Measures to Identify and Track Racial Disparities in Childhood Asthma: Asthma Disparities Workgroup Subcommittee Recommendations

Standards Subcommittee of the Asthma Disparities Workgroup

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The Standards Subcommittee of the Asthma Disparities Workgroup is an interagency committee convened to address strategies in the Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities. The Plan was published in May 2012 under the auspices of the President's Task Force on Environmental Health Risks and Safety Risks to Children

Overview

The Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities

The Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities[1] (the Plan) was released in May 2012 by an interagency Asthma Disparities Workgroup under the auspices of the President's Task Force on Environmental Health Risks and Safety Risks to Children. The Plan provided four strategies for federal agencies to organize collaboration on actions to reduce the disproportionately high burden of asthma for minority children. Using input from stakeholders gathered at a December 2010 workshop, the strategies were based on consensus by the Asthma Disparities Workgroup on preventable factors contributing to disparities and effective interventions to address them. Participating federal agencies have been charged to collaborate in addressing the priority actions for each strategy.

A Strategy to Identify Children Impacted by Asthma Disparities

Each of the four strategies outlined in the Plan contain several priority actions for federal agencies and stakeholders to undertake in collaboration. A Standards Subcommittee of the Asthma Disparities Workgroup was convened to address Priority Action 3.2, "Standardize definitions, measures, outcomes and data/information collection methods, and maximize availability and use of collected data across federal asthma programs" in Strategy Three, "Improve capacity to identify the children most impacted by asthma disparities." The Subcommittee consisted of staff from the Centers for Disease Control and Prevention (CDC), State Departments of Health (California, Minnesota, Rhode Island and Utah), the Health Resources and Services Administration (HRSA) and the National Institutes of Health (NIH, National Institute of Nursing Research) who had expertise in national and local asthma surveillance, analysis of survey data, epidemiologic research, and design and implementation of public health asthma interventions. Specifically, the Subcommittee effort focused on the first portion of the priority action to, "develop standards and apply standardization to… surveillance (health surveys, administrative data abstract)… and asthma program monitoring and evaluation." The recommendations from the Subcommittee are also intended to address Priority Action 3.3, "Promote the use of standard definitions, measures, outcomes and information/data collection methods in state, local and community settings." The overall goal of these priority actions is to improve comparability and comprehensiveness of information about the burden of asthma in disproportionately affected populations. Existing federal health surveys that have been the standard for asthma surveillance present an ideal resource to base standards for state and local level efforts to measure and track asthma disparities and to benchmark local patterns with national trends. Ultimately, increased collaboration, comparison, and data sharing will allow more accurate and timely estimation of disparities in multiple settings and across geographic levels.

Measuring disparities is complex, with conclusions easily impacted by value judgments and perspectives.[2] The interpretation of disparities is complicated further when disparate data sources and measures are used. Valid comparisons require explicit identification of methods and measures so that the identification, characterization, and tracking of asthma burdens among populations at disproportionate risk can be optimized. These recommendations are based on established definitions of common measures used in analyzing asthma disparities in population- or intervention-based settings.

Choosing Measures

The Subcommittee identified 4 domains of measures used in surveillance of asthma risk and outcomes:

- Prevalence and outcome measures
- Risk factors
- Asthma management
- Asthma control

These domains were identified through a consensus-based review of national and state asthma surveillance efforts, national and state health survey content, and several additional resources (see "Resources" below) that focused on definitions, standardization, cataloging, and/or tracking of asthma-related measures.

The initial list of measures was evaluated to explore feasibility of measurement in multiple settings (e.g., ranging from state-based surveys to local asthma programs). The template for each measure was developed by adapting existing templates used for other federal initiatives that catalogued asthma and chronic disease measures.[3, 4] Templates for each measure address data- and measures-related issues based on consensus by subcommittee members and include the following:

- definition of each measure, including verbatim survey questions and related data collection information
- information on estimation/calculation of measures
- background on each measure to provide context for its significance to defining and understanding asthma burden
- specific information about how the measure contributes to understanding childhood asthma disparities
- limitations that could be encountered in collecting and/or estimating the measure
- related data resources that could provide additional context for using the standard

This effort is focused on children given that the mandate of the Coordinated Federal Action Plan concerns childhood asthma disparities. Most measures, however, are easily adapted to the adult population. For clarity of presentation, these adaptations are not explicitly included in this document.

The recommended measures included are not an exhaustive list, but those which have an established track record in national surveillance and/or program evaluation. There are certainly other measures and data sets that could supplement those presented in this document to provide a more detailed picture of challenges and disparities within a population of children. Additionally, there are no recommendations about which measures should be included in any study or evaluation. Those included in this document represent not a list of necessary measures, but those with the most robust definitions and available data that allow replication over time and in different settings. In addition, the current list of measures reflects current best practices. As efforts to improve measurement tools are underway, it is to be expected that current best practices will evolve and measures will change.

Other review considerations

One major concern in generating or comparing estimates is considering the "population at risk." For this reason, recommendations for two types of rates are presented for some measures. A **population-based rate** is the number of persons with a given characteristic, such as a condition, divided by the total number of persons in the population. This type of measure provides information about the burden of the condition among the population, and is useful when considering questions such as whether sufficient resources exist to address the condition. Another type of rate is an **at-risk rate**, which is the number of persons with a given characteristic divided by the number of persons at risk for that characteristic. For example, for an at-risk asthma death rate, the denominator would not be the total population, but only persons with asthma which is the population at risk of dying from asthma. This type of rate is useful in that it adjusts for differences in the prevalence of the characteristic (e.g., asthma prevalence) between groups, and thus disparities reflect differences due to factors other than an underlying difference in characteristics between the groups being compared (see Appendix II in reference #5).

Recommendations are provided for different types of measures. One set includes measures of asthma prevalence and outcomes. For these types of measures (e.g., hospitalizations), definitions of counts, population-based rates, and at-risk rates are presented. Another group of measures describe aspects of quality of health care (e.g., receiving a flu vaccination) or extent of asthma symptoms (e.g., nighttime awakenings) which are

primarily of interest only among the population of children who have asthma. For this reason, only at-risk rates are described for these measures. Other measures address characteristics that have been related to disparities in asthma related indicators. These disaggregation measures, such as race/ethnicity or insurance status, are used to categorize the population into subgroups. Asthma prevalence and outcomes and health care quality indicators are compared across categories of the disaggregation measures to assess disparities. Recommendations for these disaggregation measures (e.g., race/ethnicity, insurance status) describe definitions of categories.

The recommendations do not include information about age adjustment. Age adjustment is used to eliminate differences in outcome rates for population groups that result from differences in the groups' age distributions. Among the pediatric population, however, the age span is limited, and thus differences in age distributions between groups is unlikely to contribute meaningfully to differences in outcome rates.

Resources and related efforts:

- Standardizing asthma outcomes in clinical research: report of the asthma outcomes workshop. J Allergy Clin Immunol 2012, 129(3), Supplement.
- Chronic Disease Indicators (http://www.cdc.gov/cdi/index.html), National Center for Chronic Disease Prevention and Health Promotion
- Social Determinants of Health: Know What Affects Health (http://www.cdc.gov/socialdeterminants/), Centers for Disease Control and Prevention
- Council of State and Territorial Epidemiologists
  - 2010 Position Statement: proposed that CDC, CSTE and state partners develop data collection, analysis and dissemination capacity for asthma indicators
  - 1998 Position Statement: established definitions for asthma surveillance
- The National Committee on Vital and Health Statistics recommended in a 6/22/2012 letter to the Secretary of the DHHS that DHHS undertake additional efforts in exploring the gaps in data collection and analysis for the measurement of SES on health surveys to improve population health and the efforts to reduce health disparities (http://www.ncvhs.hhs.gov/wp-content/uploads/2014/05/120622lt.pdf)
- Agency for Healthcare Research and Quality Measure Inventory (http://www.qualitymeasures.ahrq.gov/hhs/inventory.aspx#search=asthma)
- Healthy People 2020 (http://www.healthypeople.gov/)
- National Surveillance of Asthma: United States, 2001-2010[5]

References:

1. Coordinated federal action plan to reduce racial and ethnic asthma disparities. Washington, DC2012.
2. Harper S, Lynch J. *Methods for measuring cancer disparities : using data relevant to Healthy People 2010 cancer-related objectives*. Washington, D.C.: National Cancer Institute; 2005.
3. Busse WW, Morgan WJ, Taggart V, Togias A. Asthma outcomes workshop: overview. *The Journal of allergy and clinical immunology*. 2012;129(3 Suppl):S1-8.
4. Centers for Disease Control and Prevention. Chronic Disease Indicators. http://www.cdc.gov/cdi/index.html . Updated January 15, 2015. 2015.
5. Moorman JE, Akinbami LJ, Bailey CM, Zahran HS, King ME, Johnson CA, et al. National surveillance of asthma: United States, 2001-2010. *Vital & health statistics Series 3, Analytical and epidemiological studies / [US Dept of Health and Human Services, Public Health Service, National Center for Health Statistics]*. 2012(35):1-67.

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OUTCOME MEASURES
Current asthma prevalence

Data Standard	Current asthma prevalence
Measure	Annual estimates of: • Count: Estimated number of children ages 0-17 years with current asthma • At risk rate: N/A (equivalent to population-based rate given that all children are theoretically at risk of developing asthma) • Population-based rate: Percent of children ages 0-17 years with current asthma
Numerator definition	Numerator: Number of children aged 0-17 years ever diagnosed with asthma by a health professional who still have asthma Survey questions (Source: NHIS): YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2005 onward (http://www.cdc.gov/brfss/)
Denominator definition	Denominator for population-based rate: Population of children 0-17 years of age Source: Civilian noninstitutionalized population (CNIP): provided by US Census (https://www.census.gov/popest/data/index.html). When using the NHIS, survey weights incorporate the estimated CNIP to produce nationally representative percentages. When using other data sources for the numerator that do not provide population-based survey weights, US Census resident population estimates can be used as the denominator for population-based rates. Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), estimates for children for selected states, 2001 onward (http://www.cdc.gov/brfss/). • National, State and County resident population estimates: US Census Bureau (estimates are available by age, sex, race and Hispanic origin) (http://www.census.gov/popest/data/index.html)
Background	Current asthma prevalence is an estimate of the percent of the population with current asthma at the time of the survey. This measure is available from NHIS beginning in 2001. The sampling methodology of the NHIS prevents seasonal bias that could arise from asking the survey questions during different times of the year. The NHIS is conducted throughout the year, and throughout each region of the US during all seasons.

	The NHIS prevalence questions are based on case definition from the Council of State and Territorial Epidemiologists (CSTE) 1998 Position Statement(1). The NHIS was redesigned in 1997, and from 1997-2000, there was no established national point prevalence measure (see "asthma attack prevalence" definition). Prior to 1996, a period prevalence measure was used and was based on the question, "During the past year, did anyone in the family have asthma?" (2)
Significance to disparities	Current asthma prevalence indicates the percentage of each population subgroup that is theoretically at risk for adverse asthma outcomes, such as asthma emergency room visits or hospitalizations. Generally, current asthma prevalence is higher among minority and low income populations of children (3). There are few primary prevention measures that can be used to prevent asthma from developing, or to address the disparity in asthma prevalence. Thus, the Federal Action Plan (4) includes increasing primary asthma prevention research as one of its four main strategies to address asthma disparities.
Data considerations	• Current asthma prevalence based on survey data is a self-reported measure which is not confirmed by comparison to medical records. • Current asthma prevalence does not provide information about asthma severity or control that also affect disparities in adverse asthma outcomes. • The NHIS sampling methodology prevents seasonal bias (conducted throughout the year). Performing a similar survey during only a limited period or season could result in bias.
Data resources	• CDC National Asthma Program Surveillance Tables and Graphs (BRFSS and NHIS) (http://www.cdc.gov/asthma/tables_graphs.htm) • Chronic Disease Indicators (http://www.cdc.gov/cdi/) • Data Resource Center for Child and Adolescent Health (prevalence estimates from NSCH 2003, 2007, 2011) (http://www.nschdata.org/browse/survey)
Related data standards	A related measure that was available from 1997-2000 (between the start of the redesigned NHIS and introduction of current asthma prevalence measure in 2001) is asthma attack prevalence (the number or percent of children with at least one asthma attack in the past 12 months): • Asthma attack prevalence
References	(1) Asthma Surveillance and Case Definition. Council of State and Territorial Epidemiologists Position Statement 1998-EH/CD-01. Environmental and Chronic Disease Committees. (2) Akinbami LJ, Schoendorf KC, Parker J. US childhood prevalence estimates: the impact of the 1997 National Health Interview Survey redesign. Am J Epidemiology 2003:15:158(2):99-104. (3) Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012. (4) Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities: https://www.epa.gov/asthma/coordinated-federal-action-plan-reduce-racial-and-ethnic-asthma-disparities

Asthma attack prevalence

Data Standard	Asthma Attack Prevalence	
Measure	Annual estimates of: • Count: Number of children ages 0-17 with current asthma who had an episode of asthma or an asthma attack in the past 12 months • At risk-rate: Number of children ages 0-17 years with current asthma who had an episode of asthma or an asthma attack in the past 12 months per 100 children aged 0-17 years with current asthma • Population-based rate: Number of children ages 0-17 years with current asthma who had an episode of asthma or an asthma attack in the past 12 months among all children aged 0-17 years	
Numerator definition	Numerator: Number of children ages 0-17 years who have had an episode of asthma or an asthma attack in the past 12 months Survey question: (Source: National Health Interview Survey) YES response to both of two questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"During the past 12 months, has [child's name] had an episode of asthma or an asthma attack?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS): average annual estimates for survey years starting in 2006 for participating States. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by State. (http://www.cdc.gov/brfss/acbs/index.htm)	
Denominator definition	**Denominator for population-based rate**: Population of children 0-17 years of age Source: Civilian noninstitutionalized population (CNIP): provided by US Census (https://www.census.gov/popest/data/index.html). When using the NHIS, survey weights incorporate the estimated CNIP to produce nationally representative percentages. When using other data sources for the numerator that do not provide population-based survey weights, US Census resident population estimates can be used as the denominator for population-based rates. Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence): YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Exclude records with "don't know," "not applicable," and "refused" responses to above two questions. Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward

	(http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2001 onward (sample weights allow calculation of total population in the demographic group of interest) (http://www.cdc.gov/brfss/). • National, State and County resident population estimates: US Census Bureau (estimates are available by age, sex, race and Hispanic origin) (http://www.census.gov/popest/data/index.html)	(http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	In 2006-2010, 51.5% of persons with current asthma reported having had an asthma attack in the past year (1). Having an asthma attack in the past year can be a crude indicator of one's management of asthma. Children with appropriate medical care and self-management should experience no or minimal asthma symptoms (2, 3).	
Significance to disparities	In 2010, black children had an asthma attack prevalence rate of 55.1 per 100 children and white children had a prevalence rate of 62.7 per 100 children (4). A recent analysis of asthma disparities between white and black children found that when using population based rates, disparities in asthma attack prevalence widened over time. However, when using at-risk rates, which account for differences in prevalence, there were no differences between white and black children in asthma attack prevalence (4). The authors concluded that even though there were no differences in asthma attack at-risk prevalence rates between white and black children, current asthma prevalence increased among black children and racial disparities remained in asthma and ED visit and death rates (4).	
Data considerations	• Self-reported measure: not confirmed by comparison to medical records • Does not provide information about asthma severity or control which also affects disparities in adverse asthma outcomes.	
Data resources	• ACBS asthma attack prevalence is also available at http://www.cdc.gov/asthma/acbs/table4a.htm and http://www.cdc.gov/asthma/acbs/table4b.htm . • American Lung Association: Trends in Asthma Morbidity and Mortality http://www.lung.org/our-initiatives/research/monitoring-trends-in-lung-disease/ . • ACBS multiple year (2006-2010) child Asthma Call-back Survey tables (http://www.cdc.gov/asthma/acbs/acbstables.htm). ACBS is not collected in all states. • NHIS http://www.cdc.gov/asthma/nhis /.	
Related data standards	Because children with severe asthma may be more likely to have had an asthma attack in the past 12 months, have visited the emergency department (ED), be hospitalized, or received urgent care, the following indicators may be similar measures for disease severity: • ED visit • Hospitalization • Urgent care visit	

References	(1) Moorman J, Person C, Zahran, H. Asthma attacks among persons with current asthma-United States, 2001-2010. Morbidity and Mortality Weekly Report (MMWR) 2013. Accessed on February 22, 2015: http://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a16.htm . (2) Sheffer AL, ed. Fatal asthma. New York, NY: Marcel Dekker; 1998. (3) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm. Accessed February 19, 2015. (4) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. J Allergy Clin Immunol 2014, 134(3):547-553.

Asthma Emergency Department (ED) Visits

Data Standard	Asthma Emergency Department (ED) Visits	
Measure	Annual estimates of: • Count: Number of children ages 0-17 years with ED visits for asthma • At-risk rate: Number of children ages 0-17 years with an ED visits per 100 children aged 0-17 years with current asthma • Population-based rate: Number of children ages 0-17 years with an ED visit per 10,000 population aged 0-17 years	
Numerator definition	Numerator: ED visits with a principal diagnosis of asthma (ICD-9-CM code 493.XX; ICD-10-CM code J45 beginning 10/2015) for children ages 0-17 years Benchmark Source: • National Hospital Ambulatory Medical Care Survey (NHAMCS), annual nationally representative sample survey of visits to EDs and outpatient departments	
Denominator definition	***Denominator for population-based rate***: US residential population for the same calendar year as the numerator for children ages 0-17 years Benchmark Source: • National, State and County resident population estimates: US Census Bureau (estimates are available by age, sex, race and Hispanic origin) (http://www.census.gov/popest/data/index.html)	***Denominator for at-risk rate:*** Estimated Number of persons with asthma ages 0-17 years Survey questions used to determine current asthma prevalence): YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • "*Does [child's name] still have asthma?"* Exclude records with "don't know," "not applicable," and "refused" responses to above two questions. Benchmark Sources: • National: National Health Interview Survey (NHIS), 2001 onward

		(http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Asthma ED visits are an indicator of poorly controlled asthma and a risk factor for future exacerbations (1). There are specific recommendations for patient education and disease management to prevent ED visits, including assessing inhaler technique, instructions for medication, steps to follow for worsening symptoms, and referral for follow-up asthma care (1). Each year, approximately 2 million ED visits related to asthma occur in the United States (2). The cost of ED care is substantially higher than the cost of outpatient and pharmaceutical services (1). Healthy People 2020 Respiratory Disease Objective 3 (RD-3) is: Reduce emergency department (ED) visits for asthma. (https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives) CDC Chronic Disease Indicator: http://www.cdc.gov/cdi/definitions/asthma.html Emergency Department visit rate for asthma.	
Significance to disparities	Among children 0-17 years of age, black children had an asthma ED visit rate nearly 5 times higher than white children in 2010. When only children with asthma are considered, black children with asthma had about a 2.5 times higher asthma ED than white children with asthma (3).	
Data considerations	• This indicator may be an overestimate of the burden of severe asthma exacerbations since people sometime use the ED inappropriately – i.e., using the ED for primary care. However, a study comparing asthma severity by race among children visiting the ED for asthma found similar levels of severity between black and white children (4). • Not all states have access to administrative billing ED data. • ED visit rates are an event rate, that is, a count of visits rather than a count per persons. In the NHAMCS data set, repeated visits for a given children cannot be detected.	
Data resources	• Centers for Disease Control and Prevention Asthma Data: http://www.cdc.gov/asthma/asthmadata.htm •	
Related data standards	Related indicators of asthma outcomes: • Asthma attack prevalence • Asthma hospitalization • Asthma deaths • Missed school/work days due to asthma	
References	(1) U.S. Department of Health and Human Services (HHS). Expert panel report 3: Guidelines for the diagnosis and management of asthma. Bethesda, MD: HHS, National Heart, Lung and Blood Institute, National Institutes of Health. Publication No. 07–4051. 2007. (http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines) (2) Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012.	

	Barnett SBL, Nurmagambetov TA. Costs of asthma in the United States: 2002-2007. J Allergy Clin Immunol 2011; 127:145-152. (3) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. JACI 2014. (4) Boudreaux ED, Emond SD, Clark S. Camargo CA Jr. Race/ethnicity and asthma among children presenting to the emergency department: differences in disease severity and management. Pediatrics 2003 May;115:e615-621.

