Chronic obstructive pulmonary disease, hospital visits, and comorbidities – National Survey of Residential Care Facilities, 2010

Anne G. Wheaton, PhD[*], **Earl S. Ford, MD, MPH**, **Timothy J. Cunningham, ScD**, and **Janet B. Croft, PhD**

Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA

Abstract

Objectives—To characterize the prevalence of chronic obstructive pulmonary disease (COPD) among residential care facility (RCF) residents in the United States. To compare patterns of hospital visits and comorbidities to residents without COPD.

Methods—Resident data from the 2010 National Survey of Residential Care Facilities were analyzed. Medical history and information on past-year hospital visits for 8,089 adult residents were obtained from interviews with RCF staff.

Results—COPD prevalence was 12.4%. Compared to residents without COPD, emergency department visits or overnight hospital stays in previous year were more prevalent (p<0.05) among residents with COPD. <3% of residents with COPD had no comorbidities. Arthritis, depression, congestive heart failure, diabetes, coronary heart disease, and asthma were more common (p<0.05) among residents with COPD than those without COPD, but Alzheimer's disease was less common.

Discussion—COPD is associated with more emergency department visits, hospital stays, and comorbidities among RCF residents.

Keywords

Chronic obstructive pulmonary disease; Hospitalization; Comorbidity; Residential facilities

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a progressive condition characterized by breathing difficulties caused by airflow obstruction. It includes emphysema and chronic bronchitis and, in the United States, is usually attributable to smoking tobacco (Centers for Disease Control and Prevention, 2008). COPD is an important cause of mortality and

[*]Corresponding author. 4770 Buford Hwy. NE Mailstop F-78, Atlanta, GA 30341-3717, Tel.: +1 770 488 5362; Fax: +1 770 488 5965, AWheaton@cdc.gov.

morbidity in the U.S. (Ford et al., 2013). Individuals with COPD also are likely to suffer from a variety of other chronic conditions, such as cardiovascular disease and cancer (Barr et al., 2009; Cazzola, Bettoncelli, Sessa, Cricelli, & Biscione, 2010; Divo et al., 2012; Feary, Rodrigues, Smith, Hubbard, & Gibson, 2010; Garcia-Olmos et al., 2013; John, Lange, Hoernig, Witt, & Anker, 2006; Lindberg, Larsson, Ronmark, & Lundback, 2011; Nazir & Erbland, 2009; Schnell et al., 2012; Sin & Man, 2005; Soriano, Visick, Muellerova, Payvandi, & Hansell, 2005). As COPD becomes increasingly more severe, impaired lung function and symptoms such as shortness of breath may impact an individual's ability to perform basic activities.

Approximately 12% of US adults aged 65 years and older report being diagnosed with COPD, but this estimate is based on data from noninstitutionalized adults (Centers for Disease Control and Prevention, 2012). Residents of long-term care facilities such as residential care facilities (RCFs) are not included in these surveys. RCFs provide housing and support services for individuals who cannot live alone, but who do not require the level of care provided by nursing homes (Moss et al., 2011). It is important to look at this population because an estimated 733,000 individuals nationwide lived in RCFs in 2010 (Caffrey et al., 2012). The objectives of this study were to characterize the prevalence of COPD among residents of RCFs in the U.S., as well as to compare patterns of residents' hospital visits by COPD and comorbidity status.

METHODS

Design and study population

Data analyzed in this report were collected as part of the Centers for Disease Control and Prevention's National Survey of Residential Care Facilities (NSRCF). The National Center for Health Statistics conducted the NSRCF in 2010. The survey used a stratified two-stage probability sampling design. The first stage was the selection of residential care facilities (RCFs). Lists of licensed RCFs were acquired from licensing agencies in the 50 states and District of Columbia and concatenated to form a sampling frame of nearly 40,000 RCFs. The RCFs surveyed were state-regulated, had 4 or more beds, and provided room and board with at least two meals per day, around-the-clock supervision, and help with personal care or health-related services. Facilities licensed to serve developmentally disabled or severely mentally ill populations exclusively were excluded, as were nursing homes, unless they had a unit or wing meeting the RCF definition and residents who could be evaluated separately from other nursing home residents. The second stage was the selection of residents at the RCFs. Data for 8094 residents aged 18 years were obtained from in-person interviews with RCF staff (proxy respondents) of 2302 facilities. The overall weighted survey response rate was 79.4% (the product of the facility weighted response rate and the resident weighted response rate (Moss et al., 2011)). Additional details regarding the design and operation of the survey are available at http://www.cdc.gov/nchs/nsrcf.htm. NSRCF was approved by the Research Ethics Review Board of the National Center for Health Statistics.

COPD and comorbidities

For each resident selected, the survey respondent (RCF staff) was asked, "As far as you know, has a doctor or other health professional ever diagnosed [*the resident*] with any of the following conditions?" The respondent was shown a card with a list of 30 conditions and asked to select all that applied. The list included emphysema, chronic bronchitis, and COPD (each listed separately). These responses were not mutually exclusive and a resident could have more than one of these conditions (for example, emphysema and chronic bronchitis). In this study, COPD was defined as having any of these three conditions. Responses to this question were also used to categorize residents according to comorbidity status for the individual conditions included on the list, as well as categories of comorbidities: circulatory system disorders (congestive heart failure; coronary heart disease; heart attack or myocardial infarction; high blood pressure or hypertension; stroke; other heart condition or heart disease); mental and behavioral disorders (Alzheimer's disease or other dementia; depression; intellectual or developmental disabilities; serious mental problems [e.g. schizophrenia or psychosis]; other mental, emotional, or nervous conditions); musculoskeletal or connective tissue disorders (arthritis or rheumatoid arthritis; gout, lupus, or fibromyalgia; osteoporosis); eye diseases (glaucoma, macular degeneration); and nervous system disorders (nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy; partial or total paralysis; spinal cord injury; traumatic brain injury; cerebral palsy; muscular dystrophy).

