Indicator Template
Content Area: Chronic Obstructive Pulmonary Disease (COPD)
Indicator: COPD Emergency Department Visits

Environmental Public Health Tracking

Type of EPHT Indicator	Health outcome
Measures	1. Number of emergency department visits for COPD 2. Crude rate of emergency department visits for COPD among persons 25 and over per 10,000 population 3. Age-adjusted rate of emergency department visits for COPD among persons 25 and over per 10,000 population
Derivation of Measure(s)	*Numerator*: • Emergency department (ED) visits during a calendar year with COPD (ICD-9-CM 490-492 or 496 as the primary diagnosis or 493.2 as a primary diagnosis when 490-492 or 496 is present in any of the secondary diagnosis fields; ICD-10-CM codes J40-J44) (all ED visits, including those resulting in hospitalization) • Transfers to other hospitals included (not considered duplicates) • Duplicate records for ED visits removed *Denominator*: Midyear resident population estimates for state and by county from U.S. Census Bureau *Adjustment*: Age-adjustment by the direct method to year 2000 U.S. Standard Population
Unit	1. Number 2. Rate per 10,000 population 3. Age-adjusted rate per 10,000 population
Geographic Scope	State and county
Geographic Scale	Residents of jurisdiction – State, County
Time Period	Emergency department visits from January 1 to December 31, inclusive, for each year, 2000– most recent complete year available
Time Scale	Calendar year of emergency department visit date
Rationale	Chronic Obstructive Pulmonary Disease (COPD) is a large group of lung diseases characterized by airflow obstruction and is often associated with symptoms related to difficulty in breathing, but can be present without any symptoms. The most important and frequent conditions in COPD are chronic bronchitis and emphysema, but also includes other diagnoses. Chronic lower respiratory disease, primarily COPD, was the third leading cause of death in the United States in 2014[1] Beginning in 2008, COPD has surpassed stroke as the third leading cause of death in the U.S.[3,4] COPD accounts for 1.5 million ED visits annually, and the number of visits has been on the rise since the early 1990s.[5] It has been shown that roughly two-thirds of patients in the emergency department with COPD symptoms are consequently admitted as inpatients.[2] As of 2009, 11.8 million adults aged 18+ years in the United States reported having physician-

	diagnosed COPD, however it is commonly accepted that COPD is frequently underdiagnosed.[6] There are also large racial, ethnic, socioeconomic, and gender biases in COPD prevalence. Environmental Risk Factors Although the primary cause of COPD is smoking, an increasing number of epidemiologic studies have reported associations between indoor and outdoor air pollution exposures and COPD, suggesting that environmental exposures could be driving a large percentage of COPD cases.[5,8,9] The most prominent indoor exposures are from smoke from tobacco and the use of biomass fuels, while the most common non-occupational outdoor exposures are particulate matter (PM_{10} & $PM_{2.5}$), ozone, and sulfur dioxide from automobiles and industrial sources.[10,11] Studies have also shown significant associations with occupational exposures such as fumes, gases, and both inorganic and organic dusts.[9, 12, 13] In 2003, the American Thoracic Society showed that roughly 19% of all COPD cases were attributable to occupational exposures with 31% in never-smokers.[13] Studies have also linked outdoor air pollution to an increased risk of COPD exacerbations. Higher exposure to ambient ozone has been associated with an increase in COPD-related emergency department visits.[14,15] An increase in 10 ppb of 24-hour mean ozone was found to increase COPD-related emergency hospitalizations by 5%.[14] Non-environmental Risk Factors and Comorbidities COPD is associated with several important comorbidities, with asthma being the most important. It has been estimated that those with active asthma were 10 times more likely to develop chronic bronchitis, and 17 times more likely to develop emphysema compared to those without asthma, after controlling for potential confounders. Current asthma diagnosis was the most significant risk factor for COPD, even higher than cigarette smoking.[8] Prior respiratory infections has also been identified as a key risk factor for COPD.[7] Cardiovascular disease and COPD are strongly associated and frequently both are reported on the death certificate. On study has shown that of 45,000 patients with COPD, heart failure, myocardial infarction, and stroke are the leading causes of death[16], while another found that the prevalence of all cardiovascular diseases was higher in patients with COPD resulting in higher risk of an emergency department visit and mortality.[17]
Use of the Measure	These measures can be used to assess the burden of COPD, monitor trends over time, identify high-risk groups, and enhance prevention, education, and evaluation efforts. The development of a single analytic method for COPD 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 COPD surveillance data represents when interpreting number of ED visits. • 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 annual rate of COPD emergency department visits and the burden of COPD 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 COPD exacerbation leading to the ED visit. • Individuals may have COPD 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 COPD. • Reporting rates at the state and/or county level will not show the true COPD burden at a more local level (e.g. 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 an emergency department for COPD. • 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. • These measures are based upon events, not individuals, because unique identifiers tend not to be available. When multiple visits for the same person during the year are not identified, the resulting rate is not the proportion of the population that has a COPD ED visit. Rather it is the number of events per 10,000 population which is an overestimate of the proportion. • Transfers from one facility to another are included in these measures. • Moving from ICD-9-CM to ICD-10-CM coding is required for everyone covered by the Health Insurance Portability and Accountability Act (HIPAA) as of October 1, 2015. There is no exact or direct translation between the ICD-9-CM and ICD-10-CM codes, and may be instances where there is no match between the coding systems. These are important limitations, which should be noted in any interpretation of changing trends in health conditions that may occur due to the switch to ICD-10-CM.
Data Sources	*Numerator:* State emergency department visit data (using date of ED visit) *Denominator:* U.S. Census Bureau population data
Limitations of Data Sources	Emergency department data have limitations for comparisons because the use and quality of ICD-9-CM or ICD-10-CM coding may vary across medical facilities. Practice patterns and payment mechanisms may affect diagnostic coding and decisions by health care providers for the care of ED visit patients. These data usually include only cases of state residents who were treated within the state. However, health care access is not restricted to these political boundaries.

	People discharged from the emergency department for COPD in another state will typically not be counted in their own state or in the jurisdiction in which they were treated. Each state must individually obtain permission to access and, in some states, provide payment to obtain data about their state residents from another state. Currently, only a few states have access to, or agreements to obtain, their emergency department data from other states in which their residents may have received treatment. Without reciprocal reporting agreements with abutting states, statewide measures and measures for geographic areas (e.g., counties) bordering other states may be underestimated because of health care utilization patterns. To the extent that patients are treated out of state and are not included the data, there is undercounting of the rate of residents with COPD emergency department visits. Regional variations may exist between emergency departments in diagnosing COPD. Many emergency department visit data sets do not contain race or ethnicity information and those that do may have data quality issues. Yet, these characteristics are known risk factors for COPD. Each state must individually obtain permission to access and, in some states, provide payment to obtain the data. Excluded from the data are federal institutions such as Veterans Affairs, Indian Health Services, and prison facilities. Sometimes mailing address of patient is listed as the residence address of the patient. Patients may be exposed to environmental triggers in multiple locations, but discharge geographic information is limited to residence. There is usually a two-year lag period before data are available from the data owner.
Related Indicators	*COPD:* Number of hospitalizations for COPD Crude rate of hospitalizations for COPD per 10,000 population Age-adjusted rate of hospitalizations for COPD per 10,000 population *Asthma:* Number of emergency department visits for asthma Crude rate of emergency department visits for asthma per 10,000 population Age-adjusted rate of emergency department visits for asthma per 10,000 population Number of hospitalizations for asthma Crude rate of hospitalizations for asthma per 10,000 population Age-adjusted rate of hospitalizations for asthma per 10,000 population
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