

# Data Analysis Guidance

## Underlying Cause of Death Using CDC WONDER

### What is CDC WONDER?

Wide-ranging Online Data for Epidemiologic Research (WONDER) is an online system that makes the Centers for Disease Control and Prevention's (CDC) resources available to public health professionals and the public. The system provides access to a wide array of public health information.

CDC WONDER furthers CDC's mission of health promotion and disease prevention by speeding up and simplifying access to public health information. CDC WONDER is valuable in public health research, decision making, priority setting, program evaluation, and resource allocation. To learn more about WONDER go to <https://wonder.cdc.gov/wonder/help/faq.html#1>.

### Uses for Asthma Surveillance

CDC WONDER can be used to answer questions about asthma and underlying cause of death (UCD) mortality data:

- Q. What is the rate of death where asthma is the underlying cause?
- Q. Is the state's asthma mortality rate higher than the national average or the *Healthy People 2030* objectives?
- Q. Does asthma mortality vary by age, gender, race, geography, or a combination of these?
- Q. What are the yearly trends in deaths with asthma as the underlying cause?

### History of UCD Mortality Data Collection

Mortality data are compiled at the federal level using the National Vital Statistics System (<https://www.cdc.gov/nchs/nvss/index.htm>).

In the United States, death data is collected in a uniform manner. Collection is based on the U.S. Standard Certificate of Death and the U.S. Standard Report of Fetal Death, which are issued by the Public Health Service. The death certificates used by most states closely match both forms in content and arrangement of elements. However, states have the flexibility to modify the Public Health Service forms to meet particular needs or to comply with specific laws.

The UCD is defined as (a) the disease or injury which initiated the chain of events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury (United States Public Health Service 1994). Cause-of-death statistics may be based on the UCD. Deaths are coded based on the International Classification of Diseases (ICD), which is published by the World Health Organization (WHO, 1997). From 1979–1998, deaths were coded under ICD Revision 9 (ICD-9). The ICD-9 codes were 493.x

#### Footnote:

<sup>1</sup>Gender is reported as "male" or "female" in CDC Wonder and reflects mortality information, based on death certificates for U.S. residents, collected by state registries and provided to the National Vital Statistics System.



Centers for Disease  
Control and Prevention  
National Center for  
Environmental Health

(where x = blank, 0, 1, 2, or 9). The current version of CDC WONDER, compressed mortality files, gives the same results using 493–493 as it does for 493–493.9 or 493.0–493.9.

Coding terminology for asthma changed in 1999 with ICD Revision 10 (ICD-10). In ICD-10, asthma is coded as J45.x–J46.x (where x = blank, 0, 1, 8, or 9). The National Center for Health Statistics (NCHS) reports a comparability ratio of 0.8938 for the coding of asthma mortality under ICD-10 as compared to ICD-9. That is, about 11% fewer deaths will be coded as indicated that asthma was the UCD compared to those deaths coded under ICD-9. To calculate comparability ratios for your state, go to <https://www.cdc.gov/nchs/data/statab/Document%20for%20the%20States.pdf> for a copy of “A Guide to State Implementation of ICD-10 for Mortality” part II, for instructions.

## How to Access CDC WONDER Data

- Go to <http://wonder.cdc.gov>.
- Under the heading “Deaths All Ages” click on “Underlying Cause of Death.”
- Click on either “1999-2020: Underlying Cause of Death by Bridged-Race Categories” ([Bridged-Race Population Estimates United States, 1990 - 2020 \(cdc.gov\)](#)), “2018-2020 Underlying Cause of Death by Single-Race Categories” ([Single-Race Population Estimates United States, 2010 - 2021 \(cdc.gov\)](#)), or “1968-2016: Compressed Mortality” (<https://wonder.cdc.gov/wonder/help/cmf.html>). *Note: The years of data available will change as more recent years of data are added to the CDC WONDER database.*

This page contains a tutorial for retrieving data from the CDC WONDER site. In this example, age-adjusted asthma death rates can be obtained by race for all persons for the period 1999–2020.

### Go to <https://wonder.cdc.gov>.

- At the Welcome to CDC WONDER screen, under the heading “Deaths All Ages” click on “Underlying Cause of Death”, then click on “1999-2020: Underlying Cause of Death by Bridged-Race Categories” and the data use agreement will appear.
- Agree to the data use agreement.
- “The Underlying Cause of Death 1999-2020 Request Deaths occurring through 2020” screen will appear.

**Use the following directions to complete steps 1-7 on the screen.**

### 1. Organize table layout

- **Select groupings:**  
Select how you would like to summarize your data. You may choose multiple groupings.
  - **Select measures:**  
Select the measures you would like to have summarized in the output. Default measures will automatically be checked (e.g. Deaths Population Crude Rate). Select age-adjusted rate.
  - **Additional rate options:**
  - **Calculates rates per:**  
Highlight 1,000,000
  - **Select standard population:**  
Highlight 2000 U.S. Standard Population
- Or**
- Non-standard Population:**

Leave unchecked (following the recommendations of the NCHS <https://www.cdc.gov/nchs/data/statnt/statnt20.pdf>)

## 2. Select location

- **Select state, Census region or HHS region:**  
Select the state to be queried from the list of states.
- **Select 2013 urbanization**  
Select “All Categories” or one of the categories listed

## 3. Select demographics

- **Select age, gender, Hispanic origin, and race:**  
Select the desired demographics of interest.
- **Select age ranges:**  
Age may be presented in “Ten-Year Age Groups,” “Five-Year Age Groups,” “Single-Year Age,” and “Infant Age Groups.”  
To select 0–18 years, click on “Single-Year Age” and in the box, highlight “<1 year”–“18 years.”
- **Select gender:**  
Leave set at “All.”
- **Select Hispanic Origin:**  
Leave set at “All.”
- **Select race:**  
Leave set at “All.”