Hospital visits

Survey respondents also were asked the following questions about the resident's hospital visits in the past 12 months (or in the months since the resident moved into the RCF): "During this time, has [*the resident*] been treated in a hospital emergency room?"; "During this time, has [*the resident*] been a patient in a hospital overnight or longer (excluding trips to the emergency room that did not result in a hospital stay)?"; and "How many times has [*the resident*] been treated in a hospital emergency room over this period?"

Sociodemographic variables

Data was also collected on residents' sex, age (18–64 years, 65–74 years, 75–84 years,   85 years), race/ethnicity (non-Hispanic white, non-Hispanic black, other), education (high school or less, some college or more, unknown), and marital status (married, divorced/separated, widowed, never married).

Statistical analysis

Statistical analyses were conducted using SAS 9.2 (SAS Institute, Inc.) with SUDAAN 10.0.1 (RTI International) to account for the complex sampling design. The nesting variables were RSTRATUM (first stage stratum) and FACID (first stage primary sampling unit). The resident weighting variable was RESFNWT. The design option WOR (sampling without replacement) was used with the variables RPOPFAC (variable for total facilities needed to calculate the finite population correction at the first stage) and POPRES in the TOTCNT statement. (A description of the variables that should be used by other statistical packages is included in the Survey Methodology and Documentation available at http://www.cdc.gov/

nchs/nsrcf/nsrcf_questionnaires.htm.) Weighted prevalence estimates of COPD with 95% confidence intervals (CI) were obtained by sociodemographic characteristics. Prevalences of hospital visits, overnight stays, and chronic health conditions by COPD status were also calculated. Finally, prevalence of emergency department visits by COPD and comorbidity status was also calculated. T-tests were used to compare residents with COPD to those without COPD. Statistically significant differences were defined as p-value < 0.05.

RESULTS

Out of the 8094 residents for whom data was collected, 5 were missing chronic disease data and were omitted from analyses. Characteristics of the sample population are presented in Table 1. The 8089 residents surveyed represented 732,987 residents nationally. The resident population was predominantly women (69.6%), aged 85 years or older (53.8%), non-Hispanic white (91.1%), had no more than a high school education (50.4%), and widowed (63.2%). At least one of the COPD conditions (chronic bronchitis, emphysema, or COPD) was reported for 12.4% of the study population, corresponding to over 91,000 residents nationally.

The prevalence of COPD was higher (p<0.05) among men than women (14.8% vs. 11.4%) and was lower among residents aged 85 years and older (10.3%) compared to the other age groups (Table 2). COPD prevalence did not differ significantly between groups defined by race/ethnicity or level of education, but was significantly lower among married residents (9.8%) compared to residents who were divorced or separated (15.1%), as well as never married residents (13.6%).

Compared to residents without COPD, those with COPD were significantly more likely to have visited a hospital emergency room in the previous 12 months (42.5% [95% CI: 38.6%, 46.5%] compared to 33.4% [95% CI: 31.9%, 34.8%], p<0.0001), to have made at least 3 visits to a hospital emergency room in that time (10.5% [95% CI: 8.3%, 13.2%] compared to 5.3% [95% CI: 4.7%, 6.1%], p=0.0001), and to have stayed in a hospital overnight (31.6% [95% CI: 28.3%, 35.2%] compared to 22.7% [95% CI: 21.4%, 24.0%], p<0.0001) after adjustment for age differences (Figure 1).

Compared to residents without COPD, the age-adjusted prevalence of the following chronic conditions was significantly higher among residents with COPD: depression, arthritis, diabetes, coronary heart disease, congestive heart failure, anemia, serious mental problems such as schizophrenia or psychosis, kidney disease, heart attack, and asthma (Table 3). The following conditions were significantly less prevalent among residents with COPD: Alzheimer's disease or other dementia and nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy. We also grouped categories of chronic conditions. Residents with COPD were more likely to have circulatory system disorders and musculoskeletal or connective tissue disorders than residents without COPD. Overall, the age-adjusted mean number of chronic health conditions (excluding COPD) was higher among residents with COPD (mean: 3.97 vs. 3.25).

Among residents <u>without</u> a given chronic condition, COPD was associated with a higher age-adjusted prevalence of having visited a hospital emergency room in the previous 12 months (Table 4) and of having an overnight hospital stay in the previous 12 months (Table 5). Among residents <u>with</u> a given chronic condition, COPD was associated with a higher age-adjusted prevalence of having visited a hospital emergency room (Table 4) if they had hypertension (45.0% vs. 36.2%), depression (49.5% vs. 38.1%), osteoporosis (47.7% vs. 35.2%), diabetes (46.3% vs. 37.2%), congestive heart failure (54.2% vs. 42.8%), or asthma (53.7% vs. 38.5%), and of having stayed in a hospital overnight (Table 5) for hypertension (31.0% vs. 24.7%), depression (38.4% vs. 26.4%), arthritis (31.5% vs. 24.2%), osteoporosis (35.6% vs. 24.4%), other mental, emotional, or nervous condition (38.3% vs. 27.8%), cancer (42.2% vs. 26.6%), or nervous system disorders (44.5% vs. 26.4%).

