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Special Features

US COPD SURVEILLANCE DATA

COPD Surveillance—United States, 1999-2011

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This report updates surveillance results for COPD in the United States. For 1999 to 2011, data from national data systems for adults aged ≥ 25 years were analyzed. In 2011, 6.5% of adults (approximately 13.7 million) reported having been diagnosed with COPD. From 1999 to 2011, the overall age-adjusted prevalence of having been diagnosed with COPD declined (*P* = .019). In 2010, there were 10.3 million (494.8 per 10,000) physician office visits, 1.5 million (72.0 per 10,000) ED visits, and 699,000 (32.2 per 10,000) hospital discharges for COPD. From 1999 to 2010, no significant overall trends were noted for physician office visits and ED visits; however, the age-adjusted hospital discharge rate for COPD declined significantly (*P* = .001). In 2010 there were 312,654 (11.2 per 1,000) Medicare hospital discharge claims submitted for COPD. Medicare claims (1999-2010) declined overall (*P* = .045), among men (*P* = .022) and among enrollees aged 65 to 74 years (*P* = .033). There were 133,575 deaths (63.1 per 100,000) from COPD in 2010. The overall age-adjusted death rate for COPD did not change during 1999 to 2010 (*P* = .163). Death rates (1999-2010) increased among adults aged 45 to 54 years (*P* < .001) and among American Indian/Alaska Natives (*P* = .008) but declined among those aged 55 to 64 years (*P* = .002) and 65 to 74 years (*P* < .001), Hispanics (*P* = .038), Asian/Pacific Islanders (*P* < .001), and men (*P* = .001). Geographic clustering of prevalence, Medicare hospitalizations, and deaths were observed. Declines in the age-adjusted prevalence, death rate in men, and hospitalizations for COPD since 1999 suggest progress in the prevention of COPD in the United States.

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Abbreviations: BRFSS = Behavioral Risk Factor Surveillance System; CDC = Centers for Disease Control and Prevention; CHC = Community Health Center; GOLD = Global Initiative for Chronic Obstructive Lung Disease; ICD-9-CM = *International Classification of Diseases, Ninth Revision, Clinical Modification*; ICD-10 = *International Classification of Diseases, 10th Revision*; NAMCS = National Ambulatory Medical Care Survey; NHAMCS = National Hospital Ambulatory Medical Care Survey; NHDS = National Hospital Discharge Survey; NHIS = National Health Interview Survey; NHLBI = National Heart, Lung, and Blood Institute; NVSS = National Vital Statistics System; PSU = primary sampling unit

COPD is a serious public health problem in the United States. In 2008, chronic lower respiratory diseases, of which COPD represents the principal component, became the third leading cause of mortality.[1] Because smoking is the dominant risk factor for COPD and contributed to about 80% of COPD deaths in 2000 to 2004,[2] much of this disease is potentially preventable. People with COPD experience worse health-related quality of life, more disabilities, and higher rates of comorbidities than people without COPD.[3-5] The direct economic cost attributable to COPD and asthma in 2008 has been estimated at $53.7 billion in the United States.[6] These costs

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include those for prescription medicines ($20.4 billion), outpatient or office-based providers ($13.2 billion), hospital inpatient stays ($13.1 billion), home health care ($4.0 billion), and ED visits ($3.1 billion).

COPD consists of chronic bronchitis, emphysema, and small airways disease. This common lung disease is characterized by inflammation and thickening of the mucosae of the airways, weakening or destruction of alveolar walls, and excess mucus production. These mechanical and physiologic changes lead to airflow limitation with limited reversibility. Patients affected by this disorder may be asymptomatic or experience cough, dyspnea, wheezing, and chest tightness. With progression of the disease, dyspnea worsens and oxygenation impairment develops. As the capacity of the lung continues to decline, patients may have increasing difficulty in performing activities of daily living. Although the clinical course of COPD is variable, it is progressive in many patients. Increasingly, research is examining the relationships between COPD and comorbid disease.[7,8]

The condition has a diverse etiology.[4,9] Although smoking is the chief cause of COPD in most populations, substantial proportions of COPD occur among nonsmokers.[10-12] Other important causes include indoor air pollution from burning of biomass, occupational exposures to a variety of dusts and smoke, asthma, and repeated respiratory infections. In addition, genetic causes, such as α_1-antitrypsin deficiency, can result in emphysema.

In 2002, the Centers for Disease Control and Prevention (CDC) released the initial surveillance report about COPD that contained surveillance data through the year 2000.[13] This report summarized data from national data systems regarding prevalence, physician outpatient visits, ED visits, hospitalizations, and mortality. Of note was that the age-adjusted mortality rate had increased from 1980 to 2000, especially in women. The current surveillance report seeks to characterize recent aspects of the burden of COPD by providing additional information from national datasets through 2011.

Materials and Methods

The following data sources were used to produce the estimates in this report: Behavioral Risk Factor Surveillance System (BRFSS) (2011), National Health Interview Survey (NHIS) (1999-2011), National Ambulatory Medical Care Survey (NAMCS) (1999-2010), National Hospital Ambulatory Medical Care Survey (NHAMCS) (1999-2010), National Hospital Discharge Survey (NHDS) (1999-2010), death certificate data from the National Vital Statistics System (NVSS) (1999-2010), and Medicare Part A hospital claims administrative data (1999-2010). We did not include data from the National Health and Nutrition Examination Survey in this report because data from NHIS has commonly been used to provide national estimates of the prevalence of COPD. Furthermore, prevalence estimates of obstructive impairment using recent National Health and Nutrition Examination Survey data have been published.[14] Except for Medicare hospital claims, the data presented in this report are limited to adults aged ≥ 25 years, to remain consistent with the prior surveillance report. Because all the data that were used in the analyses are freely available in the public domain, our study was exempt from human subject review.

Behavioral Risk Factor Surveillance System

BRFSS data from 2011 were used to estimate the state specific and US prevalence of COPD. An annual sample representing the noninstitutionalized US adult population aged ≥ 18 years in each state was selected by state health departments in collaboration with the CDC using a complex multistage sampling design.[15] Data from 475,616 respondents aged ≥ 25 years were analyzed for this report. The BRFSS is a random-digit-dialed telephone survey of landline and cellphone households, and one adult is selected for the telephone interview. The median survey response rate in 2011 for all states and the District of Columbia was 49.7% and ranged from 33.8% to 64.1%. The median cooperation rate (percentage of people who completed interviews among all eligible contacted people) was 74.2% and ranged from 52.7% to 84.3%. The following question was used to define COPD: "Have you ever been told by a doctor or other health professional that you have chronic obstructive pulmonary disease (COPD), emphysema, or bronchitis?" An affirmative response was defined as physician-diagnosed COPD. Demographic information was self-reported.

National Health Interview Survey

NHIS data from 1999 to 2011 were used to estimate the prevalence of COPD.[16] The NHIS is implemented annually by the National Center for Health Statistics, CDC. During each year, a sample representing the civilian, noninstitutionalized US population aged ≥ 18 years was selected by using a complex multistage sampling design that involves stratification, clustering, and oversampling. The universe of primary sampling units (PSUs) (single counties or groups of adjacent counties—or equivalent jurisdictions—or metropolitan area) is organized into strata from which a sample of PSUs representing areas is drawn. From substrata (census blocks or combined blocks) created in these selected PSUs, secondary sampling units are systematically selected. From each substratum, households with African American, Hispanic, and Asian (since 2006) were oversampled, and a sample of all other households was selected. Only one randomly selected adult per family was asked to participate in the Sample Adult questionnaire. Participants were visited in their homes, where US Census Bureau interviewers conducted a computer-assisted personal interview with the participants. The number of adult participants and the response rates of the surveys are summarized in e-Table 1. Data from adult respondents aged ≥ 25 years were analyzed for this report. The following two questions were used to define COPD: "Have you ever been told by a doctor or other health professional that you had emphysema?" and "During the past 12 months, have you been told by a doctor or other health professional that you had chronic bronchitis?" An affirmative response to one or both of these questions was defined as physician-diagnosed COPD for this report. Demographic information was self-reported.

National Ambulatory Medical Care Survey

NAMCS data from 1999 to 2010 were used to estimate the annual number of physician office visits with the first-listed diagnosis of COPD.[17] The NAMCS is an annual, national probability sample survey of ambulatory visits to nonfederally employed office-based physicians conducted by the National Center for

Table 1—*Estimated Number and Prevalence of Self-Reported, Physician-Diagnosed COPD (Ever COPD, Chronic Bronchitis, or Emphysema) Among Adults Aged ≥25 Years, by Race, Sex, and Age Group—United States, Behavioral Risk Factor Surveillance System, 2011*

Characteristics	Estimated No.[a]	Age-Adjusted,[b,c] %	Unadjusted, %[c]
Race/ethnicity			
White, non-Hispanic	10,460,000	6.9	7.6
Black, non-Hispanic	1,418,000	6.5	6.4
Hispanic	1,030,000	4.1	3.6
Asian/Pacific Islander	173,000	2.5	2.2
American Indian/Alaska Native	247,000	11.0	11.5
Other, non-Hispanic	397,000	11.2	11.3
Sex			
Women	8,197,000	7.3	7.8
Men	5,681,000	5.7	5.8
Age group, y			
25-44	2,755,000	…	3.4
45-54	2,913,000	…	6.6
55-64	3,263,000	…	9.2
65-74	2,719,000	…	12.1
≥75	2,227,000	…	11.6
Total	13,724,000	6.5	6.8

[a]Numbers for each variable may not add to total because of rounding.
[b]Age-adjusted to the 2000 US standard population aged ≥25 y.
[c]All relative SEs are ≤30%.

Table 2—*Estimated Number and Prevalence of Self-Reported, Physician-Diagnosed COPD (Ever COPD, Chronic Bronchitis, or Emphysema) Among Adults Aged ≥25 Years, By State—United States, Behavioral Risk Factor Surveillance System, 2011*

State	Estimated No.[a]	Age-Adjusted,[b,c] %	Unadjusted, %[c]
Alabama	330,000	9.9	10.4
Alaska	24,000	6.1	5.5
Arizona	253,000	5.8	6.1
Arkansas	171,000	8.1	8.9
California	1,073,000	4.7	4.9
Colorado	167,000	5.1	5.0
Connecticut	155,000	6.1	6.5
Delaware	35,000	5.4	5.8
District of Columbia	20,000	5.0	4.9
Florida	1,086,000	7.5	8.4
Georgia	462,000	7.4	7.4
Hawaii	43,000	4.5	4.7
Idaho	58,000	5.7	5.9
Illinois	549,000	6.4	6.6
Indiana	390,000	8.9	9.3
Iowa	109,000	5.0	5.5
Kansas	134,000	6.9	7.3
Kentucky	306,000	10.1	10.6
Louisiana	213,000	7.0	7.3
Maine	79,000	7.5	8.5
Maryland	239,000	6.1	6.2
Massachusetts	283,000	6.0	6.4
Michigan	574,000	8.2	8.8
Minnesota	148,000	4.1	4.2
Mississippi	170,000	8.6	9.0
Missouri	353,000	8.3	8.9
Montana	44,000	6.0	6.6
Nebraska	65,000	5.2	5.5
Nevada	143,000	7.9	8.1
New Hampshire	61,000	6.4	6.9
New Jersey	329,000	5.3	5.6
New Mexico	92,000	6.5	6.9
New York	822,000	6.0	6.3
North Carolina	458,000	6.9	7.3
North Dakota	21,000	4.5	5.0
Ohio	646,000	7.9	8.4
Oklahoma	225,000	8.6	9.3
Oregon	168,000	5.9	6.5
Pennsylvania	626,000	6.7	7.3
Rhode Island	49,000	6.5	7.0
South Carolina	252,000	7.7	8.2
South Dakota	31,000	5.2	5.9
Tennessee	391,000	8.6	9.2
Texas	928,000	6.0	5.9
Utah	68,000	4.4	4.3
Vermont	24,000	4.9	5.6
Virginia	363,000	6.6	6.8
Washington	205,000	4.4	4.5
West Virginia	124,000	8.8	9.7
Wisconsin	219,000	5.4	5.8
Wyoming	25,000	6.2	6.7
Total	13,724,000	6.5	6.8

[a]Numbers may not add to total because of rounding.
[b]Age-adjusted to the 2000 US standard population aged ≥25 y.
[c]All relative SEs are ≤30%.

Health Statistics, CDC. Beginning in 2006, visits to Community Health Centers (CHCs) were also included. NAMCS used a multistage design that involved probability samples of PSUs, physicians within PSUs, and patient visits within practices. The first-stage sample included 112 PSUs. In each sample PSU, a probability sample of practicing nonfederal office-based physicians was selected from master files maintained by the American Medical Association and American Osteopathic Association. The final stage involved systematic random samples of office visits during randomly assigned 7-day reporting periods. Starting in 2006, a dual-sampling procedure was used to select CHC physicians and other providers. First, the traditional NAMCS sample was selected using the methods described previously. Second, information from the Health Resources and Services Administration and the Indian Health Service was used to select a sample of CHCs. Within CHCs, a maximum of three health-care providers were selected, including physicians, physician assistants, nurse practitioners, or nurse midwives. After selection, CHC providers followed traditional NAMCS methods for selecting patient visits. The physician-patient encounter or visit represents the basic sampling unit in NAMCS.

Data are collected by the physician or the physician's staff or by US Census Bureau field representatives. Information concerning race and ethnicity was based on the physician's knowledge of the patient or on the physician's or assistant's judgment rather than the patient self-report. The number of physician office visits and the physicians' response rates are shown in e-Table 2. Because the percent of office visit medical records that were missing race information ranged from 16.9% to 32.8% (e-Table 2), we used

FIGURE 1. Age-adjusted prevalence (%) of self-reported physician-diagnosed COPD among adults aged ≥ 25 years, by state—United States, Behavioral Risk Factor Surveillance System, 2011.

information for race (whites and blacks only) that was imputed by the National Center for Health Statistics.

Three visit diagnosis fields were available to participating physicians. A diagnosis of COPD was established from the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes 490 (bronchitis not specified as acute or chronic), 491 (chronic bronchitis), 492 (emphysema), or 496 (chronic airway obstruction, not elsewhere classified, which includes COPD) for the first-listed diagnosis. Rates for office visits were calculated using US civilian population estimates provided in the data file documentation for each year (e-Table 3). SEs were produced with statistical software.

