

# Life Course Indicator: Asthma Emergency Department Utilization

## The Life Course Metrics Project

As MCH programs begin to develop new programming guided by a life course framework, measures are needed to determine the success of their approaches. In response to the need for standardized metrics for the life course approach, AMCHP launched a project designed to identify and promote a set of indicators that can be used to measure progress using the life course approach to improve maternal and child health. This project was funded with support from the [W.K. Kellogg Foundation](#).

Using an RFA process, AMCHP selected seven state teams, Florida, Iowa, Louisiana, Massachusetts, Michigan, Nebraska and North Carolina, to propose, screen, select and develop potential life course indicators across four domains: Capacity, Outcomes, Services, and Risk. The first round of indicators, proposed both by the teams and members of the public included 413 indicators for consideration. The teams distilled the 413 proposed indicators down to 104 indicators that were written up according to three data and five life course criteria for final selection.

In June of 2013, state teams selected 59 indicators for the final set. The indicators were put out for public comment in July 2013, and the final set was released in the Fall of 2013.

### Basic Indicator Information

**Name of indicator:** Asthma Emergency Department Utilization (LC-38)

**Brief description:** Proportion of persons on Medicaid with asthma having an asthma emergency department (ED) visit

**Indicator category:** Health Care Access and Quality

**Indicator domain:** Risk/Outcome

**Numerator:** Number of Medicaid beneficiaries with asthma having one or more ED visit for asthma during the measurement year.

**Denominator:** Number of Medicaid beneficiaries with asthma during the measurement year.

**Potential modifiers:** The proportion of persons with an asthma ED visit can be stratified by age, gender, and race / ethnicity groups. In addition, the proportions may be stratified by geographic areas of interest based on available geographic indicators (e.g., zip code, county).

**Data source:** Medicaid Analytical eXtract (MAX) files

**Notes on calculation:** Numerator: Asthma ED visits. Patients with asthma who have an ED visit during the measurement year. ED visits are identified by either procedure codes 99281-99285 or revenue codes 450.xx. Either type of ED claim must have one or more of the following asthma ICD-9 diagnosis codes: 493.00, 493.01, 493.02, 4983.10, 493.11, 493.12, 493.81, 493.82, 493.90, 493.91, or 493.92 as the primary diagnosis. Dates of service must be within the measurement year. Denominator: All patients with a Medicaid claim reporting a diagnosis of asthma during the measurement period. Denominator includes beneficiaries with claims having one or more of the following asthma ICD-9 codes: 493.00, 493.01, 493.02, 493.10, 493.11, 493.12, 493.81, 493.82, 493.90, 493.91, or 493.92 (excludes 493.20, 493.21 and 493.22) as primary or secondary diagnoses. Dates of service must be within the measurement year.

**Similar measures in other indicator sets:** HP 2020 Focus area RD-3; NQF measure 1381; MIECHV Benchmark Area Improvements in

## Life Course Criteria

### **Introduction**

Asthma is a common and costly health condition affecting 25.7 million people in the United States (Akinbami et al, 2012). Through physician guided asthma management plans, appropriate medications, and control of exposure to common asthma triggers, both adults and children with asthma should experience minor symptoms, few flare-ups, and infrequent interruptions of daily life. Emergency department (ED) visits for asthma are most often a result of uncontrolled asthma. Uncontrolled asthma has an affect on the life course of an individual as it is associated with increased mortality rates, long term health effects, comorbidities, and reduced performance in school or work due to absences and illness (O'byrne, 2013). A reduction in ED utilization for asthma symptoms should indicate an increase of control over asthma in the community, improved access to resources and services for management and improved collaboration between physicians and providers for treatment.

### **Implications for equity**

The majority of patients visiting the ED for asthma have experienced uncontrolled or partially controlled bronchial asthma in the months leading up to the ED visit (AL-Jahadali et al, 2012). Age, race, socioeconomic status, and environmental factors all contribute to risk of uncontrolled asthma.

