Section I
Overview and Epidemiology

Chapter 2
The Epidemiology of Tobacco-Related Health Disparities

Contents

Introduction 27
Data Sources 27
Youth Tobacco Use Behaviors 32
Youth Susceptibility to Cigarette Smoking, by Race/Ethnicity 32
Youth Smoking Initiation, by Race/Ethnicity and SES 32
Cigarette Smoking Prevalence Among Youth 35
Current Cigarette Smoking Among Youth, by Race/Ethnicity 35
Current Cigarette Smoking Among Youth, by SES 37
Current Cigarette Smoking Among Youth, by Sexual Orientation 39
Use of Other Tobacco Products Among Youth 40
Flavored Tobacco Products 43
Cigarette Smoking Prevalence Among Young Adults 43
Current Cigarette Smoking Among Young Adults, by Race/Ethnicity 43
Current Cigarette Smoking Among Young Adults, by SES 44
Menthol Cigarette Smoking Among Youth and Young Adults 45
Adult Tobacco Use Behaviors 46
Cigarette Smoking Prevalence Among Adults 46
Current Smoking Among Adults, by Race/Ethnicity and SES 49
Current Smoking Among Adults, by Sexual Orientation 49
Adult Cigarette Consumption—Light and Intermittent Smoking 50
Smoking Duration Among Adults 51
Menthol Cigarette Smoking Among Adults 51
Use of Other Tobacco Products Among Adults 53
Electronic Cigarettes 54
Cigars 55
Flavored Tobacco Products 56
Quitting and Cessation Behaviors Among Adults 56
Insurance Coverage of Tobacco Dependence Treatment 57
Secondhand Smoke and Prenatal Tobacco Exposure 59
Tobacco-Related Cancer Incidence and Mortality 61
Tobacco-Related Cancer Incidence and Mortality, by Sex 63
Tobacco-Related Cancer Incidence and Mortality, by Race/Ethnicity 64
Tobacco-Related Cancer Incidence and Mortality, by SES 66
Tobacco-Related Cancer Incidence and Mortality and HIV 66
Methodological Limitations and Challenges in the TRHD Literature 67
Chapter Summary 69
References 71

Figures and Tables

Figure 2.1 Percentage of U.S. Current Smokers Who Initiated Regular Smoking After Age 18, by Race/Ethnicity, 1992/1993–2014/2015 33
Figure 2.2 Percentage of U.S. Current Smokers Who Initiated Regular Smoking After Age 18, by Poverty Status, 1998/1999–2014/2015 34
Figure 2.3 Percentage of U.S. Current Smokers Who Initiated Regular Smoking After Age 18, by Educational Attainment, 1992/1993–2014/2015 35

Figure 2.4 30-Day Prevalence of Cigarette Use Among U.S. 12th Graders, by Race/Ethnicity, 1991–2016 37
Figure 2.5 30-Day Prevalence of Cigarette Use Among 12th Graders, by Parental Educational Attainment, 1991–2016 38
Figure 2.6 30-Day Prevalence of Cigarette Use Among 12th Graders, by College Plans, 1991–2016 39
Figure 2.7 Ever-Use of Tobacco Products, by Product Type and Sex, 2013-2014 40
Figure 2.8 30-Day Prevalence of Tobacco Product Use, by Product Type and Race/Ethnicity, 2013-2014 41
Figure 2.9 Prevalence of Current Smoking of Any Type of Cigar Among U.S. High School Students, by Sex, 1997–2015 42
Figure 2.10 Prevalence of Current Smoking of Any Type of Cigar Among U.S. High School Students, by Race/Ethnicity, 1997–2015 42
Figure 2.11 30-Day Prevalence of Cigarette Use Among Adults Ages 18–25, by Poverty Level, 2007–2014 44
Figure 2.12 30-Day Prevalence of Menthol Cigarette Smoking Among Youth and Young Adults, by Age Group and Sex, 2015 45
Figure 2.13 Current Smoking Among U.S. Adults, by Poverty Status, 1994–2015 49
Figure 2.14 Percentage of U.S. Adults Smoking ≤10 Cigarettes per Day, by Race/Ethnicity, 1992/1993–2014/2015 50
Figure 2.15 Percentage of U.S. Adult Smokers Whose Usual Cigarette Brand Was Menthol, by Age, 2003–2014/2015 52
Figure 2.16 Percentage of U.S. Adult Smokers Whose Usual Cigarette Brand Was Menthol, by Sex, 2003–2014/2015 52
Figure 2.17 Percentage of U.S. Adult Smokers Whose Usual Cigarette Brand Was Menthol, by Race/Ethnicity, 2003–2014/2015 53
Figure 2.18 30-Day Prevalence of Tobacco Product Use Among U.S. Adults, by Product Type and Race/Ethnicity, 2013-2014 54
Figure 2.19 30-Day Prevalence of Cigar Use Among Young Adults Ages 18–25, by Poverty Level, 2005–2014 55
Figure 2.20 NHIS Participants Under Age 65 Who Lacked Health Insurance Coverage at Time of Interview, by Race/Ethnicity, 2009–2015 58
Figure 2.21 State Medicaid Coverage of Tobacco Dependence Treatments, 2008 and 2015 59
Figure 2.22 Age-Adjusted U.S. Incidence of Lung and Bronchus Cancers, by Sex, 1975–2014 63
Figure 2.23 Age-Adjusted U.S. Mortality from Lung and Bronchus Cancers, by Sex, 1975–2014 64
Figure 2.24 Smoking Prevalence in Hawaii, by Ethnicity and Sex, 2008 68

Table 2.1 Summary of State and National Surveys/Studies on Youth and Adult Tobacco Use Referenced in This Chapter 28
Table 2.2 Prevalence of Current Cigarette Smoking Among U.S. Youth Ages 12 to 17, by Race/Ethnicity and Sex, 2013–2015 36
Table 2.3 Prevalence of Current Cigarette Smoking Among U.S. Young Adults Ages 18–25, by Race/Ethnicity and Sex, 2013–2015 43
Table 2.4 Prevalence of Current Cigarette Smoking Among U.S. Adults Age 18 and Older, by Sex, Race/Ethnicity, Poverty Status, and Educational Attainment, 1994–2015 47
Table 2.5 Tobacco-Related Cancers: Estimated New Cases and Deaths in 2017 62

Table 2.6 Tobacco-Related Cancer Incidence per 100,000 People in the United States, by Race/Ethnicity and Sex, 2014 65
Table 2.7 Tobacco-Related Cancer Mortality per 100,000 People in the United States, by Race/Ethnicity and Sex, 2014 65

Introduction

Tobacco use is the leading cause of preventable premature death in the United States, causing an estimated 480,000 deaths annually.[1] Although smoking prevalence has declined substantially over time,[1] 40 million U.S adults were current smokers in 2014.[2] The 2014 Surgeon General's report, *The Health Consequences of Smoking—50 Years of Progress*,[1] noted that disparities in tobacco use persist by race, ethnicity, education level, socioeconomic status (SES), and U.S. geographical region, among other factors.

This chapter presents a detailed overview of the epidemiology of tobacco-related health disparities (TRHD) across the tobacco use continuum (defined as exposure to tobacco, tobacco use initiation, current use, number of cigarettes smoked per day, quitting/treatment, relapse, and health consequences) among youth (12–17 years old), young adults (18–25 years old), and adults (26+) in the United States. Using nationally representative data, this chapter highlights trends and current patterns for minority racial/ethnic groups; people of low SES; and lesbian, gay, bisexual, and transgender (LGBT) populations. This chapter presents the available epidemiological data for sociodemographic groups, including trends in (1) youth and young adult susceptibility to cigarette smoking, cigarette smoking initiation, and cigarette and other tobacco use prevalence; (2) adult cigarette smoking prevalence, consumption, smoking duration, quitting behaviors, and other tobacco use; (3) secondhand and prenatal tobacco smoke exposure; (4) insurance coverage of tobacco dependence treatment; and (5) tobacco-related cancer incidence and mortality. The chapter concludes with a discussion of some methodological limitations and challenges in the TRHD literature. The epidemiological data that describe disparities across the tobacco use continuum can inform prevention and cessation efforts to reduce the disproportionate burden of tobacco-related diseases and deaths on minority racial/ethnic, low-SES, and LGBT populations, and the intersection of these groups.

Data Sources

Table 2.1 describes the national and state surveys/studies that inform this chapter, with examples of measures used to report smoking prevalence and other smoking behaviors. Wording of survey questions can vary across surveys, which can lead to small differences in reported data; however, the trends across surveys are very consistent. (Note that this table does not include all surveys that measure tobacco use behaviors.)

In light of the limitations of aggregate data for explaining certain disparities, this monograph reports, where available, national data disaggregated for specific racial/ethnic groups. Although data are generally available for the larger racial/ethnic groupings (African Americans, Hispanics/Latinos, Asian Americans, Native Hawaiians/Other Pacific Islanders, and American Indian/Alaska Natives, as defined by the U.S. Office of Budget and Management), aggregate or disaggregated data may sometimes yield unstable estimates for individual years. In addition, poverty status variables in this monograph were constructed using the U.S. Census Bureau's poverty threshold, which accounts for family income, size, and number of children, adjusted annually for inflation (for additional information, see U.S. Census Bureau 2016[3]).

Table 2.1 Summary of State and National Surveys/Studies on Youth and Adult Tobacco Use Referenced in This Chapter

Survey	Description	Population and survey methodology	Example(s) of a measure(s)	Website
Monitoring the Future Study (MTF)*	MTF is an annual, ongoing study of beliefs, attitudes, and behavior of American secondary school students, college students, and young adults. Funded by the National Institute on Drug Abuse.	Nationally representative sample of 8th-, 10th-, and 12th-grade students take a group-administered school-based survey. Follow-up surveys are mailed to a randomly selected sample from each senior class, with biannual follow-up after high school on a continuing basis.	Current cigarette smoking: How frequently have you smoked cigarettes during the past 30 days?	http://monitoringthefuture.org
National Youth Tobacco Survey (NYTS)*	NYTS provides nationally representative data about middle and high school youths' tobacco-related beliefs, attitudes, behaviors, and exposure to pro- and anti-tobacco influences. Conducted biennially by the Centers for Disease Control and Prevention (CDC).	Nationally representative sample of middle and high school students (grades 6–12) Self-administered school-based survey	Current cigarette smoking: During the past 30 days, on how many days did you smoke cigarettes? Current cigar smoking: During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?	https://www.cdc.gov/tobacco/data_statistics/surveys/nyts
Youth Risk Behavior Survey (YRBS)*	YRBS is conducted biennially by the CDC to monitor priority health-risk behaviors and the prevalence of obesity and asthma among youth and young adults.	Nationally representative sample of high school students (grades 9–12) Self-administered school-based survey	Current cigarette smoking: Smoked on at least 1 day during the 30 days before the survey Current cigar smoking: Smoked cigars, cigarillos, or little cigars on at least 1 day during the 30 days before the survey	https://www.cdc.gov/mmwr/pdf/rr/rr6201.pdf

Table 2.1 continued

Survey	Description	Population and survey methodology	Example(s) of a measure(s)	Website
National Health Interview Survey (NHIS)†	NHIS is conducted annually by the CDC to monitor the health of the U.S. population. Collects and analyzes data on a broad range of health topics, including tobacco use, by various demographic and socioeconomic characteristics.	Representative sample of the U.S. population Cross-sectional in-person household interview survey	Current cigarette smoking: Persons who reported smoking ≥100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days. Interest in quitting: Current smokers who reported that they wanted to stop smoking completely Past-year quit attempt: Current smokers who reported that they stopped smoking for >1 day during the past 12 months because they were trying to quit smoking, and former smokers who quit during the past year Recent smoking cessation: Former smokers who quit smoking for ≥6 months during the past year	https://www.cdc.gov/nchs/nhis

Table 2.1 continued

Survey	Description	Population and survey methodology	Example(s) of a measure(s)	Website
National Health and Nutrition Examination Survey (NHANES)†	NHANES is a program of studies to assess the health and nutritional status of adults and children in the U.S. Conducted by the CDC. The survey is unique in that it combines interviews and physical examinations.	Nationally representative sample of the U.S. population of all ages Interviewer-administered home-based survey and physical examination by physicians	Home secondhand smoke exposure: A report of ≥1 household cigarette smokers and the number of cigarettes smoked per day Age of initiation: Age when first smoked a whole cigarette Ever tried: Ever tried cigarette smoking, even a few puffs Current cigarette smoking: Smoked a whole cigarette on at least 1 day during the 30 days before the survey	https://www.cdc.gov/nchs/nhanes
National Survey on Drug Use and Health (NSDUH)†	NSDUH is an annual survey sponsored by the Substance Abuse and Mental Health Services Administration. It provides national and state-level data on the use of tobacco, alcohol, illicit drugs (including non-medical use of prescription drugs) and mental health in the U.S.	Random sample of U.S. civilians age 12 or older Interviewer-administered home-based survey	Current cigarette smoking: During the past 30 days, have you smoked part or all of a cigarette?	https://www.samhsa.gov/data/population-data-nsduh
Population Assessment of Tobacco and Health (PATH) Study†	PATH is a national longitudinal study of tobacco use and how it affects the health of people in the U.S. Jointly conducted by the National Institutes of Health and the Food and Drug Administration.	Sample of people ages 12 and older in the U.S. 3 annual home-based in-person interviews including audio computer-assisted self-interviewing and biospecimen collection	Current cigarette smoking: Persons who reported smoking ≥100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days.	https://pathstudyinfo.nih.gov

Table 2.1 continued

Survey	Description	Population and survey methodology	Example(s) of a measure(s)	Website
Behavioral Risk Factors Surveillance System (BRFSS)‡	BRFSS, a project of the CDC, collects state data annually about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services.	Representative sample of U.S. adults age 18 or older Home-based in person or phone administered interviews via random digit dialing	Cigarette smoking prevalence: Do you now smoke cigarettes every day, some days, or not at all?	https://www.cdc.gov/brfss
Pregnancy Risk Assessment Monitoring System (PRAMS)‡	PRAMS is a surveillance project of the CDC and state health departments. PRAMS collects state-specific, population-based data on maternal attitudes and experiences before, during, and shortly after pregnancy in 47 states, as of 2017.	Stratified samples of women who have recently given birth to live infants are selected from birth certificates in participating states. The survey is sent 2–6 months after delivery. Self-administered survey	Smoking status is recorded for the 3 months before pregnancy, the last 3 months of pregnancy, and postpartum: How many cigarettes did/do you smoke on an average day?	https://www.cdc.gov/prams
Tobacco Use Supplement to the Current Population Survey (TUS-CPS)‡	TUS-CPS is a National Cancer Institute-sponsored survey of tobacco use that is administered as part of the U.S. Census Bureau's Current Population Survey every 3–4 years.	Nationally representative sample of adults (youth ages 15–17 were included in 1992–2006 cycles) Telephone survey or in-person interview collection	Age of initiation: Age started smoking cigarettes "fairly regularly' (refers to age when respondent started smoking cigarettes on a routine basis, as opposed to age when tried first cigarette) Current cigarette smoking: Now smoking cigarettes every day or some days	https://cancercontrol.cancer.gov/brp/tcrb/tus-cps

*Survey/study includes youth only.
†Survey/study includes youth and adults.
‡Survey includes adults only.

Youth Tobacco Use Behaviors

Youth Susceptibility to Cigarette Smoking, by Race/Ethnicity

Susceptibility to smoking is often measured among never-smokers to predict the likelihood of smoking in the future.[4] Never-smokers who show a firm commitment not to smoke in the future and not to smoke cigarettes offered by a friend are less likely to ever smoke,[5] experiment,[4,6–8] or initiate smoking[6] than youth who do not make this commitment.[4,9] A few studies have examined racial/ethnic differences in susceptibility to smoking. Among youth ages 12–17 who have never smoked, Hispanic youths had the highest susceptibility to smoking (24.2%), followed by American Indian/Alaska Natives (19.7%), blacks/African Americans (19.4%), non-Hispanic whites (19.0%), Native Hawaiians or Other Pacific Islanders (16.0%), and Asian Americans (15.1%).[10] Among Asian Americans, susceptibility to smoking was highest among Filipinos (18.6%) and lowest among Chinese (11.7%). Among U.S. Hispanics, Mexicans were the most susceptible to smoking (25.8%) and Puerto Ricans were the least (18.3%).[10]

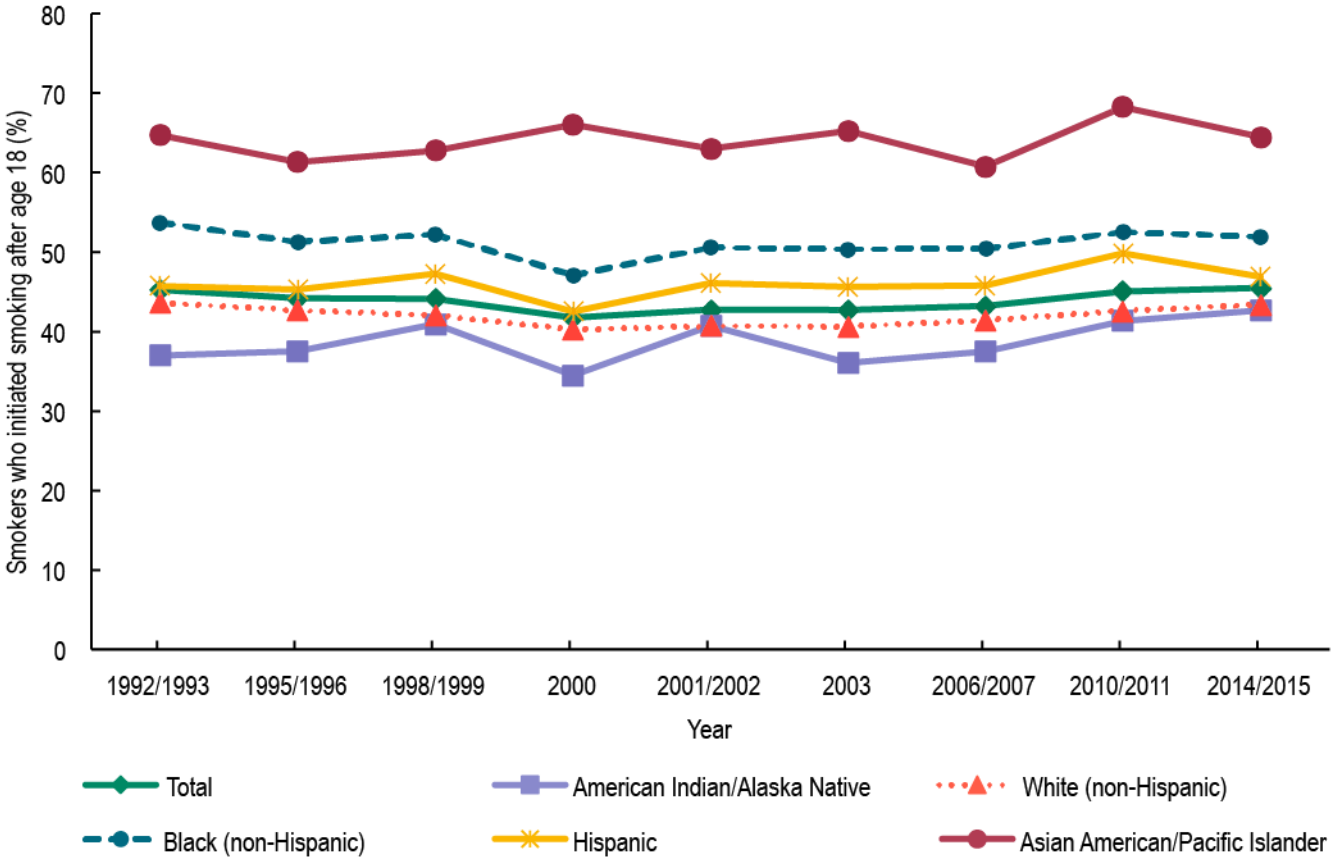
Youth Smoking Initiation, by Race/Ethnicity and SES

Age of smoking initiation is measured by asking smokers what age they were when they first smoked all or part of a cigarette (National Survey on Drug Use and Health [NSDUH]), or when they first smoked a whole cigarette (Youth Risk Behavior Survey [YRBS]), or when they first tried cigarette smoking, even one or two puffs (National Youth Tobacco Survey [NYTS], Population Assessment of Tobacco and Health [PATH] study). As highlighted in the 1994 Surgeon General's report *Preventing Tobacco Use Among Young People*,[9] most cigarette smokers began smoking during adolescence. According to data from the 2008–2010 NSDUH presented in the 2012 Surgeon General's report *Preventing Tobacco Use Among Young People*,[10] among adults ages 30–39 years who had ever tried cigarette smoking, 82% first tried before age 18, and nearly 99% first tried before age 25.

