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Smoking cessation behaviors among older U.S. adults

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ABSTRACT

Smoking cessation is a critical component of cancer prevention among older adults (age ≥ 65 years). Understanding smoking cessation behaviors among older adults can inform clinical and community efforts to increase successful cessation. We provide current, national prevalence estimates for smoking cessation behaviors among older adults, including interest in quitting, quitting attempts, quitting successes, receiving advice to quit from a healthcare provider, and use of evidence-based tobacco cessation treatments. The 2015 National Health Interview Survey and Cancer Control Supplement were used to estimate cigarette smoking status and cessation behaviors among older US adults across selected socio-demographic and health characteristics. We found that four in five older adults who had ever smoked cigarettes had quit and more than half who currently smoked were interested in quitting but fewer than half made a past-year quit attempt. Two-thirds of older adults said that a healthcare provider advised them to quit smoking, but just over one-third who tried to quit used evidence-based tobacco cessation treatments and only one in 20 successfully quit in the past year. Prevalence estimates for smoking cessation behaviors were similar across most characteristics. Our study demonstrates that few older adults, across most levels of characteristics examined, successfully quit smoking, underscoring the importance of assisting smoking cessation efforts. Healthcare providers can help older adults quit smoking by offering or referring evidence-based cessation treatments. States and communities can implement population-based interventions including tobacco price increases, comprehensive smoke-free policies, high-impact tobacco education media campaigns, and barrier-free access to evidence-based tobacco cessation counseling and medications.

1. Introduction

Among older adults (age ≥ 65 years), cigarette smoking is an important predictor of cancer mortality (Nash et al., 2017; Burns, 2000; Gellert et al., 2012). In 2015, about 3.9 million older adults currently smoked cigarettes and were therefore at risk of dying prematurely unless they quit smoking (National Center for Health Statistics, 2016). Quitting smoking at older ages cannot undo all harm accumulated from years of smoking; however, quitting at any age, even 80 years or older, reduces the risk of developing or dying from cancer or other diseases (Gellert et al., 2012; International Agency for Research on Cancer, 2007; Doolan and Froelicher, 2008; Huddlestone et al., 2015; Müezzinler et al., 2015). Among people diagnosed with cancer, smoking cessation improves prognosis while continued smoking worsens prognosis and can lead to subsequent primary cancers and may be a risk factor for cancer recurrence, poorer response to cancer treatment, and increased treatment-related toxicity (U.S. Department of Health and Human Services, 2014).

Thus, encouraging and helping adults of all ages who smoke to quit is an effective public health approach to reducing cancer incidence and mortality (Miller et al., 2008; U.S. Department of Health and Human Services, 2008). Cessation counseling, including individual, group, and telephone counseling, and Food and Drug Administration (FDA)-approved cessation medications are each effective alone; counseling and

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medication are even more effective when combined (U.S. Department of Health and Human Services, 2008; U.S. Preventive Services Task Force, 2015).

However, despite evidence that smoking cessation benefits older adults (Chen and Wu, 2015), current smoking prevalence among adults age ≥ 65 years fell by only 2.1% from 8.6% in 2005 to 8.4% in 2015 compared to a 27.7% decline from 20.9% to 15.1% among adults overall (Jamal et al., 2016). Compared with younger adults, fewer older adults express interest in quitting or make a quit attempt (Babb et al., 2017). Understanding whether and how smoking cessation behaviors differ among older adults can help inform clinical and community efforts to increase successful smoking cessation among those who need it the most. However, among older adults, descriptions of how smoking cessation behaviors differ by socio-demographic and health characteristics are limited.

The purpose of this descriptive surveillance study is to provide current, national prevalence estimates among older adults for smoking status and smoking cessation behaviors including expressing interest in quitting, attempting to quit, successfully quitting, receiving advice to quit from a healthcare provider, and using evidence-based tobacco cessation treatments, across selected socio-demographic and health characteristics. Based on limited prior research, we hypothesized that there would be no differences in the prevalence of smoking cessation behaviors across these characteristics among older adults.

2. Methods

2.1. Data source

This study uses data about participants age ≥ 65 from the 2015 National Health Interview Survey (NHIS) (National Center for Health Statistics, n.d.; Parsons et al., 2014). The NHIS is conducted by the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC), and is a large, nationally representative cross-sectional survey of the civilian noninstitutionalized population in the United States. The NHIS is fielded annually and collects information on numerous health topics. The core section has four components (household, family, sample child, and sample adult) and the questions have remained largely the same since 1997, while supplements, sponsored by NCHS and other federal agencies, change yearly. The core household component collects demographic and relationship information on those living in the household. The core family component collects information on individuals in the family, including socio-demographic and health characteristics. From each family, one adult aged 18 years or older is randomly selected to answer the sample adult core component, including questions about the individual's health status, healthcare services, and health behaviors such as smoking status and past-year quit attempts. In 2015, CDC and the National Cancer Institute co-sponsored a Cancer Control Supplement questionnaire administered to NHIS sample adult respondents that included questions about smoking cessation behaviors. Questions included in the NHIS and other documentation are available online (National Center for Health Statistics, n.d.). Adults age ≥ 65 years who are black, Hispanic, or Asian were over-sampled. The final NHIS sample size (and response rate) for sample adults age ≥ 18 years in 2015 was 33,672 (response rate = 55%) (National Center for Health Statistics, n.d.).

