

Indicator Template
Content Area: Chronic Obstructive Pulmonary Disease (COPD)
Indicator: COPD Hospitalizations

Environmental Public Health Tracking

Type of EPHT Indicator	Health outcome
Measures	<ol style="list-style-type: none"> 1. Number of hospitalizations for COPD 2. Crude rate of hospitalizations for COPD among persons 25 and over per 10,000 population 3. Age-adjusted rate of hospitalization for COPD among persons 25 and over per 10,000 population
Derivation of Measure(s)	<p><i>Numerator:</i></p> <ul style="list-style-type: none"> • Hospitalizations 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 hospitalization, transfers to other hospitals included (not considered duplicates) • Duplicate inpatient records removed <p><i>Denominator:</i> Midyear resident population estimates for state and by county from U.S. Census Bureau</p> <p><i>Adjustment:</i> Age-adjustment by the direct method to year 2000 U.S. Standard Population</p>
Unit	<ol style="list-style-type: none"> 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	Hospital admissions from January 1 to December 31, inclusive, for each year, 2000– most recent complete year available
Time Scale	Calendar year of admission date
Rationale	<p>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.</p> <p>Chronic lower respiratory disease, primarily COPD, was the third leading cause of death in the United States in 2014.¹ COPD is the third leading cause of</p>

hospitalization in the United States with over 715,000 admissions in 2005.^{2,3} Beginning in 2008, COPD has surpassed stroke as the third leading cause of death in the U.S.^{4,5} 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.⁷ There are also large racial, ethnic, socioeconomic, and gender biases in COPD prevalence. Since 1993, the rate of admission for COPD in women surpasses that of men. Between 1992 and 2006, the hospital discharge rate for COPD increased by 33.1% to 22.5 per 10,000 population.⁷ Further, hospitalization rates generally increase with age, and are highest in those 65 years of age and older. It is estimated that nearly 24% of all Americans 65 years and older have COPD.⁸

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.^{6, 10, 11} The most prominent indoor exposures are from tobacco smoke and the use of biomass fuels, while the most common non-occupational outdoor exposures are particulate matter (PM₁₀ & PM_{2.5}), ozone, and sulfur dioxide from automobiles and industrial sources.^{12,13} Studies have also shown significant associations with occupational exposures such as fumes, gases, and both inorganic and organic dusts.^{11, 14, 15} In 2003, the American Thoracic Society showed that roughly 19% of all COPD cases were attributable to occupational exposures with 31% in never-smokers.¹⁵ Studies have also linked outdoor air pollution to an increased risk of COPD exacerbations. Several air pollutants including nitrogen dioxide, ozone, and black smoke have been associated with an increased risk of COPD hospital admissions.¹⁶ A 10 µg/m³ increase in PM₁₀ has been shown to increased hospital admissions for COPD by 2.5%.^{17, 18}

Non-environmental Risk Factors and Comorbidities

COPD is associated with several important comorbidities, with asthma being the most prominent. 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.¹⁰ Prior respiratory infections have also been identified as a key risk factor for COPD.⁹ Cardiovascular disease and COPD are strongly associated and frequently appear together on death certificates. One study of 45,000 patients with COPD, showed heart failure, myocardial infarction, and stroke were leading causes of death.¹⁹ Another study found that the prevalence of all cardiovascular diseases was higher in patients with COPD, resulting in higher risk of hospitalization and mortality.²⁰

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 hospitalizations among persons living in state will inform multiple users:
State:

	<ul style="list-style-type: none"> • 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 inpatient hospitalizations. • Permits the monitoring of trends temporally and spatially. <p><i>National:</i></p> <ul style="list-style-type: none"> • It will allow for comparison across states which can be used to target interventions (especially for CDC and EPA). <p><i>Public:</i></p> <ul style="list-style-type: none"> • Public and concerned community members will be able to view the annual rate of COPD hospitalizations and the burden of COPD in their state or county.
<p>Limitations of the Measure</p>	<ul style="list-style-type: none"> • Hospitalization data, by definition, do not include COPD among individuals who do not receive medical care or who are not hospitalized, including those who die in emergency rooms, in nursing homes, or at home without being admitted to a hospital, and those treated in outpatient settings. • 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 and diet, can impact the likelihood of persons being hospitalized for COPD. • Reporting rates at the state and/or county level will not be geographically resolved enough to be linked with many types of environmental data. • These measures are based upon events, not individuals, because unique identifiers tend not to be available. When multiple admissions are not identified, the true prevalence will be overestimated. • Transfers from one hospital 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.
<p>Data Sources</p>	<p><i>Numerator:</i> State inpatient hospitalization data (using admission date) <i>Denominator:</i> U.S. Census Bureau population data</p>
<p>Limitations of Data Sources</p>	<p>A measure using all COPD hospitalizations will include some transfers between hospitals for the same person for the same event. Variations in the percentage of transfers or readmissions for the same event may vary by geographic area and could impact rates.</p>

	<p>Data on race and ethnicity are not routinely collected in all states. These data are not consistently recorded on medical records and when available are complicated further by non-standard definitions of race and ethnicity, the use of combined race/ethnicity, reporting of multiple race categories, and differences in self-report versus registrar reporting.</p> <p>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.</p> <p>Excluded from the data are federal institutions such as Veterans Affairs, Indian Health Services, and prison facilities.</p> <p>Practice patterns and payment mechanisms may affect diagnostic coding and decisions by health care providers to hospitalize patients.</p> <p>Sometimes the mailing address of a patient is listed as the residence address of the patient. Patients may be exposed to environmental triggers in multiple locations, but geographic information is limited to residence.</p> <p>Since the data capture hospital discharges (rather than admissions), patients admitted toward the end of the year and discharged the following year could be omitted from the admission year dataset. There is usually a two-year lag period before data are available from the data owner.</p>
Related Indicators	<p><i>COPD:</i> Number of emergency department visits for COPD Crude rate of emergency department visits for COPD per 10,000 population Age-adjusted rate of emergency department visits for COPD per 10,000 population</p> <p><i>Asthma:</i> 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 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</p>
References	<ol style="list-style-type: none"> 1. Heron M. Deaths: Leading Causes for 2014. Natl Vital Stat Rep. 2016;65(5):1-94. Hyattsville, MD: National Center for Health Statistics.2016.

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