Asthma-related ED or urgent care center visits are significantly more prevalent annually for non-Hispanic blacks, Puerto Ricans, other Hispanics, and non-Hispanic American Indian or Alaskan Natives than for non-Hispanic whites (Law, Oraka, & Mannino, 2011). Black persons have the highest asthma ED visit and hospitalization rates per 100 persons in the United States and the highest asthma death rate per 1,000 persons in the United States with asthma (Akinbami et al, 2012). Large differences are found in asthma ED visit rates between blacks and whites, indicating disparities not just in prevalence of asthma but also asthma control. National rates for ED visits and hospitalizations are two- to three-fold higher for black Americans than white Americans (Law, Oraka, & Mannino, 2011). In the U.S. Hispanic population, Puerto Rican Hispanics had the highest ED visit rates, particularly in the national population below the Federal Poverty Level (FPL) (Law, Oraka, & Mannino, 2011). Lack of access to care and poor adherence to prescribed management in minority populations may contribute to these disparities. An analysis of state Medicaid programs showed that while Hispanics and blacks had higher asthma ED visit rates than whites, the number of filled prescriptions for inhaled corticosteroids and asthma specialist visits were higher in whites than Hispanics or blacks (Lieu et al, 2002).

Risk for asthma ED visits also varies by age. Children under four years of age have a higher rate of ED visits than any other age category (Akinbami et al, 2012). Racial disparities exist among children as well, with the rates of asthma-related ED visits among black children being approximately three times higher than those among white children (Law, Oraka, & Mannino, 2011). Although longitudinal studies of asthma morbidity across an individual's life course are not available, evidence suggests substantial differences in asthma prevalence and ED use exist across age groups (Akinbami et al, 2012).

Children living in low-income areas have both a higher prevalence of asthma as well as higher hospital admission rates (Milton et al, 2004). Individuals with lower income and those without insurance face social and financial barriers to asthma prevention medications and consultations with specialists that would help avoid eventual ED visits. Increased exposure to household irritants in low income households may also be a contributing factor to uncontrolled asthma in this population (Milton et al, 2004).

### **Public health impact**

Approximately 34 million people (11.5 percent) in the United States have been diagnosed with asthma during their lifetime (American Lung Association, 2007). As of 2011, 18.9 million adults (8.2 percent) (Schiller, Lucas, & Peregoy, 2011) and 7.1 million children (9.5 percent) had asthma (Bloom, Cohen, & Freeman, 2012). From 2001 to 2010, asthma prevalence increased from 7.3 percent to 8.4 percent (Akinbami et al, 2012).

Asthma is the cause of 2.1 million ED visits each year (National Hospital Ambulatory Medical Care Survey, 2009), which indicates poorly controlled asthma and increased risk for future complications (U.S. Department of Health and Human Services, 2007).

Asthma is also responsible for large direct and indirect economic costs. The annual direct health care cost of asthma in the United States has been estimated at \$50.1 billion, with indirect costs due to lost productivity at \$5.9 billion, totaling \$56 billion (Barnett & Nurmagambetov, 2011). ED visits were estimated to cost approximately \$638 million in 2006 alone (U.S. Department of Health and Human Services, 2007). Uncontrolled asthma severely impacts quality of life and limits school and work attendance. Asthma resulted in 2.3 million children missing 14.4 million days of school and adults missing 36.2 million days of work in 2008 (Lyon-Callo et al). It is estimated that more than half (59 percent) of children and one-third of adults who had an asthma attack missed school or work because of asthma (Reeves et al, 2006).

A decrease in the proportion of Medicaid beneficiaries with asthma having an ED visit in a given year would indicate improved asthma management, perhaps via access to care or medication adherence and assistance. This would result in fewer missed school or work days in a population that bears a disproportionate share of risk for asthma and poor health outcomes from asthma. Improving asthma management in youth can instill health behaviors that can carry forward through transition to adult care.