DISCUSSION

The prevalence of COPD for the RCF population was 12.4%, similar to the prevalence of self-reported physician diagnosed COPD among the noninstitutionalized US population aged 65 years and older (Ford et al., 2013). However, the COPD prevalence was higher among men compared to women, in contrast to estimates in the general population (Ford et al., 2013). Since the RCF population is older than the general population, this difference may reflect more men having a history of cigarette smoking compared to women in this older cohort (Burns et al., 1997). Women with are at a higher risk of hospitalization and death from COPD than are men (Ohar, Fromer, & Donohue, 2011). Fewer women with COPD may be living long enough to be represented in the RCFs. They may also require more care than is normally provided by RCFs. The prevalence was lowest among residents aged 85 years or older (10.3%). No differences in COPD prevalence were found by race/ethnicity or level of education, but it was less common among married individuals compared to those who were separated or divorced or had never married or were widowed. This observation supports the frequently-found association between being married and better health (Schoenborn, 2004) and is similar to the pattern found in the general population (Centers for Disease Control and Prevention, 2012; Ford et al., 2013). In addition to different study populations, it should be noted that these surveys of the general population (Centers for Disease Control and Prevention, 2012; Ford et al., 2013) relied on self-reports of physician-diagnosed COPD in contrast to the NSRCF's use of medical records. This methodological difference could also contribute to discrepancies in prevalence estimates.

Comorbidities are common among patients with COPD (Garcia-Olmos et al., 2013; Mapel et al., 2000). Residents with COPD had a significantly higher mean of 4 chronic conditions (in addition to COPD), compared to only 3.25 chronic conditions for residents without COPD. In addition, various studies have observed higher rates of individual chronic conditions among persons with COPD than among those without COPD including cardiovascular disease (Feary et al., 2010; Lindberg et al., 2011; Sin & Man, 2005) (coronary heart disease (Garcia-Olmos et al., 2013; Mapel et al., 2000; Schnell et al., 2012), congestive heart failure (CHF) (Garcia-Olmos et al., 2013; Mapel et al., 2000; Schnell et al., 2012), myocardial infarction (Garcia-Olmos et al., 2013; Mapel et al., 2000; Soriano et al., 2005)), hypertension (Lindberg et al., 2011), stroke (Feary et al., 2010; Lindberg et al., 2011; Schnell et al., 2012), diabetes (Feary et al., 2010), chronic kidney disease (Schnell et

al., 2012), arthritis (Schnell et al., 2012), depression (Schnell et al., 2012), osteoporosis (Garcia-Olmos et al., 2013; Schnell et al., 2012; Soriano et al., 2005), cancer (Mapel et al., 2000; Schnell et al., 2012), ulcers/gastritis (Mapel et al., 2000), asthma (Garcia-Olmos et al., 2013), anemia (John et al., 2006), and visual impairment (Schnell et al., 2012; Soriano et al., 2005).

In this RCF population, compared to residents without COPD, residents with COPD were more likely to have the following conditions: coronary heart disease; a history of myocardial infarction; diabetes; kidney disease; arthritis; anemia; depression; serious mental problems such as schizophrenia or psychosis; and other mental, emotional, or nervous conditions. The difference in prevalence was especially pronounced for CHF (26.4% among those with COPD versus 11.3% among those without) and asthma (14.5% versus 2.7%). Other studies have observed a higher prevalence of CHF among individuals with COPD compared to those without (Garcia-Olmos et al., 2013; Mapel et al., 2000; Schnell et al., 2012). In a case-control study of a health maintenance population by Mapel and colleagues, 13.5% of patients with COPD had CHF, much higher than the prevalence among controls (2.5%) (Mapel et al., 2000). Among family practice patients in Madrid, the age and sex-adjusted prevalence ratio for CHF was 2.41 (8.03% versus 3.34%), the highest prevalence ratio for any of the chronic diseases included in the study (Garcia-Olmos et al., 2013). The difference was also dramatic in a cross-sectional study of the noninstitutionalized U.S. population (the National Health and Nutrition Examination Survey 1999–2008) with CHF prevalence of 12.1% for participants reporting COPD versus 3.9% for those without (Schnell et al., 2012). Asthma and COPD are often reported together (Garcia-Olmos et al., 2013). Due to common symptoms and risk factors, it may be difficult for primary care physicians to differentiate between the two conditions. However, the existence of an overlap syndrome, in which both asthma and COPD are present, has been confirmed among older individuals (Marsh et al., 2008).

At the other end of the spectrum, Alzheimer's disease or other dementia and nervous system disorders such as Parkinsons's disease were less common among residents with COPD. Although little is known about the association of COPD with Alzheimer's disease, many investigations into the association between smoking (the primary cause of COPD in the U.S.) and Alzheimer's disease have been undertaken (Cataldo, Prochaska, & Glantz, 2010; Ferri et al., 2011; Garcia, Ramon-Bou, & Porta, 2010). Many cross-sectional studies have demonstrated an inverse relationship, which could be attributed to early mortality from smoking-related causes (Debanne, Bielefeld, Cheruvu, Fritsch, & Rowland, 2007), the potential effects of nicotine on dementia symptoms (Echeverria & Zeitlin, 2012), or the positive association of smoking with protective factors, such as coffee consumption (Lopez-Garcia et al., 2006; Nettleton, Follis, & Schabath, 2009). However, some investigators support the hypothesis that these results are largely indicative of bias (Cataldo et al., 2010; Debanne et al., 2007). Similarly, Parkinson's disease and smoking have repeatedly been shown to be inversely related (Chen et al., 2010; Liu et al., 2012; Quik, Perez, & Bordia, 2012; Wirdefeldt, Adami, Cole, Trichopoulos, & Mandel, 2011).