2.2. Measures

2.2.1. Smoking status

The core component was used to determine smoking status, quit attempts, and cessation successes while the Cancer Control Supplement was used to determine interest in quitting smoking, receipt of advice to quit from a healthcare provider, and methods used when trying to quit. The core component asked adults, “Have you smoked at least 100 cigarettes in your entire life?” Respondents who answered “yes” were asked, “Do you now smoke cigarettes every day, some days, or not at all?” Persons were considered to be current smokers if they had smoked at least 100 cigarettes during their lifetime and, at the time of the interview, reported smoking every day or some days. Persons were considered to be former smokers if they reported smoking at least 100 cigarettes during their lifetime but did not currently smoke. Persons were considered to be never smokers if they had smoked fewer than 100 (including 0) cigarettes in their lifetime. The quit ratio was defined as the ratio of former smoking to ever smoking (current and former smoking combined), and is a measure of cessation over time.

2.2.2. Smoking cessation behaviors

Persons making quit attempts included those who currently smoked but who reported they had stopped smoking for longer than one day during the 12 months prior to the interview because they were trying to quit smoking and those who formerly smoked and had quit smoking completely within the past year. Recent cessation success included persons who formerly smoked and stopped smoking 6–12 months prior to the interview.

The Cancer Control Supplement included 3 questions about smoking cessation behaviors. Respondents who currently smoked were asked if they wanted to completely quit smoking. Current smokers and former smokers who had quit in the past 12 months were asked if they had been advised to quit smoking by a doctor, dentist, or other healthcare professional; the analysis was limited to those who had seen a healthcare professional in the past year, including doctors seen while a patient was in a hospital. Additionally, current smokers who had tried to quit within the past year and former smokers who had quit within the past two years were asked if they had used specific evidence-based tobacco cessation treatments, including counseling or FDA-approved cessation medications. Counseling methods included a telephone help or quit line, one-on-one counseling, or a cessation clinic, class, or support group. FDA-approved cessation medications included nicotine replacement therapies (i.e., nicotine patch, nicotine gum or lozenge, nicotine nasal spray or inhaler), varenicline (U.S. trade name Chantix), and bupropion (U.S. trade names Zyban or Wellbutrin SR).

2.2.3. Socio-demographic characteristics

Socio-demographic characteristics included age (65–74 or ≥75 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, or other), marital status (married or living with partner, previously married, or never married), education (less than high school, high school graduate diploma or General Educational Development high school equivalency diploma [GED] certificate, some college or associate degree, or 4-year college graduate or higher), employment status/occupation (retired or unemployed; white collar; or blue collar or service industry or farm) (Ham et al., 2011), poverty status (at or above poverty level or below poverty level based on family income), and U.S. Census region (Northeast, Midwest, South, or West).

2.2.4. Health characteristics

Health characteristics included health insurance coverage (private, Medicaid/dual eligible, Medicare Advantage, Medicare only, other coverage, or uninsured; based on NHIS-recoded data using a hierarchical assignment), usual place of healthcare other than emergency room (ER) (yes or no), number of office visits to a doctor or other healthcare provider (excluding visits to hospital ERs, overnight hospitalizations, home visits, dental visits, or telephone calls) in the past year (0 visits, 1 visit, or ≥2 visits), health status (self-reported as excellent or very good; good; or fair or poor), disability or limitation status (yes or no; based on at least one presence of selected impairments including vision, hearing, cognition, and movement and limitations in performing activities of daily living and instrumental activities of daily living), serious psychological distress measured on the Kessler scale (yes or no; based on a series of six questions about feelings of sadness, nervousness, restlessness, worthlessness, hopelessness, and “feeling like everything is

an effort during the past 30 days" individually reported on a Likert Scale ranging between 'None of the time' (score = 0) and 'All of the time' (score = 4), and sum totals categorized as ≥13 as having serious psychological distress and < 13 as not having serious psychological distress), and history of chronic disease (based on individual diseases and categorized as "smoking-related chronic disease excluding cancer" [coronary heart disease, angina, myocardial infarction/heart attack, stroke, diabetes, emphysema, chronic bronchitis], "smoking-related cancers" [lung, oral cavity and pharynx, larynx, esophagus, liver, pancreas, stomach, colon and rectum, kidney, bladder, cervix], "non-smoking-related cancers" [all other cancers except non-melanoma skin cancer], "other non-smoking-related chronic diseases" [hypertension, heart condition/disease, asthma, ulcer, arthritis], or "never diagnosed with chronic disease").

2.3. Statistical analysis

Survey data were adjusted for nonresponse and weighted to reflect the probability of selection into the sample (National Center for Health Statistics, n.d.). To account for the complex survey design, analyses were conducted using SAS-callable SUDAAN, version 11.0. National weighted self-reported prevalence estimates and 95% confidence intervals (CIs) were calculated; 95% CIs are presented to allow for informal comparisons among prevalence estimates, without specifying a referent group. All prevalence estimates shown meet the NCHS standard of reliability (relative standard error ≤ 30% and unweighted denominator ≥50).

3. Results

3.1. Smoking status

3.1.1. Smoking status overall and by sex and age

During 2015, 52% of older adults never smoked cigarettes, 8% currently smoked cigarettes, and 40% formerly smoked cigarettes (Table 1). A lower proportion of older women than men currently smoked (7% vs 10%) or formerly smoked (31% vs 51%). The prevalence of current smoking was highest among adults age 65–69 years (12%) and lowest among adults age ≥ 85 years (2%) while the prevalence of former smoking was similar by age group. Among those who formerly smoked, 3% had quit within the past year and 4% in the past 2 years. Approximately four in five older adults who had ever smoked had quit (quit ratio = 83%).