National Hospital Ambulatory Medical Care Survey

NHAMCS data for the years 1999 to 2010 were used to estimate the number of ED visits for COPD.[17] The NHAMCS is an annual, national probability sample survey of ambulatory visits made to nonfederal, general, short-stay hospitals in the US conducted by the National Center for Health Statistics, CDC. NHAMCS uses a multistage probability design with samples of PSUs, hospitals within PSUs, EDs plus clinics within outpatient departments, and patient visits within EDs and outpatient clinics. Sample hospitals are randomly assigned to 16 panels that rotate across 13 4-week reporting periods throughout the year. The initial sample frame of hospitals was based on the 1991 SMG hospital database now maintained by IMS Health Incorporated. Hospital staff or US Census Bureau field representatives performed data collection for NHAMCS. The annual number of patient record forms submitted by EDs is shown in e-Table 4.

The NHAMCS files contained three visit diagnosis fields. An ICD-9-CM code of 490-492 or 496 for the first-listed diagnosis was defined as an ED visit for COPD. Because the percentage of ED records that were missing race information ranged from 10.4% to 15.3% (e-Table 4), we used information for race (whites and blacks only) that was imputed by the National Center for Health Statistics. The US civilian population estimates that we used to calculate rates of ED visits were obtained from the data file documentation for each year (e-Table 3). SEs were produced with statistical software.

National Hospital Discharge Survey

NHDS data from 1999 to 2010 were used to estimate the annual number of hospital discharges for COPD.[18] NHDS is an annual survey of inpatient discharges from nonfederal, short-stay hospitals in the US conducted from 1965 to 2010 by the National Center for Health Statistics, CDC. Using the SMG Hospital Market

Table 3—*Estimated Annual Number of Adults Aged ≥ 25 Years With Self-Reported Physician-Diagnosed COPD (Lifetime Emphysema or Chronic Bronchitis During the Preceding 12 Months), by Race/Ethnicity, Sex, and Age Group—United States, National Health Interview Survey, 1999-2011*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Race													
White, non-Hispanic	8,193,000	8,792,000	10,034,000	8,449,000	8,050,000	8,792,000	8,751,000	9,105,000	7,789,000	9,275,000	9,902,000	9,153,000	9,038,000
Black, non-Hispanic	773,000	969,000	1,177,000	1,127,000	958,000	937,000	1,049,000	1,149,000	889,000	1,036,000	1,178,000	1,227,000	1,433,000
Hispanic	512,000	573,000	655,000	621,000	601,000	693,000	655,000	679,000	683,000	655,000	910,000	927,000	987,000
Other, non-Hispanic	224,000	182,000	273,000	253,000	214,000	261,000	236,000	376,000	285,000	324,000	347,000	323,000	441,000
Sex													
Women	6,126,000	6,717,000	7,550,000	6,514,000	6,168,000	6,750,000	6,677,000	6,891,000	5,849,000	7,266,000	7,682,000	7,066,000	7,658,000
Men	3,576,000	3,798,000	4,588,000	3,936,000	3,655,000	3,934,000	4,013,000	4,419,000	3,796,000	4,024,000	4,655,000	4,564,000	4,241,000
Age group, y													
25-44	3,087,000	3,157,000	3,899,000	3,129,000	2,526,000	2,987,000	2,868,000	2,552,000	2,159,000	2,795,000	2,597,000	2,699,000	2,560,000
45-54	1,811,000	2,184,000	2,671,000	2,311,000	1,964,000	2,294,000	2,274,000	2,461,000	2,039,000	2,703,000	2,773,000	2,383,000	2,430,000
55-64	1,725,000	1,879,000	2,135,000	2,014,000	2,126,000	2,043,000	2,199,000	2,747,000	2,351,000	2,330,000	2,937,000	2,740,000	3,053,000
65-74	1,639,000	1,721,000	1,773,000	1,678,000	1,791,000	1,702,000	1,845,000	1,703,000	1,624,000	1,902,000	2,120,000	2,018,000	2,253,000
≥ 75	1,439,000	1,573,000	1,661,000	1,318,000	1,414,000	1,658,000	1,504,000	1,847,000	1,473,000	1,560,000	1,910,000	1,790,000	1,604,000
Total	9,702,000	10,515,000	12,138,000	10,450,000	9,822,000	10,683,000	10,690,000	11,310,000	9,646,000	11,290,000	12,337,000	11,630,000	11,899,000

Numbers for each variable may not add to total because of rounding.

Table 4—*Estimated Annual Prevalence of Self-Reported Physician-Diagnosed COPD (Lifetime Emphysema or Chronic Bronchitis During the Preceding 12 Months) Among Adults Aged ≥ 25 Years, by Race/Ethnicity, Sex, and Age Group—United States, National Health Interview Survey, 1999-2011*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	*P* for Linear Trend
Race[a]														
White, non-Hispanic	6.1	6.6	7.5	6.2	5.7	6.3	6.1	6.3	5.4	6.4	6.7	6.1	6.0	.130
Black, non-Hispanic	4.3	5.4	6.3	6.0	5.0	4.8	5.2	5.4	4.2	4.6	5.3	5.5	6.2	.443
Hispanic	3.6	3.9	4.3	3.7	3.6	3.9	3.3	3.5	3.3	3.1	4.1	3.9	4.3	.805
Other, non-Hispanic	4.0	2.8	3.9	3.2	3.3	3.6	2.9	4.1	2.9	3.1	3.4	3.1	3.9	.626
Sex[a]														
Women	6.7	7.3	8.1	6.9	6.3	6.8	6.6	6.7	5.6	6.9	7.1	6.5	7.0	.136
Men	4.6	4.8	5.6	4.8	4.3	4.5	4.6	4.9	4.1	4.3	4.9	4.7	4.3	.063
Age group, y														
25-44	3.7	3.9	4.8	3.9	3.1	3.6	3.5	3.1	2.6	3.4	3.2	3.3	3.2	< .001
45-54	5.1	5.9	7.0	5.9	4.9	5.6	5.4	5.7	4.7	6.2	6.3	5.4	5.6	.655
55-64	7.5	8.0	8.8	7.9	7.7	7.1	7.3	8.8	7.2	7.0	8.4	7.7	8.2	.929
65-74	9.2	9.6	10.0	9.5	9.9	9.3	10.0	8.9	8.4	9.6	10.3	9.5	10.3	.566
≥ 75	9.8	10.6	11.0	8.6	8.8	10.2	9.1	11.1	8.7	9.0	11.1	10.3	9.0	.679
Total[a]	5.7	6.1	6.9	5.9	5.3	5.7	5.6	5.8	4.9	5.6	6.0	5.7	5.7	.019
Total[b]	5.6	6.0	6.9	5.9	5.3	5.7	5.6	5.9	5.0	5.8	6.2	5.8	5.9	.372

Annual prevalence per 100 population. All relative SEs are ≤ 30%.
[a]Age-adjusted to the 2000 US standard population aged ≥ 25 y.
[b]Unadjusted prevalence.

Data File or its successors as the sampling frame, the NHDS samples inpatient discharges from nonfederal, general, short-stay hospitals located in the 50 states and the District of Columbia. A three-stage design has been used since 1988. Units selected at the first stage of sampling consisted of either hospitals or geographic areas, such as counties, groups of counties, or metropolitan statistical areas in the 50 states and the District of Columbia. Within sampled geographic areas, additional hospitals were selected. Finally, at the last stage, discharges were selected within the sampled hospitals using systematic random sampling. Data collection was performed with manual and automated systems. The annual number of sampled records and hospital response rates are provided in e-Table 5.

Using the first-listed diagnosis, hospital discharges for COPD were identified by using the ICD-9-CM codes 490-492 or 496 as the first-listed diagnosis or ICD-9-CM code 466-466.1 (acute bronchitis) if the first-listed diagnosis of acute bronchitis was accompanied by another listed diagnosis of COPD (490-492 or 496). The percent of hospital records missing race information ranged from 16.0% to 31.0% (e-Table 5). US civilian population estimates used to calculate hospital discharge rates were obtained from the NHDS data documentation (e-Table 6). Relative SEs were calculated from the following formula: $RSE(X) = (a + b/X)^{1/2}$, where a and b represent coefficients provided in the data documentation, and X represents the number of discharges.

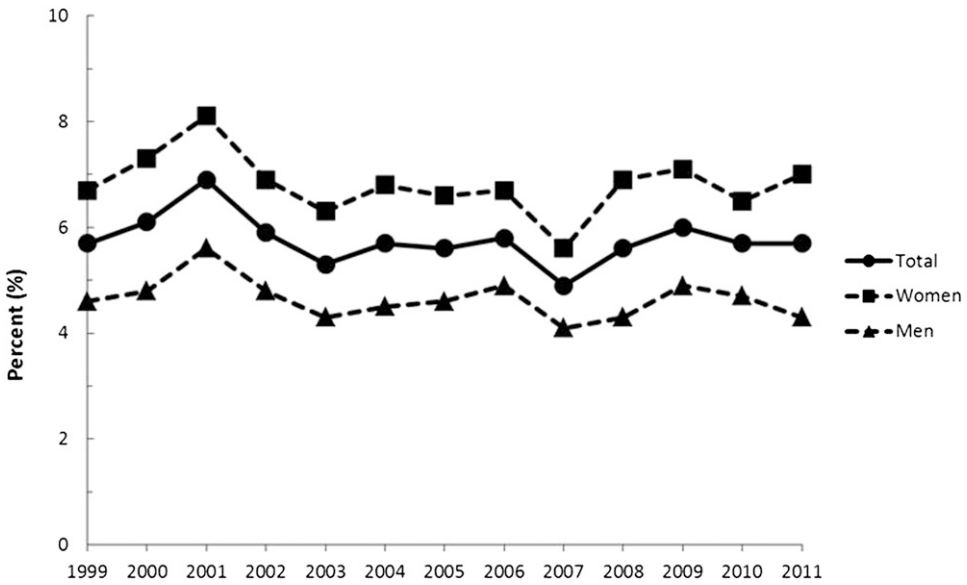

FIGURE 2. Age-adjusted prevalence (%) of self-reported physician-diagnosed COPD among adults aged ≥ 25 years, by sex and year—United States, National Health Interview Survey, 1999-2011.

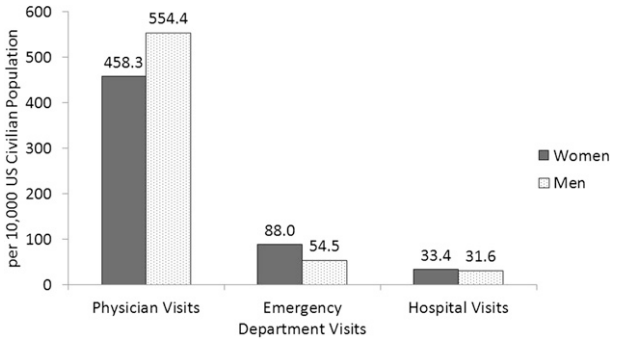

FIGURE 3. Sex-specific age-adjusted rates (per 10,000 US civilian population) of physician office visits, ED visits, and hospital visits for COPD as the first-listed diagnosis among adults aged ≥ 25 years—United States, National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, National Hospital Discharge Survey, 2010.

Medicare Part A Hospital Claims

Medicare data from 1999 to 2010 were used to estimate the annual number of hospital discharges for COPD among Medicare enrollees aged ≥ 65 years. Hospitalization information from 100% of Medicare Part A hospital claims data were obtained from an administrative claims dataset maintained by the Centers for Medicare and Medicaid Services. Information was limited to approximately 10 million annual claims submitted for short-term fee-for-service hospital stays among Medicare enrollees aged ≥ 65 years residing in one of the 50 states or the District of Columbia in a given year. A hospital discharge for COPD was defined for a first-listed discharge diagnosis with ICD-9-CM codes 490-492 or 496—about 3% of annual Medicare claims. Few Medicare claims (< 0.05%) were submitted for acute bronchitis (ICD-9-CM code 466-466.1) with concomitant COPD; therefore, we did not include these discharges in our analyses. Race/ethnicity information on the claims data for Medicare enrollees represents information provided by most Medicare enrollees at the time of enrollment into the Medicare system or is information updated for older enrollees. Less than 0.5% of COPD claims were missing race information. State of residence was also obtained from the claims data. Medicare enrollment records were obtained from the Centers for Medicare and Medicaid Services and were used as the denominator file to calculate hospital rates after restricting the denominator to Medicare enrollees who met all the following

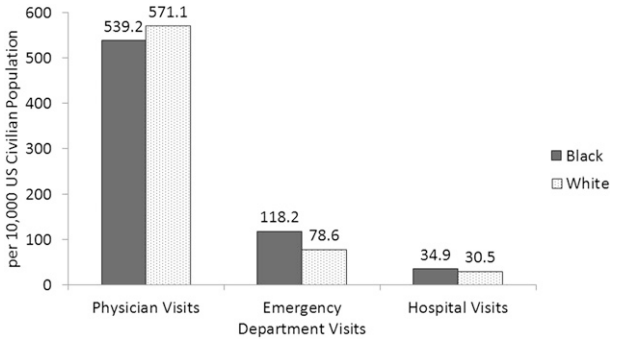

FIGURE 4. Race-specific age-adjusted rates (per 10,000 US civilian population) of physician office visits, ED visits, and hospital visits for COPD as the first-listed diagnosis among adults aged ≥ 25 years—United States, National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, National Hospital Discharge Survey, 2009-2010.

Table 5—*Estimated Annual Number of Physician Office Visits for COPD as the First-Listed Diagnosis Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, National Ambulatory Medical Care Survey, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Race[a]												
White	9,138,000	6,996,000	9,907,000	13,800,000	10,485,000	10,034,000	12,684,000	11,236,000	8,853,000	9,009,000	11,434,000	8,527,000
Black	…	…	…	…	…	…	…	…	…	…	…	…
Sex												
Women	6,080,000	4,041,000	6,260,000	9,391,000	6,667,000	6,878,000	6,405,000	6,929,000	6,099,000	5,947,000	8,001,000	5,210,000
Men	4,275,000	3,956,000	4,483,000	5,697,000	5,672,000	4,606,000	6,667,000	6,016,000	4,488,000	3,663,000	4,940,000	5,081,000
Age group, y												
25-44	1,784,000	1,446,000	1,850,000	3,022,000	2,709,000	2,126,000	2,106,000	1,301,000	1,913,000	1,902,000	1,649,000	…
45-54	1,295,000	…	…	1,970,000	2,405,000	1,599,000	…	1,758,000	1,409,000	1,005,000	2,158,000	…
55-64	2,276,000	…	…	2,538,000	1,704,000	2,440,000	2,415,000	3,171,000	1,919,000	2,077,000	3,024,000	2,153,000
65-74	2,854,000	2,175,000	2,563,000	3,878,000	2,871,000	2,499,000	3,349,000	3,418,000	3,191,000	1,895,000	2,303,000	3,191,000
≥ 75	2,147,000	2,084,000	2,920,000	3,680,000	2,649,000	2,820,000	3,522,000	3,298,000	2,154,000	2,730,000	3,808,000	3,431,000
Total	10,355,000	7,997,000	10,743,000	15,087,000	12,339,000	11,484,000	13,072,000	12,945,000	10,586,000	9,609,000	12,941,000	10,291,000

Numbers for each variable may not add to total because of rounding. COPD includes ICD-9-CM codes 490-492 or 496. Ellipses indicate unreliable estimate (relative SE > 30% and/or number of records < 30). ICD-9-CM = *International Classification of Diseases, Ninth Revision, Clinical Modification*.