Asthma Hospitalization Rate

Data Standard	Asthma Hospitalization Rate	
Measure	Annual estimates of: • Count: Annual number of hospitalizations for children ages 0-17 years for asthma • At-risk Rate: Annual number hospitalizations for children ages 0-17 years per 100 children aged 0-17 years with asthma • Population-based rate: Annual number of hospitalizations for children ages 0-17 years per 10,000 population aged 0-17 years	
Numerator definition	Numerator: Inpatient hospitalizations with a principal discharge diagnosis of asthma (ICD-9-CM code 493, ICD-10-CM code J45 beginning 10/2015) for children 0-17 years of age Benchmark Source: • National Hospital Discharge Survey through 2010. Now called the National Hospital Care Survey (http://www.cdc.gov/nchs/nhcs.htm)	
Denominator definition	***Denominator for population-based rate***: US residential population for the same calendar year as the numerator for children ages 0-17 years. Benchmark Source: • National, State and County resident population estimates: US Census Bureau (estimates are available by age, sex, race and Hispanic origin) (http://www.census.gov/popest/data/index.html)	***Denominator for at-risk rate:*** Estimated Number of persons with asthma ages 0-17 years. Survey questions used to determine current asthma prevalence): YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Exclude records with "don't know," "not applicable," and "refused" responses to above two questions. Benchmark Sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Asthma hospitalization represents a serious outcome that is theoretically preventable with high-quality health care, patient education, and optimal management of asthma. It also represent a risk factor for future asthma exacerbations (1). Each year, approximately 480,000 hospitalizations related to asthma occur in the United States.) Although inpatient hospitalization for asthma is less frequently used than outpatient and pharmaceutical services, its cost is substantially higher (4). Healthy People 2020 Respiratory Disease Objective 2 (RD-2) is: Reduce hospitalizations for asthma.	

	(https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives) CDC Chronic Disease Indicator: http://www.cdc.gov/cdi/definitions/asthma.html Hospitalizations for asthma
Significance to disparities	• Compared to white children, black children had an asthma hospitalization rate that was three times higher in 2010. If just children with asthma are considered, black children with asthma had a similar rate of asthma hospitalization rate compared to white children with asthma (about 1.5 times higher) (4). • Racial disparities in asthma hospitalization rates among children 0-17 years declined from 2001 to 2010 both for population-based rates and at-risk rates (4). • Hospitalizations due to asthma could be reduced if asthma is managed according to established guidelines. Effective management includes control of exposure to factors that trigger exacerbations, adequate pharmacological management, continual monitoring of the disease, and patient education in asthma care (1).
Data considerations	• As one person can have multiple hospitalizations for asthma in a single calendar year, this indicator describes rate of events, not rate of persons hospitalized. • Hospital discharge data may not be available for all states. State hospitalization datasets may not include all facilities or populations. • Rates can be affected by changes in prevalence over time as well as practice patterns and payment mechanisms which can affect decisions by health-care providers to hospitalize patients.
Data resources	• Centers for Disease Control and Prevention Asthma Data: http://www.cdc.gov/asthma/asthmadata.htm •
Related data standards	Related indicators of asthma outcomes: • Asthma attack prevalence • Asthma emergency room visits • Asthma deaths • Missed school/work days due to asthma
References	(1) U.S. Department of Health and Human Services (HHS). Expert panel report 3: Guidelines for the diagnosis and management of asthma. Bethesda, MD: HHS, National Heart, Lung and Blood Institute, National Institutes of Health. Publication No. 07–4051. 2007. (http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines) (2) Number and rate of discharges from short-stay hospitals and of days of care, with average length of stay, and standard error, by selected first-listed diagnostic categories: United States, 2009. National Hospital Discharge Survey. Accessed 10/30/12 at http://www.cdc.gov/nchs/data/nhds/2average/2009ave2_firstlist.pdf (3) Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012. (4) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. JACI 2014

Asthma Death Rate

Data Standard	Asthma Death Rate	
Measure	Annual estimates of: • Count: Number of asthma deaths among children ages 0-17 years due to asthma • At-risk Rate: Number asthma deaths for children ages 0-17 years per 10,000 children aged 0-17 years with asthma • Population-based rate: Number of asthma deaths among children ages 0-17 years per 1,000,000 population aged 0-17 years	
Numerator definition	Numerator: Number of deaths with underlying cause of asthma (ICD-10 J45- J46) Benchmark Source: • National Vital Statistics System, mortality file from NCHS (annual) (http://www.cdc.gov/nchs/nvss/deaths.htm)	
Denominator definition	***Denominator for population-based rate***: US residential population for the same calendar year as the numerator for children ages 0-17 years. Benchmark Source: • National, State and County resident population estimates: US Census Bureau (estimates are available by age, sex, race and Hispanic origin) (http://www.census.gov/popest/data/index.html)	***Denominator for at-risk rate:*** Estimated Number of persons with asthma ages 0-17 years. Survey questions used to determine current asthma prevalence): YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Exclude records with "don't know," "not applicable," and "refused" responses to above two questions. Benchmark Sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Asthma deaths are a rare, but preventable outcome among children. Predictors of asthma deaths include 3 or more asthma ED visits in the past year, an asthma hospitalization in the past month, overuse of short-acting beta agonist medication, an intensive care unit stay for asthma, lack of a written asthma plan, and low socioeconomic status (1). The number of deaths with asthma as the underlying cause declined steadily from 4,269 in 2001 to 3,388 in 2009, at a rate of 3.3% per year (1). Among children, the population-based rate of asthma deaths per million was 2.8 in 2009, and the at-risk based rate of asthma deaths per 10,000 children with asthma was 0.3 (2). Healthy People 2020 Respiratory Disease Objective 1 (RD-1) is: Reduce asthma deaths.	

	(https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives) CDC Chronic Disease Indicator: http://www.cdc.gov/cdi/definitions/asthma.html Asthma mortality rate
Significance to disparities	Although asthma deaths are rare among children, racial disparities in asthma death rates are the largest compared to other outcomes. In 2010, black children were 7 times more likely to die than white children. Among children with asthma, black children with asthma were 4 times more likely to die from asthma than white children with asthma (3). While there were improvements in racial disparities for asthma hospitalization rates from 2001 to 2010, there was no improvement in racial disparities for asthma death rates (3).
Data considerations	• Cause of death is recorded by attending physicians, medical examiners, and coroners on death certificated filed in state vital statistics offices. Every death is attributed to one underlying condition, based on information reported on the death certificate, and using international rules for selecting the underlying cause of death (World Health Organization defines as "the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury") from the conditions reported on the death certificate. • Race and ethnicity on death certificates are reported by the funeral director as provided by an informant, or in the absence of an informant, on the basis of observation.
Data resources	• Centers for Disease Control and Prevention Asthma Data: http://www.cdc.gov/asthma/asthmadata.htm •
Related data standards	Related indicators of asthma outcomes: • Asthma attack prevalence • Asthma emergency room visits • Asthma hospitalization rate • Missed school/work days due to asthma
References	(1) U.S. Department of Health and Human Services (HHS). Expert panel report 3: Guidelines for the diagnosis and management of asthma. Bethesda, MD: HHS, National Heart, Lung and Blood Institute, National Institutes of Health. Publication No. 07–4051. 2007. (http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines) (2)Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012. (3) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. J Allergy Clin Immunol 2014, 134(3):547-553.

Missed school/work days due to asthma

Data Standard	Missed Daycare/School/Work Days due to Asthma	
Measure	Annual estimates of: • Count: Number of children ages 0-17 years with current asthma who missed at least one day of daycare or preschool/school/work in the past 12 months due to asthma • At-risk rate: Number of children ages 0-17 years with current asthma who missed at least one day of daycare or preschool/school/work in the past 12 months due to asthma per 100 population (percent) children aged 0-17 years with current asthma • Population-based rate: Number of children ages 0-17 years with current asthma who missed at least one day of daycare or preschool/school/work in the past 12 months due to asthma per 100 population aged 0-17 years *Note: Rates may be calculated for children aged 5-17 years to include school-aged children only.*	
Numerator definition	Numerator: Number of children ages 0-17 years with current asthma who missed at least one day of daycare or preschool/school/work in the past 12 months due to asthma Survey question (Source: National Health Interview Survey): "During the past 12 months, how many days of daycare or preschool/ school or work did [child's name] miss because of asthma?" Benchmark data source: • National: National Health Interview Survey (NHIS) periodic modules: 2002, 2003, 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS): average annual estimates for survey years starting in 2006 for participating States. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by State. (http://www.cdc.gov/brfss/acbs/index.htm)	
Denominator definition	***Denominator for population-based rate***: US residential population for the same calendar year as the numerator for children ages 0-17 years. Benchmark Source: • National, State and County resident population estimates: US Census Bureau (estimates are available by age, sex, race and Hispanic origin) (http://www.census.gov/popest/data/index.html)	***Denominator for at-risk rate:*** Estimated Number of persons with asthma ages 0-17 years. Survey questions used to determine current asthma prevalence): YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Exclude records with "don't know," "not applicable," and "refused" responses to above two questions. Benchmark Sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)

		State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	In 2008, nearly 60% of children with current asthma reported missing at least one day of school in the past 12 months (1). Children 5-17 years were reported to have missed 10.5 million school days in the past year due to asthma (1). Missed school days can be used as an asthma measure of morbidity because poor asthma control can lead to a loss of productivity resulting in missed school days. Children with appropriate medical care and self-management should not experience asthma symptoms or miss school because of their asthma (2). The National Asthma Education and Prevention Program (NAEPP) provides expert guidelines for diagnosis and management of asthma https://www.nhlbi.nih.gov/health-pro/resources/lung/naci/asthma-info/asthma-guidelines.htm . Healthy People 2020 goals (RD-5.1) aim to reduce the proportion of children aged 5-17 years with asthma who miss school days http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives .	
Significance to disparities	An analysis of asthma disparities among racial/ethnic groups in Passaic, New Jersey (1998-2001) revealed that black and Puerto Rican children had a higher percentage of missed school days due to asthma than white children or children in other Hispanic subgroups (Mexican and Dominican) (3). Black and Puerto Rican children also had the highest asthma prevalence.	
Data considerations	• Self-reported measure: subject to error due to recall bias. • Does not provide information about asthma severity or control which also affects disparities in adverse asthma outcomes.	
Data resources	• ACBS data on missed school days is also available at http://www.cdc.gov/asthma/acbs/table14.htm. • American Lung Association: Trends in Asthma Morbidity and Mortality http://www.lung.org/our-initiatives/research/monitoring-trends-in-lung-disease. • ACBS multiple year (2006-2010) child Asthma Call-back Survey tables (http://www.cdc.gov/asthma/acbs/acbstables.htm). ACBS is not collected in all states. • Healthy People 2020 http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.	
Related data standards	Children who miss school due to asthma may also limit usual activities: • Limited usual activities	
References	(1) Akinbami, LJ, Moorman, JE, Liu, X. Asthma prevalence, healthcare use, and mortality: United States, 2005–2009. National health statistics report; no 32. Hyattsville, MD: National Center for Health Statistics. 2011. (2) Sheffer AL, ed. Fatal asthma. New York, NY: Marcel Dekker; 1998. (3) The Asthma and Allergy Foundation of America. Ethnic Disparities in the Burden and Treatment of Asthma. 2005. Accessed on February 22, 2015: http://www.aafa.org/page/burden-of-asthma-on-minorities.aspx	

RISK FACTORS
Race/ethnicity

Data Standard	Race/ethnicity
Measure	Annual estimates of: • Count: number of children aged 0-17 years with current asthma for each single best race as defined by the Office of Management and Budget 1997 Standards (1): ○ white ○ black ○ Asian ○ American Indian/Alaska Native ○ Native Hawaiian or other Pacific Island ○ Two or more races (multiple race) • Count: Number of children aged 0- 17 years with current asthma in each Hispanic origin (ethnicity) category: ○ Hispanic ○ non-Hispanic • Count: Number of children aged 0-17 years with current asthma in each race/ethnic category: ○ Non-Hispanic white ○ Non-Hispanic black ○ Non-Hispanic other ○ Hispanic • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is a demographic characteristic.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma in each category of race, Hispanic Origin and/or race/ethnicity (race is defined as the single race selected that best represents child's race). Survey questions (Source: NHIS): • *"Do you consider [child's name] to be Hispanic or Latino? If YES, please give me the group that represents [child's name]'s Hispanic origin or ancestry."* (Puerto Rican, Cuban/Cuban American, Dominican (Republic), Mexican, Mexican American, Central or South American, Other Latin American, Other Hispanic/Latino/Spanish) • *"Which race or races [does child's name] consider [himself/herself]] to be? Please select 1 or more of these categories."* (White, Black/African American, Indian (American), Alaska Native, Native Hawaiian, Guamanian or Chamorro, Samoan, Other Pacific Islander, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian, Some other race) ○ If more than one race selected, "Which one of these groups [read groups above] would you say BEST represents [child's name]'s race? Benchmark data sources: • National: National Health Interview Survey (NHIS), 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states (http://www.cdc.gov/brfss/)

Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	National health statistics reported by race/ethnicity are based on the 1997 Office of Management and Budget (OMB) standards (1). The OMB guidelines define race as a social definition rather than an attempt to define genetics, biology, or anthropology. Hispanic origin (ethnicity) and race are separate concepts, and thus collection of race and ethnicity data are collected using separate questions in federal data systems. Hispanic persons may be of any race, and includes persons of Mexican, Puerto Rican, Cuban, Central and South American and/or Spanish origins. Race is based on the family respondent's description of his or her own race background, as well as the race background of other family members. The 1997 OMB race groups are white, black/African American, American Indian/Alaska Native, Asian, and Native Hawaiian/Other Pacific Islander. A person may report more than one race, but OMB guidelines are based on the race that the respondent reports best represents their or their child's race. Additional categorization methods may separately classify those choosing more than one race as "multiple race."
Significance to disparities	Higher asthma prevalence among specific race/ethnic groups translates into a higher proportion of those groups at risk of adverse asthma outcomes such as exacerbations, need for emergent care, and in rare cases, death. Non-Hispanic black children had a growing prevalence rate compared to non-Hispanic white children from 2001-2010 (2). Alaska Native/American Indian and multiracial children also have higher rates of asthma compared to non-Hispanic white children (3). Puerto Rican children have among the highest rates, while Mexican children have among the lowest rates of current asthma prevalence (4,5). Data for asthma outcomes (such as hospitalizations) by Hispanic origin in national data sets are more limited.
Data considerations	In federal health surveys, respondents self-reported race/ethnicity, or proxy reported race/ethnicity for other family members. Beginning with the 2003 NHIS, in cases where "other race" was mentioned with one or more OMB race groups, the "other race" response is dropped and the OMB race group information is retained on the NHIS data file. In cases where "other race" is the only response, race is treated as missing and imputed in the NHIS data file.
Data resources	US Census information: • Hispanic Origin (http://www.census.gov/topics/population/hispanic-origin.html) • Race (http://www.census.gov/topics/population/race.html) US Census data: • Hispanic Origin (http://www.census.gov/population/hispanic/data/) • Race (http://www.census.gov/population/race/data/)
Related data standards	Race/ethnicity is associated with many sociodemographic factors, some of which are included in this document: • Poverty status • Educational attainment • Exposure and housing characteristics • Psychological distress • Insurance coverage • Cost barriers • Unemployment

References	(1) Office of Management and Budget. Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity. Federal Register Notice, October 30, 1997. (http://www.whitehouse.gov/omb/fedreg_1997standards) (2) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. J Allergy Clin Immunol. 2014 Sep;134(3):547-553 (3) Health Data Interactive. Asthma and chronic obstructive pulmonary disease: US (Source: NHIS) data table. Accessed 3/3/2015. (4) Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012. (5) Lara M, Akinbami L, Flores G, Morgenstern H. Heterogeneity of childhood asthma among Hispanic children: Puerto Rican children bear a disproportionate burden. Pediatrics. 2006 Jan;117(1):43-53.

Poverty status

Data Standard	Poverty status
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma with family income: ▪ <100% federal poverty level (poor) ▪ 100-<200% federal poverty level (near poor) ▪ ≥200% federal poverty level (non-poor) • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is a sociodemographic characteristic.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma in each category of poverty status. Survey question for family income (Source: NHIS): • *"When answering this next question, please remember to include your income plus the income of all family members living in this household. What is your best estimate of the total family income of all family members from all sources, before taxes in the last calendar year?"* This question is preceded in the National Health Interview Survey by detailed questions about income to prompt respondents to count all the sources used to compute poverty status. According to US Census definition, before-tax money income for the family is totaled, and includes earnings, unemployment compensation, worker's compensation, Social Security, Supplemental Security Income, public assistance, veteran's payments, survivor benefits, pension or retirement income, interest, dividends, rents, royalties, income from estates, trusts, educational assistance, alimony, child support, assistance from outside the household, and other miscellaneous sources. Noncash benefits (food stamps, housing subsidies) and capital gains or losses **do not** count. Money income for all family members are included (but non-relatives, such as housemates, do not count). See http://www.census.gov/hhes/www/poverty/about/overview/measure.html. Note that nonresponse for this question is relatively high in the NHIS. Therefore, missing responses are multiply imputed to reduce the bias that would result if the other health information associated with these missing responses were excluded from analysis. See the NHIS Description for additional information (ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2014/srvydesc.pdf) Survey summary variable for poverty status (Source: NHIS): Reported family income is used to calculate the ratio of family income to the poverty threshold (RAT_CAT contained in the family file). US Census federal poverty thresholds are defined annually in dollar amounts according to family size and composition. (http://www.census.gov/hhes/www/poverty/about/overview/measure.html) Survey summary variable for family size (Source: NHIS): Family type and structure is determined with a series of screening questions in the NHIS and summarized to characterize family size and structure (variables FM_SIZE and FM_KIDS

	contained in the family file, which are used to calculate the survey summary variable for poverty status described above). Benchmark data source: • National: National Health Interview Survey (person file), 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	Based on the Office of Management and Budget's (OMB) Statistical Policy Directive 14, the Census Bureau establishes a set of income thresholds that vary by family size and composition. If family income is less that the family poverty threshold, that family is categorized as poor (<100% federal income threshold). The official poverty definition uses money income before taxes and does not include capital gain or noncash benefits (e.g., food stamps).
Significance to disparities	Current asthma prevalence is significantly higher among children with family income below the federal poverty level (1). While national data on outcomes is not generally available by income level, it has been well documented that risk factors for asthma and for poor asthma outcomes are higher among lower income groups, including housing quality, stress, family resources to manage chronic conditions, etc. (2-4).
Data considerations	Nonresponse for family income and personal earnings in the NHIS are high (~20%, depending on survey year). To address this limitation, the National Center for Health Statistics provides multiply imputed values for family income variables from 1997 onward. It is highly recommended to use imputed income values when analyzing NHIS income data. Detailed technical documentation is available for each survey year (e.g., 2014: http://www.cdc.gov/nchs/nhis/2014imputedincome.htm)
Data resources	U.S Bureau of Census surveys provide estimates of poverty by geographical area: • National estimates: Current Population Survey, Annual Social and Economic Supplement (http://www.census.gov/cps/) • State/county/metropolitan areas: American Community Survey (http://www.census.gov/acs/www/) ○ beginning in 2006 for areas with population >65K ○ beginning in 2006, 3-year period estimates for areas >20K population ○ beginning in 2010 for census tract/block groups • Longitudinal estimates for the same household over 3-4 years: Survey of Income and Program Participation (http://www.census.gov/sipp/) • County/school districts: Small Area Income and Poverty Estimates (model-based) (http://www.census.gov//did/www/saipe/)
Related data standards	Poverty status is associated and affected by many sociodemographic factors. Those included in this document: • Race/ethnicity • Educational attainment • Exposure and housing characteristics • Psychological distress • Insurance coverage • Cost barriers • Unemployment

References	(1) Moorman JE, Akinbami LJ, Bailey CM, et al. National Surveillance of Asthma: United States, 2001–2010. National Center for Health Statistics. Vital Health Stat 3(35). 2012. (2) Bellin M, Osteen P, Collins K, Butz A, Land C. Kub J. The influence of community violence and protective factors on asthma morbidity and healthcare utilization in high-risk children. J Urban Health 2041;91(4):677-689. (3) Thakur N, Martin M. Castellanos E et al. Socioeconomic status and asthma control in African American youth in SAGE II. J Asthma 2014; 51(7):720-728. (4) Patel MR, Brown RW, Clark NM. Perceived parent financial burden and asthma outcomes in low-income, urban children. J Urban Health 2013;90(2):329-342.

