TOPIC AREA: RESPIRATORY DISEASE

INDICATOR: CHRONIC LOWER RESPIRATORY DISEASE (CLRD) AND ASTHMA MORTALITY

MEASURES	• Annual number of CLRD deaths (International Classification of Diseases (ICD)-10 codes J40-J47 as the underlying cause of death) • Annual number of Asthma deaths • Annual CLRD mortality rate, based on total annual population estimate for the calendar year • Annual age-adjusted CLRD mortality rate
DEMOGRAPHIC UNIT	All residents living in the state Option: By age groups (*0-17, 18-64, 65+*), gender, race, ethnicity
GEOGRAPHICAL UNIT	State or county
TEMPORAL UNIT	Calendar Year Finer temporal resolution: daily, monthly, seasonal
SIGNIFICANCE AND BACKGROUND	Over 126,000 persons died in the U.S. as a result of chronic lower respiratory diseases (CLRD) in 2003 (1). CLRD includes asthma, emphysema, chronic bronchitis, bronchiectasis and Chronic Obstructive Pulmonary Disease (COPD), all of which are characterized by impaired lung function. There were 119,000 deaths attributed to COPD in 2000 (2), making it the 4th leading cause of death in the U.S, and approximately 10 million adults reported a diagnosis of COPD. In the same year there were over 4,200 deaths in which asthma was the underlying cause (2). Non-Hispanic Blacks, females and persons 65 years of age or older have been shown to have higher asthma mortality rates (3). While COPD death rates for whites remained higher than those for blacks from 1980-2000, the rate among whites increased 67%, while among blacks it increased 87%. COPD death rates of men increased 13%, while rates in women nearly tripled (2). A number of epidemiologic studies have reported associations between air pollution exposures and respiratory disease. Increases in short term exposures to ambient air particulate matter (PM) have been associated with increased CLRD mortality (4-6), particularly in persons over age 65. Risk factors for respiratory disease deaths include viral respiratory tract infections and exposure to allergens or environmental hazards such as air pollution.
RATIONALE	Analysis of CLRD deaths will permit individual states to explore patterns and trends in mortality rates for this diagnostic category. CRLD death rates can be used to identify populations vulnerable to the effects of air pollutants, and areas for targeting intervention efforts, such as Air Quality Index alerts, pollution reduction, and occupational interventions. These indicators can also serve as a measure of the respiratory health impact of emergency and extreme weather events.
LIMITATIONS OF THE MEASURE	CLRD and/or asthma mortality measures should be interpreted in the context of other adverse outcomes, such as hospitalization, and overall prevalence within a given geographic area. Coding changes between 1998 and 1999 prevent direct comparison of mortality measures and trends from 1998 or earlier and 1999 or later. A variety of non-environmental factors can affect the clinical course of CLRD and asthma including medical practices, individual behaviors, availability of health care, and co-morbidities. Because COPD is a chronic disease that often progresses with age, current mortality may not reflect current exposures, and it may be several years before reductions in exposure affect overall disease trends. Asthma deaths are rare events and small numbers can result in unstable and unreliable rates or estimates. Causes of death listed and coding of those causes may be inaccurate. Data on race/ethnicity is not collected in some states and is incomplete and/or of questionable validity in other states. Patients may be exposed to environmental triggers in multiple locations that cross state borders, but death certificate

	information is limited to residence.
RECOMMENDATIONS/USES	Two possible uses for this indicator include: 1) Identify persons or geographic areas with higher or lower mortality rates. This information can be used to carry out environmental public health interventions, including pre- and post-intervention evaluations. 2) Explore associations with other factors that preceded higher mortality rates, such as lack of access to medical care, improper medical management, non-compliance, elevated PM levels or extreme summer heat.
RELATED MEASURES	HP 2010, Chronic Disease Indicators (COPD Mortality) BRFSS (asthma prevalence data, asthma history module, asthma call back survey) Ambient Air Quality Data (e.g. particulate matter, ozone)
NOTES AND REFERENCES	1. Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File 1999-2004. CDC WONDER On-line Database, compiled from Compressed Mortality File 1999-2004 Series 20 No. 2J, 2007. 2. Mannino DM, Homa DM, Akinbami LS, *et al*. Chronic obstructive pulmonary disease surveillance-United States, 1971-2000. *MMWR* 2002; *51* (No. SS-6): 1-16. 3. Moorman JE, Mannino DM. Increasing U.S. asthma mortality rates: Who is really dying? *J Asthma* 2001; *38*: 65-71 4. Fairley D. Mortality and air pollution for Santa Clara County, California, 1989-1996. In: *Revised Analysis of Time-Series Studies of Air Pollution and Health*. Boston, MA: Health Effects Institute, 2003, pp. 97-106. 5. Ito, K. Associations of particulate matter components with daily mortality and morbidity in Detroit, Michigan. In: *Revised Analysis of Time-Series Studies of Air Pollution and Health*. Boston, MA: Health Effects Institute, 2003, pp. 97-106. 6. Moolgavkar, SH. Air pollution and daily deaths and hospital admissions in Los Angeles and Cook Counties. In: *Revised Analysis of Time-Series Studies of Air Pollution and Health.* Boston, MA: Health Effects Institute, 2003, pp. 97-106.

HOW-TO GUIDE – ASTHMA INDICATOR #C2:

CHRONIC LOWER RESPIRATORY DISEASE (CLRD) AND ASTHMA MORTALITY

1. Annual number of deaths due to chronic lower respiratory disease

   Obtain from State Health Department's Office of Vital Records the following information:

   - Number of deaths with ICD-10 code of J40-J47 as the underlying cause of death.