[a]Data not available for other specific race groups.

criteria on July 1 of any given year (alive, aged ≥ 65 years, entitled to Part A benefits, residing in one of the 50 states or the District of Columbia, and not enrolled in a managed care plan).

National Vital Statistics System

The number of deaths with COPD as the underlying cause for the years 1999 to 2010 come from the NVSS and are made available from CDC's WONDER system (Compressed Mortality File).[19] This interactive Web-based tool allows queries to obtain numbers of death for underlying causes, crude death rates, age-adjusted death rates, 95% CIs, and SEs for groups defined by various characteristics including year, place of residence (state, county, region, or division), sex, age group, race, and Hispanic origin.[20] Data from the NVSS are based on information from all resident death certificates filed in the 50 States and the District of Columbia. Cause-of-death statistics presented in this report are classified in accordance with the *International Classification of Diseases, Tenth Revision* (ICD-10). ICD-10 codes J40-J44 were used to identify deaths from COPD as the underlying cause of death. These causes include chronic bronchitis (J40-J42), emphysema (J43), and other COPD (J44).

Mortality rates were calculated by using population estimates produced by the Bureau of the Census in collaboration with the National Center for Health Statistics.[20] The 1999 population estimates are US Census Bureau bridged-race intercensal estimates of the July 1 resident population, based on the 1990 census and the bridged-race 2000 census. The 2000 and 2010 population estimates are April 1 modified 2000 and 2010 census counts with bridged-race categories, whereas the 2001 to 2009 population estimates are bridged-race intercensal estimates of July 1 resident populations, based on the year 2000 and the year 2010 census counts (released by CDC on October 26, 2012). Age-adjusted death rates for 2001 to 2009 may vary from previous reports because of the 2012 revision of the 2001 to 2009 population denominator estimates.

Data Analysis

SAS-callable SUDAAN (Research Triangle Institute) was used to obtain weighted US estimates and prevalence from NHIS and state-specific and US estimates and prevalence from BRFSS. SAS or SAS-callable SUDAAN analyses for data from NAMCS, NHAMCS, and NHDS were weighted to obtain national US estimates. SAS was also used to obtain the number of COPD hospital discharges from Medicare hospital claims. The reported numbers of deaths, age-specific death rates, and age-adjusted death rates from COPD were obtained from CDC WONDER.[19] Estimates were produced for all adults aged ≥ 25 years as well as for groups defined by age (25-44, 45-54, 55-64, 65-74, and ≥ 75 years), sex, and race/ethnicity. Racial/ethnic categories varied between surveillance systems because of differences in Medicare definitions of race/ethnicity categories; absence of racial/ethnic information on many medical records abstracted for NAMCS, NHAMCS, and NHDS; or small numbers of NHIS respondents in some racial/ethnic categories in the population samples selected. Except for Medicare estimates, age-adjusted estimates were standardized to the 2000 standard US population aged ≥ 25 years using the direct method.[21] Medicare estimates were age-standardized to the 2000 standard US population aged ≥ 65 years. Because of the well-known relationship between age and COPD and because of the aging of the US population, we calculated age-adjusted estimates of prevalence and rates. State-specific age-adjusted estimates for BRFSS prevalence, Medicare hospitalizations, and mortality for COPD were also obtained to examine geographic clustering of COPD burden.

The statistical significance of temporal trends for age-specific prevalence of COPD in NHIS was examined by using log-linear regression analysis with time as the independent variable; analyses for trends in the age-adjusted prevalence included age as a continuous variable. The statistical significance for linear trends in age-specific and age-adjusted rates of physician-office visits, ED visits, NHDS and Medicare hospitalizations, and mortality was examined using weighted least-squares regression, where the weights were the inverse of the squared SE.

Results

Prevalence (BRFSS Telephone Survey)

After age adjustment, 6.5% of US adults (unadjusted prevalence, 6.8%) representing 13.7 million noninstitutionalized adults aged ≥ 25 years in 2011

Table 6—*Estimated Annual Rate of Physician Office Visits for COPD as the First-Listed Diagnosis Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, National Ambulatory Medical Care Survey, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Race[a,b]													
White	623.4	473.1	651.0	897.2	676.1	633.4	791.7	679.1	541.6	537.4	661.1	481.0	.585
Black	…	…	…	…	…	…	…	…	…	…	…	…	…
Sex[a]													
Women	660.2	432.4	647.4	955.5	678.8	679.0	622.1	656.2	587.7	557.3	726.3	458.3	.725
Men	572.0	519.5	583.3	714.6	701.4	547.5	789.3	688.6	515.6	410.5	525.4	554.4	.233
Age group, y													
25-44	216.2	176.3	223.0	364.8	329.5	258.9	256.8	158.5	234.2	234.0	203.8	…	.082
45-54	363.7	…	…	495.5	594.3	387.3	…	409.5	323.7	228.4	488.0	…	.033
55-64	987.5	…	…	960.0	614.4	843.8	799.8	1,009.1	589.7	619.7	873.5	600.7	.826
65-74	1,603.7	1,224.9	1,417.7	2,150.8	1,586.8	1,371.6	1,820.3	1,830.4	1,670.3	953.4	1,120.6	1,505.7	.264
≥ 75	1,464.0	1,393.7	1,867.6	2,309.7	1,636.7	1,716.1	2,102.2	1,946.0	1,257.2	1,573.2	2,189.8	1,936.1	.380
Total[a]	609.2	466.6	604.8	836.2	673.5	614.2	691.6	663.1	543.0	483.3	632.3	494.8	.541
Total[c]	596.4	456.2	594.5	824.5	668.0	614.2	689.9	674.1	545.8	490.1	654.6	516.1	.848

Annual rate per 10,000 US civilian population. COPD includes ICD-9-CM codes 490-492 or 496. Ellipses indicate unreliable estimate (relative SE > 30% and/or number of records < 30). See Table 5 legend for expansion of abbreviation.

[a]Age-adjusted to the 2000 US standard population aged ≥ 25 y.

[b]Data not available for other specific race groups.

[c]Unadjusted rate.

were estimated to have a self-reported physician diagnosis of COPD based on a telephone survey (Table 1). The age-adjusted prevalence displayed a strong age gradient, and the age-adjusted prevalence was higher in women (7.3%) than in men (5.7%) and higher in American Indian/Alaska Natives (11.0%) than in non-Hispanic whites (6.9%), non-Hispanic blacks (6.5%), Hispanics (4.1%), and Asian/Pacific Islanders (2.5%). The age-adjusted prevalence varied between states (Table 2). The highest age-adjusted prevalence of COPD in 2011 was clustered in the southern states and along the Ohio River Valley (Fig 1).

Prevalence (NHIS Interview Survey)

During the period from 1999 to 2011, the estimated numbers (Table 3) and age-adjusted prevalence of COPD (Table 4) fluctuated. Prevalence increased among successive age groups up to age 65 years and older, and the age-adjusted prevalence was usually higher among non-Hispanic whites compared with non-Hispanic blacks or Hispanics. The annual age-adjusted prevalence was higher in women than in men (Fig 2). The highest age-adjusted prevalence for both men and women was observed in 2001. Despite substantial interyear variation in age-adjusted prevalence estimates, significant tests for linear trend suggested declines during 1999 to 2011 in the age-adjusted prevalence among all adults ($P = .019$) and adults aged 25 to 44 years ($P < .001$).

Physician Office Visits (NAMCS)

In 2010, there were an estimated 10.3 million (unadjusted, 516.1 per 10,000 US civilian population; age-adjusted, 494.8 per 10,000 US civilian population) physician office visits with a first-listed diagnosis of COPD among adults aged ≥ 25 years. The age-adjusted rate of office visits for COPD was higher among men than women in 2010 (Fig 3) and higher among whites than blacks during 2009 to 2010 (Fig 4). There was considerable temporal variability in the estimated number of physician-based office visits (Table 5). As expected for a chronic disease, age-specific rates for office visits for COPD increased substantially within each given year (Table 6), and age-specific rates declined during 1999 to 2010 among those aged 45 to 54 years ($P = .033$). No clear time trend was evident for age-adjusted rates among any group defined by sex or race (Table 6).

ED Visits (NHAMCS)

In 2010, there were an estimated 1.5 million (unadjusted rate, 73.6 per 10,000 US civilian population; age-adjusted rate, 72.0 per 10,000 US civilian population) ED visits with a first-listed diagnosis of

Table 7—*Estimated Annual Numbers of ED Visits for COPD as the First-Listed Diagnosis Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, National Hospital Ambulatory Medical Care Survey, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Race[a]												
White	1,205,000	1,278,000	1,039,000	1,046,000	1,230,000	957,000	1,112,000	973,000	1,067,000	1,295,000	1,452,000	1,179,000
Black	285,000	243,000	226,000	229,000	273,000	172,000	342,000	327,000	207,000	265,000	272,000	253,000
Sex												
Women	802,000	898,000	717,000	769,000	907,000	619,000	841,000	729,000	842,000	861,000	1,029,000	945,000
Men	730,000	651,000	582,000	523,000	648,000	528,000	647,000	587,000	455,000	726,000	734,000	523,000
Age group, y												
25-44	448,000	481,000	488,000	418,000	372,000	356,000	492,000	314,000	397,000	358,000	446,000	388,000
45-54	270,000	194,000	193,000	183,000	294,000	151,000	215,000	293,000	255,000	277,000	297,000	284,000
55-64	269,000	315,000	197,000	226,000	256,000	184,000	268,000	254,000	212,000	321,000	293,000	290,000
65-74	233,000	267,000	207,000	219,000	317,000	253,000	201,000	251,000	234,000	321,000	388,000	286,000
≥ 75	312,000	292,000	212,000	246,000	315,000	202,000	311,000	204,000	198,000	311,000	340,000	221,000
Total	1,532,000	1,549,000	1,299,000	1,292,000	1,555,000	1,147,000	1,488,000	1,316,000	1,297,000	1,588,000	1,763,000	1,468,000

Annual rate per 10,000 US civilian population. COPD includes ICD-9-CM codes 490-492 or 496. See Table 5 legend for expansion of abbreviation.

[a]Data not available for other specific race groups.

Table 8—*Estimated Annual Rate of ED Visits for COPD as the First-Listed Diagnosis Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, National Hospital Ambulatory Medical Care Survey, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Race[a,b]													
White	82.7	86.7	69.0	68.4	78.9	61.4	70.6	60.4	66.0	77.8	86.9	70.6	.541
Black	160.8	133.0	120.8	120.0	143.4	87.7	166.9	153.2	94.4	121.1	123.4	112.6	.411
Sex[a]													
Women	87.7	96.9	75.0	79.0	91.5	62.5	83.5	71.3	82.1	82.4	97.9	88.0	.769
Men	95.2	82.4	70.4	62.4	77.0	62.5	74.3	64.9	49.1	78.4	79.3	54.5	.072
Age group, y													
25-44	54.3	58.6	58.9	50.4	45.2	43.4	60.0	38.2	48.7	44.1	55.0	48.2	.166
45-54	75.8	52.5	49.7	46.0	72.5	36.5	51.1	68.2	58.7	62.8	67.1	64.4	.281
55-64	116.8	133.5	78.4	85.4	92.4	63.8	88.8	80.9	65.1	95.8	84.7	80.8	.478
65-74	130.9	150.3	114.7	121.6	175.4	139.1	109.2	134.7	122.2	161.3	188.6	135.0	.505
≥ 75	212.9	195.2	135.8	154.6	194.9	123.0	185.8	120.4	115.8	179.2	195.5	124.5	.142
Total[a]	89.8	89.6	72.5	71.2	84.6	61.9	78.8	67.8	66.8	79.5	88.3	72.0	.432
Total[c]	88.3	88.4	71.9	70.6	84.2	61.3	78.5	68.5	66.9	81.0	89.2	73.6	.428

Annual rate per 10,000 US civilian population. COPD includes ICD-9-CM codes 490-492 or 496. All relative SEs are ≤ 30%. See Table 5 legend for expansion of abbreviation.

[a]Age-adjusted to the 2000 US standard population aged ≥ 25 y.

[b]Data not available for other specific race groups.

[c]Unadjusted rate.

COPD among adults aged ≥ 25 years. The age-adjusted rate of ED visits for COPD was higher among women than men in 2010 (Fig 3) and among blacks than whites during 2009 to 2010 (Fig 4). The estimated annual number of ED visits for COPD fluctuated (Table 7). There was a considerable increase each year in age-specific rates for ED visits with advancing age up to ages 65 years and older (Table 8), but there were no significant temporal trends during 1999 to 2010 in age-specific and age-adjusted rates for any group defined by age, race, or sex.