### ***Leverage or realign resources***

There are a number of opportunities to use health care and health research resources to improve this indicator. These opportunities include:

- Care managers/coordinators working with providers to target education and self-education
- Health care providers working with asthmatic patients or parents of asthmatic children to create an asthma management plan that includes use of preventer, reliever, and symptom controller medications as well as regular follow-up visits for assessment of asthma control
- Potential to alert primary care providers that their patient has been seen (or repeatedly seen) in the ED for asthma (capitalizing upon telehealth and/or electronic medical records)
- Ability to characterize ED utilization patterns, monitor outcomes of ED visits (repeat ED visits), identify subpopulations with high asthma burden (to target interventions) (Reeves et al 2006)
- Ability to monitor trends over time and compare rates of asthma between subgroups / geographic areas (e.g., zip code or county level). This may be beneficial in conjunction with air quality information, if available

In addition to these health care and health research resources, the American Lung Association lists outdoor air pollution, homes, schools, and workplaces as public policy categories that could be targeted with interventions to increase control of asthma in the United States in their National Asthma Public Policy Agenda (American Lung Association, 2009).

Although the Environmental Protection Agency (EPA) sets standards for six major outdoor air pollutants: ozone, particulate matter, sulfur dioxide, nitrogen oxide, lead and carbon monoxide, millions of Americans still live in communities that do not meet EPA air quality standards (American Lung Association, 2009). The air quality index is important for asthmatic individuals and parents or guardians of asthmatic children to know when planning outdoor activities. Modifying activities on days with a poor air quality index can help control asthma and avoid ED visits. Indoor asthma triggers include cigarette smoke, dust mites, molds, cockroaches, pet dander, and chemical irritants (American Lung Association, 2009). An opportunity exists in partnering with the housing sector to limit exposure to these asthmatic triggers. Policies and practices adopted by city and state housing authorities such as smokefree group housing and pest management strategies can reduce these indoor pollutants. Additionally, partnerships between housing and community health workers could enable home visiting for families of children with poorly controlled asthma to identify and remove or reduce household irritants.

Schools and workplaces are both stakeholders in asthma control as asthma is responsible for significant absenteeism from both school and work. The U.S. Department of Health and Human Services and the U.S. Department of Education partnered to create a guide for schools to use in asthma management. The guide includes developing student asthma management plans as well as school partnerships with families, physicians, and special service agencies to address family needs such as lack of insurance (U.S. Department of Health and Human Services & U.S. Department of Education, 2001).

The limitations of using Medicaid claims as a data source indicate the need for an increase in the amount of local and national data on asthma ED visits available for analysis. Workgroups partaking in the National Workshop to Eliminate Asthma Disparities recommended an increase in epidemiologic data surrounding asthma outcomes and risk factors through a regional coalitions engaging public (Medicaid) and private health plans (Weiss, 2007). For example, future data sources may include statewide or regional health information exchanges.

Additionally, through health reform and the Affordable Care Act (ACA) there are many opportunities through community and systems changes to improve chronic conditions such as asthma. For example, accountable care organizations (ACOs), some of which are supported through ACA funding, are “a group of health care providers who give coordinated care, chronic disease management, and thereby improve the quality of care patients get. The organization's payment is tied to achieving health care quality goals and outcomes that result in cost savings.” The Prevention and Public Health Fund, funded through the ACA, makes provisions for funding and investments in evidence-based prevention and public health to “improve health outcomes, and to enhance health care quality.” Further, the ACA authorized the Medicaid health home benefit to intensively coordinate the care of enrollees with chronic conditions such as diabetes, serious mental illness and asthma.

### ***Predict an individual's health and wellness and/or that of their offspring***

The use of the ED for asthma is a well-recognized marker for poorly controlled asthma and the increased risk of future complications (National Asthma Education and Prevention Program, 2007). Poorly controlled asthma is associated with higher asthma morbidity and mortality for affected individuals. Both school attendance among children and work attendance among adults are reduced as a result of uncontrolled asthma (Reeves et al, 2006). Asthma related absences vary across the life course, with 2.3 million children missing 14.4 million days of school and adults missing 36.2 million days of work (Lyon-Callo et al 2008). Absenteeism and “presenteeism”, being present at work or school but working in a diminished capacity due to illness symptoms, can lead to decreased overall performance and capacity.

