



## Chronic Obstructive Pulmonary Disease and Associated Health-Care Resource Use—North Carolina, 2007 and 2009

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CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD), including emphysema and chronic bronchitis, is a progressive condition in which airflow becomes limited, making it difficult to breathe. Chronic lower respiratory diseases, primarily COPD, are the third leading cause of death in the United States,<sup>1</sup> and 5.1% of U.S. adults report a diagnosis of emphysema or chronic bronchitis.<sup>2</sup> Smoking is the primary cause of COPD, and at least 75% of COPD deaths are attributable to smoking in the United States.<sup>3</sup> Information on state-specific prevalence of COPD is sparse,<sup>4</sup> as are data on the use of COPD-related health-care resources. To understand how COPD affects adults in North Carolina and what resources are used by persons with COPD, 2007 and 2009 data from the North Carolina COPD module of the Behavioral Risk Factor Surveillance System (BRFSS) were analyzed. Among 26,227 respondents, 5.7% reported ever having been told by a health professional that they had COPD. Most adults with COPD reported ever having had a diagnostic breathing test (76.4% in 2007 and 82.4% in 2009). Among adults with COPD, 43.0% reported having gone to a physician and 14.9% visited an emergency department (ED) or were admitted to a hospital (2007) for COPD-related symptoms in the previous 12

months. Only 48.1% of persons reported daily use of medications for their COPD (2007). These results indicate that many adults with COPD might not have had adequate diagnostic spirometry, and many who might benefit from daily medications, such as long-acting bronchodilators and inhaled corticosteroids, are not taking them. Continued and expanded surveillance is needed to evaluate the effectiveness of prevention and intervention programs and support efforts to educate the public and physicians about COPD symptoms, diagnosis, and treatment.

BRFSS is a state-based, random-digit-dialed telephone survey of the civilian noninstitutionalized U.S. population aged  $\geq 18$  years that is conducted annually by state health departments in collaboration with CDC.\* This report summarizes unique state-specific data collected by the North Carolina Division of Public Health in 2007 and 2009. Council of American Survey and Research Organizations (CASRO) response rates† for the state were 55.4% in 2007 and 62.5% in 2009. Cooperation rates‡ were 74.8% in 2007 and 80.5% in 2009.

All respondents were asked, "Have you ever been told by a doctor or health professional that you have COPD, emphysema, or chronic bronchitis?" Respondents who answered "yes" to this question were asked a series of follow-up questions about health-care resource use and quality of life related to their COPD.§ Crude and age-adjusted<sup>5</sup> prevalence estimates and 95% confidence intervals (CI) were calculated for groups defined by selected characteristics. Statistical significance ( $p < 0.05$ ) was determined by t-test. Follow-up questions were analyzed separately if they were not identical in the 2 years that the COPD module was administered.

Among respondents, 5.7% reported having been told by a health professional that they had COPD, emphy-

### What is already known on this topic?

Chronic obstructive pulmonary disease (COPD) is a leading cause of death and disability in the United States, but information on state-specific prevalence has been sparse.

### What is added by this report?

Among adults in North Carolina, 5.7% reported having been told by a health professional that they had COPD. A majority of persons with COPD had been given a diagnostic breathing test, but less than half were using daily COPD medications.

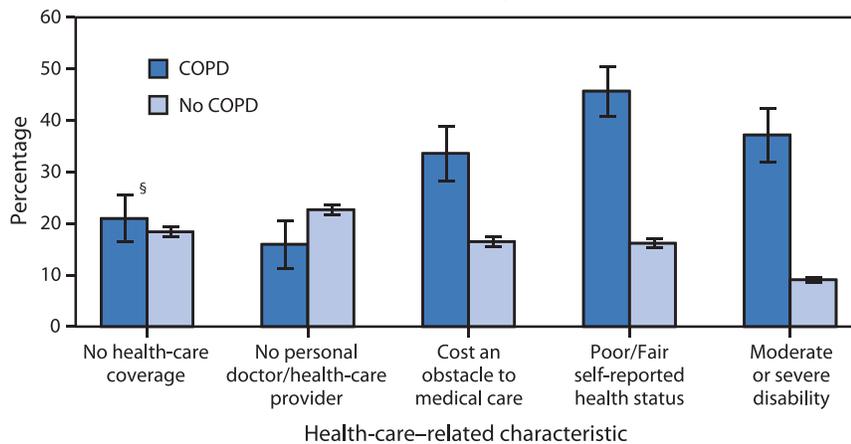
### What are the implications for public health practice?