Hospitalizations (NHDS)

In 2010, there were an estimated 699,000 hospitalizations (unadjusted rate, 34.4 per 10,000 US civilian population; age-adjusted rate, 32.2 per 10,000 US civilian population) for COPD as the first-listed diagnosis among adults aged ≥ 25 years. Age-adjusted rates of hospitalizations for COPD varied little between men and women in 2010 (Fig 3) or between blacks and whites during 2009 to 2010 (Fig 4). The annual number of hospitalizations for COPD fluctuated between 1999 and 2010 (Table 9). The age-specific hospital rates for COPD increased with advancing age each year (Fig 5), and there was a decline in age-specific rates during 1999 to 2010 among adults aged 25 to 44 years ($P = .039$), adults aged 55 to 64 years ($P = .001$), adults aged 65 to 74 years ($P = .005$), and adults aged ≥ 75 years ($P = .018$) (Table 10). Declining trends for age-adjusted rates for COPD hospitalization during 1999 to 2010 were observed among all adults

Table 9—*Estimated Annual Number of Hospitalizations for COPD as the First-Listed Discharge Diagnosis Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, National Hospital Discharge Survey, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Race[a]												
White	500,000	441,000	457,000	462,000	460,000	429,000	505,000	452,000	440,000	493,000	573,000	543,000
Black	59,000	47,000	54,000	53,000	49,000	45,000	50,000	55,000	52,000	59,000	62,000	80,000
Sex												
Women	402,000	350,000	362,000	368,000	369,000	336,000	387,000	344,000	345,000	414,000	416,000	398,000
Men	300,000	297,000	288,000	293,000	304,000	291,000	324,000	312,000	294,000	296,000	312,000	301,000
Age group, y												
25-44	28,000	28,000	21,000	27,000	24,000	19,000	21,000	23,000	25,000	20,000	18,000	17,000
45-54	59,000	64,000	62,000	66,000	70,000	72,000	81,000	72,000	75,000	75,000	86,000	81,000
55-64	134,000	129,000	115,000	132,000	128,000	123,000	145,000	133,000	126,000	138,000	150,000	145,000
65-74	219,000	188,000	190,000	200,000	189,000	173,000	193,000	183,000	179,000	193,000	211,000	205,000
≥ 75	261,000	239,000	263,000	236,000	263,000	241,000	271,000	245,000	234,000	284,000	262,000	251,000
Total	702,000	647,000	650,000	662,000	673,000	628,000	711,000	657,000	639,000	710,000	728,000	699,000

Numbers for each variable may not add to total because of rounding. COPD includes ICD-9-CM codes 490-492 or 496. See Table 5 legend for expansion of abbreviation.

[a]Data not available for other specific race groups. Race was not imputed. Percent missing data for race are shown in e-Table 5.

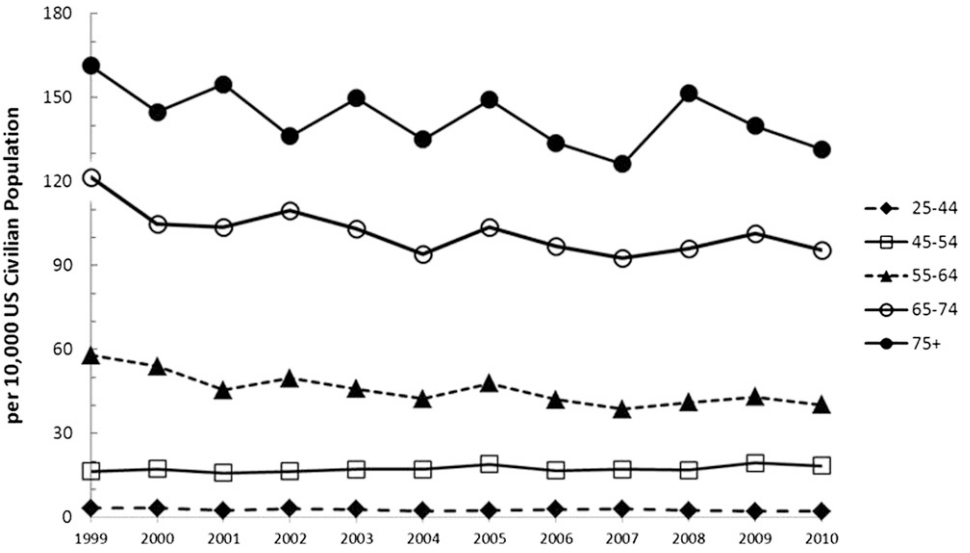

FIGURE 5. Age-specific rates (per 10,000 US civilian population) of hospitalizations for COPD as the first-listed discharge diagnosis among adults aged ≥ 25 years, by year—United States, National Hospital Discharge Survey, 1999-2010.

($P = .001$), men ($P < .001$), and women ($P = .022$) (Table 10).

Medicare Hospitalizations (Medicare Part A Hospital Claims)

In 2010, there were 312,654 (unadjusted rate, 11.11 per 1,000 Medicare enrollees aged ≥ 65 years; age-adjusted rate, 11.18 per 1,000 Medicare enrollees aged ≥ 65 years) hospital discharge claims for COPD as the first-listed diagnosis. The annual number of Medicare hospitalizations for COPD fluctuated during 1999 to 2010 (Table 11). Age-specific rates for those aged 65 to 74 years declined significantly ($P = .033$) (Table 12). Age-adjusted rates were highest among Native American enrollees and lowest among Asian enrollees in most years (Fig 6). Age-adjusted rates for Medicare hospitalizations for COPD declined during 1999 to 2010 for all enrollees overall ($P = .045$) and men ($P = .022$), but the decline was not significant for women ($P = .138$) or for specific race groups (Table 12).

Medicare hospital claims data provide an opportunity to obtain state-specific estimates (Table 13). Changes in age-adjusted rates during 1999 to 2010 varied between states (Table 14). A comparison of state-specific Medicare hospital rates in 1999 to 2000

Table 10—*Estimated Annual Rates of Hospitalizations for COPD as the First-Listed Discharge Diagnosis Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, National Hospital Discharge Survey, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Race[a,b]													
White	32.7	28.5	28.5	28.6	28.0	25.8	29.8	26.3	25.3	27.6	31.6	29.5	.104
Black	37.6	29.2	29.2	30.4	28.5	24.9	26.9	29.9	26.2	28.8	30.2	39.5	.563
Sex[a]													
Women	40.8	35.3	35.3	35.3	34.5	31.1	35.2	30.9	30.4	35.6	35.3	33.4	.022
Men	39.9	39.0	39.0	36.7	37.4	35.3	38.4	36.4	33.1	32.9	33.9	31.6	< .001
Age group, y													
25-44	3.3	3.3	2.4	3.2	2.9	2.3	2.5	2.8	3.0	2.4	2.2	2.1	.039
45-54	16.5	17.3	15.9	16.5	17.1	17.2	19.0	16.7	17.1	16.9	19.4	18.4	.102
55-64	57.9	54.0	45.5	49.7	45.8	42.3	47.8	42.1	38.6	41.0	43.1	40.2	.001
65-74	121.6	104.7	103.6	109.7	103.0	93.9	103.7	96.8	92.7	96.0	101.5	95.5	.005
≥ 75	161.3	144.8	154.7	136.1	149.7	135.0	149.1	133.7	126.2	151.4	139.8	131.4	.018
Total[a]	40.2	36.6	36.6	35.5	35.5	32.5	36.1	32.8	31.4	34.1	34.3	32.2	.001
Total[c]	39.7	36.2	35.4	35.5	35.8	33.0	36.8	33.6	32.4	35.6	36.2	34.4	.018

Annual rate per 10,000 US civilian population. COPD includes ICD-9-CM codes 490-492 or 496. All relative SEs are ≤ 30%. See Table 5 legend for expansion of abbreviation.

[a]Age-adjusted to the 2000 US standard population aged ≥ 25 y.

[b]Data not available for other specific race groups. Race was not imputed. Percent missing data for race are shown in e-Table 5.

[c]Unadjusted rate.

Table 11—*Annual Number of Medicare Hospitalizations for COPD as the First-Listed Discharge Diagnosis Among Medicare Beneficiaries Aged ≥ 65 Years, by Race/Ethnicity, Sex, and Age Group—United States, Medicare Part A Hospital Claims, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Race/ethnicity												
White, non-Hispanic	311,551	282,944	286,225	288,338	280,631	255,896	277,529	266,810	234,796	277,693	265,149	273,918
Black, non-Hispanic	25,468	23,545	24,280	25,530	24,313	22,003	24,312	22,740	21,344	23,893	24,611	27,106
Hispanic	4,422	4,030	4,256	4,347	4,183	3,945	4,505	4,196	3,892	4,531	4,517	4,770
Native American	581	519	577	1,018	1,210	1,229	1,228	1,553	1,176	1,468	1,432	1,547
Asian	1,818	1,553	1,683	1,772	1,750	2,865	1,901	1,719	1,879	2,327	2,369	2,442
Sex												
Women	194,756	177,658	179,941	181,588	176,902	162,180	174,986	167,743	149,181	174,940	168,625	175,597
Men	154,141	139,843	141,875	143,795	139,164	126,169	138,283	132,445	116,711	138,212	132,266	137,057
Age group, y												
65-74	152,179	136,721	138,118	137,777	136,354	122,701	131,321	125,471	111,455	130,057	128,891	134,072
≥ 75	196,718	180,780	183,698	187,606	179,802	165,648	181,948	174,717	154,437	183,095	172,000	178,582
Total	348,897	317,501	321,816	325,383	316,156	288,349	313,269	300,188	265,892	313,152	300891	312,654

COPD includes ICD-9-CM codes 490-492 or 496. See Table 5 legend for expansion of abbreviation.

to those in 2009 to 2010 (Fig 7) demonstrates geographic clustering of the 10 states in 1999 to 2000, with the highest hospitalization rates (14.0-26.6 per 1,000 Medicare enrollees) along the Mississippi River and Ohio River valleys. By 2009 to 2010, there was a marked improvement in rates in many of those states. States with the highest age-adjusted Medicare hospitalization rates in 2009 to 2010 in Figure 7 are similar to those states in Figure 1, with the highest age-adjusted prevalence of COPD in 2011. Figure 8 shows that there were no significant increases in age-adjusted Medicare hospitalization rates in any state during 1999 to 2010 and identifies those states which have experienced no significant change or a significant decline ($P < .05$) during the past decade.

Deaths (Death Certificates)

In 2010, there were 133,575 deaths (crude rate, 65.5 per 100,000 US population; age-adjusted rate, 63.1 per 100,000 population) among adults aged ≥ 25 years. Although the annual number of deaths increased somewhat during 1999 to 2010 (Table 15), the age-adjusted death rate for COPD declined during 1999 to 2010 among men ($P = .001$) but did not change significantly in women ($P = .127$) or overall ($P = .163$) (Table 16).

Table 12—*Annual Rates of Medicare Hospitalizations for COPD Among Medicare Beneficiaries Aged ≥ 65 Years, by Race/Ethnicity, Sex, and Age Group—United States, Medicare Part A Hospital Claims, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Race[a]													
White, non-Hispanic	13.47	12.00	11.80	11.58	11.09	10.02	10.86	10.73	9.61	11.50	11.03	11.31	.052
Black, non-Hispanic	12.59	11.29	11.19	11.42	10.63	9.48	10.49	10.29	9.98	11.37	11.55	12.39	.831
Hispanic	13.39	10.89	10.68	10.24	9.30	8.12	9.09	8.77	8.14	9.66	9.44	9.73	.081
Native American	19.21	14.65	15.62	11.80	13.14	12.73	11.61	14.84	10.88	13.32	12.62	13.23	.394
Asian	8.42	5.50	5.42	5.20	4.75	6.96	4.36	3.92	4.11	4.91	4.81	4.77	.108
Sex[a]													
Women	12.41	11.22	11.08	10.90	10.50	9.52	10.28	10.17	9.22	10.97	10.64	10.99	.138
Men	14.81	13.14	12.83	12.53	11.81	10.54	11.47	11.23	9.99	11.91	11.34	11.56	.022
Age group, y													
65-74	11.26	10.01	9.81	9.51	9.24	8.19	8.75	8.58	7.70	8.90	8.72	8.88	.033
≥ 75	15.49	13.98	13.79	13.67	12.87	11.72	12.86	12.69	11.47	13.94	13.24	13.69	.175
Total[a]	13.28	11.91	11.71	11.49	10.97	9.88	10.71	10.55	9.50	11.31	10.87	11.18	.045
Total[b]	13.31	11.94	11.74	11.53	11.00	9.91	10.74	10.58	9.51	11.29	10.83	11.11	.034

Annual rate per 1,000 Medicare beneficiaries, aged ≥ 65 y, alive, entitled to Medicare Part A, and not in a managed care plan on July 1 of the given year. COPD includes ICD-9-CM codes 490-492 or 496. See Table 5 legend for expansion of abbreviation.

[a]Age-adjusted to the 2000 US standard population aged ≥ 65 y.

[b]Unadjusted rate.

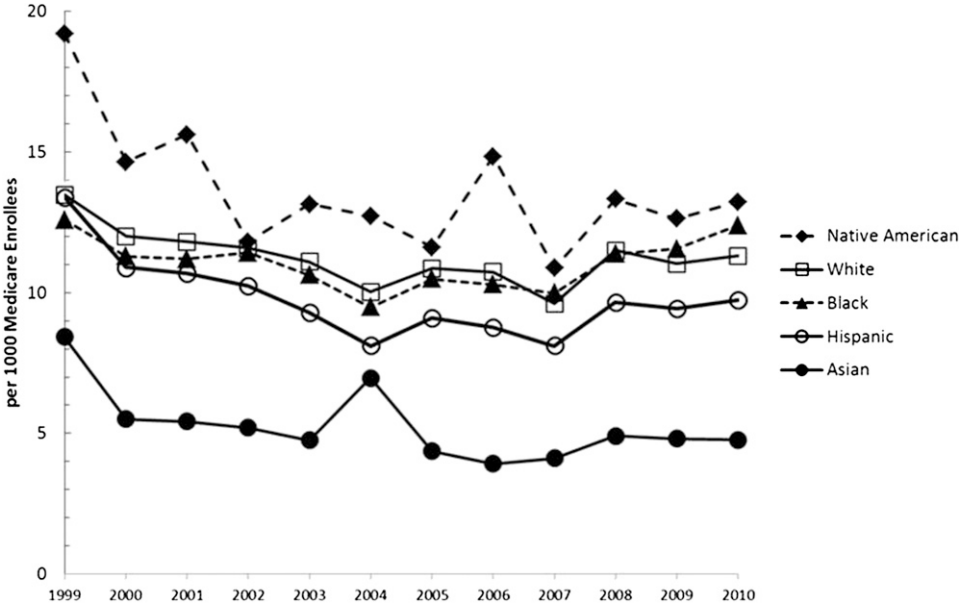

FIGURE 6. Race-specific age-adjusted rates (per 1,000 Medicare enrollees) of Medicare hospitalizations for COPD as the first-listed discharge diagnosis among Medicare enrollees aged ≥ 65 years, by year—United States, Medicare Part A hospital claims, 1999-2010.