3.1.2. Smoking status by socio-demographic characteristics

Most older adults who currently smoked were non-Hispanic white (77%), 13% were non-Hispanic black, and 7% were Hispanic (Table 2). More than half of older men who currently smoked were married or living with a partner compared with a third of women. About 40% of older adults who currently smoked had attended some college or earned an associate, undergraduate, or graduate degree. About half reported being a blue collar, service industry, or farm worker; this proportion was higher among men (64%) than among women (35%). Most lived at or above the poverty level (83%).

3.1.3. Smoking status by health characteristics

Regarding health insurance coverage, the greatest proportion had Medicare or Medicare Advantage (47% among women and 41% among men), about a third had private insurance, and 12% had Medicaid. About 90% had a usual place of healthcare other than the ER, and 73% reported an office visit to a healthcare provider 2 or more times in the past year. About 36% reported excellent or very good health, 33% good health, and 31% fair or poor health, and most reported no disability or limitation (60%) and no serious psychologic distress (95%). However, 84% reported that they had been diagnosed with a chronic disease. Among men, 24% reported a smoking-related cancer and 51% reported another smoking-related chronic disease. Among women, 27% reported a smoking-related cancer and 42% reported another smoking-related chronic disease.

3.2. Smoking cessation behaviors

3.2.1. Smoking cessation behaviors overall

Just over half (54%) of older adults who currently smoked were interested in smoking cessation, but fewer than half (47%) made a past-year quit attempt, and only 5% successfully quit in the past year (Table 3). Among older adults who currently smoked or had recently quit and who had seen a healthcare provider in the past year, two-thirds reported that a healthcare provider had advised them to quit. Among older adults attempting to quit smoking or who recently succeeded in quitting, more than a third (37%) used counseling and/or FDA-approved cessation medication to quit; 9% used at least one type of counseling (with too few using counseling without medication or specific types of counseling—telephone quitlines; one-on-one counseling; or cessation clinic, class, or support group—to be reliably estimated); and 34% used at least one type of FDA-approved cessation medication, with the largest proportion (29%) using nicotine replacement therapy, 10% using varenicline, and too few using bupropion to be reliably estimated. Only 6% used both counseling and FDA-approved cessation medication. When these smoking cessation behaviors were examined by age and sex, 95% confidence intervals overlapped, indicating that any differences may not be significant.

Table 1
Prevalence of cigarette smoking and quit ratio among adults age ≥ 65 years by sex and age group, National Health Interview Survey, 2015.

Characteristic	No. sampled	Never smoking % (95% CI)	Current smoking % (95% CI)	Former smoking % (95% CI)	Former smoking, quit within past year % (95% CI)	Former smoking, quit within past 2 years % (95% CI)	Quit ratio[a] Ratio (95% CI)
Overall	8332	51.6 (50.2–53.0)	8.4 (7.7–9.2)	40.0 (38.6–41.4)	2.5 (1.9–3.4)	4.1 (3.2–5.1)	82.7 (81.1–84.1)
Sex							
Men	3455	39.4 (37.3–41.5)	9.7 (8.5–11.0)	50.9 (48.6–53.1)	1.9 (1.3–2.9)	3.1 (2.2–4.4)	84.0 (81.8–85.9)
Women	4877	61.4 (59.5–63.2)	7.4 (6.5–8.3)	31.3 (29.5–33.0)	3.3 (2.3–4.8)	5.3 (3.9–7.1)	81.0 (78.7–83.0)
Age (years)							
65–69	2664	48.9 (46.4–51.5)	12.1 (10.5–13.8)	39.0 (36.5–41.6)	3.5 (2.3–5.2)	5.6 (4.0–7.8)	76.4 (73.2–79.3)
70–74	2006	50.2 (47.0–53.3)	9.8 (8.2–11.7)	40.0 (37.0–43.1)	3.3 (1.9–5.6)	4.8 (3.0–7.4)	80.3 (76.8–83.4)
75–79	1466	52.0 (48.6–55.4)	7.2 (5.6–9.2)	40.8 (37.6–44.1)	—[b]	3.4 (2.0–5.6)	85.0 (81.1–88.3)
80–84	1086	53.9 (50.0–57.7)	3.7 (2.6–5.4)	42.4 (38.6–46.2)	—[b]	—[b]	91.9 (88.4–94.4)
≥85	1110	59.3 (55.4–63.1)	1.7 (1.0–2.8)	39.1 (35.3–43.0)	—[b]	—[b]	96.0 (93.1–97.7)

Abbreviations: CI = confidence interval.
[a] Quit ratio was calculated as the ratio of former smoking to ever smoking (current and former smoking combined) and is a measure of cessation over time.
[b] Data not reported because sample size is < 50 and/or the relative standard error of the estimate is > 30%.

Table 2
Select sociodemographic and health characteristics of adults age ≥ 65 years who reported currently smoking cigarettes, by sex and age group, National Health Interview Survey, 2015.

