Asthma: Emergency Department Visits for Asthma

Type of EPHT Indicator	Health Outcome
Measures	1. Annual age-adjusted rate of emergency department visits for asthma per 10,000 population 2. Annual crude rate of emergency department visits for asthma per 10,000 population 3. Annual number of emergency department visits for asthma
Derivation of Measure(s)	*Numerator*: Emergency department visits during a calendar year with asthma (ICD-9-CM 493) as the primary diagnosis (include records for ED Visits resulting in a hospitalization) *Denominator*: Annual population estimates for state and county from U.S. Census Bureau *Adjustment*: Age-adjustment by the direct method to the Year 2000 US Standard population
Unit	1. Age-adjusted rate per 10,000 population 2. Rate per 10,000 population 3. Number
Geographic Scope	State and county
Geographic Scale	Residents of jurisdiction — State, County
Time Period	Emergency department visits with admission dates from January 1 through December 31, inclusive, for each year; 2003 to Most Recent Year Available
Time Scale	Annual
Rationale	Asthma continues to be a serious public health problem; asthma prevalence increased from 7.3% in 2001 to 8.4% in 2010.[1] In 2010, more than 25 million people including 7 million children (0—17 years) had asthma.[1] In 2008, there were 456,000 hospitalizations and 1.8 million emergency department visits (ED) for asthma.[2] Asthma is a leading chronic health condition among children. The greatest rise in asthma rates was among black children (almost a 50% increase) from 2001 through 2009.[2]2 There are also large racial, income, and geographic disparities in poor asthma outcomes.[1,6] As a chronic respiratory disease, asthma can interfere with everyday activities. According to CDC Vital Signs 2011 report, more than half (59%) of children and one-third (33%) of adults who had an asthma attack missed school or work because of asthma in 2008.[3] In 2007, there were over 3,400 deaths in which asthma was the underlying cause.[3] Despite the availability of effective prevention measures, asthma-associated costs are increasing. Asthma cost the US about $3,300 per person with asthma each year from 2002 to 2007 in medical expenses.[3] Medical expenses associated with asthma increased from $48.6 billion in 2002 to $50.1 billion in 2007.[3] Environment Attributable Fractions of the 1988—1994 economic costs for asthma were 39.2% for children <6 years of age and 44.4% for 6—16 years of age, costing

	more than $400 million for each age group.[4] Associations between environmental exposures and asthma have been consistently demonstrated.[6,7,8,9] Many outdoor air pollutants have been associated with increased asthma ED visits.[10,11,12,13,14] There is strong scientific evidence for direct associations between increased ozone concentrations and increases in asthma ED visits, in children and adults.[11,12] In one study, asthma ED visits increased by 33 percent when daily 1-hour maximum ozone concentration exceeded 75 ppb;[9] another study reported 26% increase in ED visits when the daytime mean ozone concentration exceeded 60ppb.[10] Associations between asthma-related ED visits and ambient air particulate matter—both PM10 and PM2.5—have been repeatedly observed, and are especially robust for children.[12, 13] Other pollutants related to higher asthma ED visit totals include carbon monoxide (CO), nitrogen dioxide (NO2), and pollution from automobiles, coal, and petrochemical sources.[14,15] Other outdoor environmental triggers for asthma ED visits in children include pollen, and ambient temperature. Increased asthma ED visits have also been associated with environmental tobacco smoke (ETS).[16] The state emergency department visit data are electronically maintained and are available in almost every state in the U.S. The data have comparable basic information about each visit and can provide a more sensitive tracking measure of asthma exacerbation than inpatient hospitalization. These measures can be used to evaluate the impact of ambient air pollution on respiratory health of children and adults. Also, the measures can be used for better resource management to further reduce asthma-related expenditures. Combined with inpatient asthma data, emergency department data will provide more complete spatial and temporal trends for asthma.
Use of the Measure	The development of a single analytic method for asthma emergency department visits among persons living in state will inform multiple users: *State*: • May be linked with other risk factors such as air pollution to identify susceptible populations and explore ecologic relationships • Allows for a better understanding of what the asthma surveillance data represents when interpreting number of inpatient hospitalizations • Permits the monitoring of trends temporally and spatially *National*: • It will allow for comparison across states which can be used to target interventions (especially for CDC and EPA). *Public*: • Public and concerned community members will be able to view the Tracking Network webpage and learn the annual rate of asthma emergency department visits and burden of asthma in

