	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arizona	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Arkansas	79	75.5	‡	5.771	0.264	**0.057**	71	74.3	6.164	**N/S**	**N/S**	**N/S**
California	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Colorado	50	83.6	‡	5.261	0.801	**0.476**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**
Connecticut	53	89.6	‡	4.633	0.134	**0.765**	51	89.3	4.740	**N/S**	**N/S**	**N/S**
Delaware	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
District of Columbia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Florida	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Georgia	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Hawaii	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Idaho	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Illinois	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Indiana	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Iowa	52	83.3	‡	6.397	0.868	**0.515**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**
Kansas	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Kentucky	243	81.0	‡	4.532	0.807	**0.206**	208	80.3	4.955	**N/S**	**N/S**	**N/S**
Louisiana	58	77.1	‡	6.601	0.457	**0.138**	50	76.2	7.182	**N/S**	**N/S**	**N/S**
Maine	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Maryland	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Massachusetts	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Michigan	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Minnesota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Mississippi	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Missouri	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Montana	**N/S**	**N/S**		**N/S**	--	--	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**
Nebraska	64	76.3	‡	5.698	0.317	**0.071**	57	75.2	6.064	**N/S**	**N/S**	**N/S**
Nevada	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New Hampshire	75	81.2	‡	7.810	0.896	**0.420**	68	81.0	8.286	**N/S**	**N/S**	**N/S**
New Jersey	121	82.0	‡	4.411	0.969	**0.270**	107	81.6	4.689	**N/S**	**N/S**	**N/S**
New Mexico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
New York	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
North Carolina	160	84.5	‡	5.238	0.676	**0.573**	140	86.1	5.525	**N/S**	**N/S**	**N/S**
North Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Ohio	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Oklahoma	122	87.2	‡	3.822	0.229	**0.883**	110	87.2	3.983	**N/S**	**N/S**	**N/S**
Oregon	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Pennsylvania	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Rhode Island	79	86.5	‡	6.718	0.534	**0.849**	73	85.8	7.047	**N/S**	**N/S**	**N/S**
South Carolina	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
South Dakota	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Tennessee	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Texas	71	83.9	‡	4.479	0.727	**0.454**	61	84.0	4.771	**N/S**	**N/S**	**N/S**
Utah	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Vermont	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virginia	80	80.5	‡	6.180	0.791	**0.282**	74	78.9	6.615	**N/S**	**N/S**	**N/S**
Washington	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
West Virginia	89	76.3	‡	5.923	0.337	**0.081**	82	77.2	6.118	**N/S**	**N/S**	**N/S**
Wisconsin	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Wyoming	**N/S**	**N/S**		**N/S**	--	--	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**
Guam	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Puerto Rico	N/C	N/C		N/C	--	--	N/C	N/C	N/C	N/C	N/C	N/C
Virgin Islands	**N/S**	**N/S**		**N/S**	--	--	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**	**N/S**

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to State or Nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.16. Percent of all adults who received flu shots and percent of adults with asthma who received flu shots by State, District of Columbia, and U.S. Territory, 2003