	Overall N = 770		Men N = 389		Women N = 381	
Characteristic	%	(95% CI)	%	(95% CI)	%	(95% CI)
Age						
65–74 years	77.5	(73.3–81.3)	81.0	(75.4–85.6)	73.8	(67.6–79.2)
≥75 years	22.5	(18.7–26.7)	19.0	(14.4–24.6)	26.2	(20.8–32.4)
Race/ethnicity						
White, non-Hispanic	77.2	(73.3–80.7)	74.2	(68.7–79.0)	80.4	(75.1–84.7)
Black, non-Hispanic	12.7	(10.2–15.7)	12.7	(9.4–17.0)	12.6	(9.1–17.2)
Other	3.0	(2.0–4.5)	4.2	(2.5–7.1)	—[a]	
Hispanic	7.1	(5.0–10.2)	8.8	(5.9–13.1)	5.4	(3.1–9.1)
Marital status						
Married or living with partner	44.4	(39.7–49.3)	57.4	(50.9–63.6)	30.7	(23.8–38.6)
Previously married	50.2	(45.4–55.0)	36.4	(30.4–42.8)	64.9	(57.1–72.0)
Never married	5.3	(3.9–7.3)	6.2	(4.2–9.1)	4.4	(2.5–7.8)
Education						
0–12 years (no diploma)	24.5	(20.4–29.1)	26.7	(21.2–33.1)	22.1	(17.1–28.2)
GED certificate or high school diploma	33.7	(29.3–38.4)	31.5	(25.7–37.9)	36.1	(29.8–42.9)
Some college or associate degree	28.2	(24.0–32.8)	25.5	(20.0–32.0)	31.0	(24.8–38.0)
Undergraduate or graduate degree	13.6	(10.7–17.2)	16.3	(11.9–21.9)	10.7	(7.3–15.5)
Employment status/occupation						
Retired or unemployed	6.0	(4.4–8.2)	3.9	(2.2–6.7)	8.2	(5.2–12.6)
White collar	44.3	(39.1–49.6)	32.2	(26.1–39.1)	56.7	(49.5–63.6)
Blue collar or service industry or farm	49.7	(44.4–55.0)	63.9	(56.9–70.3)	35.1	(28.3–42.6)
Poverty status						
At or above poverty level	83.0	(79.4–86.1)	86.5	(81.6–90.2)	79.3	(73.7–83.9)
Below poverty level	17.0	(13.9–20.6)	13.5	(9.8–18.4)	20.7	(16.1–26.3)
US Census region						
Northeast	14.9	(11.5–19.0)	15.2	(10.3–22.1)	14.5	(10.7–19.3)
Midwest	24.1	(20.1–28.6)	20.0	(15.2–25.7)	28.5	(22.8–34.9)
South	40.9	(36.2–45.8)	41.9	(35.3–48.9)	39.8	(33.7–46.3)
West	20.1	(16.5–24.3)	22.9	(17.3–29.6)	17.2	(13.3–22.0)
Health insurance coverage						
Private	32.6	(27.9–37.6)	30.4	(24.0–37.7)	34.9	(28.5–41.9)
Medicaid/dual eligible	11.7	(9.1–14.8)	12.2	(8.7–16.9)	11.1	(7.5–16.1)
Medicare-advantage	19.1	(15.5–23.2)	18.7	(13.9–24.8)	19.4	(14.4–25.8)
Medicare-only (excluding advantage)	24.7	(20.7–29.1)	22.1	(17.1–27.9)	27.5	(21.5–34.4)
Other coverage	11.2	(8.5–14.7)	15.6	(11.4–20.9)	6.6	(3.8–11.2)
Usual place of healthcare other than ER						
Yes	90.8	(87.4–93.3)	89.1	(83.4–93.0)	92.6	(88.5–95.3)
No	9.2	(6.7–12.6)	10.9	(7.0–16.6)	7.4	(4.7–11.5)
Number of office visits to healthcare provider in past year[b]						
0	15.2	(12.2–18.8)	16.3	(12.1–21.7)	14.1	(9.5–20.4)
1	12.1	(9.4–15.6)	12.1	(8.1–17.7)	12.1	(8.5–16.9)
≥2	72.7	(68.5–76.5)	71.6	(65.1–77.3)	73.8	(67.5–79.3)
Health status						
Excellent or very good	36.0	(31.5–40.7)	36.0	(30.1–42.3)	35.9	(29.2–43.2)
Good	32.7	(28.8–36.9)	32.2	(26.7–38.2)	33.3	(27.2–40.1)
Fair or poor	31.3	(27.2–35.7)	31.9	(26.7–37.5)	30.7	(24.4–37.9)
Disability or limitation						
Yes	40.1	(33.9–46.6)	41.2	(32.3–50.8)	38.9	(30.6–47.9)
No	59.9	(53.4–66.1)	58.8	(49.2–67.7)	61.1	(52.1–69.4)
Serious psychological distress (Kessler Scale)						
Yes (Kessler score ≥ 13)	5.5	(3.6–8.4)	5.2	(2.9–9.2)	—[a]	
No (Kessler score < 13)	94.5	(91.6–96.4)	94.8	(90.8–97.1)	94.2	(89.1–96.9)
History of chronic disease[c]						
Smoking-related chronic disease, excluding cancer	46.9	(42.2–51.7)	51.3	(44.4–58.1)	42.3	(35.7–49.1)
Smoking-related cancers	25.7	(17.4–36.3)	24.3	(13.1–40.7)	27.3	(16.5–41.7)
Non-smoking-related cancers	48.2	(37.3–59.2)	40.3	(26.0–56.4)	56.7	(40.2–71.9)
Other non-smoking-related chronic diseases	79.1	(74.5–83.0)	79.2	(73.8–83.8)	78.9	(71.6–84.7)
No history of chronic disease	15.6	(12.1–19.9)	15.8	(11.7–21.1)	15.4	(10.6–21.9)

Abbreviations: CI = confidence interval; ER = Emergency Room; GED = General Educational Development high school equivalency diploma; N = Number sampled.

[a] Data not reported because sample size is < 50 and/or the relative standard error of the estimate is > 30%.

[b] Excluding visits to hospital ERs, overnight hospitalizations, home visits, dental visits, or telephone calls.