Physicians should conduct spirometry to diagnose COPD and prescribe appropriate medications to control symptoms and reduce exacerbations. Clinicians and the public health community also should support smoking cessation efforts.

sema, or chronic bronchitis. The prevalence of self-reported COPD increased with age, from a low of 3.1% for adults aged 18-44 years, to  $>10\%$  for adults aged  $\geq 65$  years. Respondents with less than a high school diploma were more likely to report COPD (11.1%) than those with a high school diploma (6.7%) or at least some college education (4.2%). No significant differences were observed by sex or race. Current smokers were more likely to report COPD (11.7%) than either former smokers (5.6%) or never smokers (3.0%).

Respondents who reported COPD were less likely to report having no personal doctor or health-care provider (16.0%) than respondents without COPD (23.0%) (FIGURE). However, persons with COPD were more likely to report cost as an obstacle to medical care (34.0% versus 17.0%), poor or fair health status (46.0% versus 16.0%), or moderate or severe disability (37.0%

**FIGURE. Age-adjusted\* percentage of selected health-care-related characteristics† by COPD status — Behavioral Risk Factor Surveillance System, North Carolina, 2007 and 2009**



**Abbreviation:** COPD = chronic obstructive pulmonary disease, which includes emphysema and chronic bronchitis.

\* Age-adjusted to the 2000 U.S. standard population aged ≥18 years.

† Health-care coverage based on response to, "Do you have any kind of health-care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?" Personal doctor/health-care provider based on response to, "Do you have one person you think of as your personal doctor or health care provider?" Cost an obstacle to medical care based on response to, "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?" Health status based on response to, "Would you say that in general your health is — excellent, very good, good, fair, or poor?" Disability category based on response to, "A disability can be physical, mental, emotional, or communication related. Do you consider yourself to have a disability?" If yes, respondents were asked, "Would you say your disability is mild, moderate, or severe?"

§ 95% confidence interval.

versus 9.1%), compared with persons without COPD. No statistically significant differences were observed in having health-care coverage based on COPD status.

Among respondents who reported having ever been diagnosed with COPD, 76.4% reported having had a diagnostic breathing test in 2007 and 82.4% in 2009. A doctor's visit for COPD-related symptoms (including shortness of breath, bronchitis, and COPD or emphysema flare) in the past 12 months was reported by 43.0%. More than two thirds of respondents with COPD (70.7%) reported that shortness of breath affected their quality of life. An ED visit or hospital admission for COPD-related symptoms in the past 12 months was reported by 14.9% of respondents with COPD in 2007. In 2009, 13.8% of adults with COPD reported an overnight hospital stay for COPD-related symptoms in the past 12 months. In 2007, 48.1% of respondents with COPD reported use of

at least one daily medication for COPD, and in 2009, 28.7% said they had been prescribed prednisone. Adults who reported a physician visit for COPD symptoms, a visit to an ED or hospital admission for COPD, or impaired quality of life because of COPD symptoms were more likely to be using daily COPD medications compared with those without (56.3% versus 28.0%, 71.7% versus 34.8%, and 48.0% versus 25.5%, respectively). Those adults also were more likely to have been prescribed prednisone compared with those without such reports (50.1% versus 11.4%, 69.5% versus 21.7%, and 33.7% versus 13.9%, respectively).

Among respondents who reported a COPD diagnosis, those aged 18-44 years in 2007 were less likely to report having had a breathing test for the diagnosis of their COPD (59.1%; CI=44.7%-73.4%) compared with all other age groups. In 2009, those aged 18-44 years were less likely to report having had a diagnostic breathing test (70.8%;

CI=58.3%-83.3%) compared with those aged 65-74 years (92.0%; CI=88.5%-95.4%). No significant differences were observed between groups defined by sex, race, educational level, smoking status, health-care coverage status, having a personal physician or health-care provider, restricted access to doctor because of cost, or self-rated health status. In 2007, those who had visited an ED or had been admitted to the hospital because of COPD were more likely to report a diagnostic breathing test (90.0%; CI=81.1%-99.0%) compared with those without such a hospital visit (66.8%; CI=58.3%-75.2%). In 2009, nearly all (99.4%; CI=98.7%-100.0%) the adults who reported an overnight stay at the hospital for COPD reported a diagnostic breathing test compared with 77.3% (CI=70.2%-84.3%) of those who did not report an overnight hospital stay. In 2007, 82.9% (CI=75.6%-90.2%) of adults taking at least one COPD medication daily reported a diagnostic breathing test compared with 61.4% (CI=51.3%-71.5%) of those not taking any COPD medications.