	All Adults			All Adults with Asthma					Adults-age 18-64		
	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error	P value compared to national average	**P value compared to top decile average**	Sample Size	Percent	Standard Error
Total U.S.	257022	33.1	0.169	20807	40.3	0.635			200380	25.6	0.177
Top decile average	26217	41.2	0.362	1578	53.3	1.547	**0.000**		18391	33.3	0.427
Bottom decile average	15180	24.2	0.436	979	27.9	1.804			15032	19.7	0.432
Alabama	3330	35.2	0.983	266	41.3	3.741	0.785	0.003	2560	27.4	1.077
Alaska	2646	34.2	1.297	221	45.7 ‡	4.699	0.251	**0.126**	2343	30.7	1.343
Arizona	3228	33.0	1.216	297	42.5	4.371	0.615	0.020	2366	24.8	1.322
Arkansas	4195	37.8	0.845	322	46.8 ‡	3.142	**0.042**	**0.064**	3204	29.9	0.919
California	4471	30.1	0.804	395	36.8	2.853	0.235	0.000	3577	22.6	0.816
Colorado	4061	35.3	0.838	348	43.7	3.079	0.284	0.005	3355	29.4	0.882
Connecticut	5305	36.8	0.757	453	45.3	2.648	0.068	0.009	4137	27.9	0.805
Delaware	4037	35.0	0.984	323	39.6	3.519	0.837	0.000	3210	27.2	1.036
District of Columbia	2038	33.4	1.357	161	31.8	4.370	0.054	0.000	1660	27.3	1.434
Florida	5026	31.9	0.995	370	41.6	4.027	0.758	0.006	3546	21.5	1.041
Georgia	7631	29.0	0.718	562	36.0	3.503	0.230	0.000	6133	23.1	0.756
Hawaii	4323	42.4	0.959	259	43.4	3.929	0.431	0.020	3417	34.8	1.057
Idaho	4989	32.7	0.800	413	37.5	2.930	0.353	0.000	3943	25.5	0.851
Illinois	5262	28.0	0.692	428	37.6	2.678	0.331	0.000	4260	22.0	0.715
Indiana	5461	32.7	0.701	468	40.0	2.521	0.903	0.000	4332	25.7	0.735
Iowa	4997	38.4	0.811	308	40.5	3.244	0.955	0.000	3706	28.3	0.866
Kansas	4609	35.4	0.811	345	37.4	2.980	0.347	0.000	3532	27.4	0.872
Kentucky	7620	32.3	0.811	838	37.5	2.522	0.288	0.000	5687	24.7	0.874
Louisiana	5070	32.3	0.759	325	43.1	3.208	0.399	0.004	4059	25.3	0.797
Maine	2387	37.6	1.099	235	46.4 ‡	3.691	0.102	**0.086**	1885	28.6	1.150
Maryland	4430	35.2	0.890	340	43.7	3.540	0.347	0.013	3588	29.8	0.956
Massachusetts	7552	34.5	0.704	764	43.1	2.312	0.239	0.000	6043	25.5	0.740
Michigan	3547	31.1	0.874	327	39.5	3.062	0.799	0.000	2703	24.1	0.937
Minnesota	3867	38.0	0.859	258	45.8 ‡	3.640	0.138	**0.057**	3035	29.5	0.912
Mississippi	4405	33.1	0.825	310	35.6	3.286	0.161	0.000	3423	25.6	0.881
Missouri	4247	35.5	1.030	342	38.9	3.557	0.699	0.000	3128	27.5	1.149
Montana	4018	36.8	1.025	314	52.9 ‡	3.677	**0.001**	**0.926**	3104	28.6	1.090
Nebraska	4971	38.1	0.770	361	51.6 ‡	3.004	**0.000**	**0.607**	3716	29.8	0.839
Nevada	2967	25.6	1.120	198	32.7	4.415	0.088	0.000	2363	19.3	1.132
New Hampshire	5033	33.7	0.753	442	43.3	2.751	0.280	0.002	4038	25.6	0.786
New Jersey	11266	31.3	0.514	825	37.6	2.004	0.193	0.000	8605	23.4	0.546
New Mexico	5482	34.6	0.762	389	46.6 ‡	3.085	**0.046**	**0.052**	4236	26.9	0.819
New York	5527	32.9	0.732	439	44.3	2.689	0.150	0.004	4343	25.4	0.771
North Carolina	9423	33.9	0.770	734	41.3	2.813	0.719	0.000	7147	27.0	0.848
North Dakota	3021	37.4	0.977	221	49.6 ‡	3.749	**0.014**	**0.365**	2265	28.5	1.056
Ohio	3817	31.1	0.921	300	36.9	3.446	0.339	0.000	3049	23.0	0.933
Oklahoma	7602	40.0	0.650	579	44.1	2.472	0.140	0.002	5653	31.9	0.713
Oregon	4004	33.4	0.827	382	40.5	2.904	0.946	0.000	3105	25.7	0.879
Pennsylvania	3659	35.0	0.884	306	40.4	3.289	0.985	0.000	2797	27.0	0.952
Rhode Island	4038	39.3	0.914	417	46.1	2.938	0.055	0.030	3154	30.6	0.989
South Carolina	5910	35.0	0.723	392	48.7 ‡	3.000	**0.006**	**0.171**	4643	27.9	0.770
South Dakota	5257	46.0	0.816	370	56.0 ‡	3.603	**0.000**	**0.495**	3824	38.0	0.924
Tennessee	2585	36.1	1.084	209	37.1	3.736	0.399	0.000	2062	30.5	1.162
Texas	6010	32.5	0.692	428	38.0	2.848	0.431	0.000	4879	26.7	0.735
Utah	4044	34.5	0.986	311	35.6	3.474	0.183	0.000	3321	28.9	1.039
Vermont	4242	33.9	0.828	342	36.9	3.055	0.282	0.000	3307	25.6	0.872
Virginia	5434	34.7	0.893	450	39.4	3.391	0.789	0.000	4378	28.5	0.960
Washington	18596	35.4	0.441	1780	41.7	1.465	0.368	0.000	14648	28.5	0.471
West Virginia	3342	36.6	0.925	300	45.9	3.225	0.089	0.038	2529	28.2	0.997
Wisconsin	4051	36.1	0.911	328	43.5	3.377	0.357	0.008	3216	28.3	0.968
Wyoming	3989	36.0	0.841	312	55.0 ‡	3.198	**0.000**	**0.633**	3166	28.8	0.893
Guam	800	27.5	1.814	58	31.3	6.900	0.194	0.002	729	24.6	1.845
Puerto Rico	4114	20.1	0.802	485	25.6 -	2.482	**0.000**	0.000	3140	16.1	0.843
Virgin Islands	2037	19.6	1.229	77	18.8 -	6.433	**0.001**	0.000	1723	17.1	1.290

Source: Medstat calculations from the Behavioral Risk Factor Surveillance System 2003, Centers for Disease Control and Prevention, National Center for Chr

N/C=Data Not Collected

N/S=Data Not Sufficient for Release (sample less than 50)

Note: Estimates and standard errors have been weighted either to state or nation as appropriate.