NSDUH data analyzed by Caraballo and colleagues[11] show that the age of initiation of smoking during adolescence varies by race/ethnicity. Among youths ages 12–17, American Indian/Alaska Native youths and Native Hawaiian and Other Pacific Islander youths initiated smoking at mean ages of 11.5 and 11.8 years, respectively, compared with 12.3 years among non-Hispanic white youths, 12.4 years among African American youths, 12.5 years among Hispanic youths, and 12.8 years among Asian American youths.[11] Data from the National Health and Nutrition Examination Survey (NHANES) also show that among 12- to 17-year-old youths, Mexican American and non-Hispanic black youths initiated smoking at older ages than non-Hispanic white youths.[12]

National-level data reported in the 2012 Surgeon General's report show a lower rate of smoking initiation among non-Hispanic black youths compared with non-Hispanic white and Hispanic youths.[10] This pattern parallels data from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS) that show differences by race/ethnicity in the percentage of U.S. adult smokers who initiated regular smoking after age 18. As shown in Figure 2.1, the majority of Asian American/Pacific Islander and non-Hispanic black smokers initiated regular smoking after age 18, in contrast to other racial/ethnic groups.

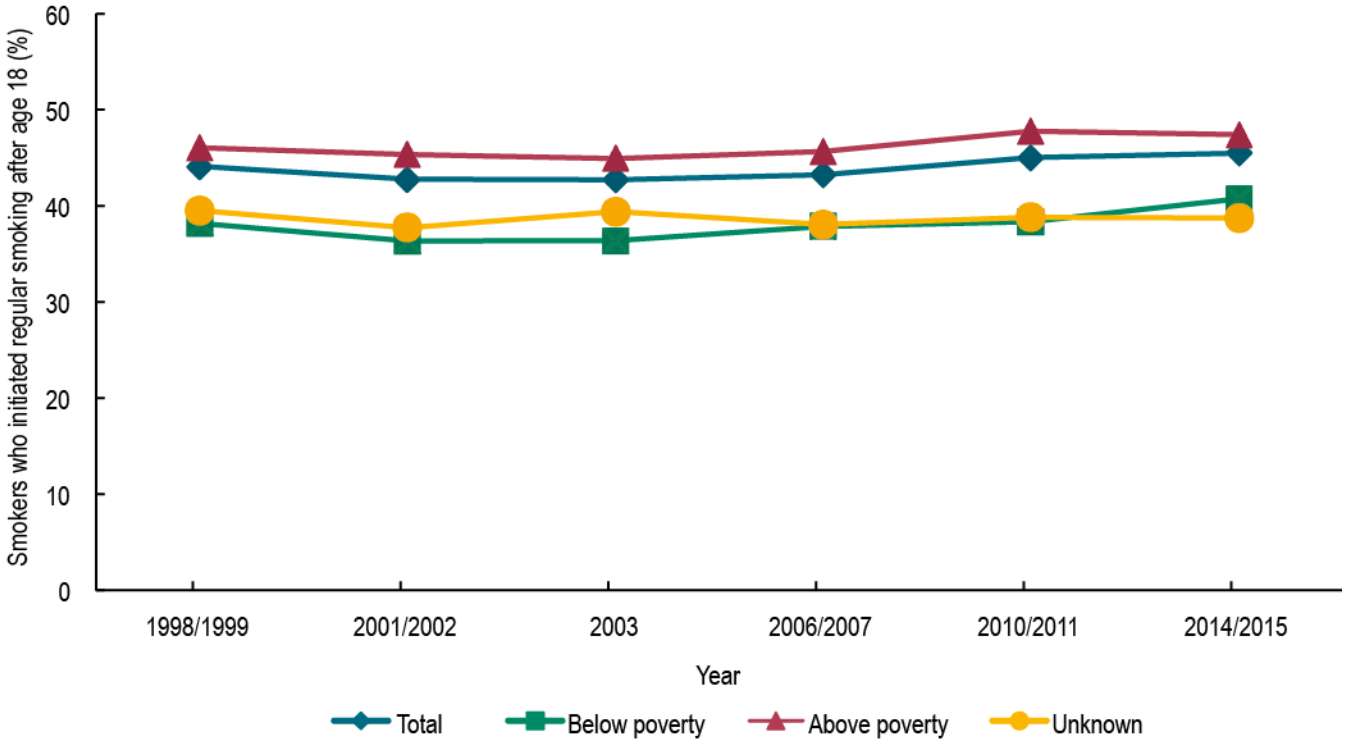
Figure 2.1 Percentage of U.S. Current Smokers Who Initiated Regular Smoking After Age 18, by Race/Ethnicity, 1992/1993–2014/2015



Note: Survey respondents were asked, "How old were you when you first started smoking cigarettes fairly regularly?"
Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 1992/1993–2014/2015.[13]

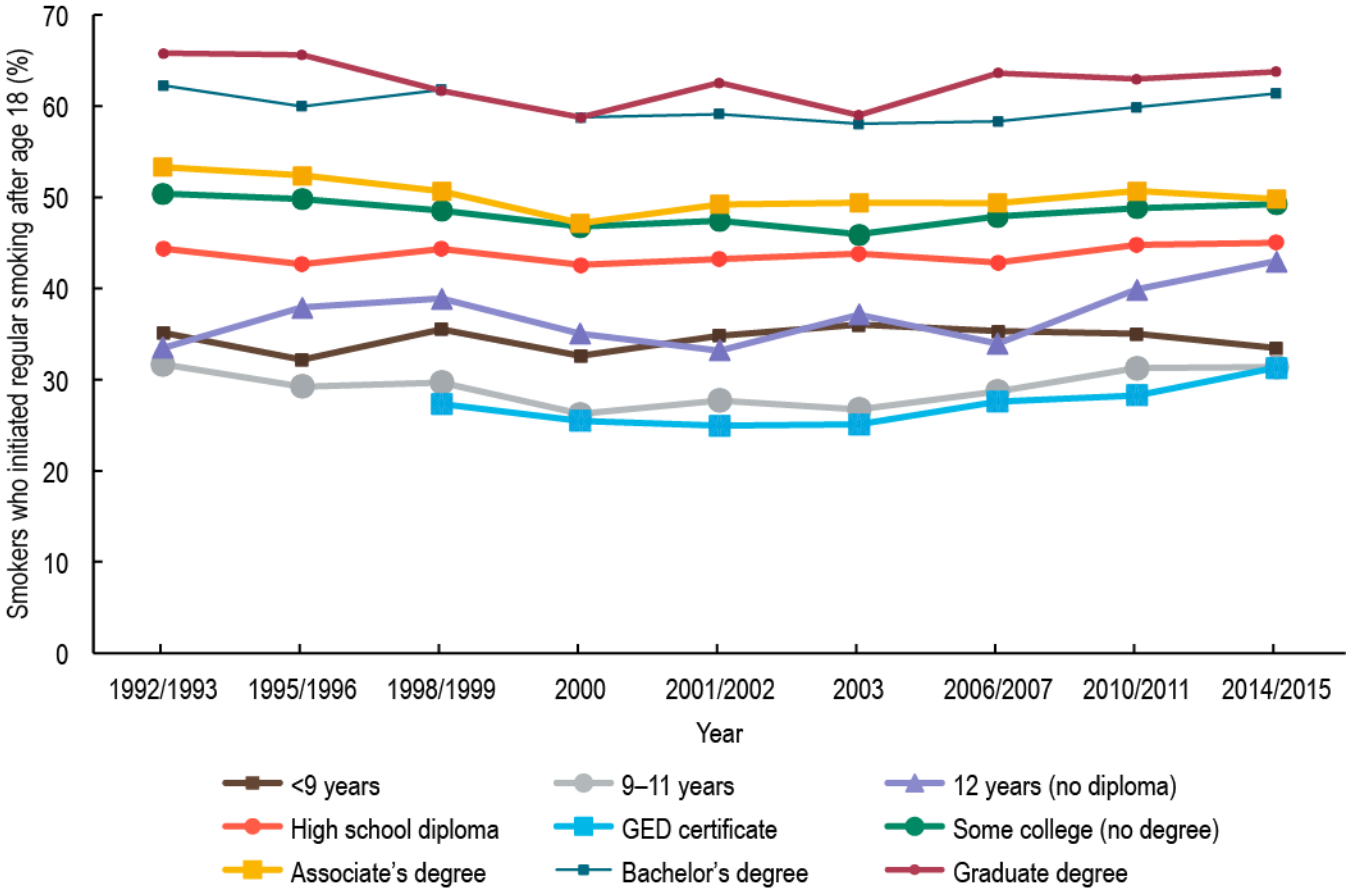
National data indicate that youths and young adults from low-SES backgrounds are at higher risk of smoking than their more advantaged counterparts.[10,12] Data from the 1999–2004 NHANES show that youth ages 12–17 living in poverty are significantly more likely to try smoking cigarettes and to report current smoking compared with more advantaged youth.[12] Trend data from the TUS-CPS also reveal differences in the age of onset of regular smoking by poverty status and educational attainment. Since 1998/1999, a higher percentage of current adult smokers living above the poverty line initiated regular smoking after age 18 (47% in 2014/2015) compared with those living below the poverty line (41% in 2014/2015) (Figure 2.2).[13] Similarly, since 1992/1993 more educated adults are more likely to have initiated smoking after age 18 than their less educated counterparts (Figure 2.3). The age of smoking initiation is an important behavior for surveillance and intervention efforts, because numerous studies have linked earlier initiation to greater nicotine dependence and longer duration of smoking.[14]

Figure 2.2 Percentage of U.S. Current Smokers Who Initiated Regular Smoking After Age 18, by Poverty Status, 1998/1999–2014/2015



Notes: Survey respondents were asked, "How old were you when you first started smoking cigarettes fairly regularly?" Unknown indicates that respondents were not part of a family to calculate poverty level (e.g., unmarried partners or roommates).
Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 1998/1999–2014/2015.[13]

Figure 2.3 Percentage of U.S. Current Smokers Who Initiated Regular Smoking After Age 18, by Educational Attainment, 1992/1993–2014/2015



Notes: GED = General Educational Development certificate. Data collection by GED certificate began in 1998/1999. Survey respondents were asked, "How old were you when you first started smoking cigarettes fairly regularly?"
Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 1992/1993–2014/2015.[13]

Cigarette Smoking Prevalence Among Youth

YRBS data show that cigarette smoking prevalence among high school youth reached a high of 36.4% in 1997, fell sharply to 21.9% in 2003,[15] and then declined to 15.7% in 2013[16] and 10.8% by 2015.[17] Data on middle and high school students collected by the NYTS between 2000 and 2015 also show a linear downward trend in current cigarette use—from 10.7% to 2.3% among middle school youths, and from 27.9% to 9.3% among high school youths.[18,19] Despite this overall progress, significant disparities in youth and young adult cigarette smoking rates persist by race/ethnicity and SES.[10,18]

Current Cigarette Smoking Among Youth, by Race/Ethnicity

Trends in youth cigarette smoking prevalence are typically reported only for the three largest racial/ethnic groups in the United States: non-Hispanic whites, Hispanics, and non-Hispanic blacks. Data from the YRBS show that historically, smoking prevalence has been highest among non-Hispanic white youth, followed by Hispanic and non-Hispanic black youth.[15]

As shown in Table 2.2, pooled NSDUH data from 2013–2015 show that the prevalence of current cigarette smoking among youth ages 12–17 was highest among American Indians/Alaska Natives (7.0%) followed by non-Hispanic whites (6.3%), Native Hawaiians or Other Pacific Islanders (3.4%), Hispanics (3.4%), non-Hispanic blacks/African Americans (2.7%), and Asians (1.6%). NSDUH[20] also collects cigarette smoking prevalence data for Asian and Hispanic subgroups. Among Asians, Asian Indian youth reported the highest prevalence of smoking (3.2%), and Chinese youth reported the lowest (0.7%). Among Hispanic youth, Mexicans reported the highest prevalence of smoking (3.6%), and Central or South American youth reported the lowest (2.4%).[20] Overall, and for most racial/ethnic groups, current smoking prevalence was higher among males than females.

Table 2.2 Prevalence of Current Cigarette Smoking Among U.S. Youth Ages 12 to 17, by Race/Ethnicity and Sex, 2013–2015

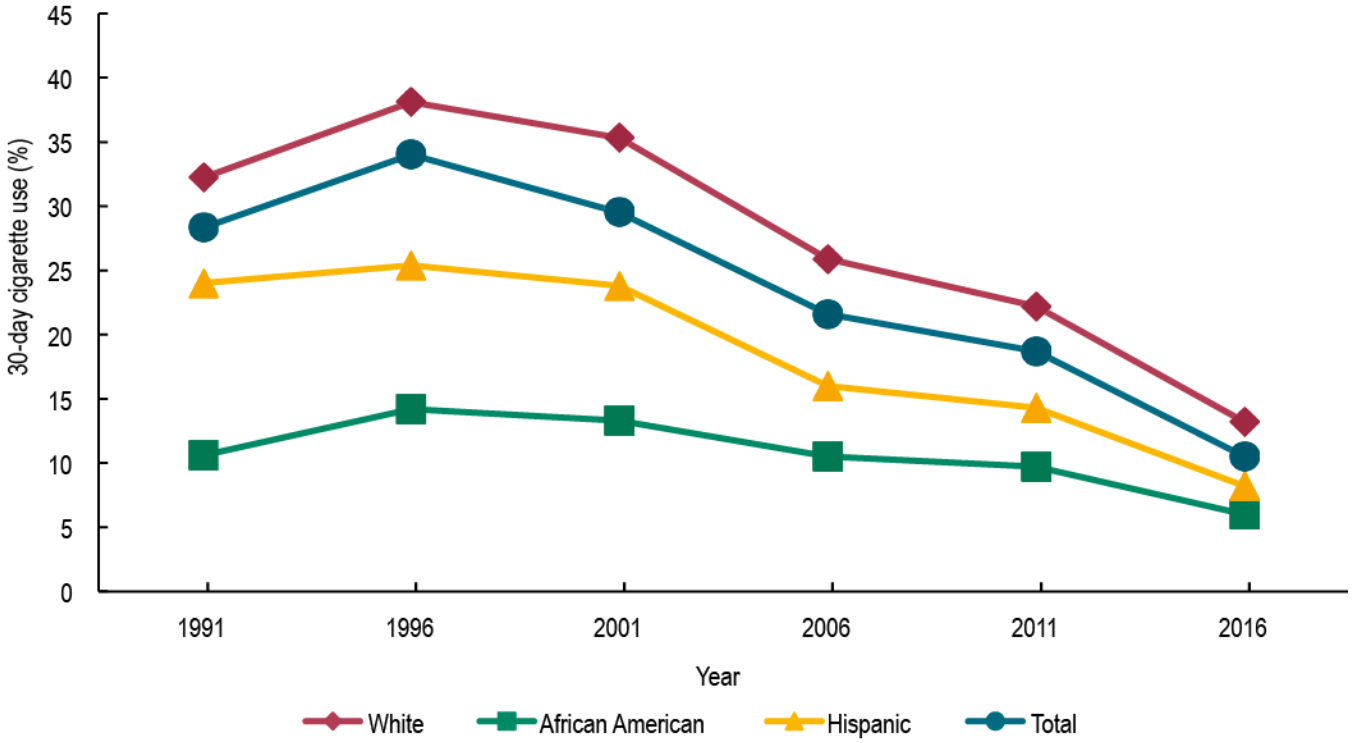
Race/Ethnicity	Total % (95% CI)	Males % (95% CI)	Females % (95% CI)
Total*	4.9 (4.7–5.1)	5.1 (4.8–5.4)	4.6 (4.3–5.0)
Not Hispanic or Latino*	5.3 (5.1–5.6)	5.6 (5.2–5.9)	5.1 (4.7–5.4)
White	6.3 (6.0–6.7)	6.5 (6.1–7.0)	6.1 (5.6–6.6)
Black/African American	2.7 (2.3–3.1)	3.1 (2.5–3.9)	2.2 (1.7–2.9)
American Indian/Alaska Native	7.0 (4.9–10.0)	6.5 (3.5–11.7)	7.7 (4.8–12.0)
Native Hawaiian or Other Pacific Islander	3.4 (1.4–8.1)	2.9 (1.3–6.1)	—
Asian*	1.6 (1.1–2.5)	2.0 (1.2–3.4)	1.2 (0.6–2.5)
Chinese	0.7 (0.2–2.1)	—	0.8 (0.2–3.4)
Filipino	0.9 (0.3–2.7)	0.3 (0.1–1.3)	1.6 (0.4–6.1)
Japanese	—	—	—
Asian-Indian	3.2 (1.7–6.1)	4.8 (2.3–10.0)	1.9 (0.5–7.1)
Korean	3.1 (1.4–7.1)	—	—
Vietnamese	—	—	—
Hispanic*	3.4 (3.0–3.9)	3.6 (3.0–4.2)	3.2 (2.7–3.9)
Mexican	3.6 (3.1–4.2)	4.0 (3.3–4.9)	3.2 (2.5–4.0)
Puerto Rican	3.3 (2.4–4.6)	3.1 (1.9–4.8)	3.6 (2.3–5.6)
Central or South American	2.4 (1.6–3.7)	1.9 (1.1–3.4)	3.0 (1.7–5.2)
Cuban	2.5 (1.1–5.4)	4.0 (1.6–9.8)	1.1 (0.3–4.2)

Notes: Based on responses to the question, "During the past 30 days, have you smoked part or all of a cigarette?" Respondents who chose "Yes" were classified as current smokers. CI = confidence interval. Em dash (—) = low precision; no estimate reported.
*Totals include data on respondents who reported being of racial or ethnic subgroups not shown and on respondents who reported being of more than one racial or ethnic group.
Source: Based on data from the National Survey on Drug Use and Health 2013–2015.[20]

An analysis of the 2014 NYTS reported cigarette smoking prevalence for high school and middle school students by race/ethnicity.[19] Current cigarette use among middle school youth was highest among Hispanic youths (2.8%) followed by non-Hispanic whites (2.1%), and non-Hispanic blacks (1.0%). Among high school students, non-Hispanic whites had the highest cigarette smoking prevalence (10.2%), followed by Hispanics (9.0%) and non-Hispanic blacks (5.7%).