COPD is an important cause of emergency department visits and hospitalization among adults in the U.S. (Buckelew, DeGood, Roberts, Butkovic, & MacKewn, 2009). In 2010,

there were an estimated 1.5 million (72.0 per 10,000) emergency department visits and more than 699,000 (32.2 per 10,000) hospital visits among U.S. adults aged   25 years with COPD as the discharge diagnosis (Ford et al., 2013). In the same year, only 4% of all emergency department visits that resulted in hospital admissions for patients aged 65 years or older had COPD listed as the principal diagnosis, but nearly a quarter (23%) had COPD listed as any diagnosis (Buckelew et al., 2009). The corresponding estimates for all hospital stays were 3.3% with COPD listed as the principal diagnosis and 21% with COPD listed as any diagnosis (Buckelew et al., 2009). Several chronic health conditions associated with an increased rate of ER visits by RCF residents had an additional increase associated with COPD. These conditions (hypertension, depression, CHF, and diabetes) were common in the RCF population, with each condition having a prevalence of at least 10%; but, with the exception of hypertension, they were even more prevalent among residents with COPD. The same can be said of the following chronic health conditions associated with a higher prevalence of overnight hospital stays and also an additional COPD-associated increase: hypertension, depression, other mental, emotional, or nervous conditions, and cancer.

There are several actions RCF staff can take to improve care of their residents with COPD. A significant portion of COPD exacerbations that require hospitalization are due to pulmonary infections (Tsai, Clark, Cydulka, Rowe, & Camargo, 2007), stressing the importance of vaccination of individuals with COPD. The American Thoracic Society has recommended that COPD patients receive an annual influenza vaccine, as well as a pneumococcal vaccination at least once (American Thoracic Society/European Respiratory Society Task Force, 2004). In addition, RCF staff may be able to help prevent COPD exacerbations by improving residents' medication adherence (Bourbeau, 2010). RCF staff may also be able to reduce hospitalizations by improving residents' adherence to treatment for their comorbidities, such as hypertension, depression, diabetes, and congestive heart failure. Providing assistance with smoking cessation and promotion of physical activity would also be especially beneficial for COPD patients (American Thoracic Society/ European Respiratory Society Task Force, 2004).

This study was subject to some limitations. The NSRCF relied on RCF staff for data on residents' chronic disease history. Although the staff had access to residents' records, it is possible that some information was overlooked or missing from these records. However, these data may also have been more reliable than residents' self-reports would have been, especially for older residents suffering from dementia or other conditions that would impair memory or understanding of questions asked. Regarding data on hospital visits, the reason for these visits was not available. Therefore, although residents with COPD were more likely to visit hospital emergency rooms and have overnight hospital stays than those without COPD, these visits may not have been due to COPD, but to other conditions. Future research in this population would benefit from details about reasons for hospital visits, as well as information about vaccinations, and smoking policies at the facilities.

CONCLUSIONS

Chronic medical conditions are common among residents of RCFs with COPD. Residents with COPD are more likely to have specific conditions such as congestive heart failure and

asthma than other residents and are also more likely to have had a visit to a hospital emergency room or overnight hospital stay in the previous year.

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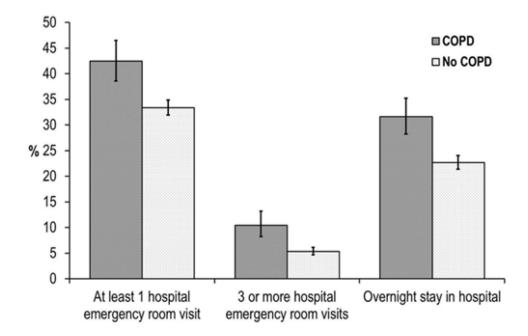
Figure 1.
Prevalence of hospital visits and overnight stays in the previous 12 months by COPD status
—NSRCF, 2010. *Note.* COPD = chronic obstructive pulmonary disease; NSRCF = National
Survey of Residential Care Facilities.

Table 1

Characteristics of study population - National Survey of Residential Care Facilities, 2010.

Characteristic	Sample size	Weighted no.	%[a](95% CI)
Total	8,089	732,987	100.0
Sex			
Men	2,582	222,710	30.4 (29.1–31.7)
Women	5,507	510,277	69.6 (68.3–70.9)
Age (years)			
18–64	1,238	77,218	10.5 (9.5–11.6)
65–74	792	62,424	8.5 (7.8–9.4)
75–84	2,037	198,727	27.1 (25.9–28.4)
85+	4,022	394,618	53.8 (52.3–55.4)
Race/Ethnicity			
White non-Hispanic	7,197	667,486	91.1 (90.1–91.9)
Black non-Hispanic	458	31,680	4.3 (3.8–5.0)
Other	434	33,821	4.6 (4.0–5.3)
Education			
High school or less	4,514	369,024	50.4 (48.7–52.2)
Some college or more	2,470	252,719	34.5 (32.9–36.2)
Unknown	1,105	111,244	15.2 (13.6–16.9)
Marital Status[b]			
Married	957	94,583	13.1 (12.2–14.1)
Divorced/Separated	932	73,094	10.1 (9.3–11.0)
Widowed	4,694	456,927	63.2 (61.6–64.7)
Never married	1,406	98,889	13.7 (12.6–14.8)
History of			
Chronic bronchitis	199	14,483	2.0 (1.6–2.4)
Emphysema	103	8,635	1.2 (0.9–1.5)
COPD	878	78,994	10.8 (9.9–11.7)
Any COPD[c]	1,034	91,119	12.4 (11.5–13.4)

[a] Weighted percentage and 95% confidence interval.