Sample size varies across asthma measures because of varying applicability of questions to respondents and refusals.

‡ Indicates that the State estimate is **not** significantly different from the best in class average (P<0.05).

+ Indicates that the State estimate is statistically better than the national average (P<0.05).

- Indicates that the State estimate is statistically worse than the national average (P<0.05).

Table E.16. Percent of all adults who received flu shots and percent of adults with asthma who received flu shots by State, District of Columbia and U.S. Territory, 2003 (continued)

	Adults with Asthma age 18-64			Adults Age 65 and over			Adults With Asthma age 65 and over		
	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error	Sample Size	Percent	Standard Error
Total U.S.	16554	33.5	0.678	54651	69.6	0.373	4108	76.1	1.160
Top decile average	1352	44.4	1.654	5211	77.7	0.656	305	88.6	1.727
Bottom decile average	796	23.8	1.870	2904	51.8	1.203	335	58.6	3.323
Alabama	215	33.8	4.115	741	70.2	1.820	50	76.4	6.083
Alaska	186	38.6	4.947	280	66.5	3.755	**N/S**	**N/S**	**N/S**
Arizona	209	33.9	4.849	831	68.9	2.286	85	74.1	7.060
Arkansas	264	40.2	3.377	963	71.0	1.608	57	87.5	4.070
California	311	28.7	2.955	879	72.5	1.931	83	80.8	4.494
Colorado	292	38.9	3.315	683	74.2	1.997	53	78.7	6.370
Connecticut	390	39.5	2.791	1068	74.3	1.509	56	84.1	5.496
Delaware	266	34.8	3.716	797	70.0	2.089	54	67.6	9.339
District of Columbia	135	24.7	4.052	333	63.0	3.137	**N/S**	**N/S**	**N/S**
Florida	254	28.8	4.440	1429	65.9	1.864	110	83.2	4.527
Georgia	460	31.6	3.890	1432	67.0	1.684	98	65.4	6.602
Hawaii	219	41.0	4.287	879	76.4	1.815	**N/S**	**N/S**	**N/S**
Idaho	328	31.3	3.129	1018	70.3	1.691	85	72.1	5.639
Illinois	355	33.8	2.888	998	62.2	1.807	73	60.2	6.655
Indiana	391	33.6	2.693	1103	66.1	1.552	76	76.6	5.324
Iowa	233	31.3	3.549	1268	77.5	1.344	74	84.8	4.709
Kansas	277	30.4	3.146	1038	70.8	1.546	66	77.1	5.715
Kentucky	604	29.5	2.817	1900	69.1	1.496	232	72.0	4.232
Louisiana	259	36.6	3.533	987	68.3	1.668	65	74.7	5.909
Maine	184	39.3	4.047	476	74.8	2.194	50	80.4	6.153
Maryland	275	38.4	3.900	771	68.4	2.119	63	80.5	5.490
Massachusetts	641	36.5	2.462	1371	74.9	1.472	112	84.7	3.421
Michigan	259	34.3	3.339	825	67.5	1.848	65	70.9	6.101
Minnesota	213	40.1	3.931	832	80.3	1.428	**N/S**	**N/S**	**N/S**
Mississippi	244	30.4	3.558	951	69.0	1.643	65	60.8	6.845
Missouri	271	31.9	3.830	1082	69.9	1.897	69	86.7	5.526
Montana	245	46.2	4.166	881	72.8	1.928	68	80.8	5.749
Nebraska	273	43.1	3.357	1230	73.6	1.352	87	88.2	3.335
Nevada	156	27.8	4.698	599	60.0	2.995	**N/S**	**N/S**	**N/S**
New Hampshire	368	36.7	2.960	922	73.9	1.606	65	84.8	4.847
New Jersey	655	31.3	2.128	2469	67.2	1.136	159	70.6	4.224
New Mexico	310	39.7	3.292	1225	72.4	1.416	79	81.7	4.514
New York	365	38.6	2.917	1112	68.0	1.730	70	79.8	5.731
North Carolina	543	34.0	3.117	2206	68.8	1.457	183	70.8	4.740
North Dakota	161	38.7	4.186	729	73.0	1.768	57	87.2	4.410
Ohio	247	30.4	3.608	729	68.0	2.159	50	72.7	8.449
Oklahoma	450	37.3	2.664	1914	75.8	1.067	125	83.0	3.548
Oregon	304	34.4	3.191	874	70.5	1.702	75	71.4	5.879
Pennsylvania	237	33.6	3.602	831	69.1	1.751	69	68.4	6.415
Rhode Island	351	42.0	3.202	833	76.2	1.672	59	76.3	6.125
South Carolina	303	38.9	3.337	1210	69.3	1.532	84	85.2	4.286
South Dakota	257	45.8	4.176	1399	77.9	1.216	111	89.8	2.791
Tennessee	168	32.8	4.039	512	69.1	2.293	**N/S**	**N/S**	**N/S**
Texas	349	31.5	3.049	1082	67.7	1.546	75	75.9	5.286
Utah	256	30.7	3.718	704	74.8	2.141	52	77.6	7.450
Vermont	291	30.7	3.156	911	74.1	1.539	50	88.0	4.293
Virginia	365	32.9	3.777	1017	69.6	1.879	84	67.8	6.722
Washington	1438	36.4	1.594	3924	73.4	0.864	338	75.9	3.164
West Virginia	231	37.5	3.576	801	69.1	1.778	68	79.1	5.369
Wisconsin	270	34.3	3.576	805	72.1	1.842	56	85.1	4.700
Wyoming	226	46.2	3.743	797	72.6	1.729	82	87.3	4.200
Guam	53	28.2	7.040	64	59.7	6.909	**N/S**	**N/S**	**N/S**
Puerto Rico	385	22.2	2.645	969	40.2	2.081	99	49.5	6.259
Virgin Islands	67	18.3	6.791	274	34.9	3.865	**N/S**	**N/S**	**N/S**