Age-specific rates increased among adults aged 45 to 54 years ($P < .001$) but declined among those aged 55 to 64 years ($P = .002$) and 65 to 74 years ($P < .001$). The age-specific rates each year were highest among those aged ≥ 75 years and 65 to 74 years (Fig 9). Age-adjusted rates were highest among non-Hispanic whites followed by American Indian/Alaska Natives, non-Hispanic blacks, Hispanics, and Asian/Pacific Islanders (Fig 10). During 1999 to 2010, age-adjusted rates increased among American Indian/Alaska Natives ($P = .008$) and declined among Hispanics ($P = .038$) and Asian/Pacific Islanders ($P < .001$) but did not change significantly among non-Hispanic whites or non-Hispanic blacks.

Numbers of deaths (Table 17) and age-adjusted death rates varied during 1999 to 2010 in most states (Table 18). Figure 11 compares aggregated age-adjusted state-specific death rates for COPD in 1999 to 2000 to those for 2009 to 2010. In 1999 to 2000, states with the highest death rates (75.0-103.9 per 100,000) were along the Ohio River valley and in multiple western states. Geographic clustering of COPD death rates aggregated for 2009 to 2010 was observed in states along the Ohio River Valley and in several western states and also in several southern states (Fig 11). Although death rates for COPD declined in many states during 1999 to 2010, five states (Alabama, Mississippi, Arkansas, Oklahoma, and South Dakota) experienced significant increases in deaths from COPD (Fig 12).

Discussion

The previous COPD surveillance report noted that rates of hospitalizations and mortality for COPD had increased from 1980 to 2000.[13] However, the mortality rate in men and some age groups and hospitalization rates in both men and women have declined since 1999. Rates of physician-based office visits and ED visits for COPD from 1999 to 2010 demonstrated substantial interyear variability and showed no particular trend; however, it is encouraging that there were no increases in office visit rates or ED rates for COPD.

Because smoking is the most important etiologic driver of COPD,[22] trends in the prevalence of smoking impacted many of the metrics examined in this surveillance report, although the exact temporal relationship between changes in the smoking prevalence and changes in health-care use and mortality for COPD are not well defined. Since 1965, the prevalence of smoking has decreased considerably. In 1965, 42.4% (unadjusted percentage) of adults aged ≥ 18 years were current smokers compared with 19.3% in 2010.[23] The crude prevalence of smoking in 2010 was one-half that in 1965 for both men (21.5% vs 51.9%, respectively) and women (17.3% vs 33.9%, respectively). In 1999 to 2001, American Indian/Alaska Native adults had a higher age-adjusted prevalence of current smoking (30.3% in men and 34.7% in women) compared with white adults (25.1% in men and 22.2% in women),[23] which may explain the increase in COPD mortality

Table 13—*Annual Number of Medicare Hospitalizations for COPD as the First-Listed Discharge Diagnosis Among Medicare Beneficiaries Aged ≥ 65 Years, by State—United States, Medicare Part A Hospital Claims, 1999-2010*

State	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Alabama	8,996	8,172	8,751	8,779	8,442	7,216	7,842	7,098	6,805	8,132	7,686	7,704
Alaska	391	404	414	378	387	341	320	408	290	355	335	373
Arizona	3,317	2,890	2,914	3,152	3,101	3,006	3,638	2,967	2,652	3,543	3,482	4,082
Arkansas	5,444	5,033	4,991	5,202	4,798	4,148	4,563	4,598	3,651	3,957	3,858	3,956
California	20,181	17,174	17,142	17,382	17,045	14,601	15,331	14,392	14,367	17,093	17,302	18,743
Colorado	2,830	2,264	2,332	2,317	2,350	2,013	2,337	2,406	1,954	2,535	2,117	2,397
Connecticut	3,032	2,964	3,125	3,315	3,276	3,227	3,487	3,359	3,300	3,886	3,698	3,768
Delaware	983	1,038	992	1,028	1,047	1,088	1,188	1,052	1,069	1,105	1,066	1,257
District of Columbia	463	458	443	418	391	343	438	363	336	445	404	451
Florida	23,513	21,200	22,448	23,194	22,096	22,210	22,732	21,121	19,590	23,592	23,926	24,952
Georgia	9,983	9,269	9,434	9,591	9,089	8,215	9,146	9,092	7,491	8,617	8,660	8,517
Hawaii	470	412	421	406	379	377	386	369	373	424	410	424
Idaho	1,249	1,001	994	930	852	659	729	884	567	609	616	603
Illinois	16,794	14,861	15,180	15,556	14,669	13,354	14,618	14,566	13,146	16,660	16,089	16,021
Indiana	10,357	9,831	9,774	9,551	9,109	8,178	9,334	9,334	7,543	9,624	8,835	8,682
Iowa	5,008	4,308	4,234	3,734	3,369	2,977	2,940	3,736	2,424	2,774	2,546	2,645
Kansas	3,822	3,321	3,247	3,205	3,282	2,759	3,066	3,542	2,440	2,749	2,450	2,441
Kentucky	10,655	9,496	9,959	9,839	9,730	8,546	9,544	9,752	7,731	9,423	9,188	8,986
Louisiana	6,520	6,031	6,373	6,418	6,228	5,258	5,887	5,155	4,490	5,389	5,150	5,287
Maine	2,380	2,477	2,056	1,863	1,837	1,635	1,761	1,938	1,438	1,625	1,712	1,588
Maryland	5,437	5,283	5,631	5,746	5,695	5,211	5,898	6,221	6,223	7,086	6,470	6,522
Massachusetts	7,890	7,447	7,117	7,053	7,170	6,754	7,277	7,108	6,828	8,437	8,185	8,689
Michigan	14,207	12,606	12,377	13,285	12,984	12,892	13,915	13,152	11,491	13,053	12,627	14,282
Minnesota	4,764	4,130	4,291	4,061	3,745	3,560	3,667	3,354	2,513	3,097	2,862	2,930
Mississippi	6,361	6,017	6,191	6,117	5,851	5,128	5,666	5,090	4,164	4,858	5,005	4,983
Missouri	8,527	7,535	8,037	7,709	7,455	7,023	7,909	7,254	6,082	7,451	6,884	6,932
Montana	1,306	1,142	1,203	1,072	1,015	874	867	1,100	704	759	718	717
Nebraska	2,108	1,713	1,542	1,452	1,443	1,208	1,590	1,981	1,337	1,693	1,516	1,705
Nevada	1,969	1,551	1,488	1,576	1,529	1,332	1,544	1,547	1,346	1,754	1,890	2,062
New Hampshire	1,329	1,450	1,361	1,305	1,335	1,452	1,318	1,640	1,358	1,626	1,541	1,499
New Jersey	10,193	9,420	9,584	10,325	10,742	10,172	11,049	10,265	9,882	11,328	10,836	11,166
New Mexico	1,569	1,309	1,342	1,400	1,356	1,138	1,430	1,214	1,116	1,348	1,316	1,418
New York	20,526	18,680	17,835	17,878	17,360	16,983	18,046	17,177	15,787	17,987	17,643	19,369
North Carolina	12,146	11,326	11,079	10,940	11,079	9,511	10,610	9,911	8,819	10,097	9,655	9,530
North Dakota	970	770	742	633	576	548	631	838	553	495	393	410
Ohio	18,466	16,823	17,282	17,601	17,255	15,239	16,863	16,229	14,217	16,242	14,712	15,278
Oklahoma	5,558	5,057	5,456	5,392	5,256	4,779	5,186	5,055	4,973	5,587	5,227	5,574
Oregon	2,329	1,925	2,073	2,201	2,029	1,672	1,646	1,768	1,354	1,469	1,544	1,551
Pennsylvania	19,100	17,406	16,841	17,294	16,401	15,426	16,677	14,169	12,866	14,900	13,724	15,694
Rhode Island	1,178	1,167	1,063	1,014	1,054	954	1,021	972	969	1,140	1,115	1,288
South Carolina	5,427	5,104	5,054	5,327	5,277	4,815	5,333	4,689	4,444	5,153	4,910	5,002
South Dakota	1,219	1,052	938	890	860	649	751	1,104	534	653	668	605
Tennessee	10,251	9,771	9,989	10,025	10,101	9,285	9,799	9,102	8,215	10,032	9,587	9,188
Texas	21,794	20,395	22,665	23,830	23,043	20,590	22,387	20,379	19,180	22,262	21,264	22,557
Utah	750	623	718	692	645	521	628	547	425	528	498	551
Vermont	719	774	632	629	601	618	568	615	458	499	549	548
Virginia	9,254	8,672	8,793	8,712	8,561	7,331	8,008	7,356	6,865	8,030	7,579	7,306
Washington	3,660	3,303	3,459	3,403	3,180	2,852	3,516	3,562	2,925	3,516	3,478	3,540
West Virginia	6,678	6,295	5,889	5,880	5,830	4,979	5,249	5,541	4,474	4,859	4,611	4,706
Wisconsin	6,064	5,573	5,353	5,143	4,747	4,290	4,441	4,548	3,639	4,088	3,828	3,735
Wyoming	760	578	567	540	504	412	492	568	494	588	526	440
Total	348,897	317,501	321,816	288,338	316,156	288,349	313,269	300,188	265,892	313,152	300,891	312,654

COPD includes ICD-9-CM codes 490-492 or 496. See Table 5 legend for expansion of abbreviation.

during 1999 to 2010 in that population. The prevalence of current smoking among American Indian/Alaska Native adults has since declined to 25.1% in men and 21.0% in women for 2008 to 2010[23]; therefore, a decline in mortality from COPD may be expected for that population in the future. However, a recent report observed that almost 39% of 15 million adults with self-reported COPD in 2011 in the United States

Table 14—*Age-Adjusted Annual Rates for Medicare Hospitalizations With COPD as the First-Listed Discharge Diagnosis Among Medicare Beneficiaries Aged ≥ 65 Years, by State—United States, Medicare Part A Hospital Claims, 1999-2010*

State[a]	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Alabama	18.10	16.42	17.33	17.04	16.17	13.84	15.11	13.99	13.56	16.73	16.15	15.68	.121
Alaska	12.62	12.31	12.26	10.89	10.60	9.05	8.01	9.85	6.59	7.76	6.88	7.49	< .001
Arizona	9.88	7.97	7.61	7.63	7.14	6.64	7.83	6.89	6.05	8.01	7.66	8.62	.541
Arkansas	16.14	14.84	14.70	14.67	13.44	11.53	12.54	13.02	10.70	11.67	11.36	11.53	< .001
California	11.33	9.44	9.06	8.51	7.98	6.71	6.95	6.56	6.49	7.57	7.54	8.04	.027
Colorado	11.93	9.22	8.96	8.35	8.17	6.79	7.71	8.01	6.44	8.27	6.80	7.49	.015
Connecticut	8.52	8.21	8.02	7.70	7.56	7.41	8.01	7.81	7.90	9.55	9.30	9.48	.057
Delaware	10.97	11.34	10.48	10.52	10.44	10.61	11.33	9.87	9.89	10.06	9.53	10.79	.060
District of Columbia	8.17	8.00	7.60	7.21	6.87	6.11	7.89	6.66	6.22	8.33	7.41	8.08	.736
Florida	13.32	11.69	11.77	11.52	10.65	10.57	10.88	10.58	9.88	12.02	12.15	12.55	.747
Georgia	14.76	13.50	13.29	13.28	12.35	10.70	11.67	11.98	10.00	11.25	11.25	11.63	.004
Hawaii	5.18	4.34	4.50	4.29	3.92	3.80	3.81	3.72	3.70	4.17	4.05	4.22	.078
Idaho	9.87	7.81	7.57	6.93	6.23	4.72	5.13	6.50	4.28	4.65	4.78	4.62	< .001
Illinois	13.49	11.91	11.91	11.72	10.89	9.88	10.79	10.94	9.95	12.53	11.94	11.71	.439
Indiana	14.92	14.09	13.85	13.38	12.57	11.21	12.73	13.09	10.88	14.05	13.11	12.83	.202
Iowa	12.18	10.46	10.28	9.04	8.16	7.26	7.24	9.54	6.31	7.18	6.65	6.91	< .001
Kansas	11.95	10.41	10.21	9.91	9.93	8.29	9.21	10.81	7.53	8.54	7.67	7.57	.001
Kentucky	23.83	21.10	21.76	21.07	20.58	17.87	19.67	20.45	16.93	20.80	20.34	19.77	.080
Louisiana	16.95	15.23	15.38	15.02	14.35	12.03	13.93	12.43	11.12	13.62	13.23	13.52	.015
Maine	13.60	14.05	11.48	10.28	10.05	8.83	9.44	10.31	7.65	8.75	9.67	9.03	.005
Maryland	11.52	10.63	10.26	10.35	10.17	9.23	10.36	11.10	11.06	12.40	10.91	10.80	.338
Massachusetts	13.15	12.28	11.53	11.28	10.85	10.14	10.95	10.66	10.31	12.72	12.30	12.93	.908
Michigan	12.71	11.24	11.00	11.32	10.93	10.74	11.53	11.24	10.99	13.38	13.43	13.05	.139
Minnesota	9.83	8.41	8.60	8.08	7.42	7.08	7.46	7.62	5.97	7.69	7.37	8.10	.036
Mississippi	19.86	18.74	19.27	18.73	17.72	15.34	16.89	16.06	13.05	15.16	15.51	15.19	< .001
Missouri	13.92	12.41	13.12	12.53	11.82	11.05	12.40	11.52	9.76	12.06	11.24	11.31	.014
Montana	11.44	9.73	10.13	8.95	8.36	7.10	6.98	9.27	6.10	6.63	6.34	6.26	< .001
Nebraska	9.92	7.90	7.11	6.66	6.64	5.54	7.32	9.32	6.38	8.14	7.26	8.09	.882
Nevada	15.60	11.66	10.85	10.78	9.79	8.31	9.31	9.20	7.83	9.83	10.37	10.85	.177
New Hampshire	10.37	10.12	9.35	8.84	8.83	9.41	8.40	10.25	8.42	10.01	9.48	9.08	.504
New Jersey	11.69	10.45	10.42	10.73	11.02	10.40	11.34	10.56	10.11	11.55	11.13	11.36	.576
New Mexico	10.62	8.60	8.26	8.52	8.10	6.73	8.29	7.24	6.59	7.89	7.68	8.09	.071
New York	11.64	10.52	9.94	9.92	9.64	9.09	9.79	9.62	9.05	10.52	10.46	11.56	.933
North Carolina	13.92	12.78	12.33	12.02	11.91	10.11	11.22	10.76	9.75	11.07	10.49	10.08	< .001
North Dakota	10.51	8.34	8.04	6.91	6.27	5.98	6.88	9.44	6.31	5.72	4.53	4.71	.003
Ohio	15.65	14.13	14.11	14.24	13.77	12.06	13.36	13.13	11.71	14.78	13.59	15.60	.494
Oklahoma	14.40	13.13	14.07	13.60	13.09	11.83	12.79	12.95	12.46	14.01	13.03	13.77	.524
Oregon	9.23	7.52	7.83	8.11	7.33	5.89	5.72	6.38	4.99	5.34	5.67	5.52	< .001
Pennsylvania	14.25	13.18	12.16	12.41	11.86	11.21	12.28	11.15	10.46	12.82	12.00	13.65	.289
Rhode Island	12.72	12.46	11.56	10.93	11.66	10.60	11.63	11.13	11.26	13.29	13.03	14.62	.223
South Carolina	12.28	11.30	10.98	11.38	11.06	9.88	10.73	9.62	9.24	10.73	10.11	10.04	.008
South Dakota	11.49	9.86	8.81	8.39	7.92	5.94	6.84	10.06	5.04	6.28	6.19	5.55	.004
Tennessee	16.34	15.49	15.54	15.68	15.75	14.43	15.28	14.82	13.66	16.73	15.82	15.12	.442
Texas	13.94	12.81	13.11	13.11	12.29	10.82	11.68	10.79	10.23	11.87	11.23	11.69	.009
Utah	4.44	3.60	4.07	3.85	3.50	2.76	3.31	3.22	2.61	3.37	3.29	3.62	.073
Vermont	9.92	10.33	8.37	8.24	7.79	7.89	7.18	7.62	5.65	6.08	6.61	6.48	< .001
Virginia	13.44	12.15	11.90	11.62	11.20	9.44	10.13	9.54	8.98	10.47	9.82	9.27	< .001
Washington	8.19	7.13	6.96	6.51	5.93	5.14	6.19	6.26	5.16	6.20	6.13	6.09	.065
West Virginia	27.38	25.81	24.10	23.95	23.62	20.11	21.06	22.62	21.20	23.50	22.52	22.50	.033
Wisconsin	9.32	8.56	8.16	7.60	7.04	6.43	6.84	7.54	6.35	7.41	7.20	7.12	.022
Wyoming	14.19	10.65	10.22	9.67	8.83	7.12	8.31	9.66	8.28	9.72	8.58	7.02	.023
Total[a]	13.28	11.91	11.71	11.49	10.97	9.88	10.71	10.55	9.50	11.31	10.87	11.18	.045