Data from the Monitoring the Future (MTF) study show that 30-day smoking prevalence estimates have consistently been higher among non-Hispanic white and Hispanic high school seniors compared with African American high school seniors (Figure 2.4). Between 1991 and 2016, smoking prevalence declined from 32.2% to 13.2% among non-Hispanic white high school seniors, from 24.0% to 8.2% among Hispanic high school seniors, and from 10.6% to 6.0% among African American high school seniors.[21] These data show a narrowing of the difference in smoking prevalence for African American compared with non-Hispanic white and Hispanic youth. Data are not reported for other racial/ethnic groups due to small sample sizes.[22]

Figure 2.4 30-Day Prevalence of Cigarette Use Among U.S. 12th Graders, by Race/Ethnicity, 1991–2016



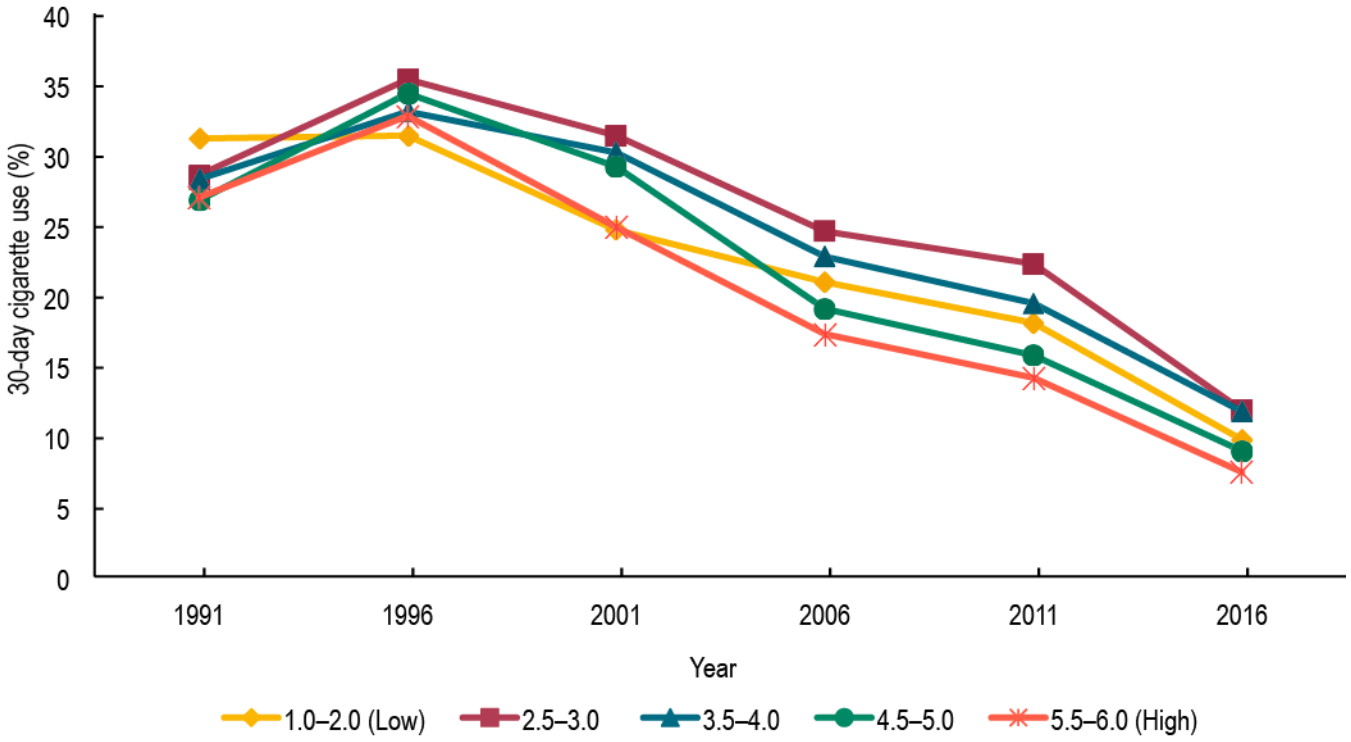
Source: Miech et al. 2016.[21]

Current Cigarette Smoking Among Youth, by SES

Parental educational attainment, often used as a proxy for SES, is also associated with disparities in youth smoking prevalence. As shown in Figure 2.5, data from the MTF study show that differences in youths' smoking prevalence by parental educational status have changed over time.[21] In 1991, smoking prevalence was fairly similar among youth whose parents were in the highest educational group compared to youths with parents in the lowest and second-lowest educational groups (27.1% compared with 31.3% and 28.7%, respectively). However, by 2006, differences in youth smoking prevalence by

parental educational attainment had increased, particularly between the second-lowest parental educational group (24.7%) and the highest educational group (17.4%). As of 2016, differences between these two groups appear to be converging (12.0% for the second- and third-lowest parental educational group and 7.6% for the highest educational group).[21]

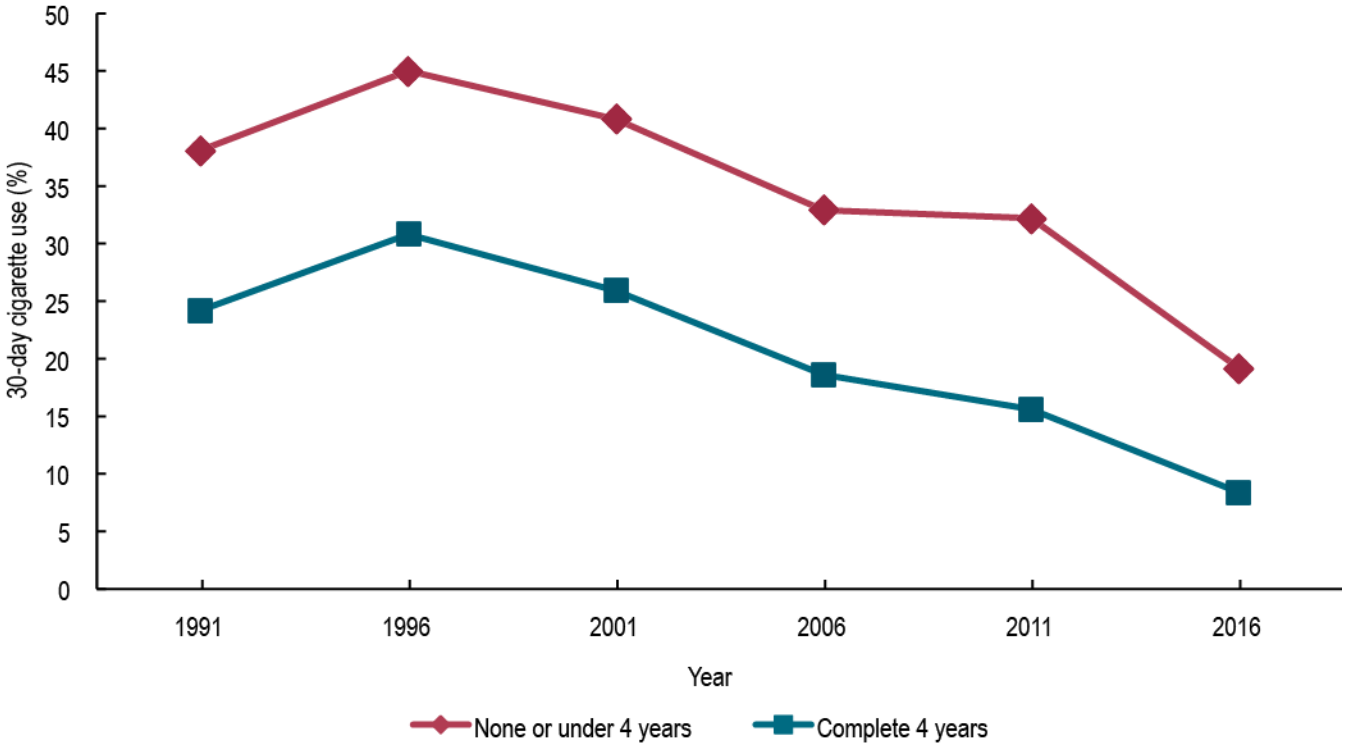
Figure 2.5 30-Day Prevalence of Cigarette Use Among 12th Graders, by Parental Educational Attainment, 1991–2016



Notes: Parental educational attainment was assessed by taking the average of the mother's reported education and the father's reported education and was categorized as follows: 1 = completed grade school or less, 2 = some high school, 3 = completed high school, 4 = some college, 5 = completed college, and 6 = graduate or professional school after college.
Source: Miech et al. 2016.[21]

Youths' own plans for educational attainment are also strongly associated with disparities in current smoking.[10] Data from MTF (Figure 2.6) show that between 1991 and 2016 there have been striking differences in the smoking prevalence of 12th graders who plan to pursue a 4-year college degree compared with those who do not. The difference in smoking prevalence increased slightly until 2011, after which it began to decrease.[21] Additionally, based on data from NSDUH (2006–2010), prevalence of current smoking among adolescent school dropouts ages 16–19 was far greater than that of adolescents of the same age who were currently enrolled in 12th grade (57.0% versus 18.6%, respectively).[10]

Figure 2.6 30-Day Prevalence of Cigarette Use Among 12th Graders, by College Plans, 1991–2016



Source: Miech et al. 2016.[21]

Some research suggests that the effects of SES on cigarette smoking among youths could be moderated by race, ethnicity, and cultural factors.[10] For example, data from the 1994–2002 National Longitudinal Study of Adolescent to Adult Health (Add Health) suggest that neighborhood poverty might be associated with smoking among non-Hispanic white but not black adolescents,[23] and an analysis of 1999–2008 MTF data by Bachman and colleagues[24] found that the effects of parental education on cigarette smoking were strongest among non-Hispanic whites compared with Hispanics and non-Hispanic blacks. The authors note that the weaker association between educational attainment and smoking among minority youth might be partially explained by the higher percentage of black and Hispanic youths whose parents are in the lower educational attainment categories.[24]

Current Cigarette Smoking Among Youth, by Sexual Orientation

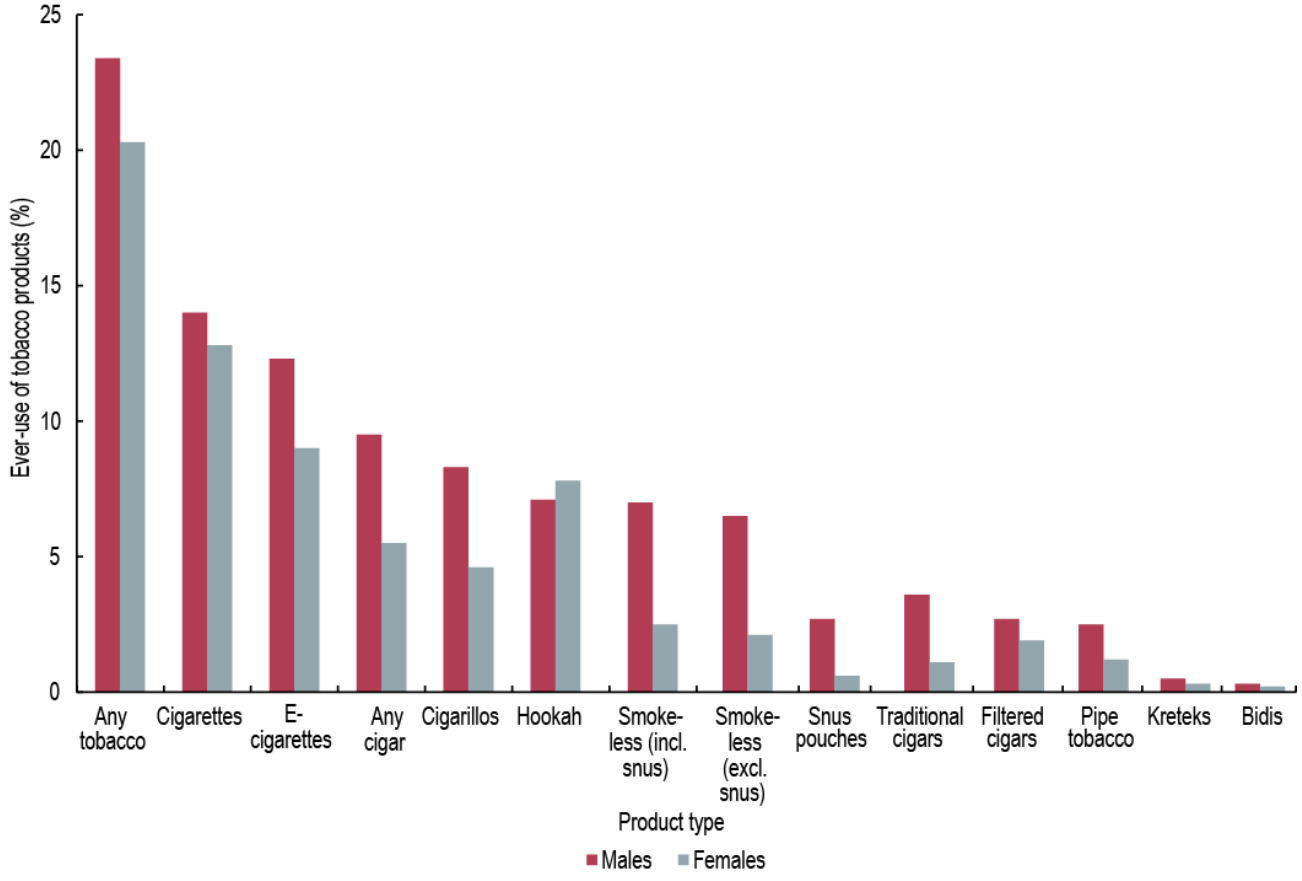
Differences in current smoking prevalence are also seen among adolescents by sexual orientation. Nationally representative data for lesbian, gay, and bisexual populations from the PATH study show that gay/lesbian and bisexual youths ages 14–17 have a significantly higher prevalence of cigarette smoking and of any tobacco use. Prevalence of cigarette use was highest among bisexual youth (20.1%; 95% CI 15.8–25.3), as was prevalence of any tobacco use (29.8%; 95% CI 24.4–35.8), compared to heterosexual youth (cigarette use: 5.8%; 95% CI 5.3–6.4) (any tobacco use: 11.8%; 95% CI 10.9–12.7).[25]

Use of Other Tobacco Products Among Youth

As novel tobacco products and marketing strategies emerge, and tobacco control policies alter the social environment, patterns of tobacco consumption among youth may become more complex and challenging to study. Other tobacco products discussed in this section include smokeless tobacco and combustible products such as cigars (including cigarillos and little cigars), hookah (waterpipe), and pipe tobacco. Another group of products has emerged more recently, often called electronic nicotine delivery systems (e.g., electronic cigarettes [e-cigarettes], e-hookah, vape pens, tank systems). These products are battery-powered devices designed to heat a liquid, which typically contains nicotine and a variety of flavors, into an aerosol for inhalation by the user.[26] Use of these and other tobacco products by youth may contribute to TRHD in the future.