Appendix F: Other Asthma-Related Data Sources

This appendix provides information on national and local data sources for asthma noted in this *Resource Guide* to further assist States in generating estimates or analyzing factors related to the quality of asthma care. The *quality of the data* is discussed throughout this section, because State leaders in quality improvement must understand issues that will be raised in the improvement process. Health care providers may argue that the data, due to limitations, do not reflect reality. They may say: "The data are the problem and not the health care system." Understanding data limitations leads to responsible use of data.

For the purposes of this *Resource Guide*, only data sources that are able to provide information that is nationally representative and available by State are used. Different sources use different methods, definitions, and classifications. Some sources produce estimates by State and some by national population subgroup, such as race/ethnicity, gender, age, and income.

Sources of Asthma Data in the NHQR

The asthma data in the NHQR come from two data sources: the Healthcare Cost and Utilization Project (provided to AHRQ by statewide discharge data organizations) and NCQA's Health Plan Employer Data and Information Set.

Healthcare Cost and Utilization Project

HCUP is a public-private partnership sponsored by AHRQ with 33 participating States that covered about 90 percent of U.S. discharges in the United States in 2001. The participating statewide data organizations (government, hospital association, or other private organization) provide their statewide hospital discharge data to HCUP for reformatting into standardized files. While national asthma estimates from HCUP are included in the NHQR, State-level data are reported in the NHQR only for one special analysis of admissions for asthma.

The following HCUP Partners provided data for the 2001 HCUP Nationwide Inpatient Sample:

Arizona	Arizona Department of Health Services
California	Office of Statewide Health Planning & Development
Colorado	Colorado Health & Hospital Association
Connecticut	Chime, Inc.
Florida	Agency for Health Care Administration
Georgia	GHA: An Association of Hospitals & Health Systems
Hawaii	Hawaii Health Information Corporation
Illinois	Illinois Department of Public Health
Iowa	Iowa Hospital Association
Kansas	Kansas Hospital Association
Kentucky	Kentucky Department for Public Health
Maine	Maine Health Data Organization
Maryland	Maryland Health Services Cost Review Commission
Massachusetts	Massachusetts Division of Health Care Finance and Policy

Michigan	Michigan Health & Hospital Association
Minnesota	Minnesota Hospital Association
Missouri	Hospital Industry Data Institute
Nebraska	Nebraska Hospital Association
New Jersey	New Jersey Department of Health & Senior Services
New York	New York State Department of Health
North Carolina	North Carolina Department of Health and Human Services
Oregon	Oregon Association of Hospitals & Health Systems
Pennsylvania	Pennsylvania Health Care Cost Containment Council
Rhode Island	Rhode Island Department of Health
South Carolina	South Carolina State Budget & Control Board
Tennessee	Tennessee Hospital Association
Texas	Texas Department of State Health Services
Utah	Office of Health Care Statistics, Utah Department of Health
Vermont	Vermont Association of Hospitals and Health Systems
Virginia	Virginia Health Information
Washington	Washington State Department of Health
West Virginia	West Virginia Health Care Authority
Wisconsin	Wisconsin Department of Health & Family Services

Contact information for these statewide data organizations is available at: http://www.hcup-us.ahrq.gov/partners.jsp?SID. Additional information on HCUP data can be found at: http://www.ahrq.gov/data/hcup/hcup-pkt.htm.

The main limitation of HCUP data (or any administrative billing data) is that the data are collected primarily for the purpose of reimbursement, and what is coded as clinical diagnoses and procedures can be affected by reimbursement incentives.[1] Such incentives can encourage or discourage coding of specific types of conditions or treatments. In addition, the data do not include detailed clinical information (e.g., physiologic measures) beyond diagnoses and procedures, which are useful in determining patient severity of illness. Nevertheless, HCUP data can be used for many purposes, provided that the bias of coding is considered and ruled out as inconsequential. Thus, while administrative hospital data can be mined for clues to quality of care, analysts should be alert for whether the data contain incomplete entries or inadequate clinical detail.