[b] Marital status was not identified for 100 residents.

[c] Any COPD includes history of chronic bronchitis, emphysema, or COPD.

Table 2

COPD[a] prevalence by sociodemographic characteristics - NSRCF, 2010.

Characteristic	%[b](95% CI)
Total	12.4(11.5–13.4)
Sex	
Men	14.8(13.1–16.6)
Women	11.4(10.4–12.5)
Age (years)	
18–64	14.1(11.5–17.1)
65–74	17.0(13.8–20.8)
75–84	14.6(12.8–16.6)
85	10.3(9.2–11.5)
Race/Ethnicity	
White non-Hispanic	12.4(11.4–13.4)
Black non-Hispanic	12.7(8.7–18.0)
Other	13.7(10.2–18.2)
Education	
High school or less	13.2(11.9–14.6)
Some college or more	11.8(10.3–13.5)
Unknown	11.3(9.1–13.9)
Marital Status	
Married	9.8(7.8–12.2)
Divorced/Separated	15.1(12.4–18.3)
Widowed	12.2(11.1–13.5)
Never married	13.6(11.1–16.5)

[a]Includes history of chronic bronchitis, emphysema, or COPD.

[b]Weighted percentage and 95% confidence interval.

Table 3

Prevalence of individual chronic health conditions by COPD status-NSRCF 2010

Chronic health condition	Total %[a]	Total (95% CI)	COPD %	COPD (95% CI)	No COPD %	No COPD (95% CI)	Difference in prevalence (COPD-No COPD)	p-value for t-test
High blood pressure/hypertension	56.7	(55.1–58.3)	59.4	(55.4–63.3)	56.4	(54.6–58.1)	3.01	NS
Alzheimer's disease or other dementia	41.8	(40.2–43.5)	33.7	(30.1–37.5)	43.0	(41.3–44.7)	−9.32	<0.001
Depression	27.4	(26.1–28.8)	31.5	(28.1–35.1)	26.8	(25.4–28.3)	4.67	0.012
Arthritis or rheumatoid arthritis	27.1	(25.6–28.6)	33.7	(30.1–37.5)	26.2	(24.7–27.7)	7.55	<0.001
Osteoporosis	20.4	(19.1–21.7)	22.4	(19.3–25.8)	20.1	(18.8–21.5)	2.28	NS
Diabetes	17.2	(16.1–18.3)	25.3	(22.1–28.7)	16.0	(14.9–17.2)	9.26	<0.001
Other heart condition (not listed elsewhere)	14.4	(13.3–15.6)	15.4	(12.7–18.5)	14.3	(13.1–15.5)	1.12	NS
Coronary heart disease	13.2	(12.2–14.4)	18.0	(15.2–21.2)	12.6	(11.4–13.8)	5.42	<0.001
Congestive heart failure	13.2	(12.2–14.3)	26.4	(23.2–29.9)	11.3	(10.4–12.4)	15.05	<0.001
Other mental, emotional, or nervous condition	11.7	(10.8–12.7)	14.8	(12.5–17.6)	11.2	(10.3–12.3)	3.61	0.007
Stroke	10.9	(10.1–11.8)	12.4	(10.1–15.1)	10.7	(9.8–11.7)	1.73	NS
Cancer or malignant neoplasm of any kind	10.7	(9.9–11.6)	10.9	(8.8–13.4)	10.7	(9.8–11.7)	0.23	NS
Anemia	9.6	(8.8–10.6)	13.5	(10.9–16.5)	9.1	(8.2–10.0)	4.38	0.003
Nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy	7.7	(7.0–8.5)	5.8	(4.3–7.7)	8.0	(7.2–8.8)	−2.15	0.020
Serious mental problems such as schizophrenia or psychosis	7.6	(6.8–8.5)	10.9	(8.6–13.8)	7.1	(6.3–8.0)	3.84	0.004
Gastrointestinal problems	7.5	(6.7–8.4)	8.6	(6.6–11.2)	7.3	(6.5–8.3)	1.3	NS
Glaucoma	6.3	(5.6–7.0)	5.7	(4.2–7.7)	6.3	(5.6–7.1)	−0.61	NS
Macular degeneration	5.9	(5.3–6.6)	6.8	(5.2–8.8)	5.8	(5.1–6.6)	0.95	NS
Kidney disease	5.7	(5.1–6.4)	9.6	(7.6–12.1)	5.1	(4.5–5.9)	4.47	<0.001
Heart attack/myocardial infarction	4.2	(3.7–4.8)	6.4	(4.6–8.7)	3.9	(3.4–4.5)	2.47	0.021
Asthma	4.2	(3.7–4.8)	14.5	(12.0–17.3)	2.7	(2.3–3.3)	11.71	<0.001
Intellectual or developmental disability such as mental retardation, severe autism, or Down syndrome	3.3	(2.9–3.9)	2.9	(2.0–4.3)	3.4	(2.9–4.0)	−0.47	NS
Gout, lupus, or fibromyalgia	2.6	(2.2–3.0)	3.7	(2.6–5.2)	2.4	(2.0–2.9)	1.31	NS
Category[b]								
Circulatory system disorders	70.7	(69.2–72.1)	77.0	(73.5–80.1)	69.8	(68.2–71.3)	7.19	<0.001
Mental and behavioral disorders	64.9	(63.2–66.5)	65.4	(61.5–69.1)	64.8	(63.1–66.5)	0.58	NS