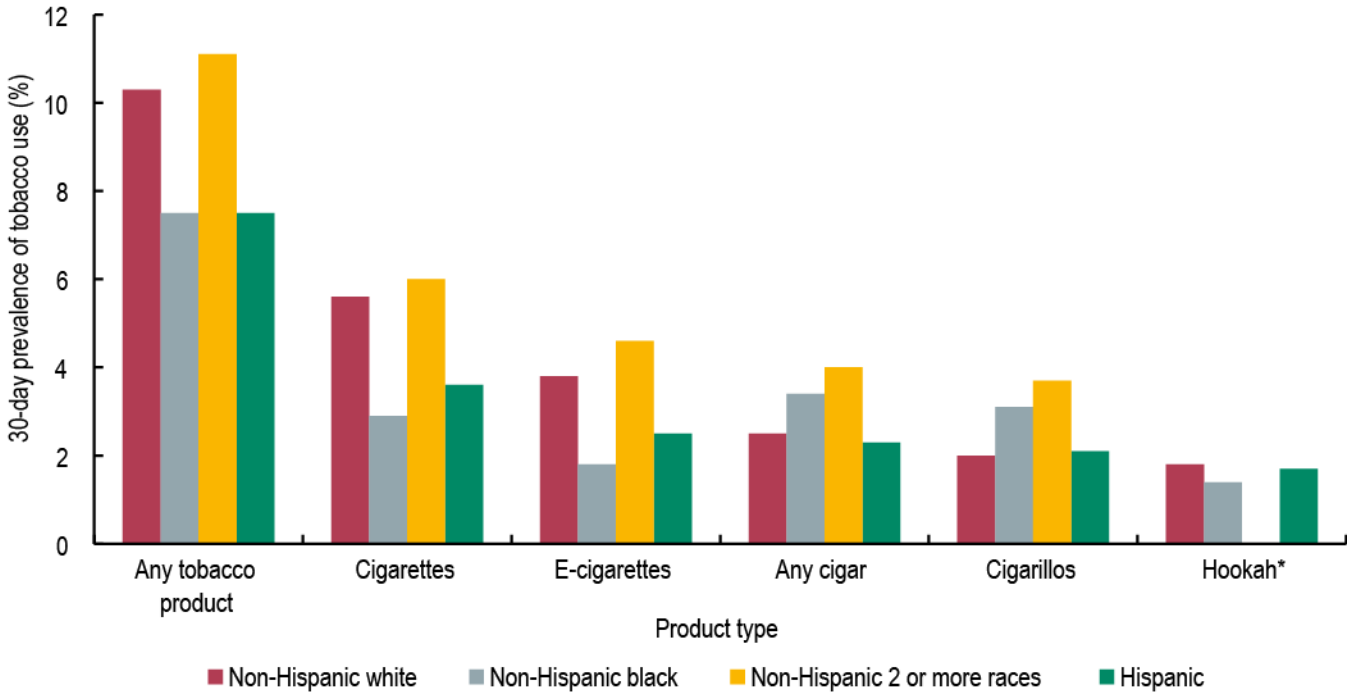
Data from the 2013-2014 PATH study show that patterns of using other tobacco products among youths (12–17 years) differ by sex, race/ethnicity, and sexual orientation. With the exception of hookah, males were more likely than females to ever use other tobacco products, including e-cigarettes, traditional cigars, cigarillos, smokeless tobacco, snus pouches, and pipe tobacco (Figure 2.7).[25] Non-Hispanic white youth and multiracial (≥2 races) youth reported the highest current use of any tobacco product, of cigarettes, and of e-cigarettes; multiracial youth also reported the highest current use of cigars and cigarillos (Figure 2.8). Non-Hispanic white youth reported the highest ever-use of smokeless tobacco and snus.[25]

Figure 2.7 Ever-Use of Tobacco Products, by Product Type and Sex, 2013-2014



Source: Kasza et al. 2017.[25]

Figure 2.8 30-Day Prevalence of Tobacco Product Use, by Product Type and Race/Ethnicity, 2013-2014



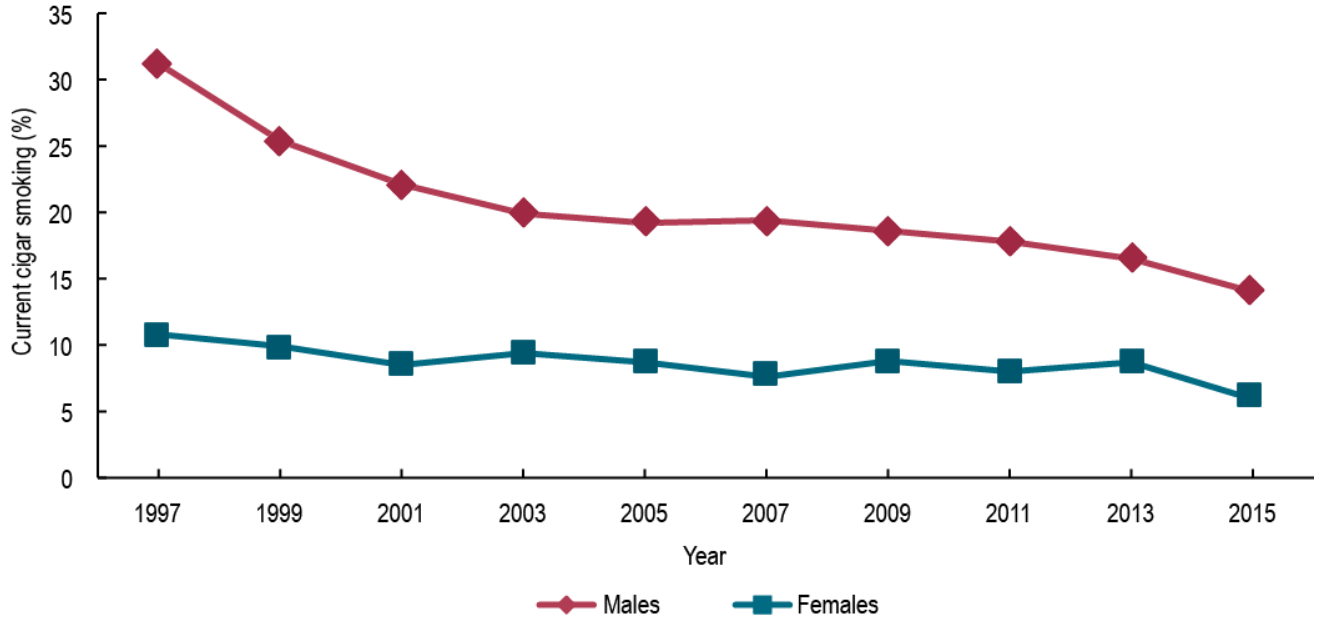
*Data not shown for hookah use by people who were non-Hispanic 2 or more races because the relative standard error was greater than 30%.
Source: Kasza et al. 2017.[25]

Gay/lesbian, and bisexual youth reported higher ever-use of any tobacco product compared to heterosexual youth, with the highest use among bisexual youth, according to 2013-2014 PATH study data. Gay/lesbian youth reported the highest prevalence of current e-cigarette use (13.4%).[25]

National Cancer Institute (NCI) Tobacco Control Monograph 9, *Cigars, Health Effects and Trends*, noted that "promotional activities for cigars have increased the visibility of cigar consumption, normalized cigar use, and broken down barriers to cigar use."[27,p.217] Research has shown that various cigar products are popular among youth and young adults.[28] According to NYTS data, past-month cigar use by youths in the United States increased during 2011-2012, declined for 2013-2014, and remained unchanged for 2014-2015.[29] Among high school students, the prevalence of current cigar use was similar across racial/ethnic groups: 8.3% among non-Hispanic whites, 8.8% among non-Hispanic blacks, and 8.0% among Hispanics.[29] Among middle school students, Hispanic youths had the highest proportion of current cigar use (2.9%), followed by non-Hispanic blacks (2.0%) and non-Hispanic whites (1.4%).[29] Other research shows that from 2012 to 2014 among middle and high school students, ever-use of cigars declined overall combined racial/ethnic groups (21.2% to 17.6%) and particularly among Hispanic youth (23.1% to 18.1%) and black youth (27.8% to 20.8%).[30]

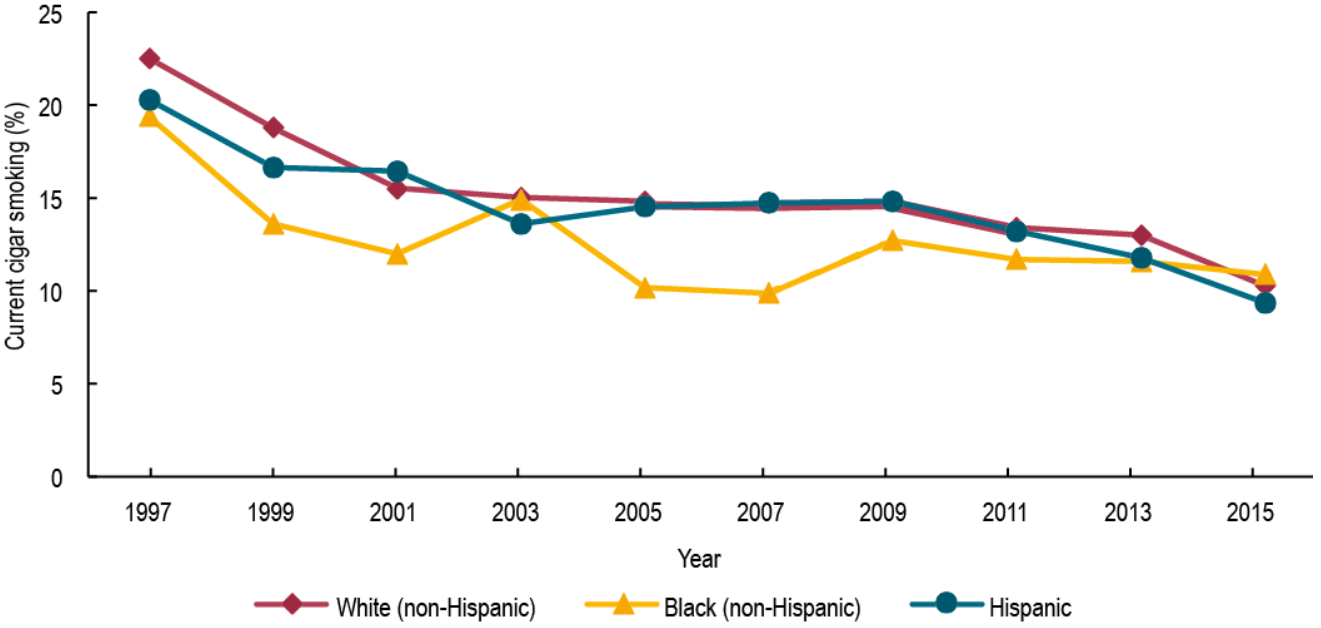
Results from the 1997–2015 YRBS show that cigar use was relatively stable among female high school students and generally declined among male students (Figure 2.9). Cigar use among Hispanic and non-Hispanic white high school students generally declined, whereas a fluctuating pattern was seen among non-Hispanic black high school students (Figure 2.10).[10,16,17,31]

Figure 2.9 Prevalence of Current Smoking of Any Type of Cigar Among U.S. High School Students, by Sex, 1997–2015



Notes: Based on responses to the question, "During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?" Respondents who reported that they had smoked any of these tobacco products on 1 or 2 days or more were classified as current cigar smokers.
Sources: Data based on the National Youth Risk Behavior Survey 1997–2009[10]; 2011[31]; 2013[16]; 2015.[17]

Figure 2.10 Prevalence of Current Smoking of Any Type of Cigar Among U.S. High School Students, by Race/Ethnicity, 1997–2015



Notes: Based on responses to the question, "During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?" Respondents who reported that they had smoked any of these tobacco products on 1 or 2 days or more were classified as current cigar smokers.
Sources: Data based on the National Youth Risk Behavior Survey 1997–2009[10]; 2011[31]; 2013[16]; 2015.[17]

Flavored Tobacco Products

Research has found that youth and young adult cigar smokers are more likely than cigar smokers in other age groups to report having a usual cigar brand that is flavored.[28] Other research shows that the majority of youth tobacco product ever-users report that their first tobacco product was flavored.[32] Overall, 70% of middle and high school students who were current users of any tobacco product—or nearly 3.3 million youth—reported past-month use of at least one flavored tobacco product.[33] Among high school students overall, e-cigarettes (8.8%) were the most commonly used flavored tobacco product, followed by hookah (6.0%), cigars (5.3%), menthol cigarettes (5.0%), any smokeless tobacco (4.1%), and pipes (0.7%).[33] Non-Hispanic black students reported lower use of flavored tobacco products than non-Hispanic whites, except that use of flavored cigarettes was highest among non-Hispanic black students (see the section "Menthol Cigarette Smoking Among Youth and Young Adults").

Cigarette Smoking Prevalence Among Young Adults

Current Cigarette Smoking Among Young Adults, by Race/Ethnicity

The patterns of current cigarette smoking among young adults ages 18–25 are generally similar to the patterns among youths. Smoking prevalence is highest among American Indian/Alaska Native young adults (41.8%), followed by non-Hispanic whites (33.3%), Native Hawaiian and Other Pacific Islanders (24.5%), non-Hispanic blacks/African Americans (23.2%), Hispanics (22.5%), and Asians (15.1%). Among Asian American young adults, smoking prevalence is highest among Koreans (21.0%) and lowest among Chinese (10.0%). Among Hispanic young adults, smoking prevalence is highest among Cubans (25.7%) and lowest among Central or South Americans (19.6%) (Table 2.3).[20]

Table 2.3 Prevalence of Current Cigarette Smoking Among U.S. Young Adults Ages 18–25, by Race/Ethnicity and Sex, 2013–2015

Race/Ethnicity	Total % (95% CI)	Males % (95% CI)	Females % (95% CI)
Total*	28.6 (28.0–29.1)	33.5 (32.7–34.3)	23.6 (22.9–24.3)
Not Hispanic or Latino*	30.2 (29.6–30.8)	34.7 (33.8–35.6)	25.7 (24.9–26.4)
White	33.3 (32.6–34.1)	37.6 (36.6–38.7)	29.0 (28.1–29.9)
Black/African American	23.3 (22.0–24.7)	29.2 (27.2–31.2)	17.9 (16.4–19.6)
American Indian/Alaska Native	41.8 (36.3–47.6)	41.3 (33.2–50.0)	42.4 (35.3–49.9)
Native Hawaiian or Other Pacific Islander	24.5 (19.1–30.8)	27.8 (19.7–37.8)	20.5 (14.3–28.5)
Asian*	15.1 (13.4–16.9)	20.3 (17.7–23.3)	9.9 (8.0–12.2)
Chinese	10.0 (7.4–13.3)	13.1 (9.3–18.1)	7.1 (4.2–11.8)
Filipino	20.4 (15.7–26.1)	25.7 (18.5–34.4)	15.6 (10.0–23.5)
Japanese	—	—	—
Asian-Indian	12.7 (9.7–16.5)	17.7 (13.1–23.5)	7.1 (3.6–13.4)
Korean	21.0 (15.1–28.3)	30.6 (20.9–42.3)	12.0 (6.9–19.8)
Vietnamese	13.8 (9.4–19.9)	19.0 (12.2–28.4)	9.0 (4.5–17.2)

Table 2.3 continued

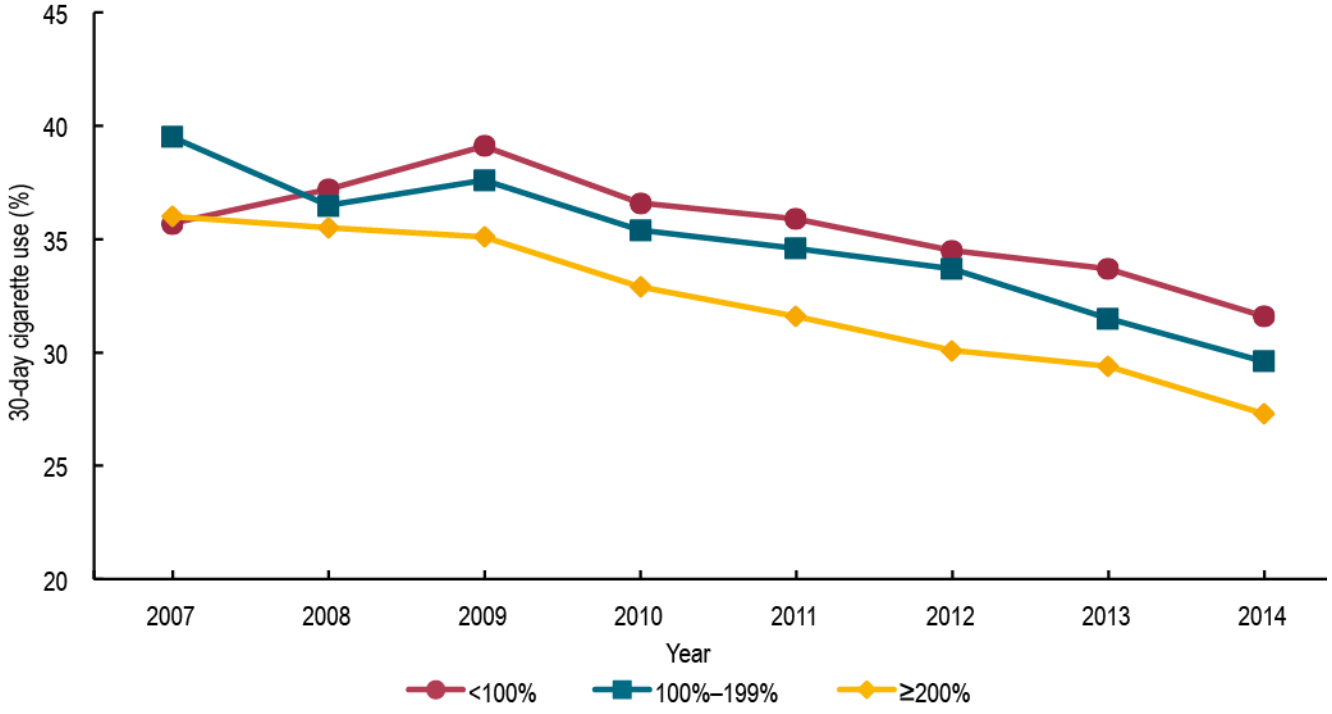
Race/Ethnicity	Total % (95% CI)	Males % (95% CI)	Females % (95% CI)
Hispanic*	22.5 (21.4–23.7)	29.2 (27.5–31.0)	15.5 (14.2–16.8)
Mexican	22.2 (20.8–23.6)	29.7 (27.6–32.0)	14.2 (12.7–15.8)
Puerto Rican	24.5 (21.3–28.0)	27.2 (22.5–32.5)	21.6 (17.6–26.2)
Central or South American	19.6 (17.0–22.4)	25.9 (22.0–30.2)	12.3 (9.7–15.5)
Cuban	25.7 (19.8–32.6)	34.9 (24.9–46.5)	17.0 (11.9–23.8)

Notes: Based on responses to the question, "During the past 30 days, have you smoked part or all of a cigarette?" Respondents who chose "Yes" were classified as current smokers. CI = confidence interval. Em dash (—) = low precision; no estimate reported.
*Totals include data on respondents who reported being of racial or ethnic subgroups not shown and on respondents who reported being of more than one racial or ethnic group.
Source: Based on data from the National Survey on Drug Use and Health 2013–2015.[20]

Current Cigarette Smoking Among Young Adults, by SES

Data from the NSDUH show a slow but steady decline in smoking prevalence for all three poverty level groups between 2009 and 2014 (Figure 2.11). However, there was no narrowing of the gap in prevalence between young adults living at 200% above the poverty threshold compared with those living at less than 100% of the poverty line during this period.