AHRQ has developed the Quality Indicators for use with HCUP and other hospital administrative data. These indicators use sophisticated clinical algorithms of inclusions and exclusions to define patients with similar characteristics and then calculate the outcomes of these groups of patients across different settings and populations. The algorithms have been tested, reviewed, and hewn by clinical consensus panels under AHRQ sponsorship. The AHRQ Quality Indicators include the Prevention Quality Indicators, which estimate rates of avoidable hospital admissions, including separate indicators for pediatric and adult asthma admissions, as an indirect measure of the quality of ambulatory asthma care in the United States. As tools for local

[1] See: Keating N, Landrum M, Landon B, Ayanian J, Borbas C, Guadagnoli E. Managing chronic illness in managed care settings: Measuring the quality of diabetes care using administrative data: Is there a bias? Health Services Research. 2003;38(6):1529-45.

quality improvement, the AHRQ Quality Indicators can be used as screens for quality problems that call for more in-depth local study; they are not considered definitive measures of local quality of care. As national measures they capture trends in quality as well as coding of diagnoses. National estimates of the asthma Prevention Quality Indicators are part of the 2003 and 2004 NHQR and NHDR; State estimates are in the 2004 NHQR. Additional information on the AHRQ Quality Indicators is available at: http://www.qualityindicators.ahrq.gov/.

Health Plan Employer Data and Information Set

HEDIS® collects data from health plans across the country. HEDIS® is a set of standardized performance measures designed to ensure that purchasers and consumers have the information they need to reliably compare the performance of managed health care plans. The performance measures in HEDIS® are related to many significant public health issues such as cancer, heart disease, smoking, asthma and diabetes. HEDIS® also includes a standardized survey of consumers' experiences that evaluates plan performance in areas such as customer service, access to care and claims possessing. HEDIS® is sponsored, supported, and maintained by the National Committee for Quality Assurance.

Because HEDIS® data are collected at the health plan level, State estimates cannot be made. To provide regional estimates, each health plan is assigned to the State in which the health plan headquarters are located, but these are not necessarily where the practices are located. HEDIS data are also limited in that they are relevant to care provided only under managed health care plans.

Other Sources of Data on Asthma Care

Asthma-related measures from the following sources discussed in this *Resource Guide* are not yet included in the NHQR. (For detailed information on State-level BRFSS measures not yet included in the NHQR, see Appendix E.)

National and Setting-Specific Data Sources

Medical Expenditure Panel Survey

MEPS is a family of surveys, including a Household Survey and surveys of related health care providers. Information is collected annually on health care utilization, expenditures, and health insurance coverage. For the most part, MEPS data are collected using computer-assisted, in-person interviews. The asthma component is collected via a separate paper and pencil questionnaire distributed to respondents who report that they have been diagnosed with asthma. More information about MEPS data and methods is available at: http://www.meps.ahrq.gov/WhatIsMEPS/Overview.HTM.

MEPS reports national rates by national subgroup for the percentages of asthma patients who used prescription asthma medications, inhaled steroids, and peak flowmeters. Other measures of asthma process of care are not captured in this data set. The following table shows MEPS data on these measures for 2000:

Asthma medication and peak flowmeter use for patients with asthma by age group, 2000

Measure	Total	Under age 18	Age 18 and older
Percent who used:			
Asthma medication	86.5	91.2	84.3
Inhaled steroids	49.8	42.3	53.5
Peak flowmeter in home	31.3	27.5	33.1

Source: Agency for Healthcare Research and Quality (2003). MEPS Statistical Brief #13, Asthma Treatment: Use of Medications and Devices, 2000.

MEPS collects expenditure data from a national sample but does not collect data by State; thus State-level estimates are not available. The following table from MEPS shows total expenses for the category of "COPD, asthma" by site of service:

Total expenses, in millions of dollars, for COPD, asthma by site of service, 1996-2002

Year	Total	Outpatient and office-based medical provider visits	Hospital inpatient stays	Emergency room visits	Prescribed medicines	Home health care
2002	45,262.78	11,923.53	12,464.81	1,642.40	15,150.31	4,081.72
2001	44,404.43	9,825.75	16,324.51	1,612.99	13,327.22	3,313.96
2000	36,487.99	7,225.14	13,929.82	1,119.92	8,750.69	5,460.57
1999	33,651.40	7,115.61	11,982.60	1,197.51	8,239.30	5,116.38
1998	31,707.10	6,820.20	14,489.72	915.37	6,719.09	2,762.73
1997	28,973.39	6,356.35	13,256.91	1,090.62	6,100.09	2,169.43
1996	28,594.88	6,895.89	12,702.23	942.14	5,630.05	2,424.57

Source: Agency for Healthcare Research and Quality. MEPS Compendium of Tables-Medical Expenditures by Condition (1996-2002). Total expenses for conditions by site of service: United States, 1997. March 3, 2003. Medical Expenditure Panel Survey Component Data.

National Hospital Discharge Survey

The NHQR uses the National Hospital Discharge Survey for one outcome measure—estimated annual rate of hospitalizations for asthma. The National Center for Health Statistics at CDC uses a national sample of hospitals and a sample of their discharges to collect administrative hospital records for the NHDS (similar to HCUP). The sample consists of about 270,000 inpatient records from about 500 hospitals and is representative of inpatient discharges nationally. Additional information on NHDS data is available at: http://www.cdc.gov/nchs/about/major/hdasd/nhdsdes.htm.