Control of asthma consists of minimizing day-to-day symptoms but also includes minimizing risks of future unstable asthma, experiencing loss of lung function, and medication side effects, underscoring the importance of ensuring effective asthma management in early childhood (O'byrne, 2013). Significant negative health impacts other than these most commonly associated impacts can result from poorly controlled asthma. Studies have shown asthmatic children who lack control of their disease are significantly less active and have less intensive daily activities than children whose asthma is controlled (O'byrne, 2013). Obesity has been associated with asthma and may be a result of weight gain and inactivity due to asthma symptoms (O'byrne, 2013). Other health effects of this indicator include asthma-disturbed sleep, reduced participation in social activities, and an increased risk for anxiety and depression (National Institute of Clinical Studies, 2005, Peters et al, 2006). Anxiety and depression can be significant contributors to non-adherence to asthma management plans, which creates a cycle of uncontrolled asthma complications and non-adherence to medications (Weiss, 2007).

Lastly, severe or difficult-to-manage asthma is associated with several other comorbidities such as allergic rhinitis and gastroesophageal reflux disease (GERD). Both conditions are thought to exacerbate asthma and are also found at a higher prevalence in asthmatics than the general population (Peters et al 2006).

## **Data Criteria**

### ***Data availability***

Medicaid administrative claims data are available from the Medicaid Analytic Extract (MAX) files maintained by the Centers for Medicare & Medicaid Services (CMS) (Medicaid Analytic Extract (MAX) files, 2013). MAX files are claim-level data files that summarize Medicaid inpatient, outpatient, and pharmacy services as well as person-level eligibility files. MAX data contain individually identifiable data, and are available for research activities approved by CMS through a Data Use Agreement (DUA) with CMS. Technical assistance with MAX data and availability is provided by the Research Data Assistance Center (ResDAC) (ResDAC, 2013).

Although MAX data are available for each state, availability may vary by state and year, and the timeliness and completeness of data reporting varies by state and year. In general, there is more than a three-year time lag for MAX data

release. ResDAC can provide the most up to date information on MAX data for a given jurisdiction. In addition, individual states may have similar data files created for other purposes that may be utilized for quality measurement activities. Those data may be available on a timelier basis from an individual state than the MAX versions ultimately released for that same state. According to CMS, the most recent MAX file available is MAX 2010, which is now available in 36 states, and Beta versions are available earlier. The rolling schedule is available on the CMS website: [cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidDataSourcesGenInfo/MAXGeneralInformation.html](https://www.cms.gov/Research-Statistics-Data-and-Systems/Computer-Data-and-Systems/MedicaidDataSourcesGenInfo/MAXGeneralInformation.html)

A limitation of the data source is the inability to obtain a national comparison statistic. Also, because the data is obtained from Medicaid claims, stratification of the indicator by two main risk factors, insurance status and poverty level, is not possible.

### **Data quality**

Data quality is an important consideration of Medicaid claims data, irrespective of the source of the data. Consequently, the user is required to understand how to determine whether the requisite fields are populated with valid values. Although MAX data are available for each state, the timeliness and completeness of data reporting varies by state and year. In general, there is more than a three-year time lag for MAX data release.

The respective MCH program should determine whether the data are sufficiently complete and accurate for their purposes. For example, one state may have incomplete data for Medicaid managed care members in a given year. If this is important to the MCH program, the MAX data should be sought for a different year that may be more complete, or complete Medicaid claims data may be available directly from the state's program. ResDAC may be able to provide information regarding the degree to which data quality issues may exist with a particular state's MAX data (Weiss, 2001). Information about the data quality of asthma ED visit as recorded in the MAX file is not available.

### **Simplicity of indicator**

This indicator is used to assess the percentage of persons with an asthma diagnosis reported during the measurement year with one or more asthma-related ED visits. The indicator is patterned after the CHIPRA measure, but the proposed modifiers (age, gender, race / ethnicity, geographic areas of interest) offer additional insights into asthma ED visit dynamics in a given population. If a state does not wish to compute the stratified counts as proposed, the total overall ED visit categories (Table 1) is equivalent to the published CHIPRA measure.

The administrative claims data necessary to compute these measures relies on a limited number of data elements, including:

- Date of service
- Diagnosis code
- Procedure code
- Revenue code
- Date of birth (age)
- Gender
- Race
- Residence county
- Residence zip code (if available)

Given the measure is consistent with the CHIPRA quality measure and is well understood to be associated with quality of and access to care for a vulnerable population, MCH programs will face few challenges explaining and using the indicator as a measure of life course health. Any complexity associated with calculating the measure is centered around the desirability for stratification.