Figure 2.11 30-Day Prevalence of Cigarette Use Among Adults Ages 18–25, by Poverty Level, 2007–2014

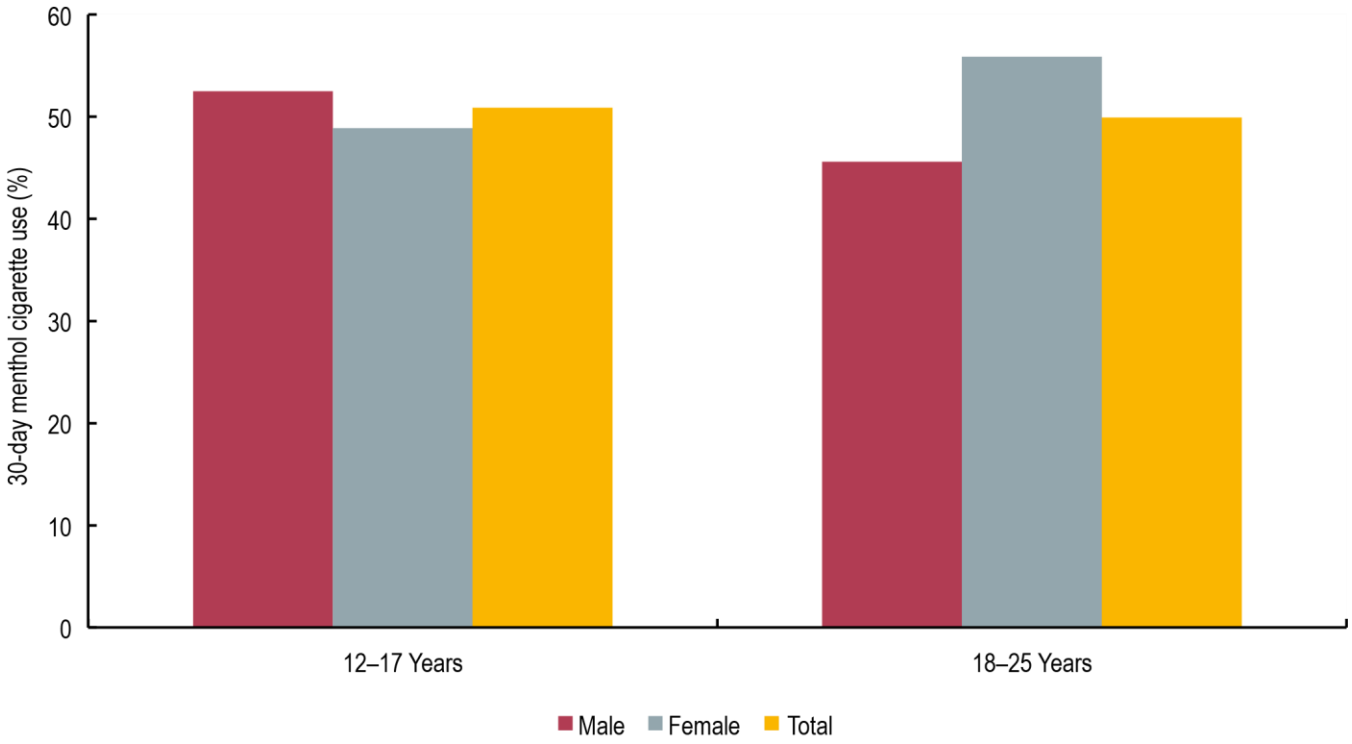


Source: Based on data from the National Survey on Drug Use and Health 2007–2014.[20]

Menthol Cigarette Smoking Among Youth and Young Adults

Various studies have documented the use of menthol cigarettes by youth and young adults over time. For example, an analysis of NSDUH data from 2007 to 2010 found that more than half (51.7%) of new cigarette smokers smoked menthol cigarettes, compared with 41.7% of new smokers between 2004–2006.[34] Additionally, NSDUH data shows that, in 2015, an estimated 50.9% of youth ages 12–17 and 49.9% of young adults ages 18–25 reported smoking menthol cigarettes; among young adults aged 18–25, menthol smoking prevalence was highest among females (56%) (Figure 2.12).[20] An analysis of 2014 NYTS data found that for current cigarette-smoking youth, prevalence of menthol cigarette smoking was 70.5% among non-Hispanic blacks, 52.3% among Hispanics, and 51.4% among non-Hispanic whites.[33]

Figure 2.12 30-Day Prevalence of Menthol Cigarette Smoking Among Youth and Young Adults, by Age Group and Sex, 2015



Source: Based on data from the National Survey on Drug Use and Health 2015.[20]

Giovino and colleagues[35] estimated the use of menthol cigarettes using data from the 2004–2010 NSDUH, adjusting for self-reported menthol status for selected brands either exclusively menthol or non-menthol. Their study found that menthol cigarette smoking was more common among youth (56.7% among 12- to 17-year-olds) and young adults (45.0% among 18 to 25-year-olds) than among older adults (30.5%–34.7%). Additionally, between 2004 and 2010, the rate of non-menthol cigarette use decreased among youth, but the rate of menthol cigarette use remained constant. Among young adults, non-menthol cigarette use also declined, but menthol smoking rates increased. The authors concluded that "young people are heavy consumers of mentholated cigarettes. Progress in reducing youth smoking has likely been attenuated by the sale and marketing of mentholated cigarettes, including emerging varieties of established youth [non-mentholated] brands."[35,p.28]

A number of factors may contribute to the high rates of menthol cigarette use among youth. As discussed in chapter 4, menthol produces a variety of sensory effects. Beyond serving as a flavorant, the multisensory effects of menthol—which acts on the olfactory, gustatory, and trigeminal systems—may appeal to youth, and may contribute to the addictive potential of cigarettes.[36,37] Current young adult menthol smokers may perceive menthol cigarettes as safer than non-menthol cigarettes.[38] An analysis of tobacco industry documents found that cigarette companies carefully researched the menthol segment of the market and tracked menthol cigarette use by age, sex, and race; this analysis concluded that "menthol is a prominent design feature used by cigarette manufacturers to attract and retain new, younger smokers."[39,p.ii12]

Adult Tobacco Use Behaviors

Cigarette Smoking Prevalence Among Adults

Table 2.4 presents National Health Interview Survey (NHIS) prevalence data on adult smoking between 1994 and 2015 by sex, race/ethnicity, and SES. As with youth, current smoking among adults has decreased substantially over time. In 1994, 25.5% of U.S. adults reported current smoking,[40] compared with 15.1% in 2015.[41] Although declines in smoking prevalence have occurred among adults of both sexes, from all racial/ethnic groups, and at all poverty and educational levels, disparities in smoking prevalence remain. For example, in 2015, males continued to have a higher prevalence of current smoking than females (16.7% versus 13.6%).[41]

Table 2.4 Prevalence of Current Cigarette Smoking Among U.S. Adults Age 18 and Older, by Sex, Race/Ethnicity, Poverty Status, and Educational Attainment, 1994–2015

Category	1994	1998	2002	2006	2010	2011	2012	2013	2014	2015
Total	25.5	24.1	22.5	20.8	19.3	19.0	18.1	17.8	16.8	15.1
Sex										
Male	28.2	26.4	25.2	23.9	21.5	21.6	20.5	20.5	18.8	16.7
Female	23.1	22.0	20.0	18.0	17.3	16.5	15.8	15.4	14.8	13.6
Race/Ethnicity*										
White	26.3	25.0	23.6	21.9	21.0	20.6	19.7	19.4	18.2	16.6
Black	27.2	24.7	22.4	23.0	20.6	19.4	18.1	18.3	17.5	16.7
Hispanic/Latino	19.5	19.1	16.7	15.2	12.5	12.9	12.5	12.1	11.2	10.1
American Indian/ Alaska Native	42.2	40.0	40.8	32.4	31.4	31.5	21.8	26.1	29.2	21.9
Asian/Pacific Islander	13.9	13.7	—	—	—	—	—	—	—	—
Asian	—	—	13.3	10.4	9.2	9.9	10.7	9.6	9.5	7.0
Multiple race	—	—	—	—	25.9	27.4	26.1	26.8	27.9	20.2
Poverty Status										
At or above	24.1	23.5	22.2	20.4	18.3	17.9	17.0	16.2	15.2	13.9
Below	34.7	32.3	32.9	30.6	28.9	29.0	27.9	29.2	26.3	26.1
Unknown	28.8	22.5	19.7	18.3	16.0	15.0	13.6	16.0	16.4	10.5
Educational Attainment†										
≤8	23.7	21.9	19.3	17.4	16.2	15.0	15.2	15.4	13.7	14.4
9–11	38.2	36.8	34.1	35.4	33.8	34.6	32.1	33.2	29.5	31.6
0–12 (no degree)	—	—	27.6	26.7	25.1	25.5	24.7	24.2	22.9	24.2
12 (no degree)	—	—	31.0	25.6	21.7	25.1	24.7	19.7	25.7	26.3
GED certificate	—	—	42.3	46.0	45.2	45.3	41.9	41.4	43.0	34.1

Table 2.4 continued

Category	1994	1998	2002	2006	2010	2011	2012	2013	2014	2015
12 (degree)	29.8	27.4	25.6	23.8	23.8	23.8	23.1	22.0	21.7	19.8
Associate's degree	—	—	21.5	21.2	18.8	19.3	17.9	17.8	17.1	16.6
Some college	—	—	23.1	22.7	23.2	22.3	20.9	20.9	19.7	18.5
Undergraduate degree	—	—	12.1	9.6	9.9	9.3	9.1	9.1	7.9	7.4
Graduate degree	—	—	7.2	6.6	6.3	5.0	5.9	5.6	5.4	3.6
13–15	25.7	24.6	—	—	—	—	—	—	—	—
≥16	12.3	11.3	—	—	—	—	—	—	—	—

Notes: Em dash (—) = data not collected in a category for a particular year. GED = general educational development certificate. Current smokers include those who smoked 100 cigarettes per day and who smoked every day or some days. Data were not collected in 1996. NHIS was redesigned in 1997, and trend analysis and comparison with data years before 1997 should be conducted with caution.

*All racial/ethnic groups are non-Hispanic except those categorized as Hispanic. In 1997 the Office of Management and Budget changed its data collection guidelines to require that Native Hawaiian and Other Pacific Islander data be collected separately from Asian. Limited data were collected on American Indians/Alaska Natives, and data for a single year could be unstable or unreliable due to a small sample size. Data on current smoking among Native Hawaiians/Pacific Islanders are not reported.

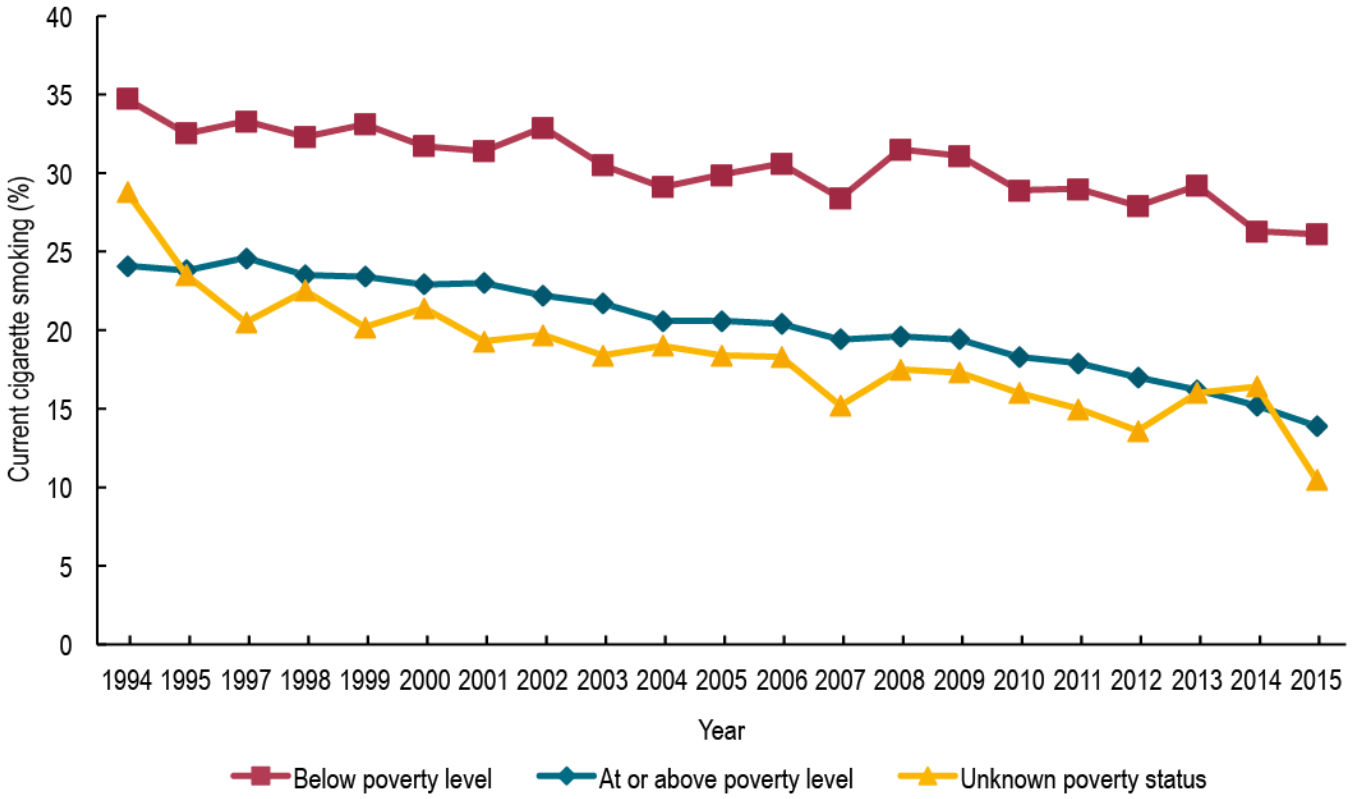
†Additional categories were added to education in 1999.

Source: Based on data from the National Health Interview Survey 1994–2015.[2,40,41,44,47,132–135]

Current Smoking Among Adults, by Race/Ethnicity and SES

American Indian/Alaska Native adults have long had the highest prevalence of current smoking of all U.S. racial/ethnic groups.[9,42] NHIS data show that in 2015, 21.9% of American Indian/Alaska Native adults reported current smoking compared with 16.7% of blacks, 16.6% of non-Hispanic whites, 10.1% of Hispanics, and 7.0% of Asian adults (Table 2.4).[41] Significant disparities in cigarette smoking also persist among adults with lower educational attainment compared with those with higher educational attainment. Additionally, smoking prevalence has long been higher among adults living below the poverty level, and is declining at a slower pace among these adults, compared with those living at or above poverty (Figure 2.13). In 1994, 34.7% of adults living below the poverty level smoked cigarettes, compared to 24.1% of those at or above poverty.[40] In 2015, 26.1% of adults living below the poverty line smoked cigarettes compared to 13.9% of adults living at or above poverty.[41]

Figure 2.13 Current Smoking Among U.S. Adults, by Poverty Status, 1994–2015



Note: Data not reported for 1996. NHIS was redesigned in 1997, and trend analysis and comparison with data prior to 1997 should be conducted with caution.
Source: Based on data from the National Health Interview Survey 1994–2015.[2,40,41,44,47,132–145]

Current Smoking Among Adults, by Sexual Orientation

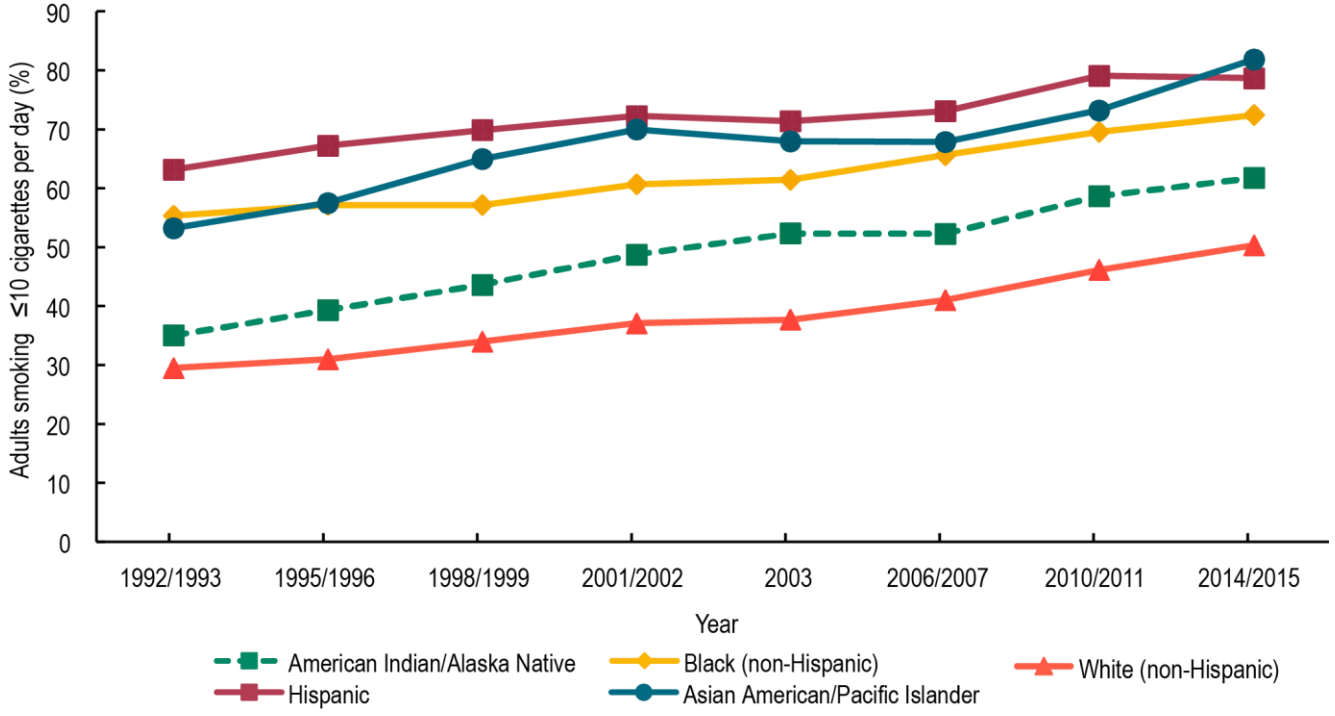
The first nationally representative study to show a higher prevalence of smoking among LGBT adults ages 18 and older compared with heterosexual/straight adults (32.8% vs. 19.5%), used data from the 2009-2010 NATS.[43] Data on sexual orientation has been collected by NHIS beginning in 2013, and by NSDUH beginning in 2015. NHIS data show that, as with other populations, the prevalence of smoking among lesbian, gay, and bisexual individuals has declined over time. However, significantly higher

smoking levels are found among lesbian, gay, and bisexual populations for both men and women, compared to heterosexuals. In 2013, 26.6% of individuals who identified as lesbian, gay, or bisexual reported current smoking compared to 17.6% of heterosexuals.[44] In 2015, 20.6% of individuals who identified as lesbian, gay, or bisexual reported smoking compared to 14.9% of heterosexuals.[41] NSDUH data show a similar trend: 32.8% of those who identified as bisexual and 30.4% of lesbians reported smoking within the past month compared to 20.7% of heterosexuals.[20] Data collected by the PATH study in 2013-2014 show a higher prevalence of current smoking among gay, lesbian, and bisexual adults compared to heterosexual adults; smoking was highest among bisexual individuals (32.6%).[25]