Parental educational attainment

Data Standard	Parental educational attainment
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma in each category of the highest level of educational attainment in the family • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is a sociodemographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in educational attainment.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma in each category of highest levels of educational attainment of parent(s)/adult(s) in the family Survey question (Source: NHIS): • *"What is the HIGHEST level of school [you have/adult's name has] completed or the highest degree [you have/adult's name has] received?"* Benchmark data source: • National Health Interview Survey (NHIS), 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) NHIS categorization of highest level of educational attainment in the family: • <8th grade; 9-12 grade no HS diploma; HS grad/GED; Some college no degree; AA degree technical; AA degree academic; Bachelor's degree; Master/professional/doctoral degree. • Small sample size or comparison across surveys may require collapsing categories, for example: No HS diploma; HS grade/GED; Some college or AA degree; Bachelor's degree or higher
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	Educational attainment refers to the highest level of education that an individual has completed (distinct from the current grade level). Categories used by U.S. Census for adults 18 years and older are more detailed than those used by the NHIS: less than high school (none, 1-4th grade, 5-6th grade, 7-8th grade, 9th grade, 10th grade, 11th grade), HS graduate, some college no degree, associate's degree (occupational, academic), bachelor's degree, master's degree, professional degree, doctoral degree. Parental educational attainment is associated with measures of well-being including school readiness, educational achievement, incidence of low birthweight, and health-related behaviors (1). Health literacy as well as health-related behaviors, such as smoking, may be related to asthma management and outcomes (2, 3).

Significance to disparities	Although the percentage of children with a parent with less than a high school diploma or equivalent has increased since the 1970s, children of minority race/ethnicity have a lower percentage of resident mothers and fathers with at least a bachelor's degree.(1, 4). Furthermore, children in single-parent households were more likely to live with a parent who had not attained a bachelor's degree or higher, or had not completed high school (4). The factors of a single-parent household and low educational achievement may compound the risk of suboptimal management of asthma.
Data considerations	Assessment of highest level of educational achievement in the family requires determination of family structure and a knowledgeable respondent about the educational achievement of all adults in the family.
Data resources	• US Census, Current Population Survey (http://www.census.gov/hhes/socdemo/education/data/) • American Community Survey (http://www.census.gov/acs/www/)
Related data standards	Asthma prevalence, management, and outcomes may vary by socioeconomic status as well as by other demographic factors. Other measures also capture aspects of socioeconomic status: • Poverty status • Insurance coverage • Usual source of health care • Unable to pay medical bills
References	(1) Child Trends Data Bank. Parental education: indicators on children and youth. Updated July 2014 (http://www.childtrends.org/wp-content/uploads/2012/04/67-Parental_Education.pdf) (2) Harrington KF, Zhang B, Magruder T, Bailey WC, Gerald LB. The impact of parent's health literacy on pediatric asthma outcomes. Pediatr Allergy Immunol Pulmonol 2015;28(1):20-26. (3) Akinbami LJ, Kit BK, Simon AE. Impact of environmental tobacco smoke on children with asthma, 2003-2010. Acad Pediatr 2013;13(6):508-516. (4) National Center for Education Statistics. The condition of education: parental education. Last updated January 2015. (http://nces.ed.gov/programs/coe/indicator_saa.asp)

Exposure to environmental factors inside homes

Data Standard	Exposure to environmental factors inside homes
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who report exposure to mold or cockroach in the past 30 days, or exposure to environmental tobacco smoke (ETS) in the past week • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is an environmental risk factor. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in exposure to environmental factors.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who lived in home where anyone saw or smelled mold in the past 30 days; saw cockroach in the past 30 days; or reported someone smoked in the past week (environmental tobacco smoke [ETS]) Survey questions (Source: Asthma Call-Back Survey): YES response to any of the following questions: • *"In the past 30 days, has anyone seen or smelled mold or a musty odor inside [his/her] home? Do not include mold on food."* • *"In the past 30 days, has anyone seen a cockroach inside [child's name]'s home?"* • *"In the past week, has anyone smoked inside [child's name]'s home?"* Benchmark data source: • State: BRFSS Asthma Call-Back Survey (ACBS) can be used to obtain average annual estimates for survey years starting in 2006 for participating States. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by State. (http://www.cdc.gov/brfss/acbs/index.htm)
Denominator definition	• This measure is intended as an indicator environmental risk factor to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	Exposure to environmental factors inside homes can exacerbate asthma symptoms (1,2). According to the National Asthma Education and Prevention Program (NAEPP) guidelines, in addition to receiving appropriate medical treatment, asthma symptoms can be controlled by avoiding exposure to environmental allergens and irritants (3). Exposure to environmental factors inside home can be assessed at state-level using the child ACBS. The ACBS has several measures to assess indoor air quality (saw or smelled mold, saw a cockroach, anyone smoked inside home, saw mice or rats; pets allowed in bedroom, gas used for cooking, wood burning fireplace or stove used, gas appliance used). For this indicator, a combination of mold, cockroach, and ETS related measures is recommended. These are the exposures highlighted in the Institute of Medicine report as having sufficient scientific evidence of association with exacerbation of asthma (2).

	Healthy People 2020: Respiratory Diseases Objectives (RD-7.5): Increase the proportion of persons with current asthma who have been advised by a health professional to change things in their home, school, and work environments to reduce exposure to irritants or allergens to which they are sensitive according to National Asthma Education and Prevention Program (NAEPP) guidelines (https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives) (3).
Significance to disparities	Among sensitive individuals, exposure to cockroach, ETS, fungi, or molds is associated with the exacerbation of asthma (2,4).
Data considerations	• Based on reported data rather than on actual inspection/measurement of home environment • Does not capture different levels of exposure • Does not capture other environments where children may spend a substantial amount of time and be exposed to indoor air pollutants and irritants (e.g., school, vehicles).
Data resources	
Related data standards	Educational attainment and income are the indicators that are most commonly used to measure the effect of socioeconomic status (SES) on health. SES is associated with health care access, environmental exposure, and health behaviors (5). • Educational attainment • Income
References	(1) Healthy People 2020; Respiratory Diseases Objective 7.5. available at: http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives (2) Institute of Medicine (U.S.). (2000). *Clearing the air: Asthma and indoor air exposures*. Washington, DC: National Academy Press. (3) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm. Accessed February 19, 2015. (4) Akinbami LJ, Kit BK, Simon AE. Impact of environmental tobacco smoke on children with asthma, United States, 2003-2010. Acad Pediatr 2013;13(6):508-516. (5) Centers for Disease Control and Prevention. CDC Health Disparities and Inequalities Report — United States, 2013: Education and Income — United States, 2009 and 2011. MMWR 2013;62(Suppl 3): 9-19.

Weight status

Data Standard	Weight status
Measure	Annual estimates of: • Count: Number of children aged 2-17 years* with current asthma in the following weight categories based on BMI age- and sex-specific percentiles: ○ Underweight: <5th percentile BMI ○ Normal weight: 5th to <85th percentile BMI ○ Overweight: 85th to <95th percentile BMI ○ Obese: ≥95th percentile BMI • At-risk rate: N/A** • Population-based rate: N/A* ** BMI percentiles are available for children starting at age 2 years.* ***Calculating outcomes rates is not applicable for this indicator which is a demographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in weight status.*
Numerator definition	Numerator: Number of children aged 2-17 years with current asthma in each category of weight status Survey items (Source: National Health and Nutrition Examination Survey): • Weight, measured in kilograms (kg) • Height, measured in meters (m) These items are measured during an examination in a Mobile Exam Center and not based on self-report by survey respondents. Calculated indicators: • Body mass index (BMI=kg/m^2)—calculated from height and weight • BMI category (based on BMI percentile-for-age)—determined using age and sex percentiles for BMI (http://www.cdc.gov/growthcharts/cdc_charts.htm) Benchmark data source: • National Health and Nutrition Examination Survey (NHANES) (http://www.cdc.gov/nchs/nhanes.htm)
Denominator definition	This measure is intended as an indicator of risk of having asthma and/or asthma complications to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	Body mass index (BMI) is calculated from measured weight and height to reliably indicate body fatness for most children (weight/height^2). BMI does not measure body fat directly, but correlates with direct measures, such as dual energy x-ray absorptiometry. It is an inexpensive alternative for direct measures of body fat. Unlike adults who have static ranges of BMI that indicate weight status (normal weight versus overweight versus obese), for children ranges of

	BMI that indicate weight status vary with age and sex. Percentiles for BMI for age and sex have been calculated using a normative, nationally representative sample of children aged 2-19 years by CDC (1). Individual BMI is plotted on the BMI age- and sex-specific growth charts to obtain a percentile ranking for that individual. Weight status category for children is based on percentile ranking rather than directly on BMI.
Significance to disparities	Overweight and obese children have increased risk of developing asthma compared to children of normal weight status (2). Higher BMI values also increased the risk for seasonal asthma exacerbations among children with persistent asthma (3).
Data considerations	• BMI is calculated for children aged 2 years and older. For children younger than 2 years, recumbent length is measured rather than standing height. Therefore, the standard BMI calculation and percentiles for age do not apply to this age group. For children under 2 years of age, weight-for-length percentiles can be reported, but these also do not correlate with BMI percentile-defined weight status categories. • Parent-reported height and weight, compared to measured values, may lead to misclassification of weight status, particularly for younger children. An analysis comparing measured and reported weight in national surveys found that classification of young children as obese was increased using reported height and weight, most likely because of underestimation of height of young children. Use of measured rather than parent-reported height and weight was recommended (4).
Data resources	• CDC growth charts: http://www.cdc.gov/growthcharts/cdc_charts.htm
Related data standards	Other measures that correlate either with weight status, or with risk of having asthma or adverse asthma outcomes include: • Race/ethnicity • Poverty status • Parental educational attainment • Exposure to environmental factors inside homes • Perceived health status
References	(1) CDC growth charts: http://www.cdc.gov/growthcharts/cdc_charts.htm (2) Chen YC1, Dong GH, Lin KC, Lee YL. Gender difference of childhood overweight and obesity in predicting the risk of incident asthma: a systematic review and meta-analysis. Obes Rev. 2013 Mar;14(3):222-31. (3) Schatz M, Zeiger RS, Zhang F, Chen W, Yang SJ, Camargo CA Jr. Overweight/obesity and risk of seasonal asthma exacerbations. Allergy Clin Immunol Pract. 2013 Nov-Dec;1(6):618-22. (4) Akinbami LJ, Ogden CL. Childhood overweight prevalence in the United States: the impact of parent-reported height and weight. Obesity (Silver Spring). 2009 Aug;17(8):1574-80

Lack of health insurance coverage

Data Standard	Lack of health insurance coverage
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who are uninsured • At-risk rate: N/A • Population-based rate: N/A *Calculating outcomes rates is not necessarily applicable for this indicator which is a demographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in not having health insurance coverage.*
Numerator definition	Numerator: Number of children aged 0-17 years (in the demographic group of interest) with current asthma who are uninsured. Survey questions (Source: National Health Interview Survey): NO response to: • *"The next questions are about health insurance. Include health insurance obtained through employment or purchased directly as well as government programs like Medicare and Medicaid that provide Medical care or help pay medical bills. [Are you/Is anyone in the family] covered by any kind of health insurance or some other kind of health care plan?"* AND/OR responses to the following question that include the three bolded responses below: • *"What kind of health insurance or health care coverage [fill: do you/does ALIAS] have?"* INCLUDE those that pay for only one type of service (nursing home care, accidents, or dental care). EXCLUDE private plans that only provide extra cash while hospitalized. (Choose all that apply) ○ Private health insurance ○ Medicare ○ Medi-Gap ○ Medicaid ○ SCHIP (CHIP/Children's Health Insurance Program) ○ Military health care (TRICARE/VA/CHAMP-VA) ○ **Indian Health Service** ○ State-sponsored health plan ○ Other government program ○ **Single service plan (e.g., dental, vision, prescriptions)** ○ **No coverage of any type**" Benchmark data source: • National: National Health Interview Survey (NHIS), 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.

Background	The NHIS determines health insurance coverage at the time of participation in the survey. Uninsured persons are those not covered by private insurance, Medicaid, Children's Health Insurance Program (CHIP), state-sponsored or other government-sponsored health plans, Medicare, or military plans. Person with only Indian Health Service coverage, or with only a private plan that paid for one type of service (e.g., accidents or dental care) are considered to have no health insurance coverage (1). Recommendations found in the Guideline Implementation Panel (GIP) report specifically recommend examining insurance coverage gaps due to the link to possible underutilization of routine (non-emergent) care. The GIP report also recommends increasing surveillance of disparities related to insurance status (2).
Significance to disparities	Lack of insurance coverage differs significantly by race and ethnicity (3). Patients with chronic illnesses without insurance are less likely to visit a health care professional, not to have a usual site for healthcare, or to identify the emergency room as their usual source of care (3). Lack of health insurance is also associated with reduced use of preventive services and medical treatment (4).
Data considerations	• Uninsured populations may be less likely to seek medical care. Those without insurance with less opportunity for health care encounters may be more likely to have undiagnosed asthma. • The NHIS definition of lack of health insurance is based on reported health insurance coverage at the time of survey participation, but does not account for periods of gaps in coverage. That is, persons insured at the time of NHIS participation may have only intermittent coverage and periods of lack of insurance which are not detected.
Data resources	• Centers for Disease Control and Prevention, "Insurance coverage and barriers to care for people with asthma" available at: http://www.cdc.gov/asthma/asthma_stats/insurance_coverage.htm • Health, United States, National Center for Health Statistics. "No health insurance coverage among persons under age 65, by selected characteristics: United States, selected years" (http://www.cdc.gov/nchs/hus/healthinsurance.htm) • National Center for Health Statistics FastStats "Health Insurance Coverage" (http://www.cdc.gov/nchs/fastats/health-insurance.htm) • Data Resource Center for Child & Adolescent Health: http://www.nschdata.org/browse/survey
Related data standards	Previous reports have found differences in insurance rates by demographic and health care access factors. Indicators in this document include: • Race/ethnicity • Poverty status • Educational attainment • Usual source of health care • Unable to pay medical bills • Personal doctor

References	(1) The National Health Interview Survey Early Release Program (http://www.cdc.gov/nchs/nhis/releases.htm), Early Release Reports on Detailed Estimates of Health Insurance Coverage. (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (3) Centers for Disease Control and Prevention, CDC Health Disparities and Inequalities Report- United States 2011 (http://www.cdc.gov/mmwr/pdf/other/su6001.pdf) (4) Hargraves JL. The insurance gap and minority health care 1997–2001. Washington, DC: Center for Studying Health System Change; 2002.

Type of Health Insurance Coverage

Data Standard	Type of health insurance coverage
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma and/or an asthma attack in the past 12 months within each category of health insurance coverage: ○ Private ○ Public ○ Uninsured • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is a demographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in type of insurance coverage.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma within each category of health insurance coverage: Survey questions (Source: National Health Interview Survey): • *"The next questions are about health insurance. Include health insurance obtained through employment or purchased directly as well as government programs like Medicare and Medicaid that provide Medical care or help pay medical bills. [Are you/Is anyone in the family] covered by any kind of health insurance or some other kind of health care plan?"* • *What kind of health insurance or health care coverage [fill: do you/does ALIAS] have?"* INCLUDE those that pay for only one type of service (nursing home care, accidents, or dental care). EXCLUDE private plans that only provide extra cash while hospitalized. (Choose all that apply) ○ Private health insurance ○ Medicare ○ Medi-Gap ○ Medicaid ○ SCHIP (CHIP/Children's Health Insurance Program) ○ Military health care (TRICARE/VA/CHAMP-VA) ○ Indian Health Service ○ State-sponsored health plan ○ Other government program ○ Single service plan (e.g., dental, vision, prescriptions) ○ No coverage of any type **Private coverage**: YES to first question, and "Private health insurance" to second question (includes comprehensive insurance—including health maintenance and preferred provider organizations--obtained through the workplace, self-employment, direct purchase, or a professional association). **Public coverage:** YES to first question, and any of the following responses for the second question: "Medicare," "Medi-Gap," "Medicaid," "SCHIP," "Military health care," "State-sponsored health plan" or "Other government program."

	Uninsured: NO to the first question, AND/OR any of the following responses for the second question "Indian Health Service," "Single service plan," or "No coverage of any type." Benchmark data source: • National: National Health Interview Survey (NHIS), 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	The NHIS determines health insurance coverage at the time of participation in the survey (1). Recommendations found in the Guideline Implementation Panel (GIP) report specifically recommend examining insurance coverage gaps due to the link to possible underutilization of routine (non-emergent) care. The GIP report also recommends increasing surveillance of disparities related to insurance status (2).
Significance to disparities	Lack of insurance coverage differs significantly by race and ethnicity (3). Patients with chronic illnesses without insurance are less likely to visit a health care professional, not to have a usual site for healthcare, or to identify the emergency room as their usual source of care (3). Lack of health insurance is also associated with reduced use of preventive services and medical treatment (4).
Data considerations	• Uninsured populations may be less likely to seek medical care. Those without insurance with less opportunity for health care encounters may be more likely to have undiagnosed asthma. • The NHIS definition of type of health insurance is based on reported health insurance coverage at the time of survey participation, but does not account for periods of gaps in coverage. That is, persons insured at the time of NHIS participation may have only intermittent coverage and periods of lack of insurance which are not detected.
Data resources	• Centers for Disease Control and Prevention, "Insurance coverage and barriers to care for people with asthma" available at: http://www.cdc.gov/asthma/asthma_stats/insurance_coverage.htm • Health, United States, National Center for Health Statistics. "No health insurance coverage among persons under age 65, by selected characteristics: United States, selected years" (http://www.cdc.gov/nchs/hus/healthinsurance.htm) • National Center for Health Statistics FastStats "Health Insurance Coverage" (http://www.cdc.gov/nchs/fastats/health-insurance.htm) • Data Resource Center for Child & Adolescent Health. http://www.nschdata.org/browse/survey
Related data standards	Previous reports have found differences in insurance type by demographic and health care access factors. Indicators in this document include: • Race/ethnicity • Poverty status • Educational attainment • Usual source of health care

	• Unable to pay medical bills • Personal doctor
References	(1) The National Health Interview Survey Early Release Program (http://www.cdc.gov/nchs/nhis/releases.htm), Early Release Reports on Detailed Estimates of Health Insurance Coverage. (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (3) Centers for Disease Control and Prevention, CDC Health Disparities and Inequalities Report- United States 2011 (http://www.cdc.gov/mmwr/pdf/other/su6001.pdf) (4) Hargraves JL. The insurance gap and minority health care 1997–2001. Washington, DC: Center for Studying Health System Change; 2002.