Chronic health condition	Total		COPD		No COPD		Difference in prevalence (COPD-No COPD)	p-value for t-test
	%[a]	(95% CI)	%	(95% CI)	%	(95% CI)		
Musculoskeletal or connective tissue disorders	40.2	(38.6–41.7)	47.5	(43.7–51.3)	39.1	(37.5–40.8)	8.36	<0.001
Eye diseases	11.3	(10.4–12.3)	11.2	(9.1–13.8)	11.3	(10.4–12.3)	−0.07	NS
Nervous system disorders	11.3	(10.5–12.2)	9.5	(7.6–11.8)	11.6	(10.7–12.5)	−2.1	NS
Number of chronic health conditions								
0	2.8	(2.2–3.4)	2.1	(1.2–3.5)	2.9	(2.3–3.6)	−0.81	NS
1–3	56.3	(54.7–57.9)	43.5	(39.7–47.4)	58.1	(56.4–59.8)	−14.64	<0.001
4–6	34.4	(33.0–35.9)	41.8	(38.2–45.5)	33.4	(31.8–35.0)	8.43	<0.001
7+	6.5	(5.8–7.3)	12.6	(10.4–15.2)	5.6	(4.9–6.4)	7.02	<0.001
Mean (SE)	3.34	(0.04)	3.97	(0.09)	3.25	(0.04)	0.72	<0.001

[a]Weighted percentage and 95% confidence interval. Prevalence estimates for paralysis, spinal cord injury, traumatic brain injury, muscular dystrophy, and cerebral palsy are not reported due to lack of reliability (cell size < 30).

[b]Circulatory system disorders: congestive heart failure; coronary heart disease; heart attack or myocardial infarction; high blood pressure or hypertension; stroke; other heart condition or heart disease.

Mental and behavioral disorders: Alzheimer's disease or other dementia; depression; intellectual or developmental disabilities; serious mental problems (e.g. schizophrenia or psychosis); other mental, emotional, or nervous conditions.

Musculoskeletal or connective tissue disorders: arthritis or rheumatoid arthritis; gout, lupus, or fibromyalgia; osteoporosis.

Eye diseases: glaucoma, macular degeneration.

Nervous system disorders: nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy; partial or total paralysis; spinal cord injury; traumatic brain injury; cerebral palsy; muscular dystrophy.

Table 4

Prevalence of at least one hospital emergency room visit in previous 12 months by COPD and chronic condition status–NSRCF 2010

Comorbidity/chronic health condition	Chronic condition absent		p-value	Chronic condition present		p-value
	No COPD %[a] (95% CI)	COPD % (95% CI)	COPD vs No COPD	No COPD % (95% CI)	COPD % (95% CI)	COPD vs No COPD
High blood pressure/hypertension	29.7 (27.6–31.8)	38.9 (32.8–45.4)	0.0060	36.2 (34.3–38.1)	45.0 (40.1–49.9)	0.0012
Alzheimer's disease or other dementia	32.3 (30.4–34.3)	44.7 (39.8–49.8)	<0.0001	34.7 (32.5–36.9)	38.2 (32.2–44.5)	NS
Depression	31.6 (30.0–33.3)	39.3 (34.7–44.1)	0.0027	38.1 (35.4–40.9)	49.5 (43.0–56.0)	0.0016
Arthritis or rheumatoid arthritis	32.3 (30.7–34.0)	43.0 (38.2–47.9)	<0.0001	36.2 (33.5–39.1)	41.6 (35.4–48.0)	NS
Osteoporosis	32.9 (31.3–34.6)	41.0 (36.6–45.5)	0.0008	35.2 (32.0–38.5)	47.7 (39.7–55.9)	0.0052
Diabetes	32.6 (31.1–34.2)	41.2 (36.9–45.8)	0.0003	37.2 (33.7–40.9)	46.3 (38.7–54.0)	0.036
Other heart condition (not listed elsewhere)	32.1 (30.5–33.7)	41.8 (37.6–46.2)	<0.0001	41.1 (37.5–44.8)	46.3 (36.6–56.3)	NS
Coronary heart disease	32.1 (30.6–33.7)	43.0 (38.7–47.4)	<0.0001	42.0 (37.8–46.3)	40.4 (32.4–48.9)	NS
Congestive heart failure	32.2 (30.6–33.8)	38.3 (34.0–42.9)	0.0096	42.8 (38.6–47.1)	54.2 (46.4–61.7)	0.0137
Other mental, emotional, or nervous condition	32.5 (31.0–34.1)	41.4 (37.1–45.9)	0.0002	39.9 (35.9–44.1)	48.7 (39.9–57.6)	NS
Stroke	32.6 (31.1–34.2)	41.9 (37.7–46.1)	0.0001	39.6 (35.4–44.0)	46.9 (36.6–57.5)	NS
Cancer or malignant neoplasm of any kind	33.3 (31.7–34.8)	42.5 (38.5–46.7)	<0.0001	34.2 (29.9–38.9)	42.3 (31.6–53.8)	NS
Anemia	32.5 (31.0–34.1)	41.6 (37.5–45.9)	0.0001	41.6 (37.0–46.4)	48.2 (37.9–58.6)	NS
Nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy	32.6 (31.1–34.1)	41.7 (37.7–45.8)	<0.0001	42.7 (37.8–47.8)	55.7 (41.2–69.3)	NS
Serious mental problems such as schizophrenia or psychosis	33.5 (31.9–35.0)	42.7 (38.5–46.9)	0.0001	32.2 (27.7–37.0)	41.1 (30.8–52.4)	NS
Gastrointestinal problems	32.7 (31.2–34.2)	42.2 (38.2–46.4)	<0.0001	41.8 (36.6–47.2)	45.6 (33.7–58.0)	NS
Glaucoma	33.1 (31.6–34.7)	42.8 (38.8–46.9)	<0.0001	37.1 (31.7–42.8)	37.4 (23.6–53.6)	NS
Macular degeneration	33.5 (32.0–35.1)	42.7 (38.7–46.8)	<0.0001	30.7 (25.5–36.4)	39.9 (27.3–54.1)	NS
Kidney disease	32.6 (31.1–34.1)	42.3 (38.2–46.6)	<0.0001	47.2 (41.1–53.4)	44.2 (32.7–56.4)	NS
Heart attack/myocardial infarction	33.1 (31.6–34.6)	42.1 (38.1–46.2)	<0.0001	40.7 (33.9–47.8)	48.7 (34.5–63.2)	NS
Asthma	33.2 (31.7–34.7)	40.6 (36.5–44.8)	0.0009	38.5 (30.8–46.9)	53.7 (43.9–63.3)	0.0171
Intellectual or developmental disability such as mental retardation, severe autism, or Down syndrome[b]	*33.5 (32.0–35.0)*	*42.4 (38.4–46.5)*	*0.0001*	*30.2 (23.9–37.5)*	*46.1 (29.8–63.3)*	*NS*
Gout, lupus, or fibromyalgia[b]	*33.0 (31.5–34.5)*	*41.7 (37.7–45.8)*	*0.0001*	*49.4 (40.1–58.8)*	*64.1 (46.1–78.8)*	*NS*
Category[c]						
Circulatory system disorders	26.0 (23.7–28.5)	33.4 (26.0–41.6)	NS	36.5 (34.8–38.3)	45.2 (40.9–49.7)	0.0004