[c] History of chronic disease: smoking-related chronic disease excluding cancer (coronary heart disease, angina, myocardial infarction/heart attack, stroke, diabetes, emphysema, chronic bronchitis), smoking-related cancers (lung, oral cavity and pharynx, larynx, esophagus, liver, pancreas, stomach, colon and rectum, kidney, bladder, cervix), non-smoking-related cancers (all other cancers except non-melanoma skin cancer), other non-smoking-related chronic diseases (hypertension, heart condition/disease, asthma, ulcer, arthritis), or no history of being diagnosed with chronic disease.

Table 3
Smoking cessation behaviors among adults age ≥ 65 years who reported currently smoking cigarettes or recently quitting, by sex and age group, National Health Interview Survey, 2015.

	Age (years)						Sex			
	Overall		65–74		≥75		Men		Women	
Smoking cessation behavior	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Interested in quitting[a]	53.7	(48.4–58.8)	56.1	(50.0–62.0)	45.2	(35.4–55.4)	51.3	(44.0–58.4)	56.2	(48.4–63.7)
Made past-year quit attempt[b]	47.2	(42.2–52.3)	47.6	(41.9–53.2)	46.2	(37.2–55.4)	44.2	(37.4–51.2)	50.4	(43.7–57.0)
Recent smoking cessation[c]	5.4	(3.7–7.9)	4.8	(3.0–7.4)	—[f]		4.3	(2.5–7.5)	6.6	(4.1–10.5)
Received advice from healthcare provider[d]	65.7	(61.2–69.9)	66.0	(60.9–70.8)	64.6	(54.8–73.2)	64.8	(58.2–70.8)	66.6	(60.1–72.5)
Used counseling and/or medication[e]	37.0	(31.2–43.3)	39.8	(32.7–47.4)	27.7	(18.4–39.3)	36.8	(28.7–45.7)	37.2	(28.9–46.3)
Used counseling and medication	5.9	(3.3–10.3)	7.4	(4.1–12.9)	—[f]		—[f]		—[f]	
Used at least one type of counseling	9.2	(6.0–13.9)	11.3	(7.2–17.3)	—[f]		—[f]		—[f]	
Used at least one type of medication	33.7	(28.0–40.0)	35.8	(29.0–43.3)	26.5	(17.5–38.1)	32.0	(24.4–40.9)	35.2	(27.3–44.0)
Used any nicotine replacement therapy	28.5	(23.0–34.7)	31.4	(24.7–38.9)	18.7	(11.9–28.1)	29.2	(21.7–38.1)	27.8	(20.3–36.9)
Used varenicline	10.3	(7.0–14.8)	10.4	(6.7–15.8)	—[f]		—[f]		12.9	(7.8–20.6)

Abbreviations: CI = Confidence Interval.
[a] Current smokers who reported that they wanted to stop smoking completely.
[b] Current smokers who reported that they stopped smoking for > 1 day in the past 12 months because they were trying to quit smoking and former smokers who quit in the past year.
[c] Former smokers who quit smoking for ≥6 months in the past year, among current smokers who smoked for ≥2 years and former smokers who quit in the past year.
[d] Received advice from a medical doctor, dentist, or other healthcare professional to quit smoking or to quit using other kinds of tobacco, among current smokers and former cigarette smokers who quit in the past 12 months. The analysis was limited to current and former cigarette smokers who had seen a doctor or other healthcare provider, including doctors seen while a patient in a hospital, in the past year.
[e] Used one-on-one counseling, a stop smoking clinic, class, or support group, and/or a telephone help line or quitline during the past year among current smokers who tried to quit during the past year or used when stopped smoking among former smokers who quit during the past 2 years.
[f] Data not reported because sample size is < 50 and/or the relative standard error of the estimate is > 30%.

3.2.2. Smoking cessation behaviors by socio-demographic characteristics

Within each socio-demographic and health characteristic, the prevalence estimates for most smoking cessation behaviors were considered similar because 95% confidence intervals overlapped (Table 4). However, there were some differences. Half as many older adults living below the poverty level (20%) than those living at or above the poverty level (40%) used evidence-based tobacco cessation treatments.

3.2.3. Smoking cessation behaviors by health characteristics

Only about half (51%) of older adults who did not report having a chronic disease said that a healthcare provider advised them to quit, compared with 85% of those who reported a smoking-related cancer. Fewer than one-third of older adults (31%) who reported no office visits to a healthcare provider in the past year said they were advised to quit (e.g., by a healthcare provider in an ER), compared with more than two-thirds (70%) who reported 2 or more office visits.

4. Discussion

Among older adults, smoking cessation remains a critical focus of cancer prevention, and our study suggests that there is ample room to improve smoking cessation behaviors in this population. We found few significant differences in smoking cessation behaviors by socio-demographic and health characteristics, consistent with a recent study that found that most persons who smoked, regardless of age or other characteristics, considered themselves to be addicted to cigarettes and wish to quit (Pechacek et al., 2017). These results suggest that all older adults may benefit from efforts to increase successful smoking cessation.

Our study found that just over half of older adults who smoked were interested in quitting, while just under half had tried to quit smoking in the past year. Because nicotine addiction is a chronic, relapsing condition, successful smoking cessation often requires repeated intervention and multiple attempts to quit (U.S. Department of Health and Human Services, 2008). While even brief advice to quit from a healthcare provider increases quit rates, more intensive clinical cessation interventions have an even greater impact (U.S. Department of Health and Human Services, 2008). Older adults may benefit from specially tailored and more intensive cessation interventions (Chen and Wu, 2015). Healthcare providers can tailor their advice and assistance by assessing whether their patient is interested in making a quit attempt and whether they tried to quit previously but were unsuccessful (Zimmerman et al., 2000). In particular, older adults may benefit from being informed by healthcare providers that they can still derive substantial health and quality-of-life benefits from quitting and that, even though they may have tried to quit unsuccessfully many times, they can still succeed in quitting, and that their chances of doing so are better if they use evidence-based tobacco cessation treatments.