No usual source of health care

Data Standard	No usual source of health care
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who do not have a usual source of health care • At-risk rate: N/A* • Population-based rate: N/A* • **Calculating outcomes rates is not necessarily applicable for this indicator which is a demographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in having a usual source of health care.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who do not have a usual source of health care Survey question: • *"Is there a place that [child's name] USUALLY goes when [he/she] is sick or you need advice about [his/her] health?"* • AND *"What kind of place does [child's name] go to most often?* ○ Clinic or health center ○ Doctor's office or HMO ○ Hospital emergency room ○ Some other place ○ Doesn't go to one place most often" Count of persons with either a "no" response to the first question, or a response "hospital emergency room" or "doesn't go to one place most often" to the second question. Benchmark data source: • National Health Interview Survey, 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	Having a usual source of care is associated with higher rates of preventive care and fewer acute care visits and hospitalizations (1). Uninsured children without a usual source of care report higher rates of unmet need (2). Recommendations found in the Guideline Implantation Panel (GIP) report include encouraging asthma patients to establish a medical home as part of a healthcare delivery system. The GIP report also recommends increasing surveillance of disparities related to access to medical homes (3). Healthy People 2020 is the most recent set of objectives developed with 4 overarching goals: attain high quality of life, eliminate disparities, create social and physical environment to promote good health, and promote healthy behaviors across all life stages. The topic area of Access to Health Services has 9 main objectives. More information is available at: https://www.healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-

	Services Healthy People 2020: AHS-5.1 Increase the proportion of persons who have a specific source of ongoing care
Significance to disparities	Prevalence of a medical home in US children has been shown to vary by insurance type, race and ethnicity, and primary language spoken. Prevalence was lower in publically insured children compared to privately insured children, racial and ethnic minorities, and non-English language speakers (4).
Data considerations	• Analysts may prefer to further limit the definition of "usual source of care." Potential answers such as retail store clinics, friend or relative, or locations outside of the US may not represent a true medical home. • Having an asthma diagnosis from a health professional may bias the sample towards those with access to care. This may artificially increase the percent of those with asthma that have a usual source of care, as those without a usual source of care may be lacking the medical diagnosis.
Data resources	• Health, United States (http://www.cdc.gov/nchs/hus.htm): trend table "No usual source of health care among children under age 18, by selected characteristics." • Health Data Interactive (http://www.cdc.gov/nchs/hdi.htm): trend table "No usual source of health care: US (Source: NHIS)" • Data Resource Center for Child & Adolescent Health. http://www.nschdata.org/browse/survey
Related data standards	This measure is closely related to other measures of health care access: • Insurance coverage • Unable to pay medical bills • Personal doctor
References	(1) Newacheck PW, Hughes DC, Stoddard JJ. Children's access to primary care: differences by race, income, and insurance status. Pediatrics.1996;97 (1):26– 32 (2) Hoilette LK1, Clark SJ, Gebremariam A, Davis MM. Usual source of care and unmet need among vulnerable children: 1998-2006. Pediatrics. 2009 Feb;123(2):e214-9. (3) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (4) Zickafoose JS, Gebermariam A, Davis MM. Medical home disparities for children by insurance type and state of residence. Journal of Maternal and Child Health. April 2012. Suppl 1: S178-87

Unable to pay medical bills

Data Standard	Unable to pay medical bills
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma whose family had difficulty paying medical bills • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is a demographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in ability to pay medical bills.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma whose family had difficulty paying medical bills in the past 12 months Survey question (Source: NHIS): • *"In the past 12 months did [you/anyone in the family] have problems paying or were unable to pay any medical bills? Include bills for doctors, dentists, hospitals, therapists, medication, equipment, nursing home or home care."* Benchmark data source: • National Health Interview Survey (NHIS) 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	The family perspective in paying medical bills is important to consider given the financial risk to the entire family unit of significant expenses. Although a child may have health insurance, insurance coverage among family members may differ. In 2012, 16.5% of US families had problems paying medical bills in the past 12 months. Low income families had the highest rate of difficulty paying medical bills (26%), as did families with one or more children (21.8%) (1). Healthy People is a federal interagency effort to identify a comprehensive set of 10-year national health objectives. Healthy People 2020 is the most recent set of objectives developed with 4 overarching goals: attain high quality of life, eliminate disparities, create social and physical environment to promote good health, and promote healthy behaviors across all life stages. The topic area of Access to Health Services has 9 main objectives. More information is available at: https://www.healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-Services. The Healthy People 2020 objective "AHS-1.1 Increase the proportion of persons with health insurance" has a stated goal of reduction in burden from large medical bills.
Significance to disparities	Poverty status in asthma patients has been shown to have differing impacts based on race and ethnicity (2). In the 2010 Asthma Call Back Survey, 13.5% of adults and 5.4% of children reported cost as a barrier to seeing a primary care physician. 18.6% of adults and 9.8% of children reported cost as a barrier to filling a

	prescription asthma medication. Black and Hispanic adults were more likely to report cost as a barrier to asthma care than white adults (3).
Data considerations	• The question does not address the amount of the medical bill the family has difficulty paying. There may be a difference in those who had difficulty paying a bill due to hospitalization versus those who had difficulty paying a co-pay or other smaller bill.
Data resources	• Asthma Facts: CDC's National Asthma Control Program Grantees, July 2013 (http://www.cdc.gov/asthma/pdfs/asthma_facts_program_grantees.pdf)
Related data standards	Other indicators related to health care access: • Insurance coverage • Usual source of health care • Frustrated in obtaining health care services • Personal doctor
References	(1) Cohen RA, Kirzinger WK. Financial burden of medical care: A family perspective. NCHS data brief, no 142. Hyattsville, MD: National Center for Health Statistics. 2014. (2) Moorman JE, Zahran H, Truman BI, Molla MT. Current Asthma Prevalence - United States, 2006--2008. MMWR January 14, 2011 60(01);84-86 (3) Centers for Disease Control and Prevention. Asthma Facts—CDC's National Asthma Control Program Grantees. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2013.

Personal doctor

Data Standard	Personal doctor
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who do not have a personal doctor • At-risk rate: N/A* • Population-based rate: N/A* **Calculating outcomes rates is not necessarily applicable for this indicator which is a demographic characteristic. It may be used to assess differences in asthma outcomes, and whether racial/ethnic disparities are partially explained by differences in having a personal doctor.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who currently do not have a personal doctor or nurse Survey question (Source: NSCH): • *"A personal doctor or nurse is a health professional who knows your child well and is familiar with your child's health history. This can be a general doctor, a pediatrician, a specialist doctor, a nurse practitioner, or a physician's assistant. Do you have one or more persons you think of as [child's name]'s personal doctor or nurse?"* Benchmark data source: • National Survey of Child Health (NSCH) 2011-2012: http://www.cdc.gov/nchs/data/slaits/2011NSCHQuestionnaire.pdf
Denominator definition	This measure is intended as an indicator of socioeconomic status to help more precisely measure disparities. Therefore, the denominator will depend on the analysis being conducted.
Background	Recommendations found in the Guideline Implementation Panel (GIP) report specifically recommends encouraging asthma patients to establish a medical home as part of a healthcare delivery system. The GIP report also recommends increasing surveillance of disparities related to access to medical homes (1). Healthy People is a federal interagency effort to identify a comprehensive set of 10-year national health objectives. Healthy People 2020 is the most recent set of objectives developed with 4 overarching goals: attain high quality of life, eliminate disparities, create social and physical environment to promote good health, and promote healthy behaviors across all life stages. The topic area of Access to Health Services has 9 main objectives. More information is available at: https://www.healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-Services Healthy People 2020: AHS-3 Increase the proportion of persons with a usual primary care provider
Significance to disparities	Uninsured people with asthma are less likely to have a primary care physician (2). Insurance status significantly differs by race and ethnicity (3).
Data considerations	The survey question does not specify the site of care. To function as an indicator of receiving care in a medical home, as advised by the American Academy of Pediatrics (4), having a personal doctor should be considered in the context of other indicators such as having a usual source of care.

Data resources	• Data Resource Center for Child & Adolescent Health. (http://www.nschdata.org/browse/survey)
Related data standards	This measure is closely related to the measure regarding having a usual source of care. Other indicators related to health care access: • Insurance coverage • Usual source of health care • Unable to pay medical bills
References	(1) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (2) Vital Signs: Asthma Prevalence, Disease Characteristics, and Self-Management Education- United States, 2001 - 2009. MMWR May 6,2011 / 60(17);547-552 (3) Centers for Disease Control and Prevention, CDC Health Disparities and Inequalities Report- United States 2011 (http://www.cdc.gov/mmwr/pdf/other/su6001.pdf) (4) American Academy of Pediatrics. Joint principles of the patient-centered medical home. http://www.aafp.org/dam/AAFP/documents/practice_management/pcmh/initiatives/PCMHJoint.pdf

MANAGEMENT

Asthma action plan

Data Standard	Asthma Action Plan
Measure	Annual estimates of: • Count: Number of children aged 0- 17 years with current asthma who have received an asthma action plan from a health professional • At-risk rate: Percent of children aged 0-17 years with current asthma who have received an asthma action plan from a health professional among all children with current asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who have ever received an asthma action plan from a health professional Survey question (Source: NHIS): YES response to: • *"An asthma action plan is a printed form with specific instructions based on [child's name]'s asthma that tells when to change the amount or type of medicine, when to call the doctor for advice, and when to go to the emergency room. Has a doctor or other health professional EVER given [child's name] an asthma action plan?"* Note: In the NHIS, this question is only asked of those who were ever diagnosed by a health professional, and who still had asthma at the time of the survey, and/or those who had at least one asthma attack in the past 12 months, i.e., those with current asthma or with recent asthma symptoms. Benchmark data source: • National: National Health Interview Survey, 2013 supplement, sample child file (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-back Survey (ACBS) can be used to obtain average annual estimates for survey years starting in 2006 for participating states. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by State. (http://www.cdc.gov/brfss/acbs/index.htm) Note: the question wording for ACBS is slightly different than NHIS. The ACBS wording is *"An asthma action plan, or asthma management plan, is a form with instructions about when to change the amount or type of medicine, when to call the doctor for advice, and when to go the emergency room. Has a doctor or other health professional EVER given you or [child's name] an asthma action plan?"*
Denominator definition	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma (in the demographic group of interest) Survey questions used to determine current asthma prevalence): YES response to both questions: • "Has a doctor or other health professional EVER told you that [child's name] had asthma?" AND • "Does [child's name] still have asthma?" Benchmark data sources:

	• National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	In 2008, 44% of children aged 0-17 years with current asthma had ever received an asthma action plan (1). Providing all patients with asthma with a written asthma action plans was included as one of six priority actions in the National Asthma Education and Prevention Program (NAEPP) Asthma Guidelines identified by the Guideline Implementation Panel (GIP), given evidence that education about recognition and appropriate treatment of asthma symptoms reduces risk and impairment (2). The six priority messages were chosen to help address disparities in asthma outcomes. Key components of an asthma action plan are instructions for: 1) daily medication and environmental control and, 2) how to recognize and address worsening asthma. Action plans are an important way to communicate management plans to schools and enhance coordination of care across multiple caregivers and sites. Healthy People https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives • Respiratory Disease Objective RD-7.2: Increase the proportion of persons with current asthma with prescribed inhalers who receive instruction on their use according to NAEPP guidelines.
Significance to disparities	Analysis of the 2006-2007 Child Asthma Call-back Survey showed that there were no racial/ethnic disparities for asthma action plan receipt: non-Hispanic black, Hispanic, and other race children were no more or less likely to receive an asthma action plan from a health professional than non-Hispanic white children (3). However, this same study also found that having a routine care visit and an ED visit were positively associated with receiving an asthma action plan. Receiving an action plan may be a marker for more severe asthma. Given that minority children are at higher risk of adverse outcomes (4), it could be expected that a higher percentage would be identified as at risk for poor outcomes and thus more likely to receive asthma action plans.
Data considerations	• Does not measure the percentage with a current or up-to-date plan, only those who have ever received a plan. • Relies on recall and self (or proxy) report of receiving an asthma action plan (as opposed to documentation in medical records). • Measures the number/percentage of children for whom a caregiver recalls receiving an asthma action plan, and thus have had the opportunity to be educated by a provider about the components of a plan.
Data resources	BRFSS Asthma Call-back Survey (ACBS): Child prevalence tables 2006-2010: http://www.cdc.gov/asthma/acbs/acbstables.htm (see Table 6: Estimated percent receiving an asthma management plan among children with current or active asthma)
Related data standards	Because children with severe asthma may be more likely to seek routine and urgent care and use preventive medication, receiving an asthma action plan may also be a similar marker for disease severity. Additional indicators of increased asthma healthcare use and severity include: • Asthma attack prevalence (crude measure of asthma control) • Asthma emergency department visits • Asthma hospitalizations • Preventive medication/ICS use • Routine asthma visit in past year

References	(1) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w) (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (3) Zahran HS, Person CJ, Bailey C, Moorman JE. Predictors of asthma self-management education among children and adults--2006-2007 Behavioral Risk Factor Surveillance System Asthma Call Back Survey. J Asthma 2012; 49:98-106. (4) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC. Trends in racial disparities for asthma outcomes among children 0 to 17 years, 2001-2010. J Allergy Clin Immunol 2014, 134(3):547-553.

Taught How to Recognize Early Symptoms

Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who have received (or their parents/guardians have received) education on how to recognize early signs or symptoms of an asthma episode • At rate risk: Percent of children aged 0-17 years with current asthma who have received (or their parents/guardians have received) education on how to recognize early signs or symptoms of an asthma episode among all children with current asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who have received (or their parents/guardians have received) education on how to recognize early signs or symptoms of an asthma episode Survey Question (Source: NHIS): *"Has a doctor or other health professional EVER taught [child's name] or [his/her] parent or guardian how to recognize early signs or symptoms of an asthma episode?"* Benchmark data sources: • National: National Health Interview Survey (NHIS) periodic modules: 2003, 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS), average annual estimates for survey years starting in 2006 for participating states. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/index.htm). Note: although the ACBS question wording *("Has a doctor or other health professional ever taught you or [child's name] how to recognize early signs or symptoms of an asthma episode?")* differs slightly from the NHIS question, the questions are similar enough to yield comparable estimates.
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions: used to determine current asthma prevalence): YES response to both of two survey questions • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • "*Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Results from the 2008 NHIS indicate that 72.1% of children with current asthma had ever been taught to recognize early signs or symptoms of an asthma episode (1). The EPR-3 recommends that every patient who has asthma be taught to recognize symptom patterns that indicate inadequate asthma control. There is evidence that asthma education about recognition of asthma symptoms reduces risk and impairment (2).

	This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.3: Increase the proportion of persons with current asthma who receive education about appropriate response to an asthma episode, including recognizing early signs and symptoms or monitoring peak flow results, according to National Asthma Education and Prevention Program (NAEPP) guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Adults with less than a high school education were less likely to report that they had been taught to recognize signs of an asthma episode (3). Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (2).
Data considerations	This item is a measurement of the respondent's recall of receiving education, and thus may be an indicator of effective communication of education to patients and caretakers.
Data resources	Behavioral Risk Factor Surveillance System (BRFSS): Asthma Call-Back Survey (ACBS), starting 2006. (http://www.cdc.gov/brfss/acbs/2006/pdf/acbs_2006_child_codebook.pdf)
Related data standards	Because being taught how to recognize early symptoms may be done at the same time as other asthma education in a health care encounter, similar measures include: • Taught how to use an inhaler • Taught how to respond to episodes of asthma • Taught how to monitor peak flow for daily therapy • Asthma Action Plan • Advised to change home/school/work environment • Insurance coverage • Usual source of health care • Personal doctor
References	(1) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w) (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (3) Zahran HS, Person CJ, Bailey C, Moorman JE. Predictors of asthma self-management education among children and adults--2006-2007 Behavioral Risk Factor Surveillance System Asthma Call Back Survey. J Asthma 2012; 49:98-106.

Taught how to use inhaler

Data Standard	Taught how to use inhaler
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who have ever used a prescription inhaler who have received (or their parents/guardians have received) instruction on inhaler use from a health professional. • At-risk rate: Percent of children aged 0-17 years with current asthma who have ever used a prescription inhaler who have received (or their parents/guardians have received) instruction on inhaler use from a health professional among all children with current asthma who have ever used a prescription inhaler. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years who have ever used a prescription inhaler who have received (or their parents/guardians have received) instruction on how to use it from a health professional. Survey Question (Source: NHIS): • *"Has a health professional shown [child name] how to use [his/her] inhaler? (This includes showing parents for young children.)"* Benchmark data sources: • National: National Health Interview Survey (NHIS) periodic modules: 2003 & 2008 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS), average annual estimates for survey years starting in 2006 for participating states. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/index.htm). Note: although the ACBS question wording *("Did a health professional show [him/her] how to use the inhaler?")* differs from the NHIS question, both questions are believed to yield comparable results
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions: used to determine current asthma prevalence): YES response to both of two survey questions • *"Has a doctor or other health professional EVER told you that your child had asthma*?" AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)

Background	Results from the 2006-2007 BRFSS Asthma Call-Back Survey (ACBS) indicate that 78.6% of children with current asthma who have ever used a prescription inhaler have been taught how to use their prescription inhaler. This measure is related to the use of asthma action plans, which should include instructions for daily treatment and are a prominent National Asthma Education and Prevention Program (NAEPP) guideline recommendation (1). Results from the 2008 NHIS indicate that 44% of children with asthma had ever received an asthma action plan (2). This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.2: Increase the proportion of persons with current asthma with prescribed inhalers who receive instruction on their use according to NAEPP guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (1).
Data considerations	This item is a measurement of the respondent's recall of receiving instruction on inhaler, and thus may be an indicator of effective communication of education of patients and caretakers. However, it may not reflect the rate at which health care providers provide instruction on inhaler use given that no comparison to medical records is performed.
Data resources	Behavioral Risk Factor Surveillance System (BRFSS): Asthma Call-Back Survey (ACBS), starting 2006. (http://www.cdc.gov/brfss/acbs/2006/pdf/acbs_2006_child_codebook.pdf) The ACBS has the advantage of being collected annually and providing state level estimates. ACBS is not collected in all states.
Related data standards	Because being taught how to use an inhaler may be done at the same time as other asthma education during a health care encounter, similar measures include: • Taught how to recognize early symptoms • Taught how to respond to episodes of asthma • Taught how to monitor peak flow for daily therapy • Asthma Action Plan • Advised to change home/school/work environment • Insurance coverage • Usual source of health care • Personal doctor
References	(1) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (2) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w)

Taught how to respond to episodes of asthma

Data Standard	Taught how to respond to episodes of asthma
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who have received (or their parents/guardians have received) education on how to respond to episodes of asthma. • At-risk rate: Percent of children aged 0-17 years with current asthma who have received (or their parents/guardians have received) education on how to respond to episodes of asthma among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who have received (or their parents/guardians have received) education on how to respond to episodes of asthma Survey Question (Source: NHIS): • *"Has a doctor or other health professional EVER taught [child name] or [his/her] parent or guardian how to respond to episodes of asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS) periodic modules: 2003, 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS), average annual estimates for survey years starting in 2006 for participating states. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/index.htm). Note: Although the ACBS question wording *("Has a doctor or other health professional ever taught you or {child name} what to do during an asthma episode or attack?")* differs from the NHIS question, the estimates are likely to be comparable.
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma*?" AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Results from the 2008 NHIS indicate that 78.3% of children with current asthma had ever been taught to respond to an asthma episode (1). This measure is related to the use of asthma action plans, which should include instructions for how to recognize and handle worsening asthma and are a prominent to National Asthma Education and Prevention Program (NAEPP) guideline recommendation (2).

	This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.3: Increase the proportion of persons with current asthma who receive education about appropriate response to an asthma episode, including recognizing early signs and symptoms or monitoring peak flow results, according NAEPP guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Adults with less than a high school education were less likely to report that they had been taught to respond to an asthma episode (3). Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (2).
Data considerations	This item is a measurement of the respondent's recall of being taught how to respond to an episode of asthma, and thus may be an indicator of effective communication of education of patients and caretakers. However, it may not reflect the rate at which health care providers provide education given that no comparison to medical records is performed.
Data resources	• Behavioral Risk Factor Surveillance System (BRFSS): Asthma Call-Back Survey (ACBS), starting 2006. (http://www.cdc.gov/brfss/acbs/2006/pdf/acbs_2006_child_codebook.pdf) The ACBS has the advantage of being collected annually and providing state level estimates. ACBS is not collected in all states.
Related data standards	Because being taught how to respond to episodes of asthma may be done at the same time as other asthma education in a health care encounter, similar measures include: • Taught how to recognize early symptoms • Taught how to use an inhaler • Taught how to monitor peak flow for daily therapy • Asthma Action Plan • Advised to change home/school/work environment • Insurance coverage • Usual source of health care • Personal doctor
References	(1) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w) (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (3) Zahran HS, Person CJ, Bailey C, Moorman JE. Predictors of asthma self-management education among children and adults--2006-2007 Behavioral Risk Factor Surveillance System Asthma Call Back Survey. J Asthma 2012; 49:98-106.