Comorbidity/chronic health condition	Chronic condition absent			Chronic condition present		
	No COPD %[a] (95% CI)	COPD % (95% CI)	p-value COPD vs No COPD	No COPD % (95% CI)	COPD % (95% CI)	p-value COPD vs No COPD
Mental and behavioral disorders	30.8 (28.3–33.4)	39.7 (33.1–46.8)	0.0155	34.8 (33.0–36.6)	44.0 (39.5–48.6)	0.0002
Musculoskeletal or connective tissue disorders	32.1 (30.3–34.0)	39.9 (34.6–45.4)	0.0068	35.3 (33.0–37.7)	45.4 (39.9–51.1)	0.0014
Eye diseases	33.4 (31.9–35.0)	43.1 (39.0–47.3)	<0.0001	32.7 (28.8–36.8)	37.9 (27.9–49.0)	NS
Nervous system disorders	32.5 (30.9–34.0)	41.8 (37.7–46.1)	<0.0001	40.2 (36.2–44.4)	49.0 (38.0–60.1)	NS

[a] Weighted percentage and 95% confidence interval. Prevalence estimates for paralysis, spinal cord injury, traumatic brain injury, muscular dystrophy, and cerebral palsy are not reported due to lack of reliability (cell size < 30).

[b] Prevalence estimates for gout, lupus, or fibromyalgia and intellectual or developmental disability may not be reliable (cell size 30–59).

[c] Circulatory system disorders: congestive heart failure; coronary heart disease; heart attack or myocardial infarction; high blood pressure or hypertension; stroke; other heart condition or heart disease.

Mental and behavioral disorders: Alzheimer's disease or other dementia; depression; intellectual or developmental disabilities; serious mental problems (e.g. schizophrenia or psychosis); other mental, emotional, or nervous conditions.

Musculoskeletal or connective tissue disorders: arthritis or rheumatoid arthritis; gout, lupus, or fibromyalgia; osteoporosis.

Eye diseases: glaucoma, macular degeneration.

Nervous system disorders: nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy; partial or total paralysis; spinal cord injury; traumatic brain injury; cerebral palsy; muscular dystrophy.

Table 5

Prevalence of at least one overnight hospital stay in previous 12 months by COPD and chronic condition status–NSRCF 2010