Our study found that just over a third of older adults used at least one evidence-based tobacco cessation treatment to quit smoking, with only 6% using the optimal approach of both counseling and FDA-approved cessation medication. The 2008 Public Health Service Clinical Practice Guideline concluded that these tobacco cessation treatments are effective in helping older adults quit (U.S. Department of Health and Human Services, 2008). In addition, buddy support programs and age-tailored self-help materials are proven to improve smoking cessation successes among adults age ≥ 50 years (U.S. Department of Health and Human Services, 2008; Chen and Wu, 2015).

We also found that only 1 in 20 older adults successfully quit smoking in the past year. To increase this quit rate, in addition to offering evidence-based tobacco cessation treatments healthcare providers can implement health system administrative and management systems to ensure barrier-free access to these treatments, and follow up with their patients to assess progress and make adjustments as needed (U.S. Department of Health and Human Services, 2008).

Our study found that a greater proportion of older adults with a history of smoking-related cancer said they were advised by a healthcare provider to quit smoking than those who did not have a chronic disease, consistent with findings from previous studies (Bailey et al., 2018; Silfen et al., 2015). We also found that about half of older adults who currently smoked had been diagnosed with a smoking-related chronic disease and that a quarter have been diagnosed with a smoking-

Table 4
Smoking cessation behaviors among adults age ≥ 65 years who reported currently smoking cigarettes or recently quitting, by select socio-demographic and health characteristics, National Health Interview Survey, 2015.

	Interested in quitting[a] N = 726		Made past-year quit attempt[b] N = 859		Recent smoking cessation[c] N = 839		Received advice from healthcare provider[d] N = 759		Used counseling and/or medication[e] N = 438	
Characteristic	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Race/ethnicity										
White, non-Hispanic	51.1	(45.1–57.1)	44.1	(38.5–49.9)	5.3	(3.3–8.3)	66.1	(60.8–71.0)	37.4	(30.4–45.0)
Black, non-Hispanic	55.7	(43.5–67.2)	55.4	(43.9–66.3)	—[f]		72.7	(62.2–81.1)	28.8	(17.4–43.5)
Hispanic	68.0	(50.2–81.7)	62.3	(49.5–73.6)	—[f]		50.0	(36.2–63.8)	—[f]	
Other	—[f]		—[f]		—[f]		—[f]		—[f]	
Marital status										
Married or living with partner	59.9	(50.5–68.6)	48.9	(40.4–57.4)	6.9	(4.0–11.8)	71.2	(64.1–77.3)	42.3	(32.3–52.8)
Previously married	48.7	(42.3–55.0)	45.6	(39.7–51.6)	3.4	(2.0–5.9)	60.6	(53.9–66.9)	31.4	(24.7–38.9)
Never married	51.4	(35.9–66.5)	47.6	(30.9–64.9)	—[f]		64.6	(47.1–78.9)	—[f]	
Education										
0–12 years (no diploma)	59.5	(49.7–68.6)	49.7	(41.0–58.4)	—[f]		64.1	(54.0–73.1)	33.9	(24.5–44.6)
GED certificate or high school diploma	45.3	(36.8–54.1)	41.5	(33.4–50.1)	—[f]		65.1	(56.0–73.2)	39.1	(28.5–50.8)
Some college or associate degree	61.6	(52.2–70.2)	55.3	(46.1–64.2)	7.6	(4.4–13.0)	65.3	(56.8–72.9)	34.2	(24.2–45.8)
Undergraduate or graduate degree	49.4	(35.4–63.6)	38.1	(26.0–51.8)	—[f]		69.3	(55.8–80.2)	44.6	(27.1–63.5)
Employment status/occupation										
Retired or unemployed	—[f]		53.1	(36.8–68.7)	—[f]		—[f]		—[f]	
White collar	57.1	(48.9–65.0)	45.5	(37.8–53.3)	7.3	(4.3–12.2)	62.8	(55.5–69.5)	43.7	(34.5–53.2)
Blue collar or service industry or farm	51.2	(43.6–58.8)	48.1	(41.1–55.1)	—[f]		69.2	(62.6–75.0)	32.9	(25.6–41.2)
Poverty status										
At or above poverty level	52.9	(47.0–58.6)	46.2	(40.8–51.7)	5.9	(3.9–8.8)	66.8	(61.8–71.4)	40.3	(33.5–47.6)
Below poverty level	57.5	(46.3–68.0)	52.8	(42.7–62.7)	—[f]		59.8	(48.2–70.3)	20.3	(12.5–31.2)
US Census region										
Northeast	63.3	(48.9–75.7)	61.1	(47.9–72.8)	—[f]		82.0	(70.3–89.8)	41.2	(28.0–55.9)
Midwest	52.6	(42.1–62.9)	50.0	(40.4–59.7)	—[f]		59.3	(50.1–67.9)	34.9	(24.6–46.8)
South	55.1	(46.6–63.3)	44.1	(36.4–52.2)	—[f]		64.1	(57.6–70.2)	35.3	(25.5–46.4)
West	44.2	(33.7–55.3)	39.4	(29.3–50.4)	—[f]		64.3	(53.4–73.8)	39.5	(27.6–52.8)
Health insurance coverage										
Private	57.9	(48.2–67.0)	49.4	(40.8–58.0)	7.2	(4.1–12.3)	68.6	(60.5–75.7)	43.6	(33.1–54.7)
Medicaid/dual eligible	64.0	(49.6–76.2)	58.4	(45.4–70.3)	—[f]		62.9	(49.0–75.0)	28.6	(15.1–47.4)
Medicare-advantage	40.6	(30.5–51.6)	42.6	(32.6–53.3)	—[f]		66.6	(55.9–75.8)	31.6	(21.0–44.4)
Medicare-only (excluding Advantage)	53.1	(42.5–63.3)	42.0	(32.6–52.0)	—[f]		62.0	(51.2–71.7)	35.9	(23.9–49.9)
Other coverage	52.5	(39.1–65.6)	48.5	(34.9–62.3)	—[f]		65.5	(52.5–76.5)	37.7	(23.0–55.2)
Usual place of healthcare other than ER										
Yes	55.0	(49.5–60.4)	49.5	(44.3–54.8)	5.9	(4.0–8.6)	66.9	(62.2–71.2)	37.5	(31.4–43.9)
No	40.2	(25.2–57.4)	22.4	(12.6–36.7)	—[f]		—[f]		—[f]	
Number of office visits to healthcare provider in past year[g]										
0	39.0	(28.0–51.2)	28.3	(18.2–41.2)	—[f]		31.4	(16.7–51.1)	—[f]	
1	54.5	(40.5–67.7)	46.1	(32.6–60.2)	—[f]		58.1	(43.6–71.2)	—[f]	
≥2	56.4	(50.6–62.0)	50.7	(45.1–56.2)	6.9	(4.6–10.2)	69.9	(65.3–74.2)	35.6	(29.1–42.7)
Health status										
Excellent or very good	59.4	(51.2–67.1)	44.3	(36.0–52.9)	—[f]		61.9	(53.9–69.2)	37.5	(26.8–49.5)
Good	46.5	(37.8–55.3)	45.5	(37.9–53.2)	7.0	(4.0–12.0)	63.2	(55.0–70.6)	39.3	(28.6–51.1)
Fair or poor	54.5	(45.1–63.6)	52.6	(44.6–60.5)	—[f]		72.9	(64.9–79.7)	34.4	(25.0–45.2)
Disability or limitation										
Yes	52.5	(42.7–62.1)	52.6	(43.8–61.2)	—[f]		66.7	(56.8–75.3)	35.9	(24.7–48.9)
No	46.8	(37.4–56.4)	43.2	(34.8–51.9)	—[f]		66.3	(57.7–74.0)	30.8	(20.3–43.6)
Serious psychological distress (Kessler Scale)										
Yes (Kessler score ≥ 13)	—[f]		—[f]		—[f]		—[f]		—[f]	
No (Kessler score < 13)	53.5	(48.1–58.8)	47.1	(41.9–52.3)	5.8	(3.9–8.5)	65.1	(60.5–69.5)	36.4	(30.4–42.9)
History of chronic disease[h]										
Smoking-related chronic disease, excluding cancer	54.9	(48.2–61.4)	49.7	(42.9–56.5)	8.3	(5.2–12.9)	70.3	(64.0–75.9)	36.1	(28.3–44.8)
Smoking-related cancers	—[f]		58.3	(39.9–74.6)	—[f]		85.3	(71.3–93.1)	—[f]	
Non-smoking-related cancers	37.2	(23.9–52.7)	43.8	(30.3–58.3)	—[f]		66.8	(50.9–79.5)	—[f]	