Annual rate per 1,000 Medicare enrollees aged ≥ 65 y, alive, entitled to Medicare Part A, and not in a managed care plan on July 1 of the given year. COPD includes ICD-9-CM codes 490-492 or 496. See Table 5 legend for expansion of abbreviation.

[a]Age-adjusted to the 2000 US standard population aged ≥ 65 y.

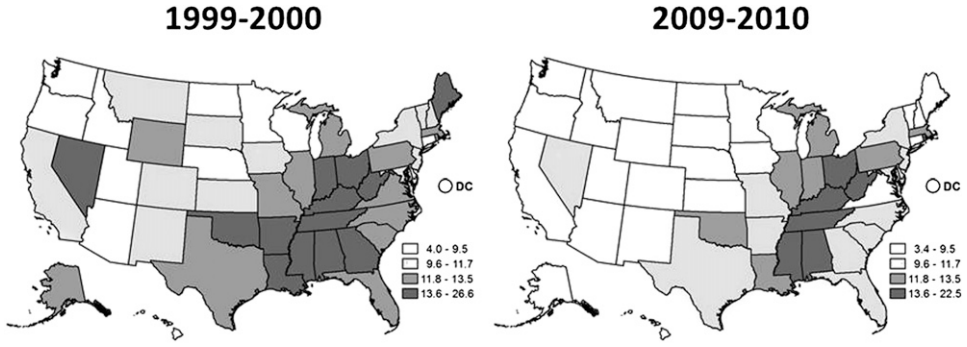

FIGURE 7. Age-adjusted rates (per 1,000 Medicare enrollees) of Medicare hospitalizations for COPD as the first-listed discharge diagnosis among Medicare enrollees aged ≥ 65 years—United States, Medicare Part A hospital claims, 1999-2000 and 2009-2010.

continued to smoke.[12] This large population represents an important opportunity for physician counseling and referral to smoking cessation interventions such as 1-800-QUIT-NOW.

Two broad currents influence mortality rates estimated from death certificate data: changes in the prevalence of COPD and changes in the case-fatality rate among people with COPD. Although the estimates of the prevalence of self-reported COPD from the NHIS suggest that the prevalence may have declined since 1999, the rates since 2002 have remained fairly stable. A number of treatment strategies have been shown to have the potential to reduce mortality in patients with COPD and include newer medications and evolving guidelines to treat COPD, oxygen therapy, respiratory management, pulmonary rehabilitation, and influenza vaccinations.[24,25] The lag times between changes in the prevalence of COPD and the uptake of treatments and COPD mortality rates may differ. The balance of these temporal changes is likely to have a substantial impact on the trajectory of the mortality rate. With continued declines in the smoking prevalence and improved management of patients with COPD, mortality rates can be expected to decline in future years.

FIGURE 8. Significant linear change ($P < .05$) in state-specific age-adjusted rates (per 1,000 Medicare enrollees) of Medicare hospitalizations for COPD as the first-listed discharge diagnosis among Medicare enrollees aged ≥ 65 years—United States, Medicare Part A hospital claims, 1999-2010.

The generally small reduction in the age-adjusted mortality rate was limited to men. It is unclear why the mortality rate in women did not fall as well, given the decline in smoking prevalence in women since 1965. If the estimates are valid, these results suggest that research will be needed to address possible explanations for the poor progress among women. These data are consistent with the results of a study showing that the mortality rate among women with an obstructive impairment changed little in contrast to the mortality rate among men with an obstructive impairment.[26]

The use of spirometry is critical to establishing the diagnosis and severity of COPD. Additional tests that can help in the diagnosis include lung diffusion capacity test, chest radiograph, and arterial blood gas test. GOLD (Global Initiative for Chronic Obstructive Lung Disease) established four levels of COPD on the basis of spirometric measurements: mild, moderate, severe, and very severe.[27] The results reported here should be considered in the context of several limitations. Depending on the spirometric criteria used, estimates of prevalence of COPD based on spirometry tests may be as much as double the estimates derived from self-reported information.[13,28,29] Consequently, the estimates of self-reported prevalence of COPD in the current surveillance report almost certainly underestimate the true prevalence of this condition. Furthermore, not accounting for the undiagnosed percentage of adults with COPD can also potentially distort demographic comparisons. As shown in the previous surveillance report, men had a higher prevalence than women when the presence of COPD was based on spirometric criteria.[13] When self-reported data were used to estimate the prevalence of COPD, however, women had a higher prevalence than men, as was also observed in the present report.

If COPD is underdiagnosed, then the mortality rates presented in the present report likely underestimate

Table 15—*Annual Number of Adults Aged ≥ 25 Years With COPD as the Underlying Cause of Death, by Race, Sex, and Age Group—United States, Mortality Component of the National Vital Statistics System, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Race/ethnicity[a]												
White, non-Hispanic	107,706	106,198	107,145	108,481	110,088	106,393	113,939	108,435	111,477	123,171	119,715	119,894
Black, non-Hispanic	6,640	6,327	6,355	6,585	6,565	6,274	7,086	6,660	6,896	7,743	7,489	7,700
Hispanic	2,488	2,341	2,512	2,724	2,827	2,779	3,166	2,994	3,238	3,623	3,672	3,817
AIAN	360	381	378	413	455	457	467	468	559	579	555	643
API	923	925	985	969	1,037	1,013	1,136	1,144	1,146	1,288	1,265	1,265
Sex												
Women	58,040	58,436	59,789	60,673	62,363	60,194	65,193	62,290	63,813	71,031	69,334	69,797
Men	60,416	58,058	57,908	58,807	58,904	56,940	60,812	57,633	59,678	65,606	63,583	63,778
Age group, y												
25-44	494	500	554	586	573	554	558	519	521	566	506	453
45-54	2,472	2,618	2,695	2,842	2,883	2,920	3,356	3,326	3,596	3869	4,083	3,861
55-64	10,643	10,130	10,545	10,670	11,451	11,183	12,173	11,823	12,273	13518	13,636	13,674
65-74	31,699	30,249	29,942	29,040	29,241	27,740	29,296	27,640	28,100	31390	30,762	31,254
≥ 75	73,148	72,997	73,961	76,342	77,119	74,737	80,622	76,615	79,001	87,294	83,930	84,333
Total	118,456	116,494	117,697	119,480	121,267	117,134	126,005	119,923	123,491	136,637	132,917	133,575

COPD includes ICD-10 codes J40–J44 from the WHO. AIAN = non-Hispanic American Indian/Alaska Natives; API = non-Hispanic Asian/Pacific Islanders; ICD-10 = International Classification of Diseases, tenth revision; WHO = World Health Organization.

[a]A summation of the annual numbers will not equal the total annual number because of small numbers of death in other race/ethnicity or unknown categories.

the true mortality rates from COPD.[30-32] Another factor that may contribute to underestimating COPD mortality rates is the possibility that comorbidities may displace COPD as the underlying cause of death that is reported on the death certificate.[33] Assuming that underestimates of the COPD mortality rates were approximately constant during the study period, the interpretation of the direction of the trends is valid.

Race was self-reported by participants of the BRFSS and NHIS but was recorded by medical or other personnel in the other data systems. The comparability of race designations among surveys is unknown. For

Table 16—*Annual Rates for Deaths With COPD as the Underlying Cause Of Death Among Adults Aged ≥ 25 Years, by Race, Sex, and Age Group—United States, Mortality Component of the National Vital Statistics System, 1999-2010*

Variable	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Race/ethnicity[a]													
White, non-Hispanic	72.0	70.5	70.4	70.5	70.7	67.7	71.5	67.2	68.1	74.1	71.0	70.2	.870
Black, non-Hispanic	45.9	43.0	42.6	43.6	42.5	39.8	43.8	40.3	40.8	44.6	41.7	41.8	.240
Hispanic	32.9	29.7	29.7	30.8	30.5	28.2	30.4	27.4	28.1	29.8	28.8	28.5	.038
AIAN	54.2	53.0	51.6	54.1	57.3	55.0	54.7	53.2	60.8	59.3	56.1	62.9	.008
API	25.7	24.8	24.2	22.2	22.7	21.2	22.1	21.0	19.8	21.0	19.7	19.0	< .001
Sex[d]													
Women	54.6	54.4	54.9	55.0	55.9	53.3	56.8	53.6	54.0	59.1	56.8	56.3	.127
Men	88.2	83.8	81.8	81.7	79.9	75.7	78.8	73.0	73.7	79.2	74.8	73.6	.001
Age group, y													
25-44	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.6	0.6	…
45-54	6.8	6.9	6.8	7.1	7.1	7.0	7.9	7.7	8.2	8.7	9.1	8.6	< .001
55-64	44.8	41.7	42.0	40.0	40.9	38.2	39.7	37.0	37.0	39.6	38.5	37.5	.002
65-74	172.1	164.5	162.9	157.9	158.1	148.6	155.2	143.9	142.6	153.1	144.9	143.9	< .001
≥ 75	446.6	439.7	437.5	445.6	444.2	426.2	453.7	426.6	435.8	477.7	456.4	454.5	.212
Total[a]	67.0	65.2	64.9	65.0	64.9	61.8	65.3	61.1	61.7	66.9	63.8	63.1	.163
Total[b]	65.7	64.0	63.9	64.2	64.5	61.6	65.4	61.5	62.6	68.4	65.8	65.5	.515

Annual rate per 100,000 US population. COPD includes ICD-10 codes J40–J44 from the WHO. Death rates for 2001-2009 will differ from previous reports because 2001-2009 population denominators have been revised In CDC Wonder (Oct 2012). See Table 15 legend for expansion of abbreviations.

[a]Age-adjusted to the 2000 US standard population aged ≥ 25 y.

[b]Unadjusted rate.

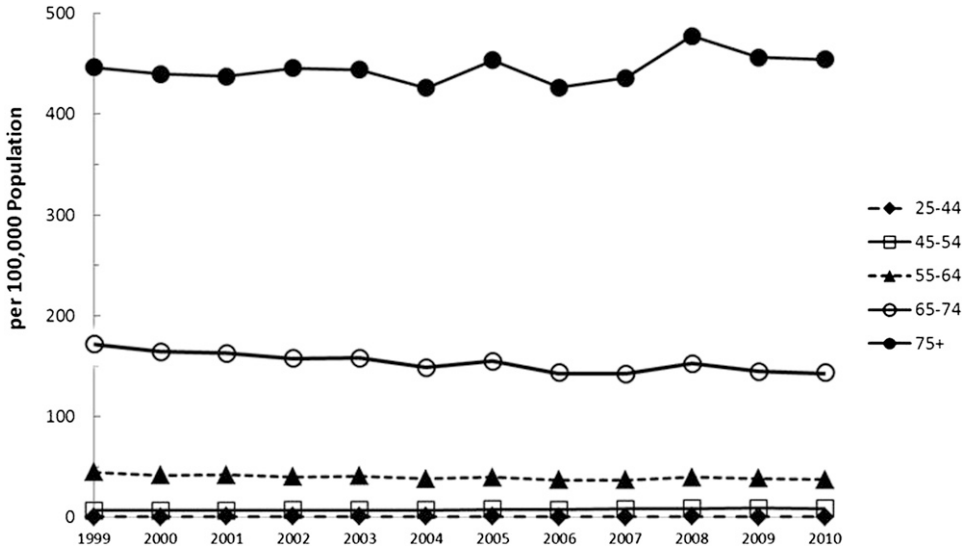

FIGURE 9. Age-specific death rates (per 100,000) for COPD as the underlying cause of death among adults aged ≥ 25 years, by year—United States, Mortality Component of the National Vital Statistics System, 1999-2010.

some data systems, such as the NAMCS, NHAMCS, and NHDS, race was missing for a large proportion of records. For example, 16% of the NHDS discharges for 2010 and 23% of NAMCS records in 2010 lacked information about the racial status of the patient. Medicare and death certificate data represented the only data that allowed trend analyses for American Indian/Alaska Natives, Hispanics, and Asian populations. Because race and ethnicity designations are subject to misclassification,[34] caution is urged in interpreting racial- and ethnic-specific disparities. In the future, the BRFSS, with its large annual sample size of almost one-half million respondents, will allow trend analyses of prevalence of self-reported COPD among those racial/ethnic groups.