Comorbidity/chronic health condition	Chronic condition absent		p-value	Chronic condition present		p-value
	No COPD %^a (95% CI)	COPD % (95% CI)	COPD vs No COPD	No COPD % (95% CI)	COPD % (95% CI)	COPD vs No COPD
High blood pressure/hypertension	20.1 (18.2–22.1)	32.5 (26.9–38.8)	0.0001	24.7 (23.1–26.5)	31.0 (26.9–35.5)	0.0073
Alzheimer's disease or other dementia	22.8 (21.1–24.6)	34.1 (29.9–38.7)	<0.0001	22.5 (20.6–24.5)	26.7 (21.5–32.6)	NS
Depression	21.4 (19.9–22.9)	28.5 (24.6–32.8)	0.0011	26.4 (24.0–28.8)	38.4 (32.6–44.7)	0.0003
Arthritis or rheumatoid arthritis	22.2 (20.7–23.7)	31.7 (27.5–36.2)	<0.0001	24.2 (21.8–26.8)	31.5 (26.1–37.4)	0.0184
Osteoporosis	22.3 (20.8–23.8)	30.5 (26.7–34.5)	0.0001	24.4 (21.6–27.3)	35.6 (28.2–43.9)	0.0076
Diabetes	21.9 (20.5–23.4)	31.4 (27.5–35.5)	<0.0001	26.7 (23.6–29.9)	32.5 (25.7–40.1)	NS
Other heart condition (not listed elsewhere)	21.6 (20.2–23.0)	30.8 (27.2–34.6)	<0.0001	29.4 (26.0–33.0)	36.3 (27.3–46.4)	NS
Coronary heart disease	21.5 (20.1–22.9)	31.7 (27.9–35.7)	<0.0001	31.3 (27.4–35.4)	31.4 (24.1–39.7)	NS
Congestive heart failure	21.1 (19.8–22.5)	27.7 (24.1–31.7)	0.0011	35.1 (31.1–39.2)	42.5 (35.1–50.2)	NS
Other mental, emotional, or nervous condition	22.0 (20.7–23.5)	30.5 (26.8–34.4)	<0.0001	27.8 (24.3–31.7)	38.3 (30.0–47.5)	0.0326
Stroke	21.8 (20.5–23.2)	31.6 (28.0–35.5)	<0.0001	29.9 (25.9–34.1)	31.8 (22.7–42.6)	NS
Cancer or malignant neoplasm of any kind	22.2 (20.9–23.6)	30.3 (26.9–34.1)	<0.0001	26.6 (22.7–30.8)	42.2 (31.4–53.7)	0.0115
Anemia	22.1 (20.8–23.5)	31.0 (27.4–34.8)	<0.0001	28.2 (24.1–32.8)	35.9 (26.7–46.2)	NS
Nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy	22.4 (21.1–23.8)	30.8 (27.4–34.5)	<0.0001	26.4 (22.2–31.0)	44.5 (31.1–58.8)	0.0162
Serious mental problems such as schizophrenia or psychosis	22.6 (21.3–24.0)	32.1 (28.5–36.0)	<0.0001	23.5 (19.5–28.0)	27.6 (20.1–36.6)	NS
Gastrointestinal problems	22.4 (21.0–23.7)	31.3 (27.8–35.1)	<0.0001	27.0 (22.2–32.4)	35.0 (24.1–47.8)	NS
Glaucoma	22.4 (21.1–23.8)	31.5 (28.0–35.2)	<0.0001	26.9 (22.0–32.4)	34.1 (20.7–50.6)	NS
Macular degeneration	22.7 (21.4–24.1)	31.5 (28.0–35.3)	<0.0001	22.1 (17.6–27.3)	33.5 (21.9–47.4)	NS
Kidney disease	21.9 (20.6–23.3)	31.3 (27.7–35.1)	<0.0001	37.3 (31.4–43.7)	34.8 (24.3–47.1)	NS
Heart attack/myocardial infarction	22.2 (20.9–23.5)	31.5 (28.1–35.2)	<0.0001	35.9 (29.3–43.1)	33.2 (21.3–47.8)	NS
Asthma	22.6 (21.3–23.9)	30.4 (26.8–34.2)	0.0001	27.8 (20.7–36.2)	39.1 (30.0–49.1)	NS
Intellectual or developmental disability such as mental retardation, severe autism, or Down syndrome^b	*22.9 (21.6–24.3)*	*31.7 (28.2–35.3)*	*<0.0001*	*16.4 (11.8–22.4)*	*30.8 (17.4–48.5)*	*NS*
Gout, lupus, or fibromyalgia^b	*22.5 (21.2–23.9)*	*30.9 (27.5–34.5)*	*<0.0001*	*30.5 (22.3–40.0)*	*50.3 (33.2–67.4)*	*NS*
Category^c						
Circulatory system disorders	16.5 (14.5–18.7)	24.9 (18.6–32.4)	0.0227	25.4 (23.8–27.0)	33.7 (29.7–37.8)	0.0001

Comorbidity/chronic health condition	Chronic condition absent			Chronic condition present		
	No COPD %[a] (95% CI)	COPD % (95% CI)	p-value COPD vs No COPD	No COPD % (95% CI)	COPD % (95% CI)	p-value COPD vs No COPD
Mental and behavioral disorders	21.8 (19.6–24.1)	31.4 (25.7–37.7)	0.0027	23.2 (21.7–24.8)	31.8 (27.9–35.9)	0.0001
Musculoskeletal or connective tissue disorders	21.8 (20.2–23.6)	28.9 (24.4–34.0)	0.0054	24.0 (22.0–26.2)	34.6 (29.6–40.0)	0.0002
Eye diseases	22.5 (21.2–24.0)	31.5 (27.9–35.3)	<0.0001	23.9 (20.5–27.7)	32.9 (23.5–43.9)	NS
Nervous system disorders	22.2 (20.9–23.6)	30.6 (27.0–34.4)	<0.0001	26.5 (22.9–30.4)	41.9 (31.6–52.9)	0.0081

[a]Weighted percentage and 95% confidence interval. Prevalence estimates for paralysis, spinal cord injury, traumatic brain injury, muscular dystrophy, and cerebral palsy are not reported due to lack of reliability (cell size < 30).

[b]Prevalence estimates for gout, lupus, or fibromyalgia and intellectual or developmental disability may not be reliable (cell size 30–59).

[c]Circulatory system disorders: congestive heart failure; coronary heart disease; heart attack or myocardial infarction; high blood pressure or hypertension; stroke; other heart condition or heart disease.

Mental and behavioral disorders: Alzheimer's disease or other dementia; depression; intellectual or developmental disabilities; serious mental problems (e.g. schizophrenia or psychosis); other mental, emotional, or nervous conditions.

Musculoskeletal or connective tissue disorders: arthritis or rheumatoid arthritis; gout, lupus, or fibromyalgia; osteoporosis.

Eye diseases: glaucoma, macular degeneration.

Nervous system disorders: nervous system disorders including multiple sclerosis, Parkinson's disease, and epilepsy; partial or total paralysis; spinal cord injury; traumatic brain injury; cerebral palsy; muscular dystrophy.