Adult Cigarette Consumption—Light and Intermittent Smoking

Recent trends in smoking patterns and behaviors indicate a higher prevalence of light smoking (variously defined as less than 9 or 10 cigarettes/day) and intermittent (non-daily) smoking in the United States and abroad.[45,46] National-level data show declines in the percentage of daily smokers who smoke 30 or more cigarettes per day (from 12.6% in 2005 to 6.8% in 2015) and a significant increase in the proportion of daily smokers who smoke 9 or fewer cigarettes per day (from 16.4% in 2005 to 25.1% in 2015).[41,47] As shown in Figure 2.14, the trend toward light (≤10 cigarettes/day) smoking is seen among all racial/ethnic groups, but historically, the prevalence of light smoking has been higher among racial/ethnic minority groups compared with non-Hispanic whites. A similar pattern is also seen among low-income adult light smokers, by race/ethnicity; nearly 80% of low-income Hispanic smokers consume 10 or fewer cigarettes per day.[13]

Figure 2.14 Percentage of U.S. Adults Smoking ≤10 Cigarettes per Day, by Race/Ethnicity, 1992/1993–2014/2015



Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 1992/1993–2014/2015.[13]

Other research also indicates that the trend toward increased light and intermittent smoking is significantly more pronounced among smokers from racial/ethnic minority groups than non-Hispanic white smokers.[46,48,49] Data from the 2003 TUS-CPS show that African American and non-Hispanic white smokers reported a higher prevalence of current daily smoking (49.2% and 43.9%, respectively), regardless of smoking intensity (assessed by cigarettes per day [CPD]) compared with Hispanic/Latino and Asian/Pacific Islander smokers (36.9% and 38.1%, respectively).[49] However, the prevalence of current intermittent smoking was significantly higher among African Americans (15.9%), Asians/Pacific Islanders (16.1%), and Hispanics/Latinos (20.8%) compared with non-Hispanic whites (8.5%). In other research modeling the odds of being a light (≤10 CPD) and/or intermittent smoker (adjusting for other characteristics), Hispanics (odds ratio [OR] 5.38; 95% CI 4.38–6.61), non-Hispanic African Americans (OR 3.67; 95% CI 2.92–4.60), and people of other races (OR 1.81; 95% CI 1.40–2.34), were much more likely to be light/intermittent smokers compared to non-Hispanic whites. A similar pattern was observed among light/daily smokers but with more attenuated risk estimates.[46]

Smoking Duration Among Adults

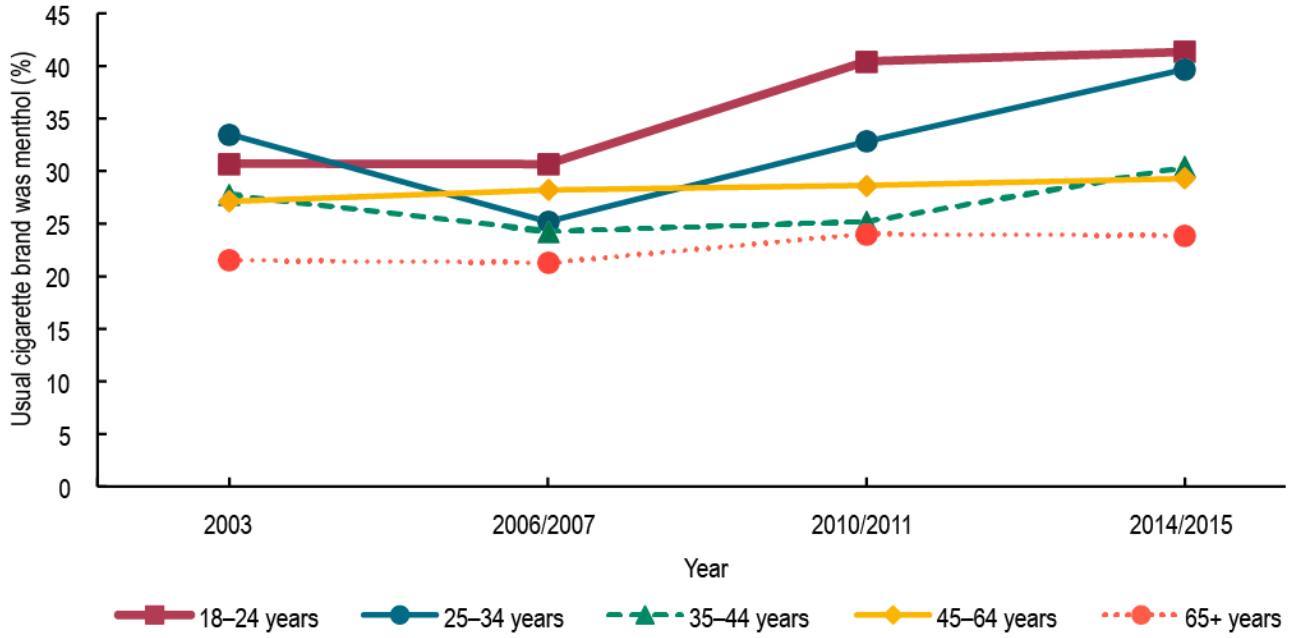
Using data from the 2003 and 2006/2007 TUS-CPS, Siahpush and colleagues[50] found substantial differences in smoking duration by race/ethnicity, SES, and other demographic factors. The highest median duration of smoking was found among American Indians (32 years), followed by blacks and "other" races (30 years), whites (28 years), and Hispanics (24 years). The authors also found a strong gradient based on SES; for example, the median duration of smoking among people living at or below the poverty level was 40 years, compared with 22 years among people living at least three times above poverty. Median duration of smoking also differed by occupation, employment status, age at smoking initiation, and region of the country.[50]

Menthol Cigarette Smoking Among Adults

The NSDUH has collected nationally representative data on menthol cigarette smoking among people age 12 years and older annually since 2004. The TUS-CPS has collected nationally representative data on menthol cigarette smoking among adults periodically since 2003. In addition, questions about menthol cigarette use have sometimes been included in other survey instruments. (See chapter 4 for information about menthol as an ingredient in cigarettes.)

Based on the four nationally representative surveys of U.S. adults (NHANES [1999–2010], NHIS [2005 and 2010], TUS-CPS [2003 and 2006/2007], and NSDUH [2000–2009]), it was estimated that approximately 26%–30% of all adult smokers smoke menthol-flavored cigarettes.[51] TUS-CPS data from 2014/2015 showed that 32.5% of U.S. smokers reported typically smoking menthol-brand cigarettes.[13] According to NSDUH data, 35.5% of adult smokers age 26 or older reported current smoking of menthol cigarettes in 2015.[20] An analysis by Villanti and colleagues[52] comparing 2008–2010 and 2012–2014 NSDUH data found that while the prevalence of current menthol cigarette smoking increased across all age groups, the largest increase was among 26- to 34-year-olds (34.6% in 2008–2010 to 43.9% in 2012–2014). TUS-CPS data (Figure 2.15) also show increased use of menthol cigarettes since 2006/2007, especially among young adults (18–24) and adults ages 25 to 34.

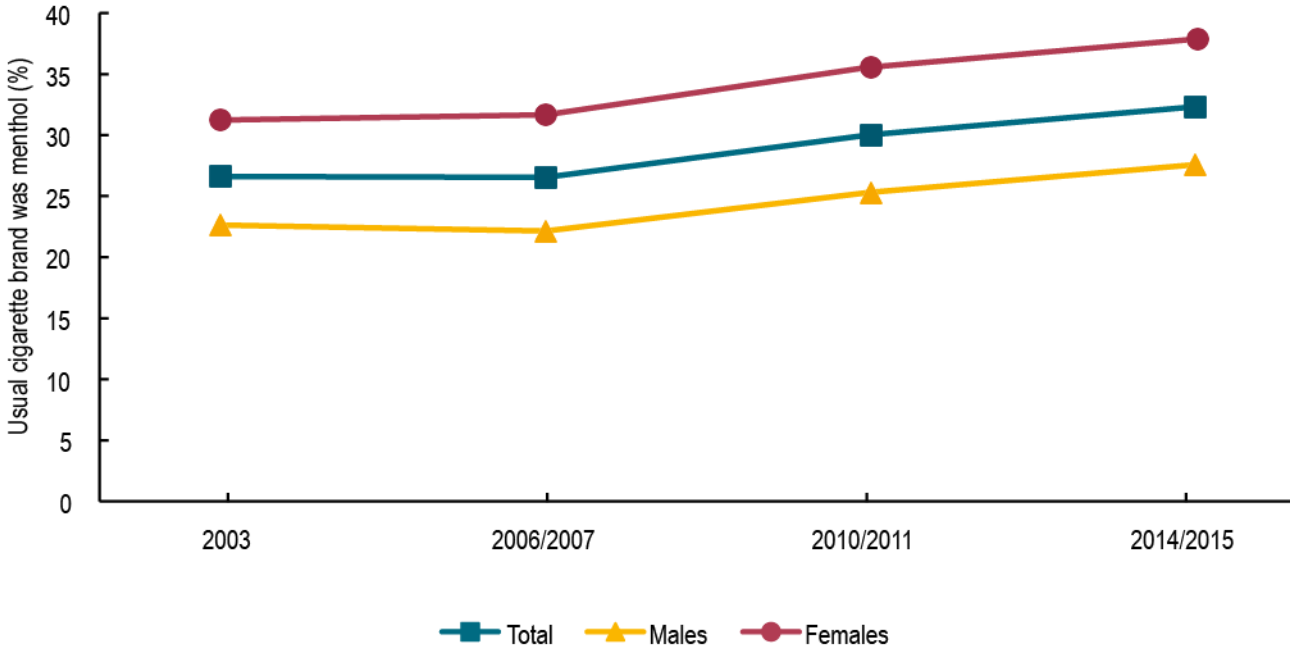
Figure 2.15 Percentage of U.S. Adult Smokers Whose Usual Cigarette Brand Was Menthol, by Age, 2003–2014/2015



Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 2003–2014/2015.[13]

An upward trend in menthol cigarette smoking is seen for both sexes, with a higher prevalence of menthol cigarette smoking among women than men (38.1% vs. 27.7% in 2014/2015) (Figure 2.16).[13]

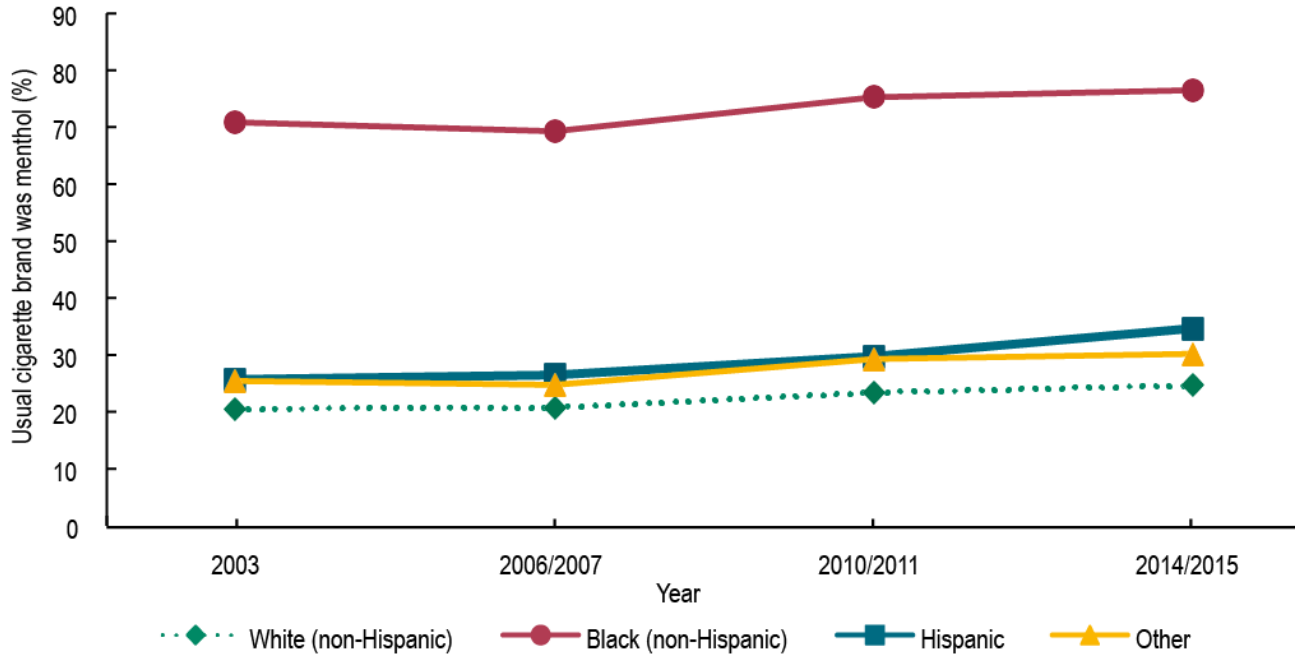
Figure 2.16 Percentage of U.S. Adult Smokers Whose Usual Cigarette Brand Was Menthol, by Sex, 2003–2014/2015



Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 2003–2014/2015.[13]

As shown in Figure 2.17, African Americans consistently report the highest prevalence of menthol cigarette smoking of any racial/ethnic group. TUS-CPS data from 2014/2015 suggest that the prevalence of menthol cigarette smoking may be increasing among Hispanics (Figure 2.17).

Figure 2.17 Percentage of U.S. Adult Smokers Whose Usual Cigarette Brand Was Menthol, by Race/Ethnicity, 2003–2014/2015



Source: Based on data from the Tobacco Use Supplement to the Current Population Survey 2003–2014/2015.[13]

The most recent TUS-CPS data also show differences in current use of menthol cigarettes by employment and educational attainment. In 2014/2015, 42.0% of current smokers who were unemployed smoked menthol cigarettes, compared with 32.2% of smokers who were employed and 30.8% of smokers not in the labor force. Additionally, service industry workers who currently smoke reported a higher prevalence of menthol cigarette smoking (41.0%) than smokers who were white-collar workers (31.3%), blue-collar workers (30.6%), or workers in other industries (30.9%). Smokers with 9–11 years of education reported a higher prevalence of current menthol cigarette smoking (35.4%) than a high school degree (31.6%), those with some college (31.5%), a college education or greater (24.7%), or 8 years or less of education (23.5%).[13]

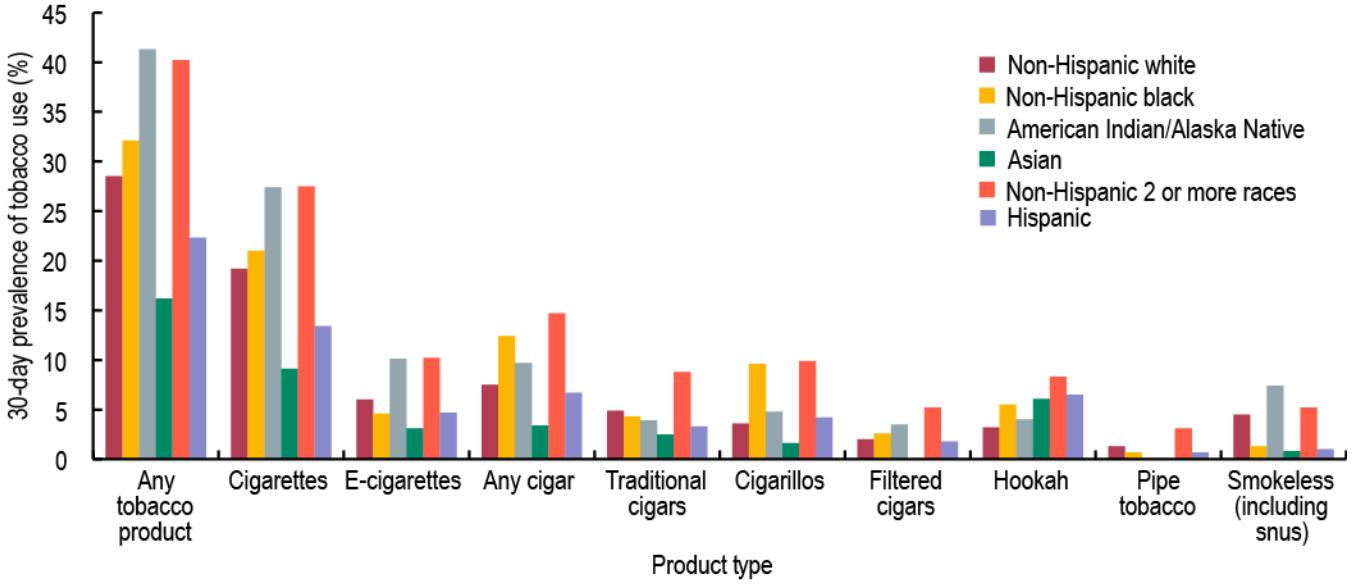
Use of Other Tobacco Products Among Adults

Use of other (non-cigarette) tobacco products is common among adults. Data from the PATH study found that, in 2013-2014, nearly 28% of adults were current users of at least one tobacco product, and approximately 40% of these adults currently used multiple tobacco products. Use of traditional cigarettes and e-cigarettes was the most common tobacco product combination.[25] According to the 2013-2014 PATH study data, young adults (18- to 24-years-old) reported a higher proportion of ever-use of e-cigarettes, cigarillos, hookah, filtered cigars, and snus pouches compared to adults age 25 years and older. Young adults also reported more frequent use of e-cigarettes, cigarillos, hookah, and

smokeless tobacco compared to older adults. Men were more likely than women to use any type of non-cigarette product.