	their state or county.
Limitations of the Measure	• Numbers may be too small in rural areas to calculate stable rates. • The timing of the exposure may not correspond with the timing of the asthma exacerbation leading to the ED visit. • Individuals may have asthma exacerbations due to exposure to an environmental risk factor that does not result in an ED visit and thus are not captured in this measure. • Differences in rates by time or area may reflect differences or changes in diagnostic techniques and criteria and in the coding of asthma. • Reporting rates at the state and/or county level will not show the true asthma burden at a more local level (i.e., neighborhood). • Differences in rates by area may be due to different socio-demographic characteristics and associated behaviors. • When comparing rates across geographic areas, a variety of non-environmental factors, such as access to medical care, can impact the likelihood of persons treated at ED for asthma. • Reporting rates at the state and/or county level may not have sufficient geographic resolution to be linked with many types of environmental data. • When looking at small geographic levels users must take into consideration appropriate cell suppression rules imposed by the data providers or individual state programs. • Although duplicate records for the same ED visit are excluded, the measures are based upon events, not individuals, because no unique identifier is always available. When multiple admissions for the same person during the year are not identified, the resulting rate is not the proportion of the population that has an asthma ED visit. Rather it is the number of events per 10,000 population which is an overestimate of the proportion. Even at the county level, it can be expected that the measures generated will often be based upon numbers too small to report or present without violating state and federal privacy guidelines and regulations. Careful adherence to cell suppression rules in cross tabulations is necessary and methods to increase cell sizes by combining data across time (e.g., months, years) and geographic areas may be appropriate.
Data Sources	*Numerator*: State Inpatient and Outpatient data *Denominator*: US Census Bureau population data
Limitations of Data Sources	*State emergency department data:* • *ED visits for asthma are only one piece of a larger picture that describes asthma burden.* • *Veteran's Administration, Indian Health Service and institutionalized (e.g., prisoners) populations are excluded* • *In-state residents who visit an ED in surrounding states would not be included unless states have emergency department data sharing agreements.* • *Practice patterns and payment mechanisms may affect diagnostic coding and decisions by health care providers.*

	• *Sometimes mailing address of patient (e.g., P.O. Box) is listed as the residence address of the patient* • *Patients may be exposed to environmental triggers in multiple locations, but ED geographic information is limited to residence.*
Related Indicators	• Hospitalizations for asthma
References	1. Akinbami LJ, Moorman JE, Bailey C, Zahran HS, King M, Johnson CA, Liu X. Trends in Asthma Prevalence, Health Care Use, and Mortality in the United States, 2001–2010. 2. Akinbami LJ, Moorman JE, Liu X. Asthma Prevalence, Health Care Use, and Mortality: United States, 2005–2009. National Health Statistics Reports; No 32. Hyattsville, MD: National Center for Health Statistics, 2011. 3. Centers for Disease Control and Prevention. Vital Signs report 2011: Asthma in the US. http://www.cdc.gov/vitalsigns/Asthma/index.html 4. Lanphear BP, Aligne CA, Auinger P, et al. Residential exposures associated with asthma in US children. Pediatrics 2001; 107: 505-511. 5. Britton JR, Lewis SA. Epidemiology of childhood asthma. In Asthma: Epidemiology, Anti-Inflammatory Therapy and Future Trends; MA Giembycz and BJ O'Connor (Eds.),. Switzerland: Birkhäuser Verlag, 2000, pp. 25-56. 6. Lanphear BP, Kahn RS, Berger O, et al., Contribution of residential exposures to asthma in US children and adolescents. Pediatrics 2001; 107: e98. 7. Redd SC. Asthma in the United States: Burden and current theories. Environ Health Perspect 2002; 110 (Suppl 4): 557-60. 8. Peel JL, Tolbert PE, Klein M, et al. Ambient air pollution and respiratory emergency department visits. Epidemiology. 2005; 16: 164-174. 9. Stieb DM, Burnett RT, Beveridge RC, et al. Association between ozone and asthma emergency department visits in Saint John, New Brunswick, Canada. Environ Health Perspect. 1996; 104: 1354-60. 10. Tolbert PE, Mulholland JA, Macintosh DL, et al. Air quality and pediatric emergency room visits for asthma in Atlanta, Georgia. Am J Epidemiol. 2000; 151: 798-810. 11. Sun HL, Chou MC, Lue KH. The relationship of air pollution to ED visits for asthma differs between children and adults. Am J Emerg Med. 2006; 24: 709-13. 12. Norris G, VoungPong SN, Koenig JQ, et al. An association between fine particles and asthma emergency department visits for children in Seattle. Environ Health Perspect. 1999; 107: 489-93. 13. Slaughter JC, Kim E, Sheppard L, et al. Association between particulate matter and emergency room visits, hospital admissions and mortality in Spokane, Washington. J Expo Anal Environ Epidemiol. 2005; 15: 153-9. 14. Villeneuve PJ, Chen L, Rowe BH, et al. Outdoor air pollution and emergency department visits for asthma among children and adults: A case-crossover study in northern Alberta, Canada. Environ Health. 2007; 6:40. 15. Clark NA, Demers PA, Karr CJ, Koehoorn M, Lencar C,

Tamburic L, Brauer M. Effect of early life exposure to air pollution on development of childhood asthma. Environ Health Perspect. 2010;118(2):284-90.
16. Teach SJ, Crain EF, Quint DM, et al. Indoor environmental exposures among children with asthma seen in an urban emergency department. Pediatrics. 2006; 117: S152-8.