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**CDC Editorial Note:** North Carolina has used the 2007 BRFSS data to identify counties with high COPD prevalence and has implemented public awareness activities for local community and education programs for health-care providers. Most recently, 2007 and 2009 BRFSS data formed the basis for community-based programs that targeted persons with low incomes who used free clinics as their primary source of health care. These programs are taking place through a network of free clinics in North Carolina, South Carolina, and Virginia.

Prevalence of self-reported, physician-diagnosed COPD was 5.7% among adults in North Carolina. More than 20% of respondents with COPD had not

been given a breathing test when diagnosed with COPD. Although COPD has no cure, medications are used to improve health status and quality of life by controlling symptoms, reducing the frequency and severity of COPD exacerbations, and improving exercise tolerance. A significant proportion of persons who likely suffer from more severe COPD, as suggested by physician visits for COPD symptoms, hospital visits for COPD, and impaired quality of life because of shortness of breath, were not using daily medications to control their COPD. This discrepancy might reflect an underuse of medications to control symptoms. Many respondents also indicated that COPD symptoms resulted in physician and hospital visits in the previous 12 months. These results suggest that COPD is not well-controlled in North Carolina.

The prevalence of COPD in this report is similar to national, self-reported data from 1998-2009.<sup>2</sup> The annual average prevalence of COPD in the U.S. Census division that includes North Carolina (South Atlantic) was 5.8% for 2007-2009.<sup>2</sup> However, if spirometry measures are used as the criterion, data from the National Health and Nutrition Examination Survey show that self-reported COPD only identifies half of persons with COPD.<sup>6</sup> Therefore, prevalence estimates based on self-report likely are underestimates.

Although most respondents with COPD reported having been given a breathing test to diagnose their COPD, >20% did not report a diagnostic breathing test. Spirometry is important to distinguish between COPD and other conditions, primarily asthma. The specificity that was added to the breathing test question in 2009 (i.e., “. . . which measures how much air you can breathe out through a tube . . .”) might have aided respondent recall, resulting in a greater number of respondents reporting having had a breathing test compared with 2007 responses. This has implications for future use of this question. Age-adjustment also affected breathing test rates, because young adults are less likely to have the

test. This, in turn, argues for the need for younger adults (18-44 years) with COPD symptoms to have a diagnostic breathing test, particularly because COPD is more difficult to diagnose in its early stages. Conducting spirometry after administration of a bronchodilator also is helpful in predicting how well a patient will respond to treatment. New clinical practice guidelines from the American College of Physicians<sup>7</sup> recommend that “spirometry should be obtained to diagnose airflow obstruction in patients with respiratory symptoms.” These respiratory symptoms include chronic cough, wheezing, sputum production, and shortness of breath. Respondents who had visited a hospital for COPD symptoms in the previous 12 months were more likely to have had a diagnostic breathing test. Determining whether this finding was a result of breathing tests being administered to persons with more severe symptoms and possibly more advanced COPD was beyond the scope of the survey.

The findings in this report are subject to at least four limitations. First, BRFSS only surveyed households with landline telephones in 2007 and 2009. The proportion of cellular telephone—only households (no landline, but accessible by cellular telephone) has increased substantially in recent years, which results in a larger segment of the younger, single or never married, Hispanic, or unemployed adult populations not being included in landline samples.<sup>8</sup> Because COPD is observed more commonly in older populations, this limitation might not be important. Second, institutionalized persons are not surveyed by BRFSS. Because this category includes older persons in nursing facilities, the actual prevalence of COPD in North Carolina might be higher than it was in the BRFSS sample. Third, the response rates (55.4% in 2007 and 62.5% in 2009) also might limit the generalizability of the results if the characteristics of the respondents and nonrespondents differ. Finally, the BRFSS North Carolina estimates are based on self-report and not

on physiologic measures, such as spirometry, and thus might underestimate the actual prevalence of COPD and burden of disease.

Although some data on COPD prevalence on a national or regional level are available, only a few states had undertaken efforts to collect COPD prevalence data before 2011. North Carolina was the first to collect data regarding use of diagnostic breathing tests, physician visits, hospital admissions, and use of COPD medications as part of an existing surveillance system. High quality surveillance data are necessary to evaluate the effectiveness of prevention and intervention programs such as the National Heart, Lung, and Blood Institute’s “COPD Learn More Breathe Better” campaign and to improve public and physician awareness of symptoms of COPD, diagnosis, and treatment. In addition to these benefits of expanded surveillance, the public health community can help to reduce the burden of COPD by reducing exposure to environmental tobacco smoke, dust, and other indoor and outdoor air pollutants through tobacco-control and other policies, and by continuing to support and expand smoking cessation programs. Physicians should encourage smoking cessation among all smoking patients. Clinical interventions have been shown to increase motivation to quit and improve abstinence rates.<sup>9</sup> Furthermore, smoking cessation decreases the rate in lung function decline among COPD patients.<sup>10</sup>

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\*Additional information about BRFSS is available at <http://www.cdc.gov/brfss>.