As shown in Figure 2.18, the prevalence of current use of other tobacco products (as well as use of cigarettes) varies by race/ethnicity. Adults reporting multiple races had the highest rates of use of many different tobacco products, except for smokeless products. Among people of a single race, American Indian/Alaska Natives had the highest use of e-cigarettes (10.1%); non-Hispanic blacks had the highest use of cigarillos (9.6%); and Asians had the highest use of hookah (6.1%). Bisexual adults reported the highest current use of any type of cigars (6.2%, traditional cigars; 11.4%, cigarillos; 5.3%, filtered cigars). Prevalence of current e-cigarette use was around 12% for both bisexual and gay adults. Prevalence estimates of use of any type of tobacco product were higher among lesbian, gay, and bisexual adults than among heterosexual adults.[25]

Figure 2.18 30-Day Prevalence of Tobacco Product Use Among U.S. Adults, by Product Type and Race/Ethnicity, 2013-2014



Source: Kasza et al. 2017.[25]

Adults with a General Educational Development (GED) certificate reported the highest current use of e-cigarettes (10.6%), any type of cigar (13.1%), and smokeless tobacco (5.9%) compared to people of other education levels.[25]

Electronic Cigarettes

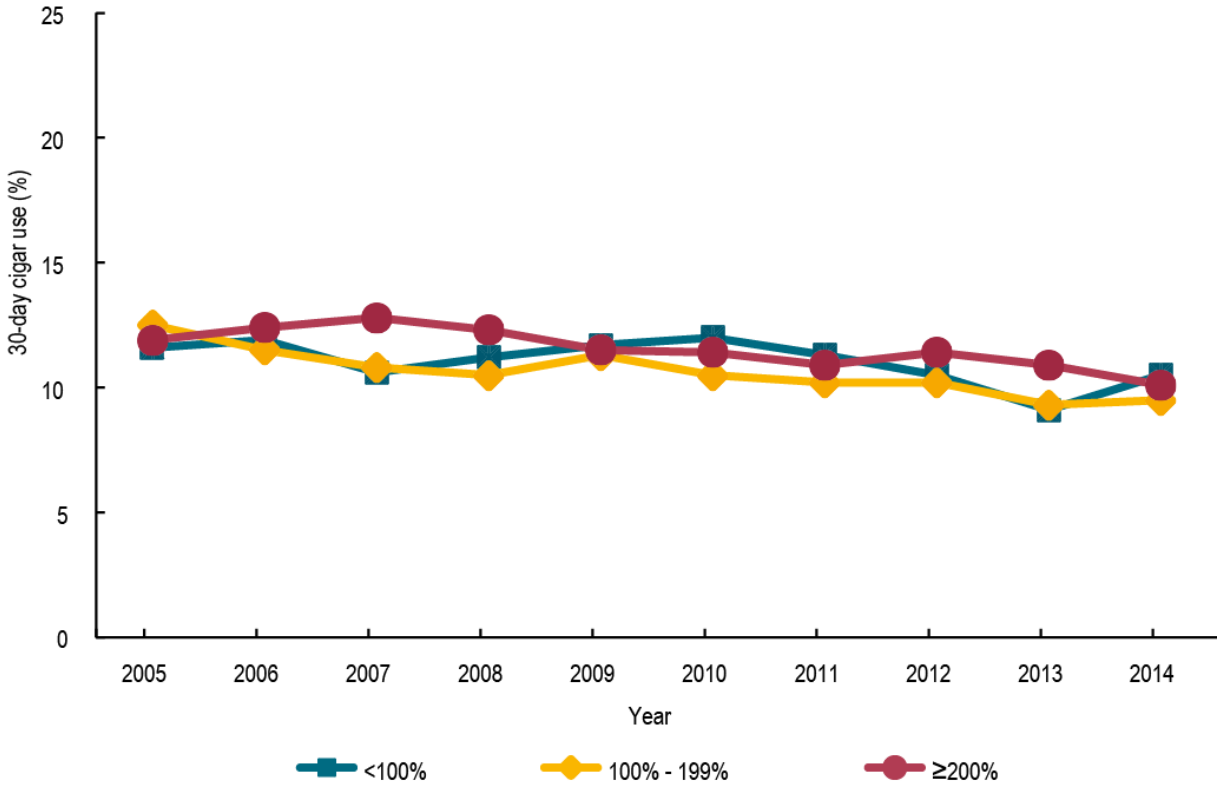
Both awareness and use of e-cigarettes have increased over time among adults: HealthStyles survey data for the years 2010–2013 found increased awareness (from 40.9% to 79.7%), ever-use (3.3% to 8.5%), and current use (1.0% to 2.6%).[53] NATS, conducted in 2013-2014, found that overall, 3.3% of adults age 18 or older used e-cigarettes every day or some days.[54] Use was higher among men (4.0%) than women (2.8%) and was also higher among young adults ages 18–24 (5.5%) than other age groups. E-cigarette use was also high among people with a GED (8.0%), and lesbian, gay, or bisexual

individuals (6.9%). Analysis of data from the 2013-2014 PATH study found that overall, 5.5% of adults were current e-cigarette users; of these, 21.3% reported using e-cigarettes on a daily basis.[55]

Cigars

In the United States, there is wide variation in the landscape of cigar products in relation to cigar type (traditional/premium/large cigars, cigarillos, little filtered cigars [LFC]), flavor, pack size, and brand.[28] Data from the 2012-2013 NATS show that 7.3% of U.S. adults smoke cigars "every day," "someday," or "rarely." Of these, 61.8% reported usually smoking cigarillos; 19.9%, premium cigars; and 18.4%, LFCs.[56] A majority of male and female cigar smokers reported cigarillos as their usual cigar type (61.6% and 59.4%, respectively); 23.9% of men reported premium cigars as their usual cigar type, and LFCs were the usual cigar type of 35.3% of women compared to 14.5% of men. Additionally, 72.1% of adults ages 18–29 reported cigarillos as their usual cigar type, but 15.1% of people in this age group smoked premium cigars and 12.8% smoked LFCs. Differences in cigar type are also found by race/ethnicity: 82.6% of non-Hispanic blacks reported cigarillos as their usual type, whereas 26.7% of non-Hispanic whites reported premium cigars as their usual type. Generally, adults with higher educational levels and annual household incomes had a lower prevalence of usual use of cigarillos and of LFCs and a higher prevalence of usual use of premium cigars. The prevalence of LFCs as the usual type was higher among lesbian, gay, and bisexual adults (35.6%) than among heterosexual adults (17.6%).[53] Figure 2.19 shows NSDUH data on trends in cigar use among young adults (18–25 years) by poverty level; these data reveal a generally decreasing trend.[20]

Figure 2.19 30-Day Prevalence of Cigar Use Among Young Adults Ages 18–25, by Poverty Level, 2005–2014



Source: Based on data from the National Survey on Drug Use and Health 2005–2014.[20]

Flavored Tobacco Products

Non-cigarette tobacco products are increasingly common and available in a growing number of flavors.[57] Research analyzing data from the 2013-2014 NATS found that reported prevalences of using flavored tobacco products in the past month by U.S. adults were: hookah, 82.3%; e-cigarette, 68.2%; smokeless tobacco, 50.6%; cigar, 36.2%; and pipe smoking, 25.8%.[58] Specific flavors varied by product type, but overall, the most commonly used flavors were menthol or mint; clove, spice, or herb; fruit; alcohol; and candy, chocolate, or other sweet flavors. Disparities in flavored tobacco product use were observed by age, sex, income, education, and sexual orientation, with more use of flavored products among young adults (ages 18–24), women, gay/lesbian and bisexual individuals, and people of less income or education. Among e-cigarette users, non-Hispanic blacks reported the highest prevalence of flavored use (87.5%).[58]

Quitting and Cessation Behaviors Among Adults

Quit attempts and smoking cessation behaviors vary by racial/ethnic group and SES. As discussed in the 1998 Surgeon General's report *Tobacco Use Among U.S. Racial/Ethnic Minority Groups*[59] and elsewhere, more white ever-smokers than African American ever-smokers report successfully quitting for at least 30 days.[59–61] Data from the 2015 NHIS show that non-Hispanic black adult smokers report greater interest in quitting smoking (72.8%; 95% CI 68.2–77.4) than Asians (69.6%; 95% CI 59.5–79.8), non-Hispanic whites (67.5%; 95% CI 65.0–70.0), Hispanics (64.7; 95% CI 61.9–72.8), and American Indians/Alaska Natives (55.6%; 95% CI 35.8–75.4).[62] The highest rate of past-year quit attempts was made by Asians (69.4%; 95% CI 62.1–76.7), followed by non-Hispanic blacks (63.4%; 95% CI 59.0–67.9), Hispanics (56.2%; 95% CI 51.6–60.9), non-Hispanic whites (53.3%; 95% CI 50.8–55.7), and American Indians/Alaska Natives (52.1%; 95% CI 32.1–72.2). However, rates of recent smoking cessation (for 6 months or more during the past year) were lower among non-Hispanic blacks (4.9%; 95% CI 3.2–6.6) compared with Asians (17.3%; 95% CI 10.1–24.5), Hispanics (8.2%; 95% CI 5.5–10.9), and non-Hispanic whites (7.1%; 95% CI 6.0–8.2).[62]

Trinidad and colleagues[49] conducted an in-depth examination of quitting and cessation behaviors across U.S. racial/ethnic groups using data from the 2003 TUS-CPS. Among current daily smokers, they found that members of racial/ethnic minority groups were significantly less likely than non-Hispanic whites to report a quit attempt lasting at least 1 day in the past year. Only 58.6% (±2.3) of African Americans, 59.6% (±5.8) of Asians/Pacific Islanders, and 60.3% (±3.1) of Hispanics/Latinos reported a quit attempt that lasted 1 day or longer in the past year, compared with 69.4% (±1.0) of non-Hispanic whites. Among current intermittent smokers, the rate of quit attempts was even lower across racial/ethnic groups, and significantly lower among Hispanic/Latino smokers compared with members of other racial/ethnic groups. In this same study, multivariable analyses found that African American smokers were only about 50% as likely to achieve smoking cessation for at least 6 months compared with non-Hispanic whites (OR = 0.51; 95% CI 0.36, 0.72), after age, sex, education, income, and nicotine dependence were controlled for. No statistically significant differences in 6-month smoking cessation were reported for Asians/Pacific Islanders or Hispanic/Latino smokers compared with non-Hispanic whites. Trinidad and colleagues[49] also found that the prevalence of former smoking among ever-smokers was lower among African Americans (30.4% ± 1.6), Hispanics (36.6% ± 1.8), and Asians/Pacific Islanders (39.8% ± 3.6) compared with non-Hispanic whites (42.9% ± 0.6); however, the difference was statistically significant only for African American and Hispanic smokers.

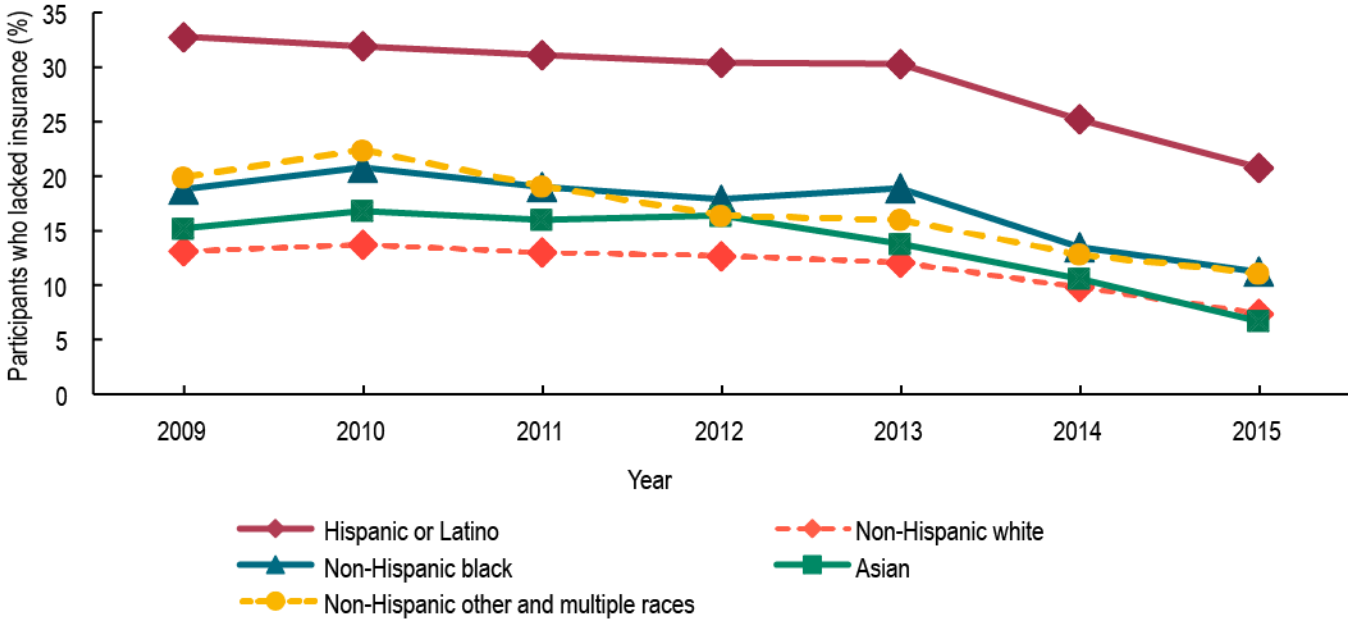
Several nationally representative studies show that low-income smokers are less likely to quit than higher income smokers.[49,63,64] Trinidad and colleagues[49] conducted multivariable analyses using data from the 2003 TUS-CPS and found that those with annual household incomes two times below the U.S. Census Bureau poverty threshold were significantly less likely than more advantaged smokers to achieve 6 months of smoking abstinence. Data from the 2015 NHIS did not show differences in quitting interest, recent quit attempts, or smoking cessation by poverty status, but did find differences by health insurance coverage. Recent smoking cessation was higher among smokers with private insurance (9.4%; 95% CI 7.9–10.9), compared with smokers covered through Medicaid (5.9%; 95% CI 4.1–7.7) and those who were uninsured (5.2%; 95% CI 3.3–7.0).[62]

National-level data also show significant disparities in quitting and smoking cessation behaviors by educational attainment.[49,63,65] In an analysis of 2003 TUS-CPS data, Trinidad and colleagues[49] found that smokers with a college degree were 1.7 times (95% CI 1.39–2.12) more likely to report a 6-month smoking cessation period than those without a high school diploma. Reid and colleagues[63] also reported that smokers with higher education were more likely to intend to quit, make a quit attempt, and be abstinent for at least 1 month or 6 months. Data from the 2015 NHIS show that a lower percentage of smokers with less than a high school education report recent smoking cessation (4.4%; 95% CI 2.7–6.1) compared with those with an associate degree (9.2%; 95% CI 7.4–15.0) and those with an undergraduate college degree (11.2%; 95% CI 7.4–15.0).[62]

Insurance Coverage of Tobacco Dependence Treatment

Health insurance coverage is associated with increased access to medical care, including preventive services such as smoking cessation treatment. Disparities in health care access and quality might contribute to higher smoking initiation and SHS exposure rates, higher current smoking prevalence, and lower quitting success among members of racial/ethnic minorities and people with lower incomes. The percentage of the overall U.S. population who are uninsured declined from 22.3% in 2010 to 12.8% in 2015.[66] However, as shown in Figure 2.20, there are substantial differences in uninsurance rates, with Hispanic/Latino adults the least likely to have health insurance of any racial/ethnic group. Among adults younger than 65, higher rates of uninsurance are also found among younger age groups and among those who are poor or near poor.