Medicaid administrative data are maintained by all states and have been used widely for asthma-related studies. Of note, the Centers for Medicare and Medicaid Services has published the initial core set of quality measures for children enrolled in Medicaid and the Children's Health Insurance Program (CHIP). Among these measures is *Measure 20: Annual Percentage of Asthma Patients with One or More Asthma-Related Emergency Room Visits*, which is a Medicaid claims-based measure.

Although the CHIPRA-proposed measure is aimed at a simple rate of patients with at least one asthma ED visit, there is ample evidence to suggest that frequent ED use among asthma patients is a common problem. One study found that asthma patients with six or more ED visits accounted for 68 percent of total ED visits. High utilizers such as these are responsible for disproportionately high costs. Data from the National Medical Expenditure Survey reported that 20 percent of all asthma patients account for 80 percent of total asthma related costs (Weiss, 2001).

With that in mind, it may be desirable to enhance the CHIPRA quality measure to reflect additional information regarding the volume of asthma ED use by beneficiaries; this can be accomplished using the same data source as basic process. Such measures help distinguish whether multiple persons are using relatively low numbers of asthma ED visits, or if relatively few persons are making repeated asthma ED visits.

To reflect this, the proportion of persons with one or more asthma ED visit can be stratified to create an indicator that distinguishes those with minimal asthma ED use (e.g., those with one asthma ED visit) from those with repeated visits (e.g., five asthma ED visits). Table 1 illustrates how measures of beneficiaries with one asthma ED visit, two, three, four, or five or more visits can be separately counted to provide an indication of the degree to which ED resources are being used by repeat ED visitors in the course of a year. Each count of persons having the respective number of asthma ED visits is divided by the same population denominator to show the fraction of persons with asthma with that number of asthma ED visits. The denominator can be for the entire population of persons with asthma in the respective Medicaid jurisdiction, or for age, gender, and race subgroups. The total overall ED visit category is equivalent to the CHIPRA indicator of the proportion of persons with asthma having one or more asthma ED visit.

**Table 1: Asthma annual ED use metric summary**

Group	Numerator	Denominator
1 asthma ED visit	Count of persons with 1 annual asthma ED visit	All persons in group (or age, gender, race, etc. subgroup )
2 asthma ED visits	Count of persons with 2 annual asthma ED visit	
3 asthma ED visits	Count of persons with 3 annual asthma ED visit	
4 asthma ED visits	Count of persons with 4 annual asthma ED visit	
5 or more asthma ED visits	Count of persons with 5 annual asthma ED visit	
All groups combined (e.g., persons with 1 or more asthma ED visit)	Count of persons with 1 or more annual asthma ED visit	

Similarly, counts of asthma ED visits can be examined to determine the average number of asthma ED visits per capita over the entire eligible population or subgroups (Table 2). This measure provides a sense of the proportion of total asthma ED visit volume that is attributable to beneficiaries having one asthma ED visit, two asthma ED visits, etc. This measure is determined by computing the number of asthma ED visits for each member with asthma (identical to the measure described in Table 1), but then summing the total number of asthma ED visits over all persons in the respective categories as shown in Table 2. Each sum of asthma ED visits is divided by the total population of persons with asthma in the respective Medicaid jurisdiction. Again, these counts can be stratified in a similar manner as above to yield per capita rates by age, gender race, etc.

**Table 2: Asthma annual ED volume metric summary**

Group	Numerator	Denominator
1 asthma ED visit	Sum of annual asthma ED visits among those with 1 visit	All persons in group (or age, gender, race, etc. subgroup )
2 asthma ED visits	Sum of annual asthma ED visits among those with 2 visits	
3 asthma ED visits	Sum of annual asthma ED visits among those with 3 visits	
4 asthma ED visits	Sum of annual asthma ED visits among those with 4 visits	
5 or more asthma ED visits	Sum of annual asthma ED visits among those with 5 or more visits	
All groups combined (e.g., persons with 1 or more asthma ED visit)	Sum of annual asthma ED visits over all groups	

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