†The percentage of persons who completed interviews among all eligible persons, including those who were not successfully contacted.

‡The percentage of persons who completed interviews among all eligible persons who were contacted.

§In 2007, the follow-up COPD module included the following questions: (1) "Have you ever been given a breathing test to diagnose your COPD, chronic bronchitis, or emphysema?" (2) "Would you say that shortness of breath affects the quality of your life?" (3) "Other than a routine visit, have you had to see a doctor in the past 12 months for symptoms related to shortness of breath, bronchitis, or other COPD, or emphysema flare?" (4) "Did you have to visit an emergency room or be admitted to the hospital in the past 12 months because of your COPD, chronic bronchitis, or emphysema?" and (5) "How many different medications do you currently take each day to help with your COPD, chronic bronchitis, or emphysema (categorized as none or at least one medication reported)?" In 2009, the follow-up COPD module included the following questions: (1) "Have you ever been given a breathing test, which measures how much air you can breathe out through a tube, to diagnose your COPD, chronic bronchitis, or emphysema?" (2) "Would you say that shortness of breath affects the quality of your life?" (3) "Other than a routine visit, have you had to see a doctor in the past 12 months for symptoms related to shortness of breath, bronchitis, or other COPD, or emphysema flare?" (4) "During the past 12 months, have you stayed in a hospital overnight because of shortness of breath, COPD, or emphysema flare?" and (5) "Prednisone is a medicine that helps people with breathing problems breathe easier. It is sometimes called Deltasone or Medrol. During the past 12 months, has a doctor ever prescribed prednisone for your breathing problems?"

||Additional information is available at <http://www.nhlbi.nih.gov/health/public/lung/copd/index.htm>.

## Notes From the Field: Multistate Outbreak of *Salmonella* Altona and Johannesburg Infections Linked to Chicks and Ducklings From a Mail-Order Hatchery—United States, February-October 2011

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SALMONELLA INFECTIONS FROM CONTACT with live poultry (chickens, ducks, turkeys, and geese) continue to be a public health problem. In summer 2011, two clusters of human *Salmonella* infections were identified<sup>1</sup> through PulseNet, a molecular subtyping network for foodborne disease surveillance. Standard outbreak and traceback investigations were conducted. From February 25 to October 10, 2011, a cluster of 68 cases caused by *Salmonella* serotype Altona and a cluster of 28 cases caused by *Salmonella* Johannesburg were identified in 24 states. Among persons infected, 32% of those with *Salmonella* Altona and 75% of those with *Salmonella* Johannesburg were aged ≤5 years. Forty-two of 57 (74%) *Salmonella* Altona patients and 17 of 24 (71%) of *Salmonella* Johannesburg patients had contact with live poultry in the week preceding illness. Most patients or their parents reported purchasing chicks or ducklings from multiple locations of an agricultural feed store chain that was supplied by a single mail-order hatchery. Live poultry were purchased for either backyard flocks or as pets.

Live poultry are commonly purchased from agricultural feed stores or directly from mail-order hatcheries; approximately 50 million chicks are sold annually in the United States. Since 1990, approximately 35 outbreaks of human *Salmonella* infections linked to

contact with live poultry from mail-order hatcheries have been reported. These outbreaks highlight the ongoing risk for human *Salmonella* infections associated with live poultry contact, especially for young children.

In response to this ongoing public health problem, officials with local, state, and federal public and animal health agencies, the U.S. Department of Agriculture's National Poultry Improvement Plan (USDA-NPIP), the mail-order hatchery industry, and other partners have collaborated to develop and implement a comprehensive *Salmonella* control strategy. Mail-order hatcheries should comply with management and sanitation practices outlined in the USDA-NPIP *Salmonella* guidelines<sup>2</sup> and should avoid the shipment of hatched chicks between multiple hatcheries before shipping to customers. Educational materials warning customers of the risk for *Salmonella* infection from live poultry contact are available<sup>3</sup> and should be distributed with all live poultry purchases. Preventing these infections will require an integrated approach at the hatchery, agricultural feed store, and consumer levels.

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