Taught how to monitor peak flow for daily therapy

Data Standard	Taught how to monitor peak flow for daily therapy
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who have received (or their guardians have received) education on how to monitor peak flow for daily therapy. • At-risk rate: Percent of children aged 0-17 years with current asthma who have received (or their guardians have received) education on how to monitor peak flow for daily therapy among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who have received (or their guardians have received) education on how to monitor peak flow for daily therapy. Survey Question (Source: NHIS): • *"Has a doctor or other health professional EVER taught [child name] or [his/her] parent or guardian how to monitor peak flow for daily therapy?"* Benchmark data sources: • National: National Health Interview Survey (NHIS) periodic modules: 2003, 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS), average annual estimates for survey years starting in 2006 for participating states. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/index.htm). Note: Although the ACBS question wording *("Has a doctor or other health professional ever taught you or {child's name} how to use a peak flow meter to adjust his/her daily medications?")* differs from the NHIS survey question, the two questions are believed to generate comparable estimates.
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence: YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)

Background	Results from the 2008 NHIS indicate that 49.4% of children with current asthma had ever been taught to use a peak flow meter (1). The EPR-3 recommends that every patient who has asthma be taught to recognize symptom patterns and/or Peak Expiratory Flow (PEF) measures that indicate inadequate asthma control. There is evidence that asthma education about recognition of asthma symptoms reduces risk and impairment (2). This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.3: Increase the proportion of persons with current asthma who receive education about appropriate response to an asthma episode, including recognizing early signs and symptoms or monitoring peak flow results, according to National Asthma Education and Prevention Program (NAEPP) guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (2).
Data considerations	This item is a measurement of the respondent's recall of being taught how to use a peak flow meter, and thus may be an indicator of effective communication of education of patients and caretakers. However, it may not reflect the rate at which health care providers provide education given that no comparison to medical records is performed.
Data resources	• Behavioral Risk Factor Surveillance System (BRFSS): Asthma Call-Back Survey (ACBS), starting 2006. (http://www.cdc.gov/brfss/acbs/2006/pdf/acbs_2006_child_codebook.pdf) The ACBS has the advantage of being collected annually and providing state level estimates. ACBS is not collected in all states.
Related data standards	Because being taught how to monitor peak flow for daily therapy may be done at the same time as other asthma education in a health care encounter, similar measures include • Taught how to recognize early symptoms • Taught how to respond to episodes of asthma • Taught how to use an inhaler • Asthma Action Plan • Advised to change home/school/work environment • Insurance coverage • Usual source of health care • Personal doctor
References	(1) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w) (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf)

Advised to change home/school/work environment

Data Standard	Advised to change home/school/work environment
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma whose parents/guardians have been advised to change their home/school/work environment to improve their asthma. • At-risk rate: Percent of children aged 0-17 years with current asthma whose parents/guardians have been advised to change their home/school/work environment to improve their asthma among all children with current asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma whose parents/guardians have been advised to change their home/school/work environment to improve their asthma. Survey Question (Source: NHIS): • *"Has a doctor or other health professional EVER advised you to change things in [child name]'s home, school, or work environment to improve [his/her] asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS) periodic modules: 2003, 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: BRFSS Asthma Call-Back Survey (ACBS), average annual estimates for survey years starting in 2006 for participating states. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/index.htm).
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Results from the 2008 NHIS indicate that 50.6% of children with current asthma had been given advice on environmental control of asthma (1). One of the six priority messages of the National Asthma Education and Prevention Program (NAEPP) guidelines is allergen and irritant exposure control. The Guideline Implementation Panel recommends: "clinicians should review each patient's exposure to allergens and irritants and provide a multipronged strategy to reduce exposure to those allergens and irritants to which a patient is sensitive and exposed, i.e., that make a patient's asthma worse." (2)

	This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.5: Increase the proportion of persons with current asthma who have been advised by a health professional to change things in their home, school, and work environments to reduce exposure to irritants or allergens to which they are sensitive according to NAEPP guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives .
Significance to disparities	Adults with less than a high school education were less likely to report that they had been given advice on environmental control (3). Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations. Exposure to environmental factors that worsen asthma is also more frequent in these populations (2).
Data considerations	This item is a measurement of the respondent's recall of being advised to change home/school/work environment, and thus may be an indicator of effective communication of education of patients and caretakers. However, it may not reflect the rate at which health care providers provide education given that no comparison to medical records is performed.
Data resources	• Behavioral Risk Factor Surveillance System (BRFSS): Asthma Call-Back Survey (ACBS), starting 2006. ((http://www.cdc.gov/brfss/acbs/2006/pdf/acbs_2006_child_codebook.pdf) The ACBS has the advantage of being collected annually and providing state level estimates. ACBS is not collected in all states. ACBS data on advising to make environmental changes is also available at http://www.cdc.gov/asthma/acbs/table8a.htm.
Related data standards	Because being advised to change home/school/work environment may be done at the same time as other asthma education in a health care encounter, similar measures include: • Taught how to recognize early symptoms • Taught how to respond to episodes of asthma • Taught how to use an inhaler • Taught how to monitor peak flow for daily therapy • Asthma Action Plan • Insurance coverage • Usual source of health care • Personal doctor
References	(1) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w) (2) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf) (3) Zahran HS, Person CJ, Bailey C, Moorman JE. Predictors of asthma self-management education among children and adults--2006-2007 Behavioral Risk Factor Surveillance System Asthma Call Back Survey. J Asthma 2012; 49:98-106.

Asked about symptom frequency

Data Standard	Asked about symptom frequency
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma whose health care provider asked them how often they had asthma symptoms at the last visit. • At-risk rate: Percent of children aged 0-17 years with current asthma whose health care provider asked them how often they had asthma symptoms at the last visit among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma whose health care provider asked them how often they had asthma symptoms at the last visit. Survey Question (Source: NHIS): • *"At his/her last visit, did [child name]'s doctor or other health professional ask HOW OFTEN [he/she] had asthma symptoms?"* Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Two of the six priority messages of the National Asthma Education and Prevention Program (NAEPP) guidelines are asthma severity and asthma control, which are both assessed by asking about symptom frequency (among other things). The Guideline Implementation Panel recommends: "all patients should have an initial severity assessment based on measures of current impairment" and "at planned follow up visits, asthma patients should review level of control … based on multiple measures of current impairment." Measures of impairment include frequency of symptoms (1).

	This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.7: Increase the proportion of persons with current asthma whose doctor assessed their asthma control at the last visit according to NAEPP guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (1).
Data considerations	This item is a measurement of the respondent's recall of being asked about symptoms frequency, and thus may be an indicator of effective communication between patients and caretakers. However, it may not reflect the rate at which health care providers ask about symptoms given that no comparison to medical records is performed.
Data resources	• National Health Interview Survey (NHIS) (http://www.cdc.gov/asthma/nhis/2013/data.htm)
Related data standards	Because being asked about symptom frequency may be done at the same time as other asthma management assessment in a health care encounter, a similar measure include: • Asked about relief inhaler frequency • Asked about limitation of daily activities • Insurance coverage • Usual source of health care • Personal doctor
References	(1) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf)

Asked about relief inhaler frequency

Data Standard	Asked about relief inhaler frequency
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma whose health care provider asked about frequency of inhaler use. • At-risk rate: Percent of children age 0-17 years with current asthma whose health care provider asked about frequency of inhaler use. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma whose health care provider asked about frequency of inhaler use. Survey Question (Source: NHIS): • *"At his/her last visit, did [child name]'s doctor or other health professional ask HOW OFTEN he/she used relief inhaler at the last visit?"* Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Two of the six priority messages of the National Asthma Education and Prevention Program (NAEPP) guidelines are asthma severity and asthma control, which are both assessed by asking about relief inhaler use frequency (among other things). The Guideline Implementation Panel recommends: "all patients should have an initial severity assessment based on measures of current impairment" and "at planned follow up visits, asthma patients should review level of control … based on multiple measures of current impairment." Measures of impairment include relief inhaler use frequency (1). This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.7: Increase the proportion of persons with current asthma whose doctor assessed their asthma control at the last visit according to NAEPP guidelines,

	http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (1).
Data considerations	This item is a measurement of the respondent's recall of being asked about frequency of relief inhaler use, and thus may be an indicator of effective communication between patients and caretakers. However, it may not reflect the rate at which health care providers ask about medication use given that no comparison to medical records is performed.
Data resources	
Related data standards	Because being asked about relief inhaler frequency may be done at the same time as other asthma management assessments at a health care encounter, similar measures include: • Asked about symptom frequency • Asked about limitation of daily activities • Insurance coverage • Usual source of health care • Personal doctor
References	(1) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf)

Asked about activity limitation

Data Standard	Asked about activity limitation
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma whose health care provider asked how often asthma symptoms limited daily activities. • At-risk rate: Percent of children age 0-17 years with current asthma whose health care provider asked how often asthma symptoms limited daily activities. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma whose health care provider asked how often asthma symptoms limited daily activities. Survey Question (Source: NHIS): • *"At his/her last visit, did [child name]'s doctor or other health professional ask HOW OFTEN asthma symptoms limited [his/her] daily activities?"* Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Two of the six priority messages of the National Asthma Education and Prevention Program (NAEPP) guidelines are asthma severity and asthma control, which are both assessed by asking about relief inhaler use frequency (among other things). The Guideline Implementation Panel recommends: "all patients should have an initial severity assessment based on measures of current impairment" and "at planned follow up visits, asthma patients should review level of control … based on multiple measures of current impairment." Measures of impairment include relief inhaler use frequency (1). This measure is related to Healthy People 2020 Respiratory Disease Objective RD-7.7: Increase the proportion of persons with current asthma whose doctor

	assessed their asthma control at the last visit according to NAEPP guidelines, http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives.
Significance to disparities	Access to medical care for asthma and the quality of care provided is often lower among minority and socioeconomically disadvantaged populations (1).
Data considerations	This item is a measurement of the respondent's recall of being asked about frequency of activity limitation, and thus may be an indicator of effective communication between patients and caretakers. However, it may not reflect the rate at which health care providers ask about medication use given that no comparison to medical records is performed.
Data resources	
Related data standards	Because being asked about activity limitation may be done at the same time as other asthma management assessments at a health care encounter, similar measures include: • Asked about symptom frequency • Asked about relief inhaler frequency • Insurance coverage • Usual source of health care • Personal doctor
References	(1) National Asthma Education and Prevention Program. Guidelines Implementation Panel Report for: Expert Panel Report 3---Guidelines for the Diagnosis and Management of Asthma. NIH Publication No. 09-6147. December 2008 (http://www.nhlbi.nih.gov/files/docs/guidelines/gip_rpt.pdf)

Flu vaccination

Data Standard	**Flu vaccination**
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma receiving a flu vaccine in the past year • At-risk rate: Percent of children aged 0-17 years with current asthma receiving a flu vaccine in past year among all children with asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*

Numerator definition	Numerator:
	Number of children aged 0-17 years with current asthma who have received influenza vaccination in the past 12 months.
	
	Survey questions (Source NHIS):
	• *"During the past 12 months, has [child's name] had a flu vaccination? A flu vaccination is usually given in the fall and protects against influenza for the flu season."*
	Additional information about mode of vaccination:
	• *"Was this a shot, or was it a vaccine sprayed in the nose?"*
	
	Benchmark data source:
	• National: National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
	• State: Behavioral Risk Factors Surveillance System (BRFSS): Asthma Call-back Survey (ACBS), starting 2006. (*http://www.cdc.gov/brfss/acbs/2012/pdf/acbs_2012_child_llcp_codebook.pdf*). Note: The survey questions for the ACBS differ from NHIS, but likely give comparable estimates: YES response to either:
	  • *"A flu shot is an influenza vaccine injected in your arm. During the past 12 months, did [child's name] have a flu shot?" OR*
	  • *"A flu vaccine that is sprayed in the nose is called FluMist™. During the past 12 months, did [he/she] have a flu vaccine that was sprayed in [his/her] nose?*

Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence : YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2001 onward (http://www.cdc.gov/brfss/)

Background	During the 2013-2014 influenza season, 46.3% of high-risk adults ages 18-64 received influenza vaccine (1). Asthma appears to be related to influenza infection. Children and adults with asthma are at higher risk for influenza-related adverse health outcomes, including pneumonia, hospitalization for acute respiratory disease, and death. Because 5 to 10% of the US population has asthma, the potential public health impact of influenza infection on this vulnerable subgroup is large(2). Healthy People 2020 Objective IID-12: Increase the percentage of children and adults who are vaccinated annually against seasonal influenza. http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23.
Significance to disparities	Persistent disparities in influenza mortality between American Indian/Alaska Native persons and whites have been documented (3). Significant disparities by race/ethnicity were found in exposure, susceptibility to complications, and access to health care during the U.S. H1N1 influenza pandemic (4). Disparities in influenza vaccination coverage between non-Hispanic whites and black, Hispanic and other and multiple race children have been reported (5). However, more recent data show similar vaccination rates for children of all races/ethnicities (6).
Data considerations	Estimates are not specific to one influenza season; influenza vaccinations reported in the past 12 months could have been received for one or more of up to three prior influenza seasons.
Data resources	• Behavioral Risk Factor Surveillance System (BRFSS), Asthma Call-Back Survey (ACBS) (http://www.cdc.gov/brfss/acbs/index.htm) • FluVaxView: influenza vaccination coverage estimates by season: http://www.cdc.gov/flu/fluvaxview/) • Chronic Disease Indicators: Influenza vaccination among non-institutionalized adults aged 18-64 years with asthma (http://www.cdc.gov/cdi/definitions/asthma.html)
Related data standards	Additional indicators of healthcare access and quality: • Asthma action plan • Taught How to Recognize Early Symptoms • Taught how to use inhaler • Taught how to respond to episodes of asthma • Taught how to monitor peak flow for daily therapy • Advised to change home/school/work environment • Asked about symptom frequency • Asked about relief inhaler frequency
References	(1) CDC. Flu vaccination coverage, United States, 2013-14 influenza season. http://www.cdc.gov/flu/fluvaxview/coverage-1314estimates.htm (2) Eisner MD. Asthma and influenza vaccination. Chest 2003;124:775-777. (3) Groom AG, Hennessy TW, Singleton RJ, et al. Pneumonia and influenza mortality among American Indian and Alaska Native People, 1990-2009. AJPH 2014;104:S460-S469.

	(4) Quinn SC, Kumar S, Freimuth VS, et al. Racial disparities in exposure, susceptibility, and access to health care in the US H1N1 influenza pandemic. Am J Public Health. 2011;101:285–293. http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2009.188029 (5) CDC. Influenza vaccination coverage—United States, 2000–2010. In: CDC health disparities and inequalities report—United States, 2011. MMWR 2011;60(Suppl; January 14, 2011):38–41. (6) CDC. Seasonal influenza vaccination coverage – United States, 2009-10 and 2010-11. In: CDC health disparities and inequalities report—United States, 2013. MMWR Surveill Summ. 2013 Nov 22;62 Suppl 3:65-8. http://www.cdc.gov/mmwr/pdf/other/su6203.pdf

Routine asthma visits in past year

Data Standard	Routine asthma visits in past year
Measure	Annual estimate of: • Count: Number of children aged 0-17 years with one or more routine checkup visits for asthma. • At-risk rate: Percent of children aged 0-17 years with one or more routine checkup visits for asthma among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who have had at least one routine follow-up visit in the past 12 months. Survey question (Source: NHIS): • *"During the past 12 months, how many times did [child's name] see a doctor or other health professional for a routine checkup for [his/her] asthma? Please do not include emergency room visits, visits to urgent care centers, or other visits for acute care for an asthma episode or attack."* Benchmark data source: • National: National Health Interview Survey (NHIS) periodic modules: 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm • State: Behavioral Risk Factors Surveillance System (BRFSS): Child Asthma Call-back Survey (ACBS), starting 2006. (http://www.cdc.gov/brfss/acbs/index.htm) Note: Although, the ACBS question wording *(which omits the phrase about excluding ED and urgent care center visits)* differs from the NHIS question, the two surveys likely provide comparable estimates.
Denominator definition	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS)), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	For better asthma care and management, the National Asthma Education and Prevention Program (NAEPP) Expert Panel recommends regular follow-up visit with a frequency of visits depending on the level of asthma control (1). Patients who have intermittent or mild or moderate persistent asthma that has been under control for at least 3 months should be seen by a clinician for assessment of asthma control about every 6 months, whereas patients who have uncontrolled and/or severe persistent asthma and those who need

	additional supervision to help them follow their treatment plan should be seen more often. Routine follow-up visit can be assessed at national and state level. Nearly 74% of children aged 0-17 years reported routine checkup visits for their asthma based on 2006–2007 ACBS data analyses findings and those who reported at least one routine checkup visit are more likely to receive self-management education and appropriate medication than those who did not (2). Healthy People 2020: Respiratory Diseases Objectives (RD-7.6): Increase the proportion of persons with current asthma who have had at least one routine follow-up visit in the past 12 months according to NAEPP guidelines. (https://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives)
Significance to disparities	
Data considerations	• Respondents were specifically asked to exclude ER visits, visits to urgent care centers, or other visits for acute care for an asthma episode or attack
Data resources	
Related data standards	Having routine follow-up visits may indicate higher socio-economic status (SES) and better health care coverage. Therefore, routine care visits measure may also be a marker for • Insurance coverage • Usual source of health care • Unable to pay medical bills • Personal doctor
References	(1) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm. Accessed February 19, 2015. (2) Zahran HS, Person CJ, Bailey C, Moorman JE. Predictors of asthma self-management education among children and adults--2006-2007 Behavioral Risk Factor Surveillance System Asthma Call Back Survey. J Asthma 2012; 49:98-106.

Any preventive medication use

Data Standard	Any preventive medication use
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who are currently taking a preventive asthma medication. • At-risk rate: Percent of children aged 0-17 years with current asthma who are currently taking a preventive asthma medication among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children with current asthma who used any form of preventive asthma medicine Survey question (Source: NHIS): • *"The second kind of asthma medication is different from inhalers used for quick relief. It is the preventive kind that is used to protect your lungs and keep you from having attacks. It can be either a pill or an inhaler.* *Is [fill: S.C. name] NOW taking a preventive asthma medication every day or almost every day, less often, or never?"* Note: This question is in a period asthma module fielded in 2013. Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Background	Asthma symptoms can be controlled with appropriate medical treatment, self-management education, and by avoiding exposure to environmental allergens and irritants that can trigger an attack according to the National Asthma Education and Prevention Program (NAEPP) guidelines (1). Taking a preventive asthma medication is recommended to control asthma symptoms for people with persistent asthma symptoms. Approximately 34% percent of persons (31.3% children and 34.4% adults) with current asthma had taken prescription preventive asthma medicine in 2008. Anti-inflammatory medications, especially inhaled corticosteroids are most commonly prescribed preventive asthma medications to control asthma symptoms (2).

Significance to disparities	Non-Hispanic black, Mexican American children and those lacking health insurance are less likely to use preventive asthma medications(3). Furthermore, in a nationally representative population of children with asthma who were prescribed preventive asthma medication, non-Hispanic black children were more likely than non-Hispanic white children to discontinue preventive asthma medications (4).
Data considerations	
Data resources	• Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552
Related data standards	Preventive asthma medication use may indicate uncontrolled asthma and persistent asthma. Preventive asthma medication use may be associated with measures on asthma severity and asthma control: • Overuse of short-acting beta agonists • Asthma control • Daytime symptoms • Nighttime awakenings • Activity limitation • Short acting beta agonist use
References	(1) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm. (2) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (3) Kit BK, Simon AE, Ogden CL, Akinbami LJ. Trends in preventive asthma medication use among children and adolescents, 1988-2008.Pediatrics. 2012 Jan;129(1):62-9. (4) Capo-Ramos DE, Duran C, Simon AE, Akinbami LJ, Schoendorf KC. Preventive asthma medication discontinuation among children enrolled in fee-for-service Medicaid. J Asthma. 2014 Aug;51(6):618-26

Regular use of preventive medication

Data Standard	Regular use of preventive medication
Measure	Annual estimate of: • Count: Number of children aged 0-17 years with current asthma who were taking a preventive asthma medication every day or almost every day. • At-risk rate: Percent of children aged 0-17 years with current asthma who were taking a preventive asthma medication every day or almost every day among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children with current asthma who were taking a preventive asthma medication every day or almost every day. Survey question (Source: NHIS): • *"Is [fill: S.C. name] NOW taking a preventive asthma medication every day or almost every day, less often, or never?""* Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Background	Asthma symptoms can be controlled with appropriate medical treatment, self-management education, and by avoiding exposure to environmental allergens and irritants that can trigger an attack according to the National Asthma Education and Prevention Program (NAEPP) guidelines (1). Taking a preventive asthma medication every day is an important step in controlling asthma symptoms for persons with persistent as. In 2008, 33.5 percent of persons (31.3% children and 34.4% adults) with current asthma had taken prescription preventive asthma medicine.(2) Anti-inflammatory medications, especially inhaled corticosteroids are most commonly prescribed preventive asthma medications to control asthma symptoms (2).

Significance to disparities	Minority race and low parental education have been associated with underuse of preventive asthma medication among those prescribed such medications (3). Having a primary care physician, a written asthma action pan, a follow up visit, and having seen an asthma specialist have been associated with lower rates of preventive asthma medication underuse (3).
Data considerations	Starting 2013, the question differentiates between those who take a prescription asthma preventive medicine every day or almost every day, less often, or never. Persons are classified as having used preventive asthma medicine properly if they responded "every day or almost every day" to the question listed above.
Data resources	
Related data standards	Proper use of preventive medication use may influence asthma symptoms and control: • Overuse of short-acting beta agonists • Asthma control • Daytime symptoms • Nighttime awakenings • Activity limitation • Short acting beta agonist use
References	(1) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm (2) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 (3) Finkelstein JA1, Lozano P, Farber HJ, Miroshnik I, Lieu TA. Underuse of controller medications among Medicaid-insured children with asthma. Arch Pediatr Adolesc Med. 2002 Jun;156(6):562-7.