## 4. Select year

- **Select years:**  
Highlight desired year(s).

## 5. Select weekday, autopsy, or place of death

- **Select weekday:**  
Leave set at “All weekdays.”
- **Select autopsy**  
Leave set at “All values.”
- **Select place of death:**  
Leave set at “All places.”

## 6. Select cause of death

- **To search for asthma ICD code ranges:**
- Click on “ICD-10 Cause List.” Scroll down and click on “Asthma (J45-J46).” In the box below, select “search.” In the box, type “asthma.” When the list appears, select J45–J46 (highlight the codes). Once all six are highlighted, they will appear in the box on the right.

## 7. Other Options

- **Select “Show Suppressed Values.”**

Click “Send.” The results of your query will appear in another window.

More detailed instructions and background for those who wish to query the compressed mortality data can be found at <https://wonder.cdc.gov/wonder/help/cmfd.html> or by clicking the link “Compressed Mortality data description” after selecting “Compressed Mortality” from the main landing page.

## Additional Queries

Additional queries can be generated by repeatedly modifying the indicators in various steps of the Underlying Cause of Death 1999–2020 Request Screen. By manipulating the region, age, gender, and race fields in the appropriate steps, the data set queried can be limited to conduct analyses *within* specific demographic, geographic, or temporal specifications. By manipulating the fields in step 7, crude or adjusted death rates can be compared *between* categories of age, race, gender, year, ICD-10 code, or county of residence.

## Analysis Standards

Standard demographic breakdowns may be used when analyzing asthma surveillance data. The applicability of these breakdowns to CDC WONDER UCD data is summarized below:

- **Age categories:** Rates can be calculated by age for single year, 5-year, 10-year, and infant age intervals for groups.
- **Gender categories:** Rates can be calculated separately for “Male” and “Female” categories.
- **Race categories:** Rates can be calculated separately for “White,” “Black,” and “Other” categories. The “Other” category includes American Indian or Alaska Native and Asian or Pacific Islander.
- **Hispanic origin:** Hispanic origin can also be identified. It can be combined with the race categories or it can be a mutually exclusive category.
- **Time trends:** Rates can be calculated by year if the cell size permits.
- **Geographic categories:** Rates can be calculated at the state and county level if the cell sizes permit. Age standardized rates should be used to compare geographic units.

**NOTE:** Small sample size can result in release or inferred release of confidential or sensitive information and can also affect reliability of rates. Please consider collapsing years or demographic groups, presenting confidence intervals, and/or suppressing rates and counts if the sample size of the numerator or the denominator is inadequate. In some cases, an aggregation of categories of data may be necessary to achieve the relative standard error of 23% that has been suggested to produce reliable rates (<https://www.cdc.gov/nchs/data/statnt/statnt24.pdf>). For example, if the event count is <20 in any particular year, we recommend combining years to achieve numerators  $\geq 20$  and/or estimating trends based on 3-year rolling averages (e.g., calculate a single rate for 1978–1980, then 1979–1981, etc.). To protect patient confidentiality, we recommend that counts <10 cases be suppressed.

### National Indicators

Mortality due to asthma is included in the HP2030 objectives. These objectives use deaths with an underlying cause of asthma (ICD-9 Code 493.x, where x = blank, 0, 1, 2, or 9; ICD-10 Code J45.x–J46.x where x = blank, 0, 1, 8, or 9) for the numerator and resident population from the U.S. Census for the denominator.

**HP2030 Objective RD-1:** Reduce asthma deaths to the following:

- 8.9/1,000,000

*National Comparison Data Source:* National Vital Statistics System (NVSS), CDC, NCHS.

## Anticipated Questions and Answers

**Q.** Shouldn't states use their own vital statistics data services instead of CDC WONDER?

**A.** The use of CDC WONDER will facilitate standardization and comparability of rates across states, as each state will make use of a common approach to age-adjustment, and they will use a common source of denominator data. However, states may want to produce asthma death rates using their own vital statistics data (e.g., to look at deaths for smaller geographic regions within their state). In these cases we encourage states to make use of July 1 state resident population estimates for each year (not including armed forces overseas) as denominators to maintain comparability of rates across states. These data can be downloaded from the U.S. Census Bureau website at <https://www.census.gov/programs-surveys/popest.html>.

**Q.** Is mortality a good indicator of the burden of asthma?

**A.** Publication of mortality data does not replace the need for estimation of asthma prevalence and healthcare utilization as indicators of disease burden.

**Q.** Are deaths that occur out of the state of residence linked back to that state?

**A.** Deaths are assigned to the decedent's state of residence as determined by the person completing the death certificate.

## Federal and State Contacts and Resources for UCD Mortality Data

### Centers for Disease Control and Prevention Contacts (CDC)

#### National Center for Environmental Health

#### Asthma and Community Health Branch

General number: (770) 488-3700

Current state asthma contacts: <https://www.cdc.gov/asthma/contacts/default.htm>

### CDC WONDER

General contact number: 1-800-496-8347

[cwus@cdc.gov](mailto:cwus@cdc.gov)

### National Center for Health Statistics

#### Division of Vital Statistics

General Number: 1-800-232-4636

## References

1. United States Public Health Service. *Vital Statistics of the United States, 1990. Vol. II: Mortality, Part A. Technical Appendix*. Washington, DC: US Government Printing Office; 1994. DHHS publication no. (PHS) 95-1101.
2. World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death: 9<sup>th</sup> rev.* Geneva. 1977.
3. World Health Organization. *International Statistical Classification of Diseases and Related Health Problems: 10<sup>th</sup> rev.* Geneva. 1992.
4. *Healthy People 2030* is available at <https://www.health.gov/healthypeople/>