Since 1997, GOLD has striven to increase awareness of COPD as a major public health problem across the globe, to spur efforts to prevent this disease, and to develop guidelines to improve the diagnosis and treatment of COPD. In 2013, it released updated

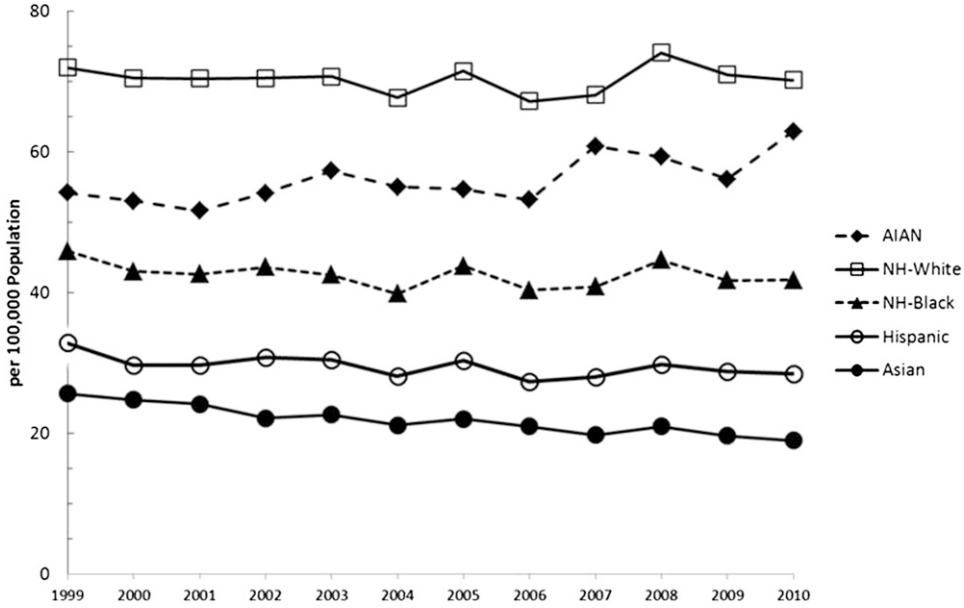

FIGURE 10. Race-specific age-adjusted death rates (per 100,000) for COPD as the underlying cause of death among adults aged ≥ 25 years, by year—United States, Mortality Component of the National Vital Statistics System, 1999-2010.

Table 17—*Annual Number of Adults Aged ≥ 25 Years With COPD as the Underlying Cause of Death, by State—United States, Mortality Component of the National Vital Statistics System, 1999-2010*

State	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Alabama	2,095	1,964	2,125	2,245	2,347	2,256	2,318	2,239	2,463	2,655	2,693	2,784
Alaska	133	125	134	132	132	128	145	129	164	176	187	165
Arizona	2,414	2,410	2,382	2,462	2,448	2,328	2,723	2,695	2,605	2,860	2,773	2,836
Arkansas	1,296	1,328	1,297	1,383	1,439	1,375	1,508	1437	1,587	1,833	1,772	1,732
California	12,488	12,092	12,356	12,088	12,833	11,971	12,608	12,223	11,995	12,870	12,393	12,455
Colorado	1,791	1,715	1,762	1,773	1,864	1,823	1,864	1,873	1,948	2,128	2,012	2,143
Connecticut	1,366	1,469	1,429	1,385	1,395	1,375	1,421	1,400	1,310	1,461	1,389	1,237
Delaware	316	322	286	335	333	334	398	338	370	460	421	427
District of Columbia	150	160	138	125	126	144	123	114	122	133	127	139
Florida	8,815	8,345	8,621	8,738	8,778	8,703	9,173	8,668	9,092	9,957	9,891	10,076
Georgia	2,903	2,914	2,950	3,032	3,105	2,980	3,262	3,241	3,269	3,426	3,615	3,694
Hawaii	250	233	243	234	249	270	260	258	260	266	269	265
Idaho	542	549	562	574	575	544	691	624	639	682	699	701
Illinois	4,851	4,486	4,499	4,539	4,601	4,493	4,817	4,521	4,552	5,384	5,093	4,998
Indiana	2,915	2,948	3,053	3,032	3,167	3,030	3,365	3,193	3,130	3,768	3,649	3,697
Iowa	1,574	1,454	1,482	1,521	1,620	1,492	1,650	1,603	1,605	1,803	1,777	1,633
Kansas	1,323	1,351	1,393	1,328	1,407	1,272	1,529	1,447	1,437	1,581	1,537	1,532
Kentucky	2,260	2,090	2,204	2,339	2,327	2,202	2,507	2,331	2,577	2,874	2,791	2,721
Louisiana	1,525	1,591	1,684	1,598	1,660	1,547	1,830	1,630	1,633	1,831	1,826	1,895
Maine	730	755	773	769	762	744	813	763	717	774	801	788
Maryland	1,836	1,828	1,813	1,838	1,887	1,808	1,823	1,761	1,813	1,916	1,980	1,955
Massachusetts	2,729	2,799	2,699	2,630	2,668	2,466	2,529	2,457	2,260	2,510	2,481	2,306
Michigan	4,130	4,150	3,974	4,251	4,316	4,099	4,304	4,334	4,466	5,050	4,814	4,943
Minnesota	1,880	1,794	1,816	1,864	1,742	1,762	1,883	1,706	1,686	2,023	1,879	1,923
Mississippi	1,217	1,189	1,275	1,320	1,352	1,295	1,416	1,324	1,363	1,464	1,505	1,602
Missouri	2,949	2,692	2,781	2,765	2,836	2,628	3,002	2,922	2,990	3,663	3,354	3,453
Montana	538	499	559	554	568	563	569	561	595	681	588	586
Nebraska	893	794	831	885	851	774	897	845	882	1,009	945	976
Nevada	987	959	1,108	1,149	1,155	1,097	1,209	1,046	1,027	1,233	1,215	1,155
New Hampshire	578	560	596	553	509	581	611	589	593	676	640	594
New Jersey	2,993	2,874	2,761	2,737	2,775	2,895	3,009	2,732	2,881	3,159	3,010	2,998
New Mexico	810	725	734	815	893	722	824	857	852	973	955	996
New York	6,653	6,419	6,514	6,581	6,336	6,430	6,472	6,047	6,281	6,619	6,440	6,509
North Carolina	3,412	3,533	3,343	3,531	3,725	3,474	4,005	3,858	4,071	4,413	4,196	4,357
North Dakota	256	280	298	306	284	260	260	274	255	341	330	341
Ohio	5,656	5,773	5,686	5,840	5,739	5,727	6,406	5,871	6,263	6,771	6,479	6,520
Oklahoma	1,683	1,906	1,853	1,920	2,093	1,923	2,296	2,133	2,333	2,645	2,539	2,679
Oregon	1,664	1,599	1,646	1,754	1,738	1,711	1,767	1,730	1,816	1,868	1,847	1,888
Pennsylvania	5,922	5,837	5,646	5,797	5,816	5,774	5,935	5,420	5,871	6,531	6,254	6,025
Rhode Island	478	493	494	509	474	447	502	467	406	462	500	498
South Carolina	1,675	1,645	1,640	1,805	1,819	1,699	1,879	1,854	1,949	2,176	2,245	2,175
South Dakota	315	364	335	364	365	375	424	363	437	474	431	430
Tennessee	2,655	2,765	2,826	2,874	2,939	2,885	3,076	2,875	3,064	3,462	3,408	3,460
Texas	7,139	6,960	7,404	7,400	7,264	7,110	7,666	7,334	7,814	8,605	8,365	8,667
Utah	523	482	483	555	525	549	559	548	589	604	547	637
Vermont	288	295	298	267	295	286	370	308	307	330	353	322
Virginia	2,549	2,667	2,607	2,620	2,840	2,607	2,770	2,592	2,656	2,899	2,901	2,865
Washington	2,604	2,533	2,520	2,604	2,545	2,448	2,591	2,553	2,597	2,832	2,835	2,634
West Virginia	1,208	1,300	1,242	1,195	1,257	1,207	1,315	1,233	1,289	1,567	1,462	1,455
Wisconsin	2,172	2,202	2,286	2,246	2,223	2,220	2,352	2,273	2,325	2,455	2,397	2,384
Wyoming	327	277	256	319	270	301	279	329	285	304	307	324
Total	118,456	116,494	117,697	119,480	121,267	117,134	126,005	119,923	123,491	136,637	132,917	133,575

COPD includes ICD-10 Codes J40–J44 from the WHO. See Table 15 legend for expansion of abbreviations.

versions of Global Strategy for Diagnosis, Management, and Prevention of COPD.[24] Several studies have reported imperfect implementation of the GOLD guidelines in clinical practice.[35] Additional efforts may be needed to educate physicians about the management of this condition.

Healthy People objectives provide science-based, 10-year national objectives for improving the health of all Americans; identify nationwide health improvement priorities; and strive to engage multiple sectors (public health agencies, communities, organizations, academia, and medicine) to take actions to strengthen

Table 18—*Age-Adjusted Annual Rates for Deaths With COPD as the Underlying Cause of Death Among Adults Aged ≥ 25 Years, by State—United States, Mortality Component of the National Vital Statistics System, 1999-2010*

State[a]	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	*P* for Linear Trend
Alabama	72.2	67.1	72.0	75.5	78.1	74.2	75.4	71.3	77.2	81.4	81.5	83.2	.002
Alaska	81.1	71.0	74.3	69.2	67.0	57.7	62.3	55.2	67.6	67.2	73.6	60.6	.202
Arizona	74.9	73.2	70.3	71.4	68.9	63.8	71.6	68.5	64.4	68.5	64.5	64.5	.003
Arkansas	68.9	70.0	68.0	72.0	74.3	70.3	76.3	71.2	77.8	88.1	83.9	80.8	.001
California	68.9	65.6	65.5	63.0	65.4	60.2	61.9	59.2	56.8	59.3	55.7	54.9	< .001
Colorado	85.4	80.4	80.3	78.9	80.8	77.0	76.8	74.1	74.4	79.1	71.8	75.0	.002
Connecticut	55.5	59.3	56.7	54.3	53.8	52.5	53.7	51.9	48.3	53.0	49.6	43.6	< .001
Delaware	63.8	64.3	55.4	64.0	61.6	60.4	70.0	57.5	61.0	73.5	65.9	65.8	.236
District of Columbia	41.7	44.2	38.3	34.5	35.1	40.3	34.7	32.4	34.2	37.4	35.2	37.7	.099
Florida	64.0	60.0	61.1	60.7	60.1	58.4	60.3	56.3	57.8	61.9	60.3	60.3	.338
Georgia	72.5	72.0	71.4	71.6	72.3	67.7	71.9	68.8	67.7	68.1	70.1	70.0	.030
Hawaii	31.9	29.0	29.4	27.4	28.4	29.9	27.7	27.1	26.7	27.0	26.1	24.8	< .001
Idaho	73.1	72.9	72.7	72.7	70.9	65.6	80.6	70.4	69.9	72.4	71.8	70.1	.597
Illinois	63.0	57.9	57.6	57.6	57.9	56.1	59.4	55.3	55.0	64.2	59.9	58.2	.908
Indiana	76.2	76.6	78.4	77.0	79.2	75.1	82.1	76.6	73.9	87.2	83.6	83.3	.060
Iowa	69.3	63.6	64.2	66.0	69.6	63.6	70.3	67.6	66.4	74.3	73.0	66.2	.157
Kansas	71.8	72.6	74.7	70.8	74.6	67.1	79.4	74.4	73.1	79.4	76.0	75.0	.155
Kentucky	88.6	81.5	85.2	89.4	87.9	82.3	91.6	83.3	90.7	99.0	94.1	90.7	.050
Louisiana	59.0	61.0	63.9	60.1	61.4	56.9	66.3	61.0	60.1	65.8	64.1	65.9	.072
Maine	79.0	80.5	81.1	79.5	77.2	74.5	80.5	73.9	67.7	72.0	73.3	71.3	.002
Maryland	61.0	60.1	58.2	57.9	58.2	54.8	54.0	51.3	52.0	53.5	53.8	52.0	< .001
Massachusetts	61.3	62.3	59.6	57.6	58.0	53.2	54.0	52.1	47.4	51.8	50.6	46.5	< .001
Michigan	67.0	66.8	63.1	66.5	66.5	62.3	64.6	64.1	64.8	72.0	67.4	68.6	.271
Minnesota	60.2	56.9	57.1	57.4	52.8	52.9	55.6	49.6	48.3	56.5	51.6	51.9	.015
Mississippi	70.1	68.1	72.6	74.7	76.1	71.8	77.4	71.9	73.0	76.7	78.7	82.3	.004
Missouri	76.7	69.7	71.2	70.2	71.4	65.5	74.0	70.9	71.3	86.3	77.8	78.8	.097
Montana	87.3	80.0	87.9	85.9	86.9	84.1	83.1	79.9	83.2	92.9	78.5	77.2	.218
Nebraska	73.8	66.1	67.8	71.8	69.2	62.0	71.3	66.0	68.2	76.9	71.5	73.1	.389
Nevada	96.5	92.1	99.2	100.0	95.9	86.7	92.2	76.5	74.0	85.7	80.6	74.9	.001
New Hampshire	77.0	73.6	77.0	70.3	63.4	69.9	72.3	67.7	66.4	74.2	69.2	62.9	.053
New Jersey	53.0	50.4	47.9	46.9	47.1	48.7	50.1	44.9	46.7	50.4	47.3	46.8	.186
New Mexico	78.2	68.6	67.3	73.1	78.8	62.2	68.8	69.4	67.3	74.7	70.7	71.8	.816
New York	53.6	51.0	51.1	50.9	48.5	48.8	48.6	45.1	46.3	48.1	46.4	46.2	< .001
North Carolina	70.6	72.3	67.1	69.3	71.5	65.1	73.4	68.0	69.8	73.5	68.0	69.1	.897
North Dakota	51.9	56.6	59.1	61.4	56.5	51.1	50.8	51.7	48.7	64.3	62.2	63.8	.383
Ohio	74.4	75.5	73.7	74.8	72.6	71.8	79.4	71.8	75.5	80.5	75.9	75.7	.291
Oklahoma	73.2	82.2	79.5	81.7	88.4	80.7	95.3	86.6	93.8	104.4	98.3	102.6	< .001
Oregon	73.5	70.0	70.7	73.8	71.7	69.5	70.0	66.8	68.4	68.9	66.6	67.1	.001
Pennsylvania	61.1	59.7	57.4	58.5	58.1	57.6	58.5	52.9	56.7	62.4	59.4	56.8	.463
Rhode Island	60.5	61.5	61.7	62.6	57.5	54.2	60.2	56.8	48.4	55.8	60.2	58.4	.147
South Carolina	69.5	67.4	65.7	71.2	69.7	63.7	68.6	65.2	66.5	72.0	72.2	68.6	.478
South Dakota	55.9	64.0	59.5	63.6	63.7	63.5	71.5	59.8	70.9	75.5	68.0	67.8	.012
Tennessee	74.6	77.1	77.6	77.8	78.3	75.7	79.0	71.7	74.8	82.6	79.5	79.3	.298
Texas	69.0	66.3	69.2	68.0	65.2	62.5	65.6	60.8	63.1	67.8	63.8	64.8	.105
Utah	54.4	49.4	48.2	54.3	50.1	50.8	50.3	47.3	49.0	48.9	43.1	48.8	.031
Vermont	73.2	73.9	73.3	64.4	70.0	67.1	85.7	69.2	67.5	71.2	74.0	67.3	.729
Virginia	64.2	66.2	63.5	62.3	66.5	59.8	61.9	56.5	56.8	60.3	59.0	56.9	.002
Washington	76.2	73.1	71.2	72.1	69.2	65.1	67.4	64.6	64.1	68.1	66.4	60.3	< .001
West Virginia	87.4	93.8	89.3	85.1	88.5	84.6	91.1	84.6	87.0	104.9	96.8	95.1	.138
Wisconsin	59.8	60.3	61.8	59.8	58.5	57.8	60.4	57.5	57.8	59.7	58.0	56.5	.019
Wyoming	113.4	94.6	85.1	104.6	86.7	94.8	85.4	99.4	84.6	88.4	87.8	89.6	.119
Total[a]	67.0	65.2	64.9	65.0	64.9	61.8	65.3	61.1	61.7	66.9	63.8	63.1	.163