The limitation of NHDS data are similar to those for HCUP data (described above) because NHDS also uses discharge records or inpatient claims for reimbursement. In addition, although NHDS is a true probability sample, it has a much smaller size than HCUP. As a result, many subgroup estimates that can be made with HCUP cannot be supported with NHDS data. The NHDS cannot produce State-level estimates.

National Asthma Survey

The National Asthma Survey, a national sample of households interviewed by phone, was conducted by CDC beginning in 2004. The survey contains questions that can be used to develop measures similar to BRFSS asthma measures in addition to other measures related to processes of asthma care including asthma education, peak flow meter use, spirometer use, demographic information of persons with asthma, and others. Pilot survey data were released in 2005. (Results of pilot tests in four States are available at: http://www.cdc.gov/nchs/about/major/slaits/nas.htm.)

National Health Interview Survey

Conducted by CDC's National Center for Health Statistics, the National Health Interview Survey collects data on asthma prevalence for all ages and for children only. Twelve-month prevalence data were collected for children from 1980 to 1996 and for all ages from 1982 to 1996. Beginning in 1997, the survey asks questions on lifetime diagnosis and 12-month attack prevalence; a question on current prevalence (i.e., "Do you still have asthma?") was added in 2001. The NHIS also includes questions on the number of school days missed by children and the number of workdays missed by adults due to asthma.

National Ambulatory Medical Care Survey/National Hospital Ambulatory Medical Care Survey (NAMCS/NHAMCS)

These surveys are conducted annually by CDC's National Center for Health Statistics. NAMCS surveys office-based physicians who are randomly assigned to a 1-week reporting period. The survey form includes questions on reason for the visit and physician diagnosis as well as whether the patient has various chronic diseases, including asthma, regardless of diagnosis. NHAMCS collects similar data for hospital emergency and outpatient departments over a 4-week reporting period. Recent findings related to asthma from these and other NCHS surveys can be found at: http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm.

Health Care Setting-Specific Data Sources

The following data sources collect asthma care quality data for specific health care settings rather than nationally representative or state level data. Therefore, data from these sources are useful for informing initiatives or policies in the appropriate health care setting but not necessarily for broad statewide programs. However, the availability of these data point to important opportunities for collaborations with other health providers and sectors to improve the quality of asthma care.

- The **Joint Commission on Accreditation of Healthcare Organizations**, an organization that oversees the quality of hospitals and other health care organizations, collects hospital data on disease-specific care, including asthma.
- **Health Disparities Collaboratives**, learning processes of HRSA's Bureau of Primary Health Care, are disease specific (diabetes, heart disease, and asthma) and include community health centers across the Nation.

- **National Institute for Children's Healthcare Quality Learning Collaboratives** are partnerships and learning networks that collect quality data on care for specific diseases in primary care practices. NICHQ efforts aim to measure and improve quality of care and build structural support for quality improvement.

Local Data Sources

Below are summaries of some local data sources that have been developed to assess more closely the processes of asthma care for specific populations in specific geographic areas. (See Appendix D for descriptions of measures from local and other health care setting data sources.)

Chicago Asthma Surveillance Initiative (CASI)

The goal of CASI is to develop a community-wide surveillance program that characterizes and monitors asthma care in the Chicago area in greater detail than other public health surveillance. To accomplish this, CASI surveyed Chicago-area hospitals, emergency departments, primary care physicians, specialty care physicians, pharmacists, managed care organizations, the general public, and persons or families affected by asthma to learn about asthma care and its outcomes. Seven surveys are included: emergency department, hospital, managed care, primary care physician, specialty care physician, pharmacist, and asthma survey of the general population. The CASI surveys were designed to assist the Chicago Asthma Consortium in setting program priorities and to evaluate the impact of these programs over time. The first promising effect stemming from the CASI surveys was the creation of the Chicago Emergency Department Asthma Collaborative in 1997 in which 28 EDs agreed to participate in a 1-year community-based collaborative aimed at improving ED asthma care.[2]

Guide to Improving Asthma Care in Oregon

The goal of this Oregon Asthma Program guide is to steer efforts to improve asthma management and to define appropriate indicators for monitoring the quality of medical care provided to Oregonians with asthma. The guide establishes nine priority areas including: periodic assessment and monitoring of asthma; spirometry; coordination of care; written asthma action plan; asthma education; pharmacology; influenza immunization; assessment, education, management, and treatment of allergens and irritants; and asthma recommendations for health systems. The guide was developed through a consensus process and includes population-based goals and indicators. The guide does not address all the care a patient with asthma may need. Rather, it is based on a set of procedures that are measurable for defined populations and therefore lend themselves to systematic monitoring. The guide can be accessed at: http://www.dhs.state.or.us/publichealth/asthma/guideor.cfm.