     J40 bronchitis, not specified acute or chronic
     J41 simple and mucopurulent chronic bronchitis
     J42 unspecified chronic bronchitis
     J43 emphysema
     J44 other COPD
     J45 asthma
     J46 status asthmaticus
     J47 bronchiectasis

     (ICD-9 code is 490-496. These are a slightly different set of diseases than in ICD-10).
   - Select for state of residence='*your state'*.
   - Exclude:
     - out-of-state residents *persons of unknown state of residence*
     - out-of-state deaths
   - Specify year(s)

NOTE: If less than 5 events, the number may be too small to produce reliable estimates or may violate confidentiality requirements. Rates should not be calculated.

1a. Annual number of deaths due to asthma

From 1 (Annual number of deaths due to CLRD) above, select:

- Number of deaths with ICD-10 code of J45-J46 as the underlying cause of death.

2. Annual rate of CLRD mortality per 1,000,000 residents (Crude)

a) To obtain the denominator for the rate:

- Go to the U.S. Census Population Estimates website: http://www.census.gov/popest/states/
- From the menu on the left, select "*State estimates by demographic characteristics."*
- From the drop down menu on the right ("popular tables"), select "*Age and sex by state: April 1, 2000 to July 1, 2006."* Click the "Go" icon.
- Download the table for your state, using your choice of the formats available (Excel, CSV)
- Obtain the state population total from the table that includes "both sexes." The population estimate should correspond with the year for which you wish to calculate the mortality rate.

b) To calculate annual mortality rate per 1,000,000 residents:

- Divide the numerator (number of deaths obtained in 1) by the denominator (total state population obtained in 2a).
- Multiply this result by 1,000,000.
- This gives you the "**Annual crude rate of CLRD deaths per 1,000,000 residents"**

3. Annual age-adjusted rate of CLRD mortality per 1,000,000 residents (Age-Adjusted)

a) To obtain the numerator for the rate:

- Obtain the number of deaths by age categories as documented in Table 1 below, utilizing the criteria outlined in 1 ("Annual number of deaths due to chronic lower respiratory disease"). Note that you will need to obtain the number of deaths for individuals 15-17 year olds and 18-19 year olds rather than a "15-19" year olds.
- Enter the number of CLRD deaths by age category appropriate row in Column B of Table 1. Column A is for Age Groups.

b) To obtain the denominator for the rate

- Use results previously obtained in 2a.
- Column C can be copied and pasted from Table 1 constructed in the How-to-guide "Annual number of hospitalizations due to asthma." Alternatively, you can obtain the population for the year of interest from the table containing estimates for "both sexes" by 5-year age category. Enter these values into Column C of Table 1 below. To obtain the population for the 15-17 and 18-19 age categories for input into Table 1, do the following:
    1. Population for 15-17:
        a) Subtract the population for persons "18 years and over" from the total population. This gives you the # of persons under 18 years of age.
        b) Sum the age categories representing "Under 5 years" through "10-14 years." This gives you the # of persons under 15 years of age.
        c) Subtract 1b (persons <15 yrs) from 1a (persons <18 years). This gives you the population 15-17 years of age.
    2. Population for 18-19:
        a) Subtract the # obtained in 1c (directly above) from the 15-19 years category provided in the US Census population estimate table. This will give you the population 18-19 years of age.

c) To calculate the rate:

- Use Table 1 below: A spreadsheet of Table 1 has been formatted to produce the necessary calculations. Column A is for Age Categories.
- Columns B and C should already be populated utilizing information obtained in 3a and 3b.

- Calculate the age specific hospitalization rate by obtaining the value of Column B / Column C and placing this value in Column D.
- Column E is the weight of the US 2000 Standard population by age category. These values were derived from Table 1 in: http://www.cdc.gov/nchs/data/statnt/statnt20.pdf
- To calculate the "**Annual age-adjusted CLRD mortality rate**" multiply the values in Column D by those in Column E" and place this value in Column F. Sum the values in Column F and multiply by 1,000,000. This is your "Annual age-adjusted CLRD mortality rate per 1,000,000 residents."

Table 1: Calculation Table Template for Annual State Age-Adjusted CLRD Mortality Rate per 1,000,000 Residents						
	Column A	**Column B**	**Column C**	**Column D**	**Column E**	**Column F**
Row #	**Age Group**	**State Resident Deaths, for year "X"**				
		# State Deaths For Year "X"	**State Pop For Year "X"**	**Deaths/Pop**	**US 2000 Std Pop Weight**	**Adjusted Mortality Rate**
7	Under 5			B7/C7	0.069135	D7*E7
8	5-9			B8/C8	0.072532	D8*E8
9	10-14			B9/C10	0.073032	D9*E9
10	15-17			B10/C10	0.043035	D10*E10
11	18-19			B11/C11	0.029133	D11*E11
12	20-24			B12/C12	0.066478	D12*E12
13	25-29			B13/C13	0.06453	D13*E13
14	30-34			B14/C14	0.071044	D14*E14
15	35-39			B15/C15	0.080762	D15*E15
16	40-44			B16/C16	0.081851	D16*E16
17	45-49			B17/C17	0.072118	D17*E17
18	50-54			B18/C18	0.062716	D18*E18
19	55-59			B19/C19	0.048454	D19*E19
20	60-64			B20/C20	0.038793	D20*E20
21	65-69			B21/C21	0.034264	D21*E21
22	70-74			B22/C22	0.031773	D22*E22
23	75-79			B23/C23	0.027	D23*E23
24	80-84			B24/C24	0.017842	D24*E24
25	85+			B25/C25	0.015508	D25*E25
	Total					**[Σ(F7:F25)] *1000000**

*Please note that an Excel spreadsheet has been provided for your use. This spreadsheet will auto-calculate the age-adjusted mortality rate. The user enters the state population for each age category, followed by the number of state deaths for year "x". This is done for each age category.