Short acting beta agonist overuse

Data Standard	Short Acting Beta Agonist (SABA) overuse
Measure	Annual estimate of: • Count: Number of children aged 0-17 years with current asthma who used more than three canisters of PRESCRIPTION inhaler that gives QUICK relief from asthma symptoms in the past three months. • At-risk rate: Percent of children aged 0-17 years with current asthma who used more than three canisters of PRESCRIPTION inhaler that gives QUICK relief from asthma symptoms in the past three months among all children with asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children with current asthma who used more than three canisters of PRESCRIPTION inhaler that gives QUICK relief from asthma symptoms in the past three months. Survey question (Source: NHIS): • *"DURING THE PAST 3 MONTHS did [PERSON] use more than three canisters of this type of inhaler?"* Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2008, 2013 (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Background	Asthma symptoms can be controlled with appropriate medical treatment, self-management education, and by avoiding exposure to environmental allergens and irritants that can trigger an attack according to the National Asthma Education and Prevention Program (NAEPP) guidelines. Overuse of quick relief medicine from asthma symptoms may indicate inadequate asthma control and the need to initiate or adjust anti-inflammatory medications. Furthermore, excessive use of relief medications is associated with poorer quality of life and increased risk for future asthma exacerbations (1). Respiratory Disease Objective RD-7.4: Increase the proportion of persons with current asthma who do not use more than one canister of short-acting inhaled beta agonist per month according to National Asthma Education and Prevention Program (NAEPP) guidelines (2,3).

Significance to disparities	In 2008, 12.1% of persons with current asthma did used more than one canister of short-acting inhaled beta agonist (SABA) per month. Using more than one canister of SABA use per month is considered overuse and may indicate inadequate asthma control and the need to initiate or adjust anti-inflammatory medications (2).

Data considerations	• Note that this indicator differs from "Use of short-acting beta agonists" which measures SABA use according to NAEPP criteria for asthma control (2). SABA overuse, in contrast, specifically addresses excessive use that may be associated with poor outcomes (1).
	• Questions asked to determine inhaler overuse in the ACBS include:
	  • *"Has [he/she] ever used a prescription inhaler?"*
	  • *"In the past 3 months has [child's name] taken prescription asthma medicine using an inhaler?"*
	  • *"How many canisters of this inhaler has [he/she] used in the past 3 months?"* This question was asked for each quick relief medications, but is not available for nebulizers.
	• Questions for nebulizers ask about time used per day or per week, which can't be used to quantify overuse of nebulizers.

Data resources	
Related data standards	SABA overuse may indicate uncontrolled asthma and inadequate preventive asthma medication use: • Preventive medication use • Asthma control • Daytime symptoms • Nighttime awakenings • Activity limitation • SABA use
References	(1) Schatz M, Zeiger RS, Vollmer WM, Mosen D, Apter AJ, Stibolt TB, et al. Validation of a beta-agonist long-term asthma control scale derived from computerized pharmacy data. J Allergy Clin Immunol 2006;117:995-1000. (2) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm (3)Healthy People 2020; Respiratory Diseases Objectives. available at: http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives

Action taken to address environmental risks

Data Standard	Action taken to address environmental risks
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who followed the advice of a doctor or health professional to change things at home, school, or work to improve their asthma. • At-risk rate: Percent of children aged 0-17 years with current asthma who followed the advice of a doctor or health professional to change things at home, school, or work to improve their asthma. • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who followed the advice of a doctor or health professional to change things at home, school, or work to improve their asthma Survey question (Source: NHIS): YES or "was told no changes needed" response: • *"Has a doctor or other health professional ever advised you to change things in (your/child's) home, school, or work to improve (your/his/her) asthma? "* • AND response "some/most/all" to *"How much of this advice did you follow?"* Benchmark data source: • National Health Interview Survey (NHIS) periodic modules: 2008(http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
Denominator definition	Denominator for at-risk rate: Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence (hyperlink to this standard within the document): YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Asthma symptoms can be controlled with appropriate medical treatment, self-management education, and by avoiding exposure to environmental allergens and irritants that can trigger an attack according to the National Asthma Education and Prevention Program (NAEPP) guidelines (1). Healthy People 2020: Respiratory Diseases Objectives (RD-7.5): Increase the proportion of persons with current asthma who have been advised by a health professional to change

	things in their home, school, and work environments to reduce exposure to irritants or allergens to which they are sensitive according to National Asthma Education and Prevention Program (NAEPP) guidelines (http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives).
Significance to disparities	In 2008, 50.6% of children with current asthma were advised by a health professional to change things in their home, school, and work environments to reduce exposure to irritants or allergens to which they are sensitive. Receiving advice on environmental control did not differ by race or ethnicity (2).
Data considerations	• The measure is about ever receiving advice to change things in home, school, or work and how much of this advice was followed, but does not measure how long or how effectively the advice was followed. • Given that those who followed advice are more likely to recall receiving advice, this measure may provide reliable estimates of the number/percentage of children for whom a caregiver recalls receiving advice and making changes in their home, school, or work.
Data resources	BRFSS Asthma Call-back Survey (ACBS): Child prevalence tables 2006-2010: http://www.cdc.gov/asthma/acbs/acbstables.htm (see Table 8a: Estimated percent advised to make environmental changes for active and inactive asthma status among children ever diagnosed with asthma by state/territory - BRFSS Asthma Call-back Survey, United States, 2006-2010).
Related data standards	Because following advice on environmental control is one of several asthma education and management components, this measure may also be associated with other effective asthma management practices: • Routine asthma visits in past year • Any preventive medication use • Regular use of preventive medication • Short acting beta agonist overuse
References	(1) National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm. Accessed February 19, 2015. (2) Vital Signs: Asthma prevalence, disease characteristics and self-management education--United States, 2001-2009. MMWR May 6, 2011 / 60(17):547-552 http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6017a4.htm?s_cid=mm6017a4_w

CONTROL

Asthma Control

Data Standard	Asthma control
Measure	Annual estimate of: • Count: Number of children aged 0-17 years with current asthma with not-well-controlled/very-poorly-controlled asthma • At-risk rate: Percent of children aged 0-17 years with current asthma with not-well-controlled/very-poorly-controlled asthma among all children with asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma with not-well-controlled/very-poorly-controlled asthma (versus well controlled asthma) Survey questions for individual components of asthma control (Source: Asthma Call-back Survey (ACBS)): 1. Daytime symptoms: *"During the past 30 days, on how many days did [child's name] have any symptoms of asthma?"* 2. Nighttime awakenings: *"During the past 30 days, on how many days did symptoms of asthma make it difficult for [him/her] to stay asleep?"* 3. Interference with normal activity: *"During just the past 30 days, would you say [child's name] limited [his/her] usual activities due to asthma not at all, a little, a moderate amount, or a lot?"* Note: the recall period for this question changed in the ACBS from "12 months" to "30 days" in 2012. 4. Short-acting beta agonist (SABA) use: estimates using responses from 5 questions (1): • *"In the past 3 months has [child's name] taken prescription asthma medicine using an inhaler? "* • *"In the past 3 months, what prescription asthma medications did [he/she] take by inhaler?" (choose SABA from [MEDICINE FROM INH_MEDS SERIES])*[1] • *"In the past 3 months, did [he/she] take [MEDICINE FROM INH_MEDS SERIES]*[3] *when [he/she] had an asthma episode or attack?"* • *"In the past 3 months, did [he/she] take [MEDICINE FROM INH_MEDS SERIES]*[3] *before exercising?"*

[1] Identify those medications that are inhaled SABA. This determination needs annual update, since new inhaled medications may be become available. INH_MEDS series is a list of medications which the ACBS interviewer uses to identify up to 8 medications reported by the respondent. This list should be checked in the ACBS child questionnaire each year for updates. In 2012, it included the following SABA medications: albuterol (Ventolin, Proair HFA, Proventil), bitolterol (Tornalate), Combivent, levalbuterol (Xopenex), metaproterenol (Alupent), pirbuterol (Maxair), salbutamol (albuterol), and terbutaline (Brethaire).

<table>
<tr>
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“How many times per day or per week did [he/she] use [MEDICINE FROM INH_MEDS SERIES][3]?”

Algorithm for converting SABA use to control level according to the EPR-guidelines (Source: ACBS Users Guide (1)):

Identify all respondents who have taken a prescription asthma medicine using an inhaler (“In the past 3 months have you taken prescription asthma medicine using an inhaler?”)
Identify those medications that are inhaled SABAs (e.g., Albuterol).
Determine SABA medications for which there is evidence that they were taken in the past 3 months only for treatment before exercise (“In the past 3 months, did you take [inhaler] when you had an asthma episode or attack?; “In the past 3 months, did you take [inhaler] before exercising?”). If taken before exercise, and not taken for an asthma attack or episode, then the response for SABA use before exercise does not contribute to the SABA use total (see Technical Appendix).
Then determine the frequency of use (“How many times per day or per week do you use [inhaler]?”) and convert to number of times per day.
Convert to control level: cut-off for Not Well Controlled is >2 days/week which is equivalent to >0.29 uses per day.

Category of asthma control was based on the most impaired level across all four components (symptoms, nighttime awakenings, interference with activity, and Short-acting beta agonist use). Categorizing levels of control therefore requires assessing all 4 components for each individual child (see Technical Appendix):
<table>
<tr><td></td><td>Well controlled</td><td>Not well controlled/very poorly controlled</td></tr>
<tr><td>Symptoms</td><td>≤8 days in past 30 days (EPR-3: ≤2 days/week)</td><td>>8 days in past 30 days (EPR3: >2 days/week)</td></tr>
<tr><td>Nighttime awakenings</td><td></td><td></td></tr>
<tr><td>0- 4 year</td><td>≤1 time/month</td><td>>1 time/month</td></tr>
<tr><td>5-11 years</td><td>≤1 time/month</td><td>≥2 times/month</td></tr>
<tr><td>12+ years</td><td>≤2 times/month</td><td>≥1-3 times/week</td></tr>
<tr><td>Interference with activity</td><td>Not at all</td><td>A little/moderate/lot</td></tr>
<tr><td>Short-acting beta agonist use</td><td>≤2 days/week</td><td>>2 days/week</td></tr>
</table>
<u>Benchmark data source:</u>

Behavioral Risk Factors Surveillance System (BRFSS): Child Asthma Call-back Survey (ACBS), starting 2006 (http://www.cdc.gov/brfss/acbs/index.htm)

Note: This survey is conducted only among respondents who report that they have ever been diagnosed with asthma. Estimates from this survey are typically reported as at-risk rates (rates of events among persons who currently have asthma). However, population-based rates may also convey useful information about the burden of asthma, but does not take into account differences in asthma prevalence between demographic groups.
</td>
</tr>
<tr>
<td>Denominator definition</td>
<td><u>Denominator for at-risk rate</u>:
Number of children aged 0-17 years with current asthma

<u>Survey questions</u> used to determine current asthma prevalence
YES response to both questions:</td>
</tr>
</table>

	• *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Monitoring asthma control helps determine the effectiveness of current treatment in limiting frequency and intensity of symptoms and functional limitations. Asthma control is measured by determining the most severe levels of impairment (frequency of daytime symptoms, nighttime awakenings, interference with normal activity, SABA use, and lung function) and risk (frequency of use of oral steroids). Level of asthma control is a function of underlying severity, responsiveness to treatment and the adequacy of asthma management (2).
Significance to disparities	Uncontrolled asthma is associated with an increased risk of adverse asthma outcomes, significantly decreased quality of life and increased health care use (2,3). Non-Hispanic black children are more likely that non-Hispanic white children to have very poorly controlled asthma (3).
Data considerations	The measure available from national survey questionnaire items is a compilation of 4 components and captures a subset of 2007 NAEPP guideline impairment criteria. The lung function impairment and risk criteria are not captured in the survey-based measurement (2). The component of control considering use of short-acting beta agonists is based only on inhaler use and does not include use of syrups, pills or nebulizer. Therefore, prevalence of poor asthma control may be underestimated for younger children who may be more likely to use nebulizers.
Data resources	BRFSS Asthma Call-back Survey (ACBS): Child prevalence tables 2006-2010: http://www.cdc.gov/asthma/acbs/acbstables.htm
Related data standards	Asthma control is determined by assessing degree of symptoms and impairment over multiple components. A simplified measure of control is defined in this document to facilitate measurement using surveys and other data not necessarily collected in a clinical environment. Four components are included which are also included as individual indicators in this document: • Daytime symptoms • Nighttime awakenings • Activity limitation • Short-acting beta agonist use Additional factors may be related to achieving and maintaining asthma control, including access to health care and adherence to components of the guidelines: • Asthma action plan • Taught how to recognize early symptoms • Taught how to use inhaler • Taught how to respond to episodes of asthma • Taught how to monitor peak flow for daily therapy • Routine asthma visits in past year • Any preventive medication use

	• Regular use of preventive medication • Short-acting beta agonist overuse
References	(1) Asthma Call-back Survey Users Guide available upon request at asthmacallbackinfo@cdc.gov. (2)National Institutes of Health, National Asthma Education and Prevention Program. Expert panel report 3: guidelines for the diagnosis and management of asthma. Expert panel report 3. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute. 2007. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/index.htm. Accessed February 19, 2015. (3) Zahran Hs, Bailey CM, Qin X, Moorman JE. Assessing asthma control and associated risk factors among persons with current asthma—findings from the child and adult Asthma Call-back Survey. J Asthma. Nov 2014 early online.

See “Technical appendix for asthma control"

Health status

Data Standard	Health status: self-reported fair or poor health
Measure	Annual estimate of: • Count: Number of children aged 0-17 years with current asthma with fair or poor health. • At-risk rate: Percent of children aged 0-17 years with current asthma with fair or poor health among children with current asthma. • Population-based rate: N/A* • ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.*
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma with fair or poor health (versus good, very good or excellent health). Survey question (Source: NHIS): Responses of "fair/poor" to the following question: • *"Would you say your child's health in general is excellent, very good, good, fair, or poor?"* Benchmark data source: • National: National Health Interview Survey (NHIS), 1997 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)` • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states (http://www.cdc.gov/brfss/)
Denominator definition	**Denominator for at-risk rate**: Number of children aged 0-17 years with current asthma (in the demographic group of interest) Survey questions used to determine current asthma prevalence YES response to both questions: • *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND • *"Does [child's name] still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2006 onward (http://www.cdc.gov/brfss/)
Background	Among adults, those with self-reported current asthma were significantly more likely to report having fair or poor health compared to those who formerly or never had asthma. These differences persisted after adjustment for sociodemographic factors (1). Similarly, among adolescents, those with symptomatic asthma had a higher percentage reporting fair or poor health compared to adolescents with asthma without symptoms, and those without asthma (2).

Significance to disparities	Those with symptomatic asthma are more likely to have lower quality of life, which is reflected in self-reported health status (2). To the extent that symptoms and poor asthma control are higher among minority and poor children, this group may more likely to have overall impacts of asthma on self-reported health status.
Data considerations	Self- or proxy-reported perceived health status can be affected by numerous considerations other than actual health status (e.g., by the health or mental status of the proxy reporter)
Data resources	
Related data standards	Health status may be related to frequency and severity asthma symptoms: • Asthma control • Daytime symptoms • Nighttime awakening • Activity limitations
References	(1) Ford ES, Mannino DM, Homa DM, Gwynn C, Redd SC, Moriarty DG, Mokdad AH. Self-reported asthma and health-related quality of life: findings from the behavioral risk factor surveillance system. Chest 2003; 123(1):119-27. (2) Cui W, Zack MM, Zahran HS. Health-related quality of life and asthma among United States adolescents. J Pediatr. 2015 Feb;166(2):358-64.

Daytime symptoms

Data Standard	**Daytime symptoms**
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who had symptoms of asthma on one or more days in the past 30 days. • At risk rate: Percent of children aged 0-17 years with current asthma who had symptoms of asthma on one or more days in the past 30 days among all children with asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.* This indicator can also be used to estimate asthma control based on NAEPP criteria, but adapted for population-based surveys (1): Percent of children aged 0-17 years with current asthma who had daytime symptoms of asthma that meet the EPR-3 criteria for Not Well-Controlled/Very Poorly Controlled asthma: Age 0-4: 3 or more days per week or multiple times on ≤2 days per week Age 5-11: 3 or more days per week or multiple times on ≤2 days per week Age 12-17: 3 or more days per week or throughout the day (See Technical Appendix for Asthma Control)
Numerator definition	Numerator: • Number of children aged 0-17 years with current asthma who had daytime asthma symptoms on one or more days in the past 30 days • Number of children aged 0-17 years with current asthma who had daytime asthma symptoms that meet the EPR-3 criteria for Not Well-Controlled/Very Poorly Controlled asthma by age group Survey questions (Source: ACBS): • *"During the past 30 days, on how many days did [child's name] have any symptoms of asthma?"* Benchmark data source: • Behavioral Risk Factors Surveillance System (BRFSS): Asthma Call-back Survey (ACBS), starting 2006. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/2012/pdf/acbs_2012_child_llcp_codebook.pdf)
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions • "*Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources:

	• National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data available for children 0-17 years of age for selected states, 2001 onward (http://www.cdc.gov/brfss/)
Background	Daytime asthma symptoms, which can include wheezing, shortness of breath, chest tightness and coughing, are one of the key indicators of asthma control, along with nighttime awakenings, activity limitations and lung function. According to the NAEPP guidelines for asthma diagnosis and management, asthma is considered well controlled only if daytime symptoms occur less than or equal to 2 days per week (1).
Significance to disparities	Population-based asthma attack prevalence is higher for black children than white children; however, when asthma prevalence is taken into account (i.e., at-risk rates) asthma attack rates are the same for white children compared to black children. Nonetheless, black children are still more likely than white children to experience severe outcomes (e.g., asthma hospitalizations) (2).
Data considerations	Reporting of symptoms in the past 30 days is subject to recall bias. In addition, estimates of daytime symptom frequency for children are based on report of parent/guardian and so may be under- or over-reported.
Data resources	
Related data standards	Daytime symptoms are one criteria used to determine asthma control: • Asthma control Asthma control is a composite of the following indicators: • Daytime symptoms • Nighttime awakenings • Activity limitations • Short acting beta-antagonist use
References	(1) National Asthma Education and Prevention Program. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. National Heart, Lung and Blood Institute, US Department of Health and Human Services. 2007. (2) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC.J Allergy Clin Immunol. 2014 Sep;134(3):547-553

Nighttime awakenings

Data Standard	**Nighttime awakenings**
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who had nighttime symptoms on one or more days in the past 30 days • At-risk rate: Percent of children aged 0-17 years with current asthma who had nighttime symptoms on one or more days in the past 30 days among all children with asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.* This indicator can also be used to estimate asthma control based on National Asthma Education and Prevention Program (NAEPP) criteria, but adapted for population-based surveys (1): Percent of children aged 0-17 years with current asthma who had nighttime symptoms of asthma that meet the EPR-3 criteria for Not Well-Controlled/Very Poorly Controlled asthma: Age 0-4: more than 1 time per month Age 5-11: 2 or more times per month Age 12-17: 1 or more times per week (See Technical Appendix for Asthma Control)
Numerator definition	Numerator: • Number of children aged 0-17 years with current asthma who had nighttime asthma symptoms on one or more days in the past 30 days • Number of children aged 0-17 years with current asthma who had nighttime asthma symptoms that meet the EPR-3 criteria for Not Well-Controlled/Very Poorly Controlled asthma by age group Survey questions (Source: ACBS): • *"During the past 30 days, on how many days did symptoms of asthma make it difficult for [him/her] to stay asleep?"* Benchmark data source: • Behavioral Risk Factors Surveillance System (BRFSS): Asthma Call-back Survey (ACBS), starting 2006. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/2012/pdf/acbs_2012_child_llcp_codebook.pdf)
Denominator definition	Denominator: Number of children aged 0-17 years ever diagnosed with asthma by a health professional who still have asthma Survey questions used to determine current asthma prevalence (hyperlink to this standard within the document: YES response to both of two survey questions: • *"Has a doctor or other health professional EVER told you that your child had asthma?"* AND

	• *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data for children 0-17 years of age for selected states, 2001 onward (http://www.cdc.gov/brfss/
Background	Nighttime awakenings are one of the key indicators of asthma control, along with daytime symptoms, activity limitations and lung function. According to the NAEPP guidelines for asthma diagnosis and management, asthma is considered well controlled only if nighttime awakenings occur less than 2 times per month for children age 0-11 and less than 3 times per month for persons 12 and older (1). Nighttime awakenings due to asthma have been shown to impact school attendance, academic performance and parents' work attendance (2).
Significance to disparities	Population-based asthma attack prevalence is higher for black children than white children; however, when asthma prevalence is taken into account (i.e., at-risk rates) asthma attack rates are the same for white children compared to black children. Nevertheless, black children are still more likely than white children to experience severe outcomes (e.g., asthma hospitalizations) (3).
Data considerations	Reporting of symptoms in the past 30 days is subject to recall bias. In addition, estimates of the frequency of nighttime awakenings for children are based on report of parent/guardian and so may be under- or over-reported.
Data resources	
Related data standards	Daytime symptoms are one criteria used to determine asthma control: • Asthma control Asthma control is a composite of the following indicators: • Daytime symptoms • Nighttime awakenings • Activity limitations • SABA use
References	(1) National Asthma Education and Prevention Program. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. National Heart, Lung and Blood Institute, US Department of Health and Human Services. 2007. (2) Diette, G.B., Markson, L., Skinner, E.A., et al. (2000). Nocturnal asthma in children affects school attendance, school performance, and parents' work attendance. Archives of Pediatrics & Adolescent Medicine, 154, 923-928. (3) Akinbami LJ, Moorman JE, Simon AE, Schoendorf KC.J Allergy Clin Immunol. 2014 Sep;134(3):547-553