(*continued on next page*)

Table 4 (*continued*)

	Interested in quitting[a] N = 726		Made past-year quit attempt[b] N = 859		Recent smoking cessation[c] N = 839		Received advice from healthcare provider[d] N = 759		Used counseling and/or medication[e] N = 438	
Characteristic	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Other non-smoking-related chronic diseases	56.0	(50.1–61.7)	49.4	(43.9–54.9)	6.7	(4.5–9.7)	68.9	(64.2–73.3)	37.0	(30.6–43.8)
No history of chronic disease	45.4	(32.1–59.4)	39.2	(28.2–51.4)	—[f]		50.6	(36.0–65.1)	31.2	(16.5–51.1)

Abbreviations: CI = confidence interval; ER = Emergency Room; GED = General Educational Development high school equivalency diploma; N = Number sampled.

[a] Current smokers who reported that they wanted to stop smoking completely.

[b] Current smokers who reported that they stopped smoking for > 1 day in the past 12 months because they were trying to quit smoking and former smokers who quit in the past year.

[c] Former smokers who quit smoking for ≥ 6 months in the past year, among current smokers who smoked for ≥ 2 years and former smokers who quit in the past year.

[d] Received advice from a medical doctor, dentist, or other healthcare professional to quit smoking or to quit using other kinds of tobacco, among current smokers and former cigarette smokers who quit in the past 12 months. The analysis was limited to current and former cigarette smokers who had seen a doctor or other healthcare provider, including doctors seen while a patient in a hospital, in the past year.

[e] Used one-on-one counseling, a stop smoking clinic, class, or support group, and/or a telephone help line or quitline during the past year among current smokers who tried to quit during the past year or used when stopped smoking among former smokers who quit during the past 2 years.

[f] Data not reported because sample size is < 50 and/or the relative standard error of the estimate is > 30%.

[g] Excluding visits to hospital ERs, overnight hospitalizations, home visits, dental visits, or telephone calls.