Michigan Quality Improvement Consortium (MQIC)

The goal of the Michigan Quality Improvement Consortium is to establish and implement a core set of clinical practice guidelines and performance measures for Michigan health plans. The

[2] See: Weiss KB, Grant EN. The Chicago Asthma Surveillance Initiative: a community-based approach to understanding asthma care. Chest. 1999;116:141S-145S.

interventions designed and implemented by each plan to improve consistent delivery of services are at the discretion of individual plans; but guidelines, performance goals, measurement methodology, and performance reporting are standardized. The MQIC asthma guideline recommends provision of specific services at least annually including a written action plan for self-management and education regarding use of peak flowmeter, inhaler, spacer and medication, recognition/treatment of symptoms and when to seek medical attention, identification, and avoidance of triggers and smoking cessation counseling.

New York City Childhood Asthma Initiative (NYCCAI)

The New York City Department of Health and Mental Hygiene's Childhood Asthma Initiative is a public health effort to reduce asthma morbidity among children 0 to18 years of age. Expected outcomes of the NYCCAI include reductions in hospitalizations, ED visits, and school absences due to asthma and improvements in management of childhood asthma among families. The NYCCAI is building on existing research and educational and clinical efforts, resulting in a coordinated and comprehensive effort to understand, treat, and prevent asthma in New York City.[3]

[3] See: Garg R, Karpati A, Leighton J, Perrin M, Shah M. *Asthma Facts, Second Edition.* New York City Department of Health and Mental Hygiene, May 2003 (available at: http://nyc.gov/html/doh/pdf/asthma/facts.pdf).

Appendix G: Benchmarks From the NHQR

The NHQR provides a national set of estimates and, often, State estimates that can be used as benchmarks for quality improvement. A benchmark can be a baseline or point from which you start, not necessarily representing a goal or target; or it can be the best current rate, something achievable; or it can represent a consensus of what should be achieved. It is a basis for making comparisons.

Key Messages on Benchmarks:

A benchmark:
- Is a point for comparison.
- Is a place to start.
- May be inadequate or impractical from different vantage points.

Methods matter:
They can have a large impact on comparisons.

Several types of benchmarks can be derived from the NHQR:

- **Theoretic limit benchmark—**The theoretic limit refers to the maximum or minimum level that a measure can take on. For example, 100 percent for positive outcomes or 0 percent for negative, avoidable events. In an ideal world, these would be achievable, but in a world where so many factors are involved in achieving a maximum result, those benchmarks may be unrealistic. Also, some concepts might feasibly come closer to the theoretic limit than others.

- **Best-in-class benchmark—**The rate for the top State or top tier of States can be used for what manufacturers call a "best in class" benchmark. (The top tier can be defined as the top 5 or 10 percent of States averaged together.) Using influenza vaccination as an example, the highest rate of flu vaccination for people with diabetes across the States (64 percent) may be assumed to be a feasible goal for States to achieve. However, some may view the top State rate as an impractical target given their population and circumstances. Others may view that goal as inadequate depending on the value of the rate and the state of medical knowledge and practice, and they may view the 100-percent goal as their target. These judgments will vary across States because States face different circumstances and environments. This *Resource Guide* uses the top 10 percent of States, combined in a simple average, to derive the best-in-class estimate. A simple average, rather than weighted average, was used because the denominators from the BRFSS estimates were not available in the NHQR.

- **A national consensus-based goal—**Some organizations propose targets that should be achieved to improve the health status of the overall population and vulnerable subgroups. For example, two decades ago, the Centers for Disease Control and Prevention developed diabetes-related goals for a healthier U.S. population. Each decade those goals are reviewed and reestablished.

- **National average—**The overall average indicates where the average member of a group stands. For example, the average of influenza vaccination rates for people with diabetes in States (37 percent according to the BRFSS data source) is the "norm" for States or is the rate

for the "average" State. States with rates below the average would prefer to be at or above the average. But the average may not be an indicator of quality health care.

- **Regional norm—**States may prefer a regional estimate for comparison because they want to see how they perform compared to medical practice within the region. Given the wide regional variation in U.S. medical practice, regional estimates may be weak goals for regions where practice should change to enhance the health care quality for people with asthma. For this *Resource Guide*, the regional averages are calculated for the four Census regions, Northeast, Midwest, South, and West. (The averages are simple averages because the denominators for BRFSS estimates were not available from the NHQR.)

- **State rate—**The State's own rate may serve as a benchmark for various purposes, such as tracking changes over time, evaluating the effect of a statewide intervention to improve quality, or reporting the norm for local communities and providers to use as a comparison with their own performance. Concerns noted above about using national or regional averages as goals also apply to State rates. For provider-level estimates, the best-in-class providers may be a better indication of what is achievable and should be used as a goal rather than the State average rate. Severity adjustments are an important issue at the provider level, where populations of patients with varying severity and comorbidity levels are unlikely to be distributed evenly across providers.

Appendix H: Information on Statistical Significance

This section is provided for data analysts who wish to generate other statistics and/or perform statistical tests for other comparisons than those that are provided in the NHQR and NHDR.