Annual rate per 100,000 US population. COPD includes ICD-10 codes J40–J44 from the WHO. Death rates for 2001-2009 will differ from previous reports because 2001-2009 population denominators have been revised in CDC Wonder (Oct 2012). See Table 15 legend for expansion of abbreviations.

[a]Age-adjusted to the 2000 US population aged ≥ 25 y.

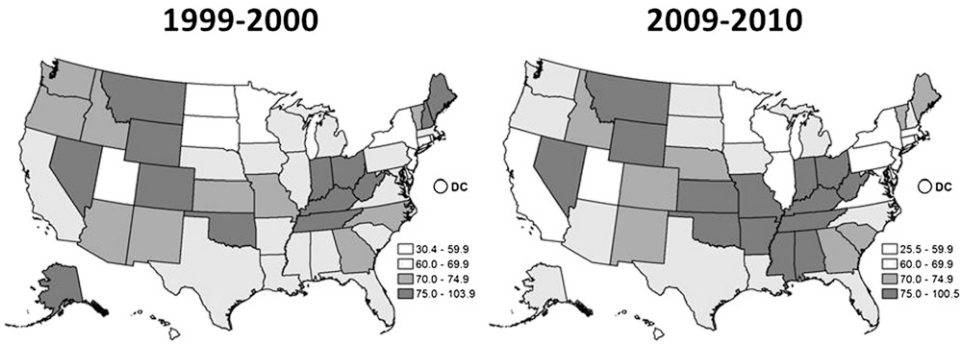

FIGURE 11. Age-adjusted state-specific death rates (per 100,000) for COPD as the underlying cause of death among adults aged ≥ 25 years, by state—United States, Mortality Component of the National Vital Statistics System, 1999-2000 and 2009-2010.

policies and improve practices that are driven by the best available evidence and knowledge. The Healthy People 2010 objective for COPD called for a 50% reduction in the mortality rate from COPD among adults aged ≥ 45 years at baseline in 1999 (123.9 per 100,000)[36]; however, that objective was not met by 2010 (116.6 per 100,000)—possibly for many reasons described above. The new Healthy People 2020 effort[37] has been expanded to include the following objectives that pertain to the evaluation and management of COPD among adults aged ≥ 45 years:

- Reduce activity limitations among adults with COPD.
- Reduce deaths from COPD.
- Reduce hospitalizations for COPD.
- Reduce hospital ED visits for COPD
- Increase the proportion of adults with abnormal lung function whose underlying obstructive disease has been diagnosed.

The CDC and the National Heart Lung Blood Institute (NHLBI) have a formal collaboration to increase public awareness and identify critical communication, research, evaluation, and data collection needs to prevent and manage COPD. This collaboration has resulted in the annual BRFSS collection since 2011 of COPD prevalence data at state and local levels, which will enhance the COPD Learn More Breathe Better Campaign supported by the NHLBI. Such state-level and county-level data as the BRFSS, Medicare, and vital statistics can identify geographic clustering of, as well as racial/ethnic disparities in, COPD indicators to provide guidance to public health agencies in leveraging and targeting resources to those geographic areas and local populations with the greatest burden of COPD. These data will also be critical in identifying communities that will likely benefit best from awareness and outreach campaigns and in evaluating the effectiveness of public health efforts to prevent, treat, and control COPD.

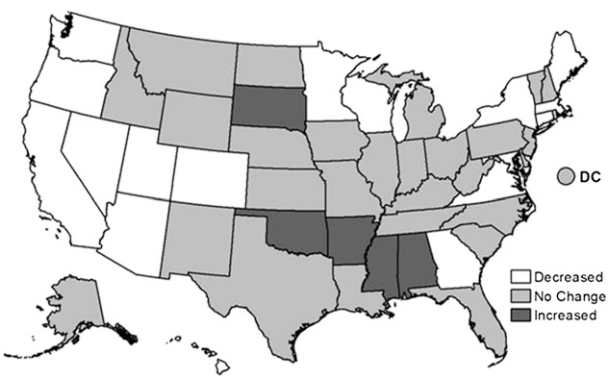

FIGURE 12. Significant linear change ($P < .05$) in state-specific age-adjusted death rates for COPD as the underlying cause of death among adults aged ≥ 25 years, by state—United States, Mortality Component of the National Vital Statistics System, 1999-2010.

COPD remains a significant source of morbidity and mortality in the United States. In 2007, chronic lower respiratory diseases constituted the fourth leading cause of death and rose to the third leading cause of death in 2008 primarily because cerebrovascular disease deaths continued a consistent decline and to a lesser extent as a result of adjustments to coding and classification.[1] The data examined in this surveillance report testify to the heavy public health burden that COPD continues to levy in the United States. Prior to 1999, rates of mortality and hospitalizations had shown worrisome increases. Thus, the apparent leveling of the mortality rate and a decrease in the rate of hospitalization represent cause for cautious optimism. Future surveillance efforts will be critical to tracking the course of COPD in the United States.

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Additional information: The e-Tables can be found in the "Supplemental Materials" area of the online article.

References

1. Miniño AM, Xu J, Kochanek KD, Division of Vital Statistics. Deaths: preliminary data for 2008. *Natl Vital Stat Rep*. 2010; 59(2):1-52.
2. Centers for Disease Control and Prevention (CDC). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000-2004. *MMWR Morb Mortal Wkly Rep*. 2008;57(45):1226-1228.
3. Engström CP, Persson LO, Larsson S, Sullivan M. Health-related quality of life in COPD: why both disease-specific and generic measures should be used. *Eur Respir J*. 2001;18(1): 69-76.
4. Viegi G, Pistelli F, Sherrill DL, Maio S, Baldacci S, Carrozzi L. Definition, epidemiology and natural history of COPD. *Eur Respir J*. 2007;30(5):993-1013.
5. Maurer J, Rebbapragada V, Borson S, et al; ACCP Workshop Panel on Anxiety and Depression in COPD. Anxiety and depression in COPD: current understanding, unanswered questions, and research needs. *Chest*. 2008;134(suppl 4):43S-56S.
6. National Institutes of Health, National Heart, Lung, and Blood Institute. Morbidity & mortality: 2012 chartbook on cardiovascular, lung, and blood diseases. National Heart, Lung and Blood Institute website. http://www.nhlbi.nih.gov/resources/docs/2012_ChartBook_508.pdf. Accessed March 15, 2013.
7. Barnes PJ, Celli BR. Systemic manifestations and comorbidities of COPD. *Eur Respir J*. 2009;33(5):1165-1185.
8. Stockley RA. Progression of chronic obstructive pulmonary disease: impact of inflammation, comorbidities and therapeutic intervention. *Curr Med Res Opin*. 2009;25(5):1235-1245.
9. Mannino DM. Epidemiology and global impact of chronic obstructive pulmonary disease. *Semin Respir Crit Care Med*. 2005;26(2):204-210.
10. Salvi SS, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. *Lancet*. 2009;374(9691):733-743.
11. Lamprecht B, McBurnie MA, Vollmer WM, et al; BOLD Collaborative Research Group. COPD in never smokers: results from the population-based burden of obstructive lung disease study. *Chest*. 2011;139(4):752-763.
12. Centers for Disease Control and Prevention (CDC). Chronic obstructive pulmonary disease among adults—United States, 2011. *MMWR Morb Mortal Wkly Rep*. 2012;61(46):938-943.
13. Mannino DM, Homa DM, Akinbami LJ, Ford ES, Redd SC. Chronic obstructive pulmonary disease surveillance—United States, 1971-2000. *MMWR Surveill Summ*. 2002;51(6):1-16.
14. Ford ES, Mannino DM, Wheaton AG, Giles WH, Presley-Cantrell L, Croft JB. Trends in the prevalence of obstructive and restrictive lung function among adults in the United States: findings from the National Health and Nutrition Examination Surveys from 1988-1994 to 2007-2010. *Chest*. 2013; 143(5):1395-1406.
15. Centers for Disease Control and Prevention. Behavioral risk factor surveillance system: survey data and documentation. Centers for Disease Control and Prevention website. http://www.cdc.gov/brfss/data_documentation.htm. Accessed March 15, 2013.
16. Centers for Disease Control and Prevention. National Health Interview Survey. Centers for Disease Control and Prevention website. http://www.cdc.gov/nchs/nhis.htm. Accessed October 3, 2011.
17. Centers for Disease Control and Prevention. Ambulatory health care data. Centers for Disease Control and Prevention website. http://www.cdc.gov/nchs/ahcd.htm. Accessed October 3, 2011.
18. Centers for Disease Control and Prevention. National Hospital Discharge Survey. Centers for Disease Control and Prevention website. http://www.cdc.gov/nchs/nhds.htm. Accessed October 3, 2011.
19. Centers for Disease Control and Prevention. Compressed mortality file 1979-1998 and 1999-2007. Centers for Disease Control and Prevention website. http://wonder.cdc.gov/wonder/help/cmf.html#. Accessed October 3, 2011.
20. Centers for Disease Control and Prevention. Compressed mortality file. Centers for Disease Control and Prevention website. http://www.cdc.gov/nchs/data_access/cmf.htm. Accessed October 3, 2011.
21. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. *Healthy People 2010 Stat Notes*. 2001;Jan(20):1-10.
22. Forey BA, Thornton AJ, Lee PN. Systematic review with meta-analysis of the epidemiological evidence relating smoking to COPD, chronic bronchitis and emphysema. *BMC Pulm Med*. 2011;11:36.
23. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. Health, United States, 2011: with special feature on socioeconomic status and health. Centers for Disease Control and Prevention website http://www.cdc.gov/nchs/data/hus/hus11.pdf. Accessed March 15, 2013.
24. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease (updated 2013). GOLD website. http://www.goldcopd.org/guidelines-global-strategy-for-diagnosis-management.html. Accessed March 15, 2013.
25. Qaseem A, Wilt TJ, Weinberger SE, et al; American College of Physicians; American College of Chest Physicians; American Thoracic Society; European Respiratory Society. Diagnosis and management of stable chronic obstructive pulmonary disease: a clinical practice guideline update from the American College of Physicians, American College of Chest Physicians, American Thoracic Society, and European Respiratory Society. *Ann Intern Med*. 2011;155(3):179-191.
26. Ford ES, Mannino DM, Zhao G, Li C, Croft JB. Changes in mortality among US adults with COPD in two national cohorts recruited from 1971-1975 and 1988-1994. *Chest*. 2012;141(1):101-110.
27. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. GOLD website. http://www.goldcopd.org/uploads/users/files/GOLDWkshp2001.pdf. Accessed August 24, 2012.
28. Celli BR, Halbert RJ, Isonaka S, Schau B. Population impact of different definitions of airway obstruction. *Eur Respir J*. 2003;22(2):268-273.
29. Halbert RJ, Natoli JL, Gano A, Badamgarav E, Buist AS, Mannino DM. Global burden of COPD: systematic review and meta-analysis. *Eur Respir J*. 2006;28(3):523-532.
30. Hansell AL, Walk JA, Soriano JB. What do chronic obstructive pulmonary disease patients die from? A multiple cause coding analysis. *Eur Respir J*. 2003;22(5):809-814.

31. Jensen HH, Godtfredsen NS, Lange P, Vestbo J. Potential misclassification of causes of death from COPD. *Eur Respir J*. 2006;28(4):781-785.
32. Hughes TS, Muldoon SB, Tollerud DJ. Underestimation of mortality due to chronic obstructive pulmonary disease (COPD) in Kentucky. *J Ky Med Assoc*. 2006;104(8):331-339.
33. Sin DD, Anthonisen NR, Soriano JB, Agusti AG. Mortality in COPD: role of comorbidities. *Eur Respir J*. 2006;28(6):1245-1257.
34. Arias E, Schauman WS, Eschbach K, Sorlie PD, Backlund E. The validity of race and Hispanic origin reporting on death certificates in the United States. *Vital Health Stat 2*. 2008;Oct(148):1-23.
35. Chavez PC, Shokar NK. Diagnosis and management of chronic obstructive pulmonary disease (COPD) in a primary care clinic. *COPD*. 2009;6(6):446-451.
36. U.S. Department of Health and Human Services. *Tracking Healthy People 2010*. Washington, DC: US Government Printing Office; 2000.
37. U.S. Department of Health and Human Services. Respiratory diseases. Healthy People website. http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=36. Accessed October 3, 2011.