Activity limitation

Data Standard	**Activity limitations due to asthma** (degree of)
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma reporting that they limited usual activities a little/moderate amount/a lot due to asthma in the past 30 days • At-risk rate: Percent of children aged 0-17 years with current asthma reporting that they limited usual activities a little/moderate amount/a lot due to asthma in the past 30 days among all children with asthma • Population-based rate: N/A* ** This outcome is primarily of interest among persons with asthma—comparisons between groups should account for differences in asthma prevalence, and thus be made using at-risk rates.* This indicator can also be used to estimate asthma control based on National Asthma Education and Prevention Program (NAEPP) criteria, but adapted for population-based surveys (1): Percent of children aged 0-17 years with current asthma with activity limitation that meet the EPR-3 criteria for Not Well-Controlled/Very Poorly Controlled asthma: Limited activities in the past 30 days a little, moderate amount or a lot due to asthma (See Technical Appendix for Asthma Control)
Numerator definition	Numerator: Number of children aged 0-17 years with current asthma who limited their usual activities a little/a moderate amount/a lot due to asthma in the past 30 days Survey question (Source: ACBS): Reponses of "a little/moderate amount/a lot" to: • *"During just the past 30 days, would you say [child's name] limited [his/her] usual activities due to asthma not at all, a little, a moderate amount, or a lot?"* Note: the recall period for this question changed in the ACBS from "12 months" to "30 days" in 2012. Benchmark data source: • Behavioral Risk Factors Surveillance System (BRFSS): Asthma Call-back Survey (ACBS), starting 2006. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/2012/pdf/acbs_2012_child_llcp_codebook.pdf)
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years with current asthma Survey questions used to determine current asthma prevalence: YES response to both of two survey questions: • "*Has a doctor or other health professional EVER told you that your child had asthma?"* AND • "*Does your child still have asthma?"*

	Benchmark data sources: • National: National Health Interview Survey (NHIS, 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data for children 0-17 years of age for selected states, 2001 onward (http://www.cdc.gov/brfss/)
Background	Interference with normal activity is one of measure of asthma control, along with daytime symptoms, nighttime awakenings and lung function. According to the NAEPP guidelines, asthma is considered well controlled only if there is no interference with normal activity (1). From CDC Chronic Disease Indicator: Experiencing activity limitations because of poor physical or mental health interferes with social functioning, is associated with health behavior, and is an indicator of population productivity (2).
Significance to disparities	
Data considerations	Reporting of activity limitations in the past 30 days may be subject to recall bias. In addition, estimates of the degree of activity limitations for children are based on report of parent/guardian and so may be under- or over-reported.
Data resources	Healthy People 2020: RD-4. Number of persons who report having current asthma and activity limitation due to a respiratory problem (http://www.healthypeople.gov/2020/topics-objectives/topic/respiratory-diseases/objectives). ACBS Child prevalence tables 2006-2010: Estimated percent with activity limitations among children with current asthma by state/territory – BRFSS Asthma Call-back Survey, United States, 2006-2010 http://www.cdc.gov/asthma/acbs/acbstables.htm
Related data standards	Daytime symptoms are one criteria used to determine asthma control: • Asthma control Asthma control is a composite of the following indicators: • Daytime symptoms • Nighttime awakenings • Activity limitations • SABA use
References	(1) National Asthma Education and Prevention Program. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. National Heart, Lung and Blood Institute, US Department of Health and Human Services. 2007. (2) Moriarty DG, Zack MM, Kobau R. The Centers for Disease Control and Prevention's healthy days measures – population tracking of perceived physical and mental health over time. Health Qual Life Outcomes 2003;1(37):1-8.

Frequent use of short-acting beta-agonists

Data Standard	**Frequent use of short-acting beta-agonists**
Measure	Annual estimates of: • Count: Number of children aged 0-17 years with current asthma who do not meet the EPR-3 criteria for well-controlled asthma according to reported use of short-acting beta-agonists in the previous 3 months. • At-risk rate: Percent of children aged 0-17 years with current asthma who do not meet the EPR-3 criteria for well-controlled asthma according to reported use of short-acting beta-agonists in the previous 3 months among all children with asthma.

Numerator definition	Numerator: Number of children with current asthma whose use of short-acting beta-agonists (SABAs) in the previous 3 months does not meet the EPR-3 criteria for well-controlled asthma according to reported use of short-acting beta-agonists in the previous 3 months among all children with asthma (i.e., children who use SABA >2 days per week). Survey questions (Source: ACBS): • *"In the past 3 months has [child's name] taken prescription asthma medicine using an inhaler? "* • *"In the past 3 months, what prescription asthma medications did [he/she] take by inhaler?" (choose SABA from [MEDICINE FROM INH_MEDS SERIES)*[1] • *"In the past 3 months, did [he/she] take [MEDICINE FROM INH_MEDS SERIES]* [1] *when [he/she] had an asthma episode or attack?"* • *"In the past 3 months, did [he/she] take [MEDICINE FROM INH_MEDS SERIES]*[1] *before exercising?"* Algorithm for converting SABA use to control level according to the EPR-guidelines (from ACBS users guide, available upon request via email: asthmacallbackinfo@cdc.gov): • Identify all respondents who have taken a prescription asthma medicine using an inhaler *("In the past 3 months has [your child] taken prescription asthma medicine using an inhaler?")* • Identify those medications that are inhaled SABAs (e.g., Albuterol). • Determine SABA medications for which there is evidence that they were taken in the past 3 months only for treatment before exercise *("In the past 3 months, did [your child] take [inhaler] when he/she had an asthma episode or attack?" "In the past 3 months, did [your child] take [inhaler] before exercising?")*

[1] Identify those medications that are inhaled SABA. This determination needs annual update, since new inhaled medications may be become available. INH_MEDS series is a list of medications which the interviewer uses to identify up to 8 medications reported by the respondent. This list should be checked in the ACBS child questionnaire each year for updates. In 2012, it included the following SABA medications: albuterol (Ventolin, Proair HFA, Proventil), bitolterol (Tornalate), Combivent, levalbuterol (Xopenex), metaproterenol (Alupent), pirbuterol (Maxair), salbutamol (albuterol), and terbutaline (Brethaire).

	• Then determine the frequency of use *("How many times per day or per week did [your child] use [inhaler]?")* and convert to # times per day. • Convert to control level: cut-off for Not Well Controlled is >2 days/week which is equivalent to >0.29 uses per day. Benchmark data source: Behavioral Risk Factors Surveillance System (BRFSS): Asthma Call-back Survey (ACBS), starting 2006. Aggregation of at least 2 survey years is recommended to obtain reliable estimates by state. (http://www.cdc.gov/brfss/acbs/2012/pdf/acbs_2012_child_llcp_codebook.pdf)
Denominator definition	Denominator (at-risk rate): Number of children aged 0-17 years ever diagnosed with asthma by a health professional who still have asthma Survey questions used to determine current asthma prevalence YES response to both of two survey questions: • "*Has a doctor or other health professional EVER told you that your child had asthma?"* AND • *"Does your child still have asthma?"* Benchmark data sources: • National: National Health Interview Survey (NHIS), 2001 onward (http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm) • State: Behavioral Risk Factor Surveillance System (BRFSS), data for children 0-17 years of age for selected states, 2001 onward (http://www.cdc.gov/brfss/)
Background	SABAs are used to prevent exercise-induced bronchospasm and to provide quick relief of acute asthma symptoms, but do not provide long-term control of asthma. SABAs are bronchodilators and work by relaxing airway muscles. According to the National Asthma Education and Prevention Program guidelines, use of SABAs more than 2 days a week is an indicator of inadequate asthma control and the need to start or increase long-term controller medications (1).
Significance to disparities	Minority children are less likely than white children to be prescribed or take recommended treatments to control their asthma, and are less likely to attend outpatient appointments (2).
Data considerations	Reporting of medication use in the past 30 days is subject to recall bias. This indicator only includes SABA medications taken by inhaler since the frequency of SABAs taken in some other form (including nebulizer) is not captured on the ACBS. Therefore, control assessed by SABA use may be an underestimate SABA use among younger children who are more likely to use nebulizers.
Data resources	ACBS Child prevalence tables 2006-2010: Estimated percent using inhaled short acting beta agonists in the past 3 months among children with current or active asthma status by state/territory - BRFSS Asthma Call-back Survey, United States, 2006-2010 http://www.cdc.gov/asthma/acbs/acbstables.htm
Related data standards	Daytime symptoms are one criteria used to determine asthma control: • Asthma control Asthma control is a composite of the following indicators: • Daytime symptoms • Nighttime awakenings • Activity limitations

References	(1) National Asthma Education and Prevention Program. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. National Heart, Lung and Blood Institute, US Department of Health and Human Services. 2007. (2) Crocker, D., Brown, C., Moolenaar, R., et al. (2009). Racial and ethnic disparities in asthma medication usage and health care utilization. Chest, 136 (4), 1063-1071.

TECHNICAL APPENDIX

Definition of terms:

Survey resources:

Asthma control:

Definition of Terms:

At-risk rates

At-risk rates measure the rate of disease/outcome in the population at risk for that disease/outcome. For asthma outcomes, such as asthma hospitalizations, the population at risk used in the rate denominator is persons with asthma in the demographic group of interest. For national estimates, the estimate used for the population of persons with asthma is the number of people with current asthma obtained from the National Health Interview Survey.

Risk-based rates account for prevalence differences over time and between subgroups and can be used to directly compare the risk of an outcome (e.g., hospitalizations or deaths) among subgroups due to factors other than a difference in current asthma prevalence.

Population-based rates

Population-based rates are used to measure the risk of disease/outcome in a given population overall without regard to disease prevalence. The population used in the denominator is the total population of the demographic group of interest. For national estimates, U.S Census population estimates for the resident population can be used.
http://www.census.gov/popest/

Commonly used rate denominators

U.S. Census population estimates (http://www.census.gov/popest/)

The census of population (decennial census) has been held in the United States every 10 years since 1790. Since 1930, it has enumerated the resident population as of April 1 of the census year. Data on sex, race, Hispanic origin, age, and marital status are collected from 100% of the enumerated population.

Post-censal population estimates are estimates made for the years following a census, before the next census has been taken. Post-censal population estimates are derived annually by updating the resident population enumerated in the decennial census using a components-of-population change approach. Each annual series includes estimates for the current data year and revised estimates for the earlier years in the decade. The following formula is used to derive national estimates for a given year from those for the previous year, starting with the decennial census enumerated resident population as the base:

Resident population estimate + births to U.S. resident women – deaths to U.S. residents + net international migration.

Inter-censal population estimates are estimates made for the years between two decennial censuses and are produced once the census at the end of the decade has been completed. They replace the post-censal estimates produced prior to the completion of the census at the end of the decade. Inter-censal estimates are more accurate than post-censal estimates because they are based on both the census at the beginning and the census at the end of the decade. They are derived by adjusting the final post-censal estimates for the decade to correct for the error of closure (the difference between the estimated population at the end of the decade and the census count for that date). The patterns of population change observed over the decade are preserved.

Count of persons with current asthma

The number of persons with current asthma on a national level can be obtained from the National Health Interview Survey (NHIS). Current asthma is based on a yes response to both of two questions:

- *"Has a doctor or other health professional EVER told you that [child's name] had asthma?"* AND
- *"Does [child's name] still have asthma?"*

To match estimates in CDC publications, records with responses to these questions including "don't know," "not applicable" and "refused" should be excluded. As a result, the total estimated count will represent a slight undercount given that the above categories cannot be assigned an asthma status.

Race and Hispanic Origin (Ethnicity)

Ascertainment of race and Hispanic Origin has changed over time in national health surveys. For example, in the National Health Interview Survey, race was recorded solely on the basis of the interviewer's observation, and no information was recorded about Hispanic origin through 1975. In 1977, the Office of Management and Budget (OMB) established Directive 15 to establish standards to improve information on race and ethnicity (Office of Management and Budget. Standards and guidelines for federal statistics: race and ethnic standards for federal statistics and administrative reporting. Federal Register, 1977; Circular No A48, Section 7H, Exhibit F.). In 1997, the OMB released revisions to the original Directive on which national health data collection efforts are based (Office of Management and Budget. Revisions to the standards for the classification of federal data on race and ethnicity. Federal Register, 1997; 62(210): 58782-58790,). The National Health Interview Survey has detailed documentation on the data collection, data editing, imputation and release of race/ethnicity data: http://www.cdc.gov/nchs/nhis/rhoi.htm.

Health Insurance (http://www.cdc.gov/nchs/nhis/insurance.htm)

The health insurance standards have been adapted from the methods used by the National Health Interview Survey (NHIS). The Health Insurance section of the NHIS Family Core (FHI) has a full range of data items addressing health insurance. A family respondent answers these questions about all family members. However, individual members present can also respond to the questions as well. Although the questions are asked on the Family Core component of the questionnaire, health insurance coverage status is collected for each family member. The flow of the questions pertaining to health insurance programs in this section has been similar since 1997. The FHI section begins by asking an overall question of whether anyone in the family has health insurance coverage. If there is a positive response to this initial overall question, then the types of coverage are collected for each family member. The types include "no coverage of any type," in case one or more family members are uninsured but others are not. The questions about types of coverage are followed by detailed questions about each coverage type collected on a person basis, with an exception of detailed questions about private plans which are asked by plan, for up to four plans per family. If there is a negative response to the initial overall question, then all family members are marked as not having health insurance coverage and the appropriate follow-up questions for those who lack coverage are asked. The FHI section ends with a series of family-level questions about out-of-pocket expenses, flexible spending accounts, and problems paying medical bills.

A feature that distinguishes the NHIS estimates of health insurance coverage from other survey-based estimates is the use of responses to follow-up questions to evaluate the reliability of the reported health insurance coverage and to adjudicate conflicting information. For many survey respondents, health insurance is a complex topic, and some inconsistencies in survey response are expected. If the follow-up questions clearly

suggest that the original responses were incorrect, the original responses are edited. As a result, a portion of the sample is reassigned to a different type of coverage or reclassified from insured to uninsured (or vice versa). On the data file, the recodes are: MEDICARE, MEDICAID, PRIVATE, SCHIP, IHS, MILCARE, OTHPUB, OTHGOV, SINGLE, and NOTCOV. NOTCOV reflects the definition of non-coverage as used in Health, United States (in which persons with only Indian Health Service coverage are considered uninsured). Analysts are strongly advised to use the recodes MEDICARE, MEDICAID, PRIVATE, SCHIP, IHS, MILCARE, OTHPUB, OTHGOV, and SINGLE for estimates of types of health care coverage and NOTCOV to derive estimates of un-insurance. For more detail, please see: http://www.cdc.gov/nchs/nhis/health_insurance/hi_eval.htm.

Income

The U.S. Census states that "income is the gauge many use to determine the well-being of the U.S. population." However, income and poverty are complex measurements. The U.S. Census collects data on income using several household surveys, and estimates vary from the family level to more broad measures of mean income for certain geographic areas. To be comparable measures used in national surveys, measures of income and poverty should use similar methods outlined by the U.S. Census and federal statistical agencies. Two resources for more in-depth information are:

- U.S. Census "Income & Poverty": http://www.census.gov/topics/income.html
- Health US "Appendix II: Family Income": http://www.cdc.gov/nchs/hus/index.htm

Medical home

Four professional medical associations (American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, American Osteopathic Association) issued joint principles of the Patient-Centered Medical Home as an approach to providing comprehensive primary health care in 2007 (http://www.aafp.org/dam/AAFP/documents/practice_management/pcmh/initiatives/PCMHJoint.pdf). The underlying goals of the medical home concept—including accessibility, continuity, comprehensiveness, family-centered, care coordination, and cultural competence—align closely with goals for high quality asthma care, management and education that are recommended in the NAEPP Guidelines (http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines/full-report).

Survey Resources:

Estimating counts in national population surveys

The estimated national counts of persons with asthma (National Health Interview Survey), number of office visits for asthma to private physicians' offices (National Ambulatory Medical Care Survey), hospital outpatient departments and emergency rooms (National Hospital Ambulatory Medical Care Survey), and asthma hospitalizations (National Hospital Discharge Survey) are calculated by weighting the number of respondents or visits by the survey weights. For information about national health surveys, please see the survey descriptions below.

Behavioral Risk Factor Surveillance System (http://www.cdc.gov/brfss/)

The state-based Behavioral Risk Factor Surveillance System (BRFSS) is a cross-sectional telephone survey that state health departments conduct monthly over landline telephones and cellular telephones with a standardized questionnaire and technical and methodologic assistance from CDC. BRFSS is used to collect prevalence data among adult U.S. residents regarding their risk behaviors and preventive health practices that can affect their health status. For some survey modules, a responsible adult answers questions in proxy for a child in the family.

In some instances, states design samples within boundaries of sub-state geographic regions. States may determine that they would like to sample by county, public health district or other sub-state geography in order to make comparisons of geographic areas with their states. In order to conduct the BRFSS, states obtain samples of telephone numbers from CDC. States then review their sampling methodology with a state statistician and CDC to make sure data collection procedures are in place to follow the methodology. If any change in sampling methodology is considered, states consult with CDC before making changes. The BRFSS uses two samples: one for landline telephone respondents and one for cellular telephone respondents. Since landline telephones are often shared among persons living within a residence, household sampling is used in the landline sample. Household sampling requires interviewers to collect information on the number of adults living within a residence and then select randomly from all eligible adults. Cellular telephone respondents are weighted as single adult households.

The BRFSS questionnaire is comprised of an annual standard core, a biannual rotating core, optional modules, and state-added questions. The standard core is the portion of the questionnaire that is included each year and must be asked by all states. Each year, the core includes questions about emerging or "late-breaking" health issues. After one year, these questions are either discontinued or incorporated into the fixed core, rotating core, or optional modules. The rotating core portion of the questionnaire asked by all states on an every-other year basis. The optional modules are sets of standardized questions on various topics that each state may select and include in its questionnaire. Once selected, a module must be used in its entirety and asked of all eligible respondents. If an optional module is modified in any way (e.g., if a question is omitted), then the questions will be treated as state-added questions (see below). In addition, there are state-added questions. States are encouraged to gather data on additional topics related to their specific health priorities through the use of extra questions they choose to add to their questionnaire. All questions included in the BRFSS are cognitively tested prior to inclusion in the questionnaire.

Asthma Call-Back Survey (http://www.cdc.gov/asthma/acbs.htm)

The Asthma Call-back Survey (ACBS) is a product of CDC's National Asthma Control Program. The ACBS is conducted approximately 2 weeks after the Behavioral Risk Factor Surveillance Survey (BRFSS). BRFSS adult respondents who report ever being diagnosed with asthma are eligible for the ACBS. If a state includes children in the BRFSS and the randomly selected child has ever been diagnosed with asthma, then the child is eligible for the ACBS. If both the selected child and the BRFSS adult in a household have asthma, then only one or the other is eligible for the ACBS.

Annual state-level data are available for some states, however, multiple years (currently five years) of combined data are needed to have stable estimates. State participation varies each year. From the parent survey (BRFSS), the ACBS inherits a complex sample design and multiple reporting areas. These factors complicate the analysis of the ACBS. Some states vary from both BRFSS and ACBS protocol. These variations should be considered prior to analysis of these data. Information on the BRFSS deviations can be found in the document titled Comparability of Data which can be accessed at: http://www.cdc.gov/brfss/annual_data/annual_data.htm when selecting an individual survey year. Also, new weighting (since 2011) and dual mode data collection (landline and cell phone data) may be an obstacle for trend analyses.

To request the manual, send an email to asthmacallbackinfo@cdc.gov.

National Health Interview Survey (http://www.cdc.gov/nchs/nhis.htm)

The National Health Interview Survey (NHIS) is a cross-sectional household interview survey of the civilian noninstitutionalized population of the United States. Sampling and interviewing are continuous throughout each year. The sampling plan follows a multistage area probability design that permits the representative sampling of households. Traditionally, the sampling methodology for NHIS is redesigned about every 10 years to better measure the changing U.S. population and to meet new survey objectives. A new sample design was implemented in the 2006 survey. The fundamental structure of the 2006 design is very similar to the previous design for the 1995–2005 surveys.