Comparing State and Average Estimates Using P-Values

When comparing an individual State estimate to another estimate, such as the all-State average or the average for the top tier of States, every measure has error associated with it. The error is associated with sampling (size of the sample or sampling methods), accuracy of respondent recall and responses, data entry processes, and many other factors. When comparing estimates it is important to take this error (which can be estimated with statistical assumptions) into account.

A common statistic for comparing two rates to determine whether they differ is the t-test based on a normal distribution. The t-test can be compared to a normal distribution with a prespecified level of significance or acceptable error in conclusions about whether or not two statistics come from the same distribution or population. The *p-value,* a statistic for a normal distribution, can be calculated to determine whether two measures are likely from the same or from different distributions.

Statistical significance and magnitude of the difference should be considered together when comparing two estimates. The first check should be: Is the difference statistically different? The second check should be: Are the differences large enough to be meaningful for policy purposes? These questions are addressed below:

- **Is the difference statistically different?** Are the p-values less than 0.05? If so, you can assume that the underlying distributions come from different populations or experiences. But there are some other considerations. The statistical test of differences is affected by the number of observations from which the measures were generated. For example, if the measures were generated from hundreds of thousands of records then summary measures (such as averages) have less variance and lower p-values, which imply "statistical significance" even when the magnitude of the differences might be tiny. Alternatively, when differences are large and the number of observations is few, the absence of statistical significance might simply mean that the data set does not have enough observations for a powerful test. This happens frequently with the BRFSS measures because the annual sample sizes of the State surveys are small—from about 2,000 to 8,500 observations.

- **Are the differences large enough to be meaningful for policy purposes?** Because of the relationship between the statistical test and the number of observations, some judgment must be used to assess the meaning of the differences between State estimates. Thus, in addition to statistical significance it is important to ask the second question: Is the State-to-benchmark difference large enough to warrant efforts to rectify it? A one or two percentage point difference in a measure may not be worth the effort to improve it. A 5 or 10 percentage point difference may mean that a substantial number of State residents are affected by poor health care quality in the State. These are judgments that local experts and stake holders who understand the environment of a State can help make.

Calculating P-Values

Calculating the p-value is straightforward when the standard errors (SEs) of the estimate are provided. For example, standard errors are provided for the national average and for individual States. Thus, the test for statistical significance between those two estimates is straightforward (and provided first). However, calculating another average (say, the top decile average) for which the standard error has not been provided is more complicated. In fact, the top decile comparisons in this work are evaluated for statistical significance because the population denominators were not readily available in time for publication of this *Resource Guide*. Nevertheless, the method for that calculation is presented below.

Calculating the p-value when the relevant standard errors are provided. For an individual State estimate compared to the all-State average, the appropriate standard errors have been provided in the NHQR tables. To assess whether or not a State rate is statistically different from the average, calculate the p-value, as follows.

Two-sided t-test:

$$t = \frac{R_1 - R_2}{\sqrt{SE_1^2 + SE_2^2}}$$

$$p = 2 * \text{Prob}(Z > |t|)$$

Where:

R_1 = a State rate
R_2 = national rate
SE^2_1 = square of the standard error of the State rate (or its variance)
SE^2_2 = square of the standard error of the national rate (or its variance)

If the p value is smaller than 0.05, then a State can conclude, with 95 percent confidence, that the State rate is statistically different from the all-State average rate.

The p-value can be calculated using SAS or EXCEL with the following data elements and formula functions:

SAS: p = 2 * (1 - PROBNORM(ABS(t)));
EXCEL: p= 2*(1- NORMDIST(ABS(t),0,1,TRUE))

Calculating the p-value when the relevant standard errors are not provided. The fundamental equation of analysis of variance can be used to calculate p-values for other comparisons. For example, comparing a State rate to the average of the top three States would involve the following. The total sum of squares about the overall three-State mean is the sum of the within-State sum of squared deviations from the State mean and the between-State sum of squared deviations from the three-State pooled mean. The within-State sum of squares is obtained by squaring the State's standard error and multiplying by the sample size. The between-State sum of squares is obtained by summing the sample-weighted squared difference between the State average and the overall three-State average. The formula is below (note: x**2 = x squared and sqrt(x) = square root of x):

Let n1, n2, and n3 be the sample sizes for each State.
Let m1, m2, and m3 be the means for each State.
Let s1, s2, and s3 be the standard errors for each State.
N = n1 + n2 + n3, is the overall three-State sample size.
M = (n1*m1 + n2*m2 + n3*m3) / N, is the overall three-State mean.
SS = n1*(n1-1)*s1**2 + n2*(n2-1)*s2**2 + n3*(n3-1)*s3**2 + n1*(m1-M)**2 + n2*(m2-M)**2 + n3*(m3-M)**2
VAR = SS / (N-1)
SE = sqrt(VAR), which is the estimated standard error for the three-State mean.

Now suppose you have a mean m0 and standard error s0 from a State and you want to test whether m0 is significantly different from M. The test statistic is:

$$Z = (m0 - M) / \sqrt{SE^2 + s0^2},$$

which can be compared to 1.96 to test the difference at the 5-percent significance level. Or alternatively the p-value can be calculated as in the previous section.