[h] History of chronic disease: smoking-related chronic disease excluding cancer (coronary heart disease, angina, myocardial infarction/heart attack, stroke, diabetes, emphysema, chronic bronchitis), smoking-related cancers (lung, oral cavity and pharynx, larynx, esophagus, liver, pancreas, stomach, colon and rectum, kidney, bladder, cervix), non-smoking-related cancers (all other cancers except non-melanoma skin cancer), other non-smoking-related chronic diseases (hypertension, heart condition/disease, asthma, ulcer, arthritis), or no history of being diagnosed with chronic disease.

related cancer, suggesting that an opportunity exists for healthcare providers and others to motivate these persons to quit smoking. Studies have shown that adverse health events, such as a hospitalization or being diagnosed a chronic illness, are associated with increased odds of smoking cessation among older adults (Doolan and Froelicher, 2008; Westmaas et al., 2015; Keenan, 2009).

Similarly, lung cancer screening may offer a teachable moment that could be leveraged to motivate and help older adults to quit smoking (Piñeiro et al., 2016; Pua et al., 2016). Lung cancer screening is recommended for adults at high risk of developing lung cancer, specifically those age 55–80 years who have smoked at least 30 pack-years (the number of cigarette packs smoked per day multiplied by the number of years smoked) and who currently smoke or who have quit smoking within the past 15 years (Moyer, 2014). Smoking cessation is recommended for all current smokers undergoing lung cancer screening, regardless of whether they screen negative or positive for lung cancer (Pedersen et al., 2016). Robust, evidence-based smoking cessation interventions can be integrated throughout the lung cancer screening process (Fucito et al., 2016; National Cancer Institute, n.d.).

Our study found that use of evidence-based tobacco cessation treatments was lower among older adults living below the poverty level. Making proven tobacco cessation treatments available with minimal barriers and promoting their use may increase the use of these treatments and boost successful smoking cessation (U.S. Department of Health and Human Services, 2008; Centers for Disease Control and Prevention, 2014; McAfee et al., 2015; Centers for Disease Control and Prevention, 2018). For example, Medicare covers four sessions of individual counseling for a quit attempt (up to two quit attempts each year) with no cost sharing (Centers for Medicare and Medicaid Services, 2019a; Centers for Medicare and Medicaid Services, 2019b). Medicare also covers prescription cessation medications through Medicare's prescription drug program, Part D, although cost-sharing still applies (Centers for Medicare and Medicaid Services, 2016). In addition, older adults can access nationally available, free cessation resources (Centers for Disease Control and Prevention, 2017), such as age-tailored information (National Cancer Institute, 2019; National Cancer Institute, 2013) and state quitlines (North American Quitline Consortium, 2019) that provide individualized counseling and, in many cases, a starter supply of nicotine replacement therapy, which was the most commonly used cessation treatment in our study.

Community-based strategies can also play an important role in increasing smoking cessation and achieving health equity among older adults (Centers for Disease Control and Prevention, 2014; Centers for Disease Control and Prevention, 2018; Centers for Disease Control and Prevention, 2019; Major and Stewart, 2009). Proven population-based interventions, including tobacco price increases, comprehensive smoke-free policies, high-impact tobacco education media campaigns, and barrier-free access to tobacco cessation counseling and medications, can both motivate adults to quit smoking and make it easier for them to succeed in quitting, and are effective in reducing cigarette smoking and smoking-related disease and death (U.S. Department of Health and Human Services, 2014; Centers for Disease Control and Prevention, 2014; Task Force on Community Preventive Services, 2014).

The NHIS is a large, nationwide survey and its data have been used extensively in secondary analyses on tobacco-related topics, including smoking prevalence and cessation (Backinger et al., 2008). Because of the large number of variables collected, the NHIS allows for examination of a variety of socio-demographic and health characteristics in relation to tobacco-related behaviors. Other strengths of the NHIS include the representativeness of the sample among households across the United States and the large sample size which allows estimation for a number of population subgroups, such as by age. The focus on adults age ≥ 65 years in our study allows for an understanding of cessation behaviors among older adults that may be lost in less focused analyses.

One limitation of this study was that it examined only a single year of data; however, the NHIS Cancer Control Supplement, which contains three of the questions about smoking cessation behaviors that provided data for this study, is not administered annually. Furthermore, the study's ability to draw conclusions about the impact of socio-demographic and health characteristics was limited due to small numbers in certain subgroups. Additionally, smoking status was self-reported, which may result in under- or over-reporting; however, self-reported smoking status in national U.S. surveys has been correlated with serum cotinine levels (Caraballo et al., 2001). Similarly, cessation behaviors and socio-demographic and health characteristics were self-reported, which may potentially lead to biased estimates due to recall bias or

social desirability bias. Lastly, because NHIS does not include institutionalized populations or persons in the military, results are not generalizable to these groups.

5. Conclusion

Quitting smoking at any age is beneficial in preventing cancer and other diseases. We found that about two-thirds of older adults were advised to quit by a healthcare provider and just over half were interested in quitting smoking, but a little more than one-third used proven tobacco cessation treatments when trying to quit and, in part as a result, only 1 in 20 successfully quit. Older adults may benefit from tailored smoking cessation interventions, such as being told that, even at their age, they can still derive substantial benefits from quitting, that they can succeed in quitting, and that their chances of doing so are better if they use proven tobacco cessation treatments. Healthcare providers can assist older adults who want to quit smoking by offering or referring cessation counseling and FDA-approved cessation medications, implementing health system administrative and management systems to ensure patients have barrier-free access to these treatments, and following up with patients to assess progress and make adjustments as needed. States and communities can motivate smokers of all ages to quit smoking and create a supportive environment for them to do so by implementing population-based interventions, including tobacco price increases, comprehensive smoke-free policies, high-impact tobacco education media campaigns, and barrier-free access to smoking cessation counseling and medications.

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Declaration of competing interest

We have no conflict of interest to declare.

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