Because the NHIS is conducted in a face-to-face interview format, the costs of interviewing a large simple random sample of households and non-institutional group quarters would be prohibitive; randomly sampled dwelling units would be too dispersed throughout the nation. To achieve sampling efficiency and to keep survey operations manageable, cost-effective, and timely, the NHIS survey planners used multistage sampling techniques to select the sample of dwelling units for the NHIS. These multistage methods partition the target population into several nested levels of strata and clusters. In order to increase the precision of estimates of the black, Hispanic, and Asian populations, the current NHIS sample design oversamples black persons, Hispanic persons, and Asian persons.

The current NHIS questionnaire, implemented in 1997, has two basic parts: a Basic Module or Core and one or more supplements that vary by year. The Core remains largely unchanged from year to year and allows for trend analysis and for data from more than 1 year to be pooled to increase the sample size for analytic purposes. The Core contains three components: the Family, the Sample Adult, and the Sample Child. The Family component collects information on everyone in the family. From each family in NHIS, one sample adult and for families with children under age 18 years, one sample child are randomly selected to participate in the Sample Adult and Sample Child questionnaires. For children, information is provided by a knowledgeable family member aged 18 years or over residing in the household. Because some health issues are different for children and

adults, these two questionnaires differ, but both collect basic information on health status, use of health care services, health conditions, and health behaviors.

The NHIS has collected information on the race and Hispanic origin of its respondents, following guidelines set forth by the Office of Management and Budget (OMB) in a policy known as OMB Directive 15. The NHIS provides information about race/ethnicity data in its "Frequently Asked Questions" guide found here: http://www.cdc.gov/nchs/nhis/rhoi/rhoi_faq.htm.

For national NHIS estimates of some asthma outcomes and management measures, NHIS asthma supplement data are available periodically (e.g., 2002, 2003, 2008, 2013) and future data availability depends on funding.

National Ambulatory Medical Care Survey (http:/www.cdc.gov/nchs/ahcd.htm)

The National Ambulatory Medical Care Survey (NAMCS) is an annual probability survey of nonfederal, office-based physicians who provide direct patient care in the 50 states and the District of Columbia, excluding radiologists, anesthesiologists, and pathologists. NAMCS collects data from a national sample of over 2,000 physicians each year who provide information on nearly 30,000 visits. Because persons with multiple visits during the year may be sampled more than once, NAMCS estimates are for visits, not persons.

NAMCS uses a multistage sample design procedure and sampling weights applied to each record to provide nationally representative estimates. Visits to private, nonhospital-based clinics, and health maintenance organizations (HMOs) were within the scope of the survey, but those that occurred in federally operated facilities and hospital-based outpatient departments were excluded. A sample of office-based physicians who reported that they were in direct patient care was taken from the master files of the American Medical Association and the American Osteopathic Association.

National Hospital Ambulatory Medical Care Survey (http://www.cdc.gov/nchs/ahcd.htm)

The National Hospital Ambulatory Medical Care Survey (NHAMCS) is a national probability sample survey of in-person visits made in the United States to EDs and outpatient departments (OPDs) of nonfederal, short-stay hospitals (hospitals with an average stay of fewer than 30 days) and those whose specialty is general (medical or surgical) or children's general. EDs that operate 24 hours a day are considered within the scope of the ED component; EDs that operate fewer than 24 hours are included in the OPD component of NHAMCS. The hospital sampling frame for 2006 consisted of hospitals listed in the 1991 Verispan Hospital Database (formerly known as the SMG Hospital Database), and updated using hospital data from Verispan, L.L.C. About 500 hospitals are included in the sample from which about 1,200 outpatient clinics and 400 ED departments are selected. Because persons with multiple visits during the year may be sampled more than once, estimates are for visits, not persons. NHAMCS uses a multistage probability sample and sampling weights applied to each record to produce nationally representative estimates.

National Hospital Care Survey/National Hospital Discharge Survey (http://www.cdc.gov/nchs/nhcs.htm)

The National Hospital Care Survey was initiated in 2011 that integrates inpatient data formerly collected by the National Hospital Discharge Survey with the emergency department (ED), outpatient department (OPD), and ambulatory surgery center (ASC) data collected by the National Hospital Ambulatory Medical Care Survey. The integration of these two surveys along with the collection of personal identifiers (protected health

information) will allow the linking of care provided to the same patient in the ED, OPD, ASC, and inpatient departments.

Through 2010, the NHDS collected data from a sample of inpatient records acquired from a national sample of hospitals. Because persons with multiple discharges during the year could have been sampled more than once, estimates are for discharges, not persons. Only hospitals with an average length of stay of fewer than 30 days for all patients, general hospitals, and children's general hospitals were included in the survey. Federal, military, and Department of Veterans Affairs hospitals, as well as hospital units of institutions, such as prison hospitals, and hospitals with fewer than six beds staffed for patient use, were excluded. NHDS collected data from a sample of approximately 270,000 inpatient records acquired from a national sample of about 500 hospitals.

National Health and Nutrition Examination Survey (http://www.cdc.gov/nchs/nhanes.htm)

The National Health and Nutrition Examination Survey (NHANES) is a program of studies designed to assess the health and nutritional status of adults and children in the United States. The survey is unique in that it combines interviews and physical examinations. NHANES is a major program of the National Center for Health Statistics (NCHS). NCHS is part of the Centers for Disease Control and Prevention (CDC) and has the responsibility for producing vital and health statistics for the Nation.

The NHANES program began in the early 1960s and has been conducted as a series of surveys focusing on different population groups or health topics. In 1999, the survey became a continuous program that has a changing focus on a variety of health and nutrition measurements to meet emerging needs. The survey examines a nationally representative sample of about 5,000 persons each year. These persons are located in counties across the country, 15 of which are visited each year.

The NHANES interview includes demographic, socioeconomic, dietary, and health-related questions. The examination component consists of medical, dental, and physiological measurements, as well as laboratory tests administered by highly trained medical personnel.

Findings from this survey will be used to determine the prevalence of major diseases and risk factors for diseases. Information will be used to assess nutritional status and its association with health promotion and disease prevention. NHANES findings are also the basis for national standards for such measurements as height, weight, and blood pressure. Data from this survey will be used in epidemiological studies and health sciences research, which help develop sound public health policy, direct and design health programs and services, and expand the health knowledge for the Nation.

National Vital Statistics System (http://www.cdc.gov/nchs/deaths.htm)

Data on deaths in the United States are based on information about underlying cause of death from all death certificates filed in the 50 states and the District of Columbia, and are processed by National Center for Health Statistics (NCHS). Mortality statistics are based on information coded by the states and provided to NCHS through the Vital Statistics Cooperative Program and from copies of original certificates received by NCHS from state registration offices.

Asthma Control

Asthma control is based on the most impaired level across four components or variables. Control classification is dichotomized into "well controlled" versus "not well controlled/very poorly controlled." This is a simplification of the NAEPP Guideline (EPR-3) control categories where "not well controlled" and "very poorly controlled" are separate categories.

Components of asthma control:

Symptoms: "During the past 30 days, on how many days did [child's name] have any symptoms of asthma? (SYMP_30D)"

Nighttime awakenings:

"During the past 30 days, on how many days did symptoms of asthma make it difficult for [him/her] to stay asleep? (ASLEEP30)"

Interference with normal activity:

"During just the past 30 days, would you say [child's name] limited [his/her] usual activities due to asthma not at all, a little, a moderate amount, or a lot? (ACT_DAYS30)" *Note: the recall period for this question changed in the ACBS from "12 months" to "30 days" in 2012.*

Short-acting beta agonist use: Requires an algorithm using responses from 4 questions:

"In the past 3 months has [child's name] taken prescription asthma medicine using an inhaler? (INH_SCR)"

"How many times per day or per week does [he/she] use [MEDICATION FROM INH_MEDS SERIES][1] ? (ILP08_#)"

"In the past 3 months, did [he/she] take [MEDICATION FROM INH_MEDS SERIES][1] when [he/she] had an asthma episode or attack? (ILP04_#)"

"In the past 3 months, did [he/she] take [MEDICATION FROM INH_MEDS SERIES][1] before exercising? (ILP05_#)"

[1] INH_MEDS series is a list of medications which the interviewer uses to identify up to 8 medications reported by the respondent. This list should be checked in the ACBS documentation each year for updates. In 2012, it included the following SABA medications: albuterol (Ventolin, Proair HFA, Proventil), bitolterol (Tornalate), levalbuterol (Xopenex), metaproterenol (Alupent), pirbuterol (Maxair), salbutamol (albuterol), and terbutaline (Brethaire).

Classification of asthma control for each component:

	Well Controlled		Not Well/Very Poorly Controlled	
	EPR-3 Guideline	BRFSS Call Back	EPR-3 Guideline	BRFSS Call Back
Symptoms	≤2 days/week	SYMP_30D ≤8 days or =88*	>2 days/week	SYMP_30D>8 days
Nighttime awakenings				
Aged 0-4	≤1 time per month	ASLEEP30≤1 or 88*	>1 time per month	ASLEEP30 ≥2
Aged 5-11	≤1 time per month	ASLEEP30≤1 or 88*	≥2 times per month	ASLEEP30≥2
Aged 12+	≤2 time per month	ASLEEP30≤2 or 88*	1-3 times per week	ASLEEP30≥3
SABA inhaler use for asthma attack	≤2 days/week	See algorithm above	>2 days/week	See algorithm above
Interference with normal activity	None	ACT_DAYS30 =”Not at all”	Some limitation	ACT_DAYS30=“A little, a moderate amount, or a lot”

* Response code “88” corresponds to zero or no days.

Overall classification of asthma control across 4 components:

Code control for each of the indices below (Symptoms, Nighttime Awakenings, and SABA Use) into 4 separate variables. Then create a control variable based on the most impaired level across the 4.

TABLE 1

Respondent	Control_1 *Symptom*	Control_2 *Nighttime Awakenings*	Control_3 *Activity limitation*	Control_4 *SABA Use*	**CONTROL SCORE**
A	2	1	1	2	**2**
B	1	1	1	2	**2**
C	1	1	1	1	**1**
D	1	2	1	1	**2**
E	1	Missing	*Missing*	1	***Missing***
F	*Missing*	2	1	2	***2***
G	*Missing*	*Missing*	*Missing*	*Missing*	***Missing***

1= Well Controlled

2= Not Well/Very Poorly Controlled

Assign missing value for CONTROL_SCORE when **2 or more** components have missing data (scenarios E and G in Table 1)

Categorizing asthma symptoms (Control_1)

BRFS Call Back item used: SYMP_30D

SYMP_30D question wording: "During the past 30 days, on how many days did [child's name] have any symptoms of asthma?"

Level of control for this index is determined the same way for all 3 age pediatric groups. They are left stratified in Table 2 to demonstrate differences in the EPR-3 Guidelines by age group.

TABLE 2

	Well Controlled		Not Well/ Very Poorly Controlled	
Age (years)	EPR-3 Guideline	BRFSS Call Back	EPR-3 Guideline	BRFSS Call Back
0-4	≤2 days/week	SYMP_30D ≤8 days or =88	>2 days/week	SYMP_30D>8 days
5-11	≤2 days/week but not >1/day***	SYMP_30D ≤8 days or =88	>2 days/week or many times on ≤2days/week***	SYMP_30D>8 days
12+	≤2 days/week	SYMP_30D ≤8 days or =88	>2 days/week	SYMP_30D>8 days

******* Cannot be measured since we don't have the number of times per day asthma symptoms were experienced

Exclude responses SYMP_30D=77 or 99 (don't know or refused to answer)

CUT POINT DETERMINATION

SYMP_30D: measures # days the respondent had symptoms in the past 30 days. The following demonstrates how the cut points in the table above were derived for all age groups above:

TABLE 3

Well Controlled	Not Well/Very Poorly Controlled
2/7 = x/30 x=8.6 ∴ ≤2 days/week ≈ 8 days/30 days	>8 days/30 days

Categorizing nighttime awakenings (Control_2):

BRFS Call Back item used: ASLEEP30

ASPEEP30 question wording: "During the past 30 days, on how many days did symptoms of asthma make it difficult for [him/her] to stay asleep?"

Table 7

	Well Controlled		Not Well/Very Poorly Controlled	
Age (years)	EPR-3 Guideline	BRFSS Call Back	EPR-3 Guideline	BRFSS Call Back
0-4	≤1 time per month	ASLEEP30≤1 or 88	>1 time per month	ASLEEP30 ≥2
5-11	≤1 time per month	ASLEEP30≤1 or 88	≥2 times per month	ASLEEP30≥2
12+	≤2 time per month	ASLEEP30≤2 or 88	1-3 times per week	ASLEEP30≥3

Note: 88=code for no days

Exclude responses ASLEEP30=77 or 99 (don't know or refused to answer)

CUT POINT DETERMINATION

ASLEEP30: measures # days the respondent had difficulty staying asleep in the past 30 days due to asthma symptoms. The following demonstrates how the cut points in the table above were derived:

TABLE 8

	Well Controlled	Not Well/Very Poorly Controlled
0-4 years	Assumes month = 30 days	Assumes month = 30 days When response=2 days, criteria for well controlled is no longer met
5-11 years	Assumes month = 30 days	Assumes month = 30 days When response=2 days, criteria for well controlled is no longer met
12+ years	Assumes month = 30 days	Assumes month = 30 days When response=3 days, criteria for well controlled is no longer met

Categorizing interference with activity (Control_3):

BRFS Call Back item used: ACT_DAYS

ACT_DAYS question wording: "During just the past 30 days, would you say [child's name] limited [his/her] usual activities due to asthma not at all, a little, a moderate amount, or a lot?"

Note: the recall period for this question changed in the ACBS from "12 months" to "30 days" in 2012.

For this component of asthma control, the EPR-3 Guidelines are the same for all pediatric age groups:

Well Controlled		Not Well/ Very Poorly Controlled	
EPR-3 Guideline	BRFSS Call Back	EPR-3 Guideline	BRFSS Call Back
No interference with normal activity	ACT_DAYS=1 (not at all)	Some limitation or extremely limited	ACT_DAYS=2,3 or 4 (a little, a moderate amount, a lot)

Exclude responses with ACT_DAYS = 7 or 9 (don't know or refused to answer)

Categorizing short-activing beta agonists use (Control_4):

- **BRFS Call Back items used: INH_SCR, INH_MEDS, ILP08, ILP04, ILP05**
- INH_SCR question wording: "In the past 3 months has [child's name] taken prescription asthma medicine using an inhaler?"
- INH_MEDS question wording: "How many times per day or per week does [he/she] use?"
- ILP04 question wording: "In the past 3 months, did [he/she] take [MEDICINE FROM INH_MEDS SERIES] when [he/she] had an asthma episode or attack?"
- ILP05 question wording: "In the past 3 months, did [he/she] take [MEDICINE FROM INH_MEDS SERIES] before exercising?"
- ILP08 question wording: "How many times per day or per week did [he/she] use [MEDICINE FROM INH_MEDS SERIES]?
- Level of control for this index is determined the same way for all 3 age groups, using inhaled medications only. The frequency of using nebulized medications are not available from the survey and therefore cannot be assessed for asthma control.

Process:

1. Identify all those respondents who have taken a prescription asthma medicine using an inhaler (INH_SCR: 1)
2. Identify those medications that are inhaled SABA (INH_MEDS: 3, 4, 9, 10, 20, 21, 23, 24, 28, 30, 33, 37, 38, 41. These are SABA inhalers.). This determination needs annual update because new inhaled medications may be added to the survey. This list should be checked in the ACBS documentation each year for updates. In 2012, it included the following SABA medications: albuterol (Ventolin, Proair HFA, Proventil), bitolterol (Tornalate), Combivent, levalbuterol (Xopenex), metaproterenol (Alupent), pirbuterol (Maxair), salbutamol (albuterol), and terbutaline (Brethaire). Limitation: This indicator ONLY includes SABA medications taken by inhaler since the frequency of SABAs taken in some other form (including nebulizer) is not captured on the survey. Therefore, control assessed by SABA use will be an underestimate and may pose a severe limitation, especially to the 0-4 year olds.
3. Determine which SABA medications where there is evidence that they were taken in the past 3 months only for treatment before exercise. For responses consistent with SABA use only before exercise, exclude from SABA total use according to Table 9.
4. Then determine the frequency of use (ILP08) for the remaining responses and convert all to # times per day.
5. Code Control_4 using Table 11.

Notes:

- If ILP08=555 (Never), contribute "0" per day to the total.
- IF ILP08=666 (less often than 1 per week), contribute as 1 per 10 day, or 0.10 per day.
- When data is missing or the response is Don't Know or Refused for ILP08 (frequency use of INHALER medications), set the contribution of that SABA to the total to "0" so as to prevent missing values for the total SABA meds variable. If all reported SABAs have ILP08 = Don't Know, Refused, or missing, then set the Total SABA Med Frequency to "missing" See Table 10, response scenarios M, N, O and P.
- If none of their reported asthma medications in the past 3 months are SABAs, then their total SABA frequency per day is "0" and they are "well controlled" for CONTROL_4.
- See Table 10 for example response scenarios.

TABLE 9.

Response to ILP05 (*taken before exercise)*	Response to ILP04 (*taken for episode/attack)*	Action
1 (yes)	1 (yes)	Contributes to SABA use total
	2 (no) or 3 (no attack)	Does not contribute to SABA use total
	7 (DK) or 9 (Refused)	Does not contribute to SABA use total
	Missing	Does not contribute to SABA use total
2 (no) or 3 (did not exercise) or 7 (DK) or 9 (Refused) or Missing	1	Contributes to SABA use total
	2 or 3	Contributes to SABA use total
	7 or 9	Contributes to SABA use total
	Missing	Contributes to SABA use total

TABLE 10. *Some* Examples of Possible Response Scenarios

										α	β	χ	θ	
Res.	SABA Med 1			SABA Med 2			SABA Med 3			Convert SABA Med 1 (per day)	Convert SABA Med 2 (per day)	Convert SABA Med 3 (per day)	Total SABA Med Freq (per day)	Calculated Control Based on Table 10
	ILP08	ILP04	ILP05	ILP08	ILP04	ILP05	ILP08	ILP04	ILP05	If 3xy, = xy If 4xy, =(xy/7)	If 3xy, = xy If 4xy, =(xy/7)	If 3xy, =xy If 4xy, =(xy/7)	θ=α+β+χ	
A	301	1	2	301	1	2	401	1	2	1.00	1.00	0.14	2.14	Not Well/Very Poorly Controlled
B	404	1	2	301	1	2				0.57	1.00		1.57	Not Well/Very Poorly Controlled
C	402	1	2							0.29			0.29	Well Controlled
D	301	1	2	555	1	2				1.00	0.00		1.00	Not Well/Very Poorly Controlled
E	301	1	2	666	1	2				1.00	0.10		1.10	Not Well/Very Poorly Controlled
F	402	1	1							0.29			0.29	Well Controlled
G	402	2	1							0.00			0.00	Well Controlled
H	401	7	2	401	1	2				0.14	0.14		0.28	Well Controlled
I	401	7	1	401	1	2				0.00	0.14		0.14	Well Controlled
J	402	1	2	666	2	1				0.29	0.00		0.29	Well Controlled
K	402	7	7	301	1	2				0.29	1.00		1.29	Not Well/Very Poorly Controlled
L	301	7	3	303	1	3				1.00	3.00		4.00	Not Well/Very Poorly Controlled
M	777	1	2	301	1	2				0.00	1.00		1.00	Not Well/Very Poorly Controlled
N	777	1	2	777	1	2				0.00	0.00		Missing	Missing
O	Blank	1	2	301	1	2				0.00	1.00		1.00	Not Well/Very Poorly Controlled
P	Blank	1	2							0.00			Missing	Missing

TABLE 11

	Well Controlled		Not Well/Very Poorly Controlled	
Age (years)	EPR-3 Guideline	BRFSS Call Back	EPR-3 Guideline	BRFSS Call Back
0-4 or 5-11 or 12+	≤2 days per week	$\theta \leq 0.29$	>2 days per week	$\theta > 0.29$

CUT POINT DETERMINATION

TABLE 12

Well Controlled	Not Well/Very Poorly Controlled
Assume 1 use per day on 2 days per week is well controlled 2/7 = 0.286 uses per day $\therefore \theta \leq 0.29$	Assume 1 use per day on >2 days per week Based on other cut points, $\theta > 0.29$

Note: 555 = Never…score as 0.00 per day

666 = less often than 1 per week…score as 1 per 10 days…or 0.10 per day

Where INH_SCR: 2 or where none of the inhaled meds are SABAs, code to well controlled