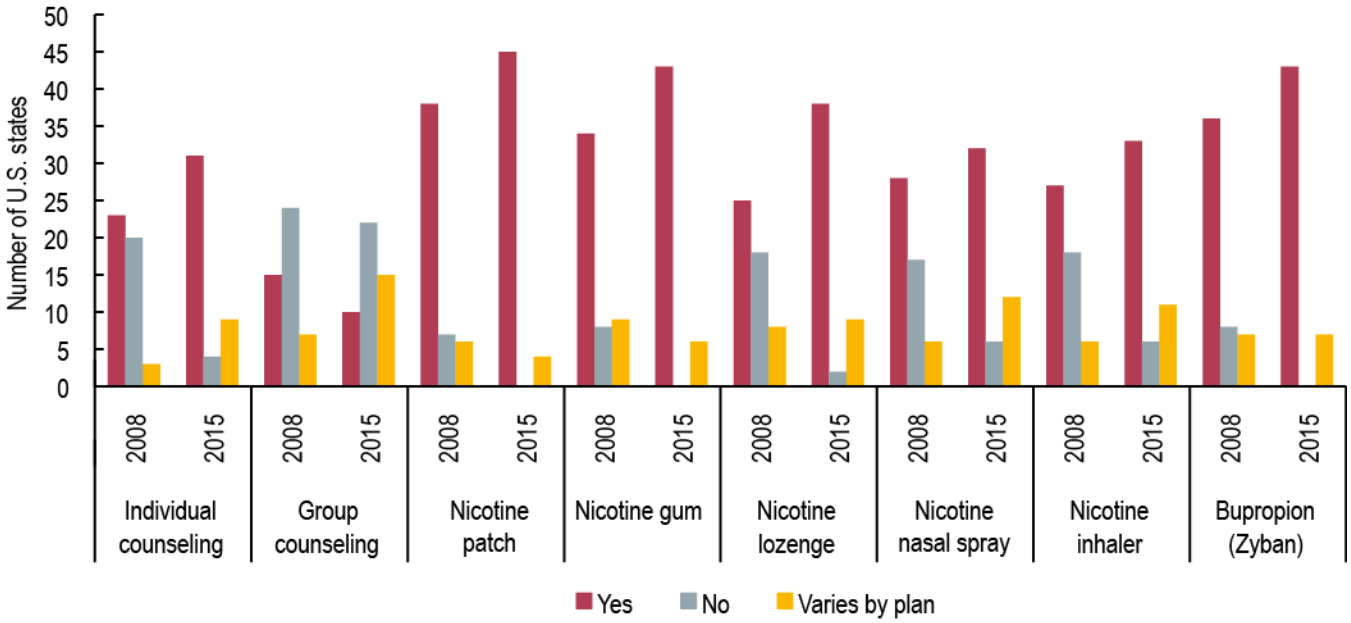
Figure 2.20 NHIS Participants Under Age 65 Who Lacked Health Insurance Coverage at Time of Interview, by Race/Ethnicity, 2009–2015



Sources: Martinez and Cohen 2014[146]; Cohen et al. 2016.[66]

Various steps have been taken to provide tobacco dependence treatments for Americans, including low-income Americans, through insurance coverage. The 2008 Public Health Service Clinical Practice Guidelines recommended that all state Medicaid insurance programs provide coverage for tobacco dependence treatment medications (i.e., gum, patch, lozenge, nasal spray, inhaler, varenicline, bupropion hydrochloride) and behavioral counseling (i.e., individual, group, telephone).[67] The Affordable Care Act (ACA) mandated that all United States Preventive Services Task Force A and B level recommendations must be covered by private health plans without cost-sharing, which includes tobacco cessation interventions.[68] Additionally, in October 2010, the ACA mandated Medicaid coverage of tobacco dependence treatments for pregnant women. As of January 2014, state Medicaid programs were required by the ACA to cover the costs of FDA-approved tobacco dependence medications for all Medicaid recipients. The 2014 report on state Medicaid coverage for tobacco dependence treatments finds that while all states cover tobacco dependence treatments for some enrollees, only nine states cover all nine evidence-based cessation methods (excluding telephone counseling) (Figure 2.21).[69] While this is a marked improvement from previous years, barriers to access still exist, including duration limits (applicable in 40 states), annual limits on quit attempts, pre-authorization requirements, and co-pays. In addition, studies indicate that many smokers with Medicaid insurance are unaware of programs that provide coverage for smoking cessation pharmacotherapies,[70,71] and that Medicaid programs that offer treatment lack the necessary outreach efforts to inform clients of those benefits.[72] Increasing coverage of tobacco dependence treatment and awareness of this coverage by both smokers and health care providers can increase quit attempts, use of effective treatment, and quit rates, and contribute to reducing TRHD.[67,68]

Figure 2.21 State Medicaid Coverage of Tobacco Dependence Treatments, 2008 and 2015



Notes: Yes = state Medicaid coverage for treatment; No = no state Medicaid coverage for treatment; Varies by plan = varies by state Medicaid insurance plan.
Source: Singleterry et al. 2015.[69]

Secondhand Smoke and Prenatal Tobacco Exposure

The 2006 Surgeon General's report, *The Health Consequences of Involuntary Exposure to Secondhand Smoke*, concluded that "secondhand smoke exposure causes premature death and disease in children and in adults who do not smoke"[73,p.11] and that, among nonsmoking adults, SHS exposure is causally related to heart disease and lung cancer. The 2014 Surgeon General's report confirmed a causal relationship between secondhand smoke (SHS) exposure and stroke.[1] Children exposed to SHS are at a higher risk of sudden infant death syndrome (SIDS), acute respiratory infections, ear problems, and poor lung function.[73] Prenatal smoke exposure is causally linked to reduced fertility, pregnancy complications, and poor birth outcomes, including impaired lung development, low birth weight, and preterm delivery.[73,74]

The burden of SHS exposure is experienced disproportionately among nonsmoking racial/ethnic minority individuals and people from low-SES backgrounds, including nonsmoking pregnant women, as detected by biomarkers of exposure (e.g., cotinine). From 1999 to 2012, the percentage of the nonsmoking population age 3 and older with detectable serum cotinine levels ≥0.05 ng/mL declined across all racial/ethnic groups.[75] However, a significantly higher proportion of non-Hispanic black nonsmokers continued to have serum cotinine levels of ≥0.05 ng/mL, compared to Mexican American and non-Hispanic white nonsmokers. For example, in 2011-2012, nearly 50% of non-Hispanic black nonsmokers had serum cotinine levels of ≥0.05 ng/mL, compared with 22% of non-Hispanic white and 24% of Mexican American nonsmokers.[75] Also between 1999 and 2012, serum cotinine levels of ≥0.05 ng/mL declined significantly among nonsmokers age 3 years and older regardless of poverty status. However, in 2011-2012, a significantly greater percentage of nonsmokers living in poverty had serum cotinine levels of ≥0.05 ng/mL compared with their higher income counterparts (43.2% vs. 31.7%).[75]

Data from the Pregnancy Risk Assessment Monitoring System (PRAMS) show that the prevalence of maternal smoking during pregnancy declined significantly between 2000 and 2010.[76] However, PRAMS data also show differences in the prevalence of smoking during pregnancy by race/ethnicity. In 2010, smoking during pregnancy was highest among American Indians/Alaska Natives (26.0%), followed by non-Hispanic whites (14.3%), non-Hispanic blacks (8.9%), Hispanics (3.4%), and Asians/Pacific Islanders (2.1%).[76] Birth certificate data from 2014 show a similar trend: American Indians/Alaska Natives had the highest prevalence of smoking during pregnancy (18.0%) followed by non-Hispanic whites (12.2%); lower prevalence rates were found for non-Hispanic blacks (6.8%), Hispanics (2.0%), and Asians (0.7%).[77]

Birth certificate data for 2014 show that, overall, about 8.4% of women smoked at any time during their pregnancy, and differences between groups in the prevalence of maternal smoking during pregnancy closely followed differences between groups in the prevalence of smoking before pregnancy. Higher rates of smoking during pregnancy were seen in women with fewer than 12 years of education (14.1%), women with Medicaid coverage (14.0%), women ages 20–24 (13.0%), unmarried women (14.7%), and non-Hispanic American Indian/Alaska Native women (18.0%).[77] National data also show that a mother's educational level and smoking during pregnancy independently increase the risk of smoking among her offspring.[78] Additionally, being black non-Hispanic (adjusted prevalence ratio [aPR] = 1.25; 95% CI 1.14–1.38) compared with being white non-Hispanic and having 12 years of education (aPR = 1.09; 95% CI 1.01–1.17) compared with having more than a high school education were found to be associated with postpartum relapse to smoking.[79] Data from the 2010 PRAMS also indicate disparities in the prevalence of smoke-free home rules postpartum.[76] Overall, 93.6% of women with a recent live birth reported having a complete smoke-free home rule; women who smoked during pregnancy and postpartum had the lowest percentage of smoke-free home rules (77.6%). Lower percentages of smoke-free home rules were also found among non-Hispanic black women (86.8%), American Indian/Alaska Native women, women with an annual income below $15,000 (87.6%), women with fewer than 12 years of education (88.6%), women with Medicaid coverage during pregnancy or delivery (89.7%), and women enrolled in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) (90.6%).[76]

Disparities also exist regarding SHS exposure among children and adolescents. While overall SHS exposure, measured by serum cotinine, declined from 52.5% in 1999-2000 to 25.3% in 2011-2012, declines have been slower and rates of exposure have remained higher among children ages 3 to 11 (40.6%) and adolescents ages 12 to 19 (33.8%) compared with adults (21.3%).[75] NHANES data from 2011-2012 show that 67.9% of non-Hispanic black children (3–11 years old) were exposed to SHS compared with 37.2% of non-Hispanic white and 29.9% of Mexican American children.[75] Using NHANES data from 2003 to 2006, Marano and colleagues[80] found that 24.1% of non-Hispanic black youth (3–19 years old) were exposed to SHS in the home compared with 19.4% of non-Hispanic white and 6.6% of Mexican American youth. Even among children and youths who were not exposed to SHS in the home, non-Hispanic blacks had significantly higher serum cotinine levels compared with non-Hispanic whites.[80]

NHANES data from 2003 to 2006 also show that SHS exposure in the home was significantly higher among children and adolescents from families with annual family incomes of less than $20,000 compared with those from families with annual family incomes of $20,000 or more (26.4% vs. 15.5%, respectively).[80]

Prevalence of SHS exposure in the home among children and adolescents also varied by the educational attainment level of the household reference person, defined as an adult resident 18 years old or older owning or renting the residence sampled. When the household referent had less than a high school education, prevalence of exposure was 24.9%; with a high school education or equivalent, 19.7%; and with more than a high school education, 11.8%. These data also show significantly higher serum cotinine levels among children and youths from families with lower annual family incomes and lower householder educational levels, regardless of SHS exposure in the home.[80]

Tobacco-Related Cancer Incidence and Mortality

Approximately half of all people who continue to smoke will die from tobacco-related diseases,[81] and smoking contributes to at least 30% of all cancer deaths in the United States.[82] Cigarette smoking and exposure to SHS are estimated to result in more than 480,000 premature deaths in the United States each year.[1] Annual smoking-attributable costs for the years 2009–2012 are estimated at $289–$332.5 billion, which includes $132.5–$175.9 billion for adult direct medical care, $151 billion for lost productivity due to premature deaths, and $5.6 billion for lost productivity due to exposure to SHS.[1]

There are at least 7,000 chemicals in tobacco smoke, and at least 69 are known to cause cancer.[83] Tobacco smoking, SHS, and smokeless tobacco were listed as human carcinogens in the U.S. Department of Health and Human Services *Report on Carcinogens, 9th edition* (2000).[84] The International Agency for Research on Cancer (IARC) has designated tobacco smoking, SHS exposure, and smokeless tobacco as carcinogenic to humans.[85,86] As of 2014, the Surgeon General has causally linked cigarette smoking to 12 different cancers: acute myeloid leukemia, and cancers of the lung, trachea, and bronchus; oropharynx; esophagus; larynx; stomach; bladder; kidney and ureter; pancreas; uterine cervix; colon and rectum; and liver. The evidence for a causal relationship between active smoking, SHS exposure, and breast cancer was found to be suggestive but not sufficient.[1] The 2014 Surgeon General's report, as well as many previous reports, confirms a causal link between smoking and many serious chronic diseases, including chronic obstructive pulmonary disease (COPD), coronary heart disease, stroke and atherosclerotic peripheral vascular disease, diabetes, and overall diminished health status. The 2014 Surgeon General's report estimated that the leading causes of annual average smoking-attributable mortality (SAM) among adults age 35 and older between 2005 and 2009 were lung and other cancers (163,700 deaths), followed by cardiovascular diseases (160,600 deaths) and respiratory diseases (113,100 deaths). Lung cancer alone contributed to 158,530 deaths annually (88,730 deaths among men, 69,800 deaths among women).[1]

The 2010 Surgeon General's report, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease*,[83] summarizes the science on how tobacco smoking harms health. The conclusions of the 2010 Surgeon General's report include:

> Inhaling the complex chemical mixture of combustion compounds in tobacco smoke causes adverse health outcomes, particularly cancer and cardiovascular and pulmonary diseases, through mechanisms that include DNA damage, inflammation, and oxidative stress.
>
> Through multiple defined mechanisms, the risk and severity of many adverse health outcomes caused by smoking are directly related to the duration and level of exposure to tobacco smoke.[83,p.9]

Cigar smokers have an increased risk of oral, esophageal, laryngeal, and lung cancer[85,87] and "regular cigar smokers who inhale, particularly those who smoke several cigars per day, have an increased risk of coronary heart disease and chronic obstructive pulmonary disease."[87,p.i] As with cigarettes, cigar smoking involves the burning of tobacco; cigars have the potential to deliver as much nicotine and may contain the same or higher levels of carcinogens and toxicants as cigarettes.[27] A systematic review of the literature on the health risks of cigar smoking concluded that mortality from cigar smoking varies by level of smoke exposure (measured by cigars per day, inhalation level) and can equal or exceed the mortality risk of cigarette smoking; even among cigar smokers who do not inhale, mortality risk from oral, esophageal, and laryngeal cancers was elevated.[88] In another study examining the SAM of regular cigar smoking, cancers of the trachea, lung, and bronchus were the leading causes of premature death, followed by cancers of the larynx and lip, oral cavity, and pharynx.[89] This study estimated that in 2010, cigar smoking caused more than 9,000 premature deaths among adults age 35 years and older, with lung cancer as the leading cause of premature death. SAM estimates for men (>8,000) were higher than for women (>1,000), reflecting men's higher cigar smoking rates.

The estimated number of new cancer cases and deaths (in 2017) for selected tobacco-related cancers, based on incidence data from the North American Association of Central Cancer Registries (1999–2013) and mortality date from the National Center for Health Statistics, Centers for Disease Control and Prevention (2000–2014), is shown in Table 2.5.[90] Among men, the highest number of new cases were lung/bronchial, bladder, and kidney/renal cancers, and the highest number of deaths were lung/bronchial, pancreatic, and esophageal cancers. Among women, both the highest number of new cases and the highest number of deaths were lung/bronchial, pancreatic, and kidney/renal cancers.[90] The proportion of cancer deaths attributed to cigarette smoking varies by cancer site, from an estimated 80% of lung, bronchus, and trachea cancer deaths to 10% of deaths from colorectal cancer.[91]

Table 2.5 Tobacco-Related Cancers: Estimated New Cases and Deaths in 2017

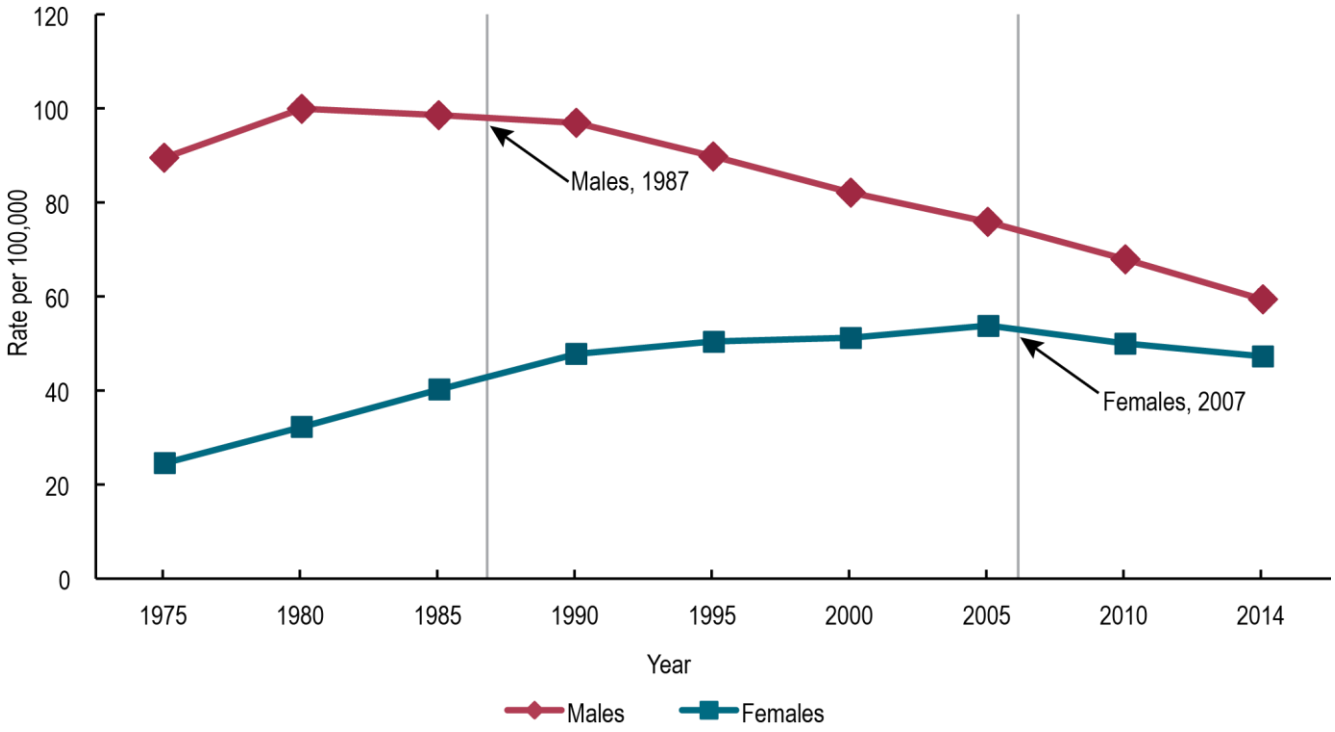
	Expected New Cases in 2017			Estimated Deaths in 2017		
Tobacco-Related Cancer	Total	Men	Women	Total	Men	Women
Lung and bronchus	222,500	116,990	105,510	155,870	84,590	71,280
Bladder	79,030	60,490	18,540	16,870	12,240	4,630
Kidney and renal pelvis	63,990	40,610	23,380	14,400	9,470	4,930
Pancreas	53,670	27,970	25,700	43,090	22,300	20,790
Cervix/uterus	12,820	N/A	12,820	4,210	N/A	4,210
Oral cavity and pharynx	49,670	35,720	13,950	9,700	7,000	2,700
Stomach	28,000	17,750	10,250	10,960	6,720	4,240
Esophagus	16,940	13,360	3,580	15,690	12,720	2,970
Acute myeloid leukemia	21,380	11,960	9,420	10,590	6,110	4,480
Larynx	13,360	10,570	2,790	3,660	2,940	720

Note: N/A = not applicable.
Source: American Cancer Society 2017.[90]

Tobacco-Related Cancer Incidence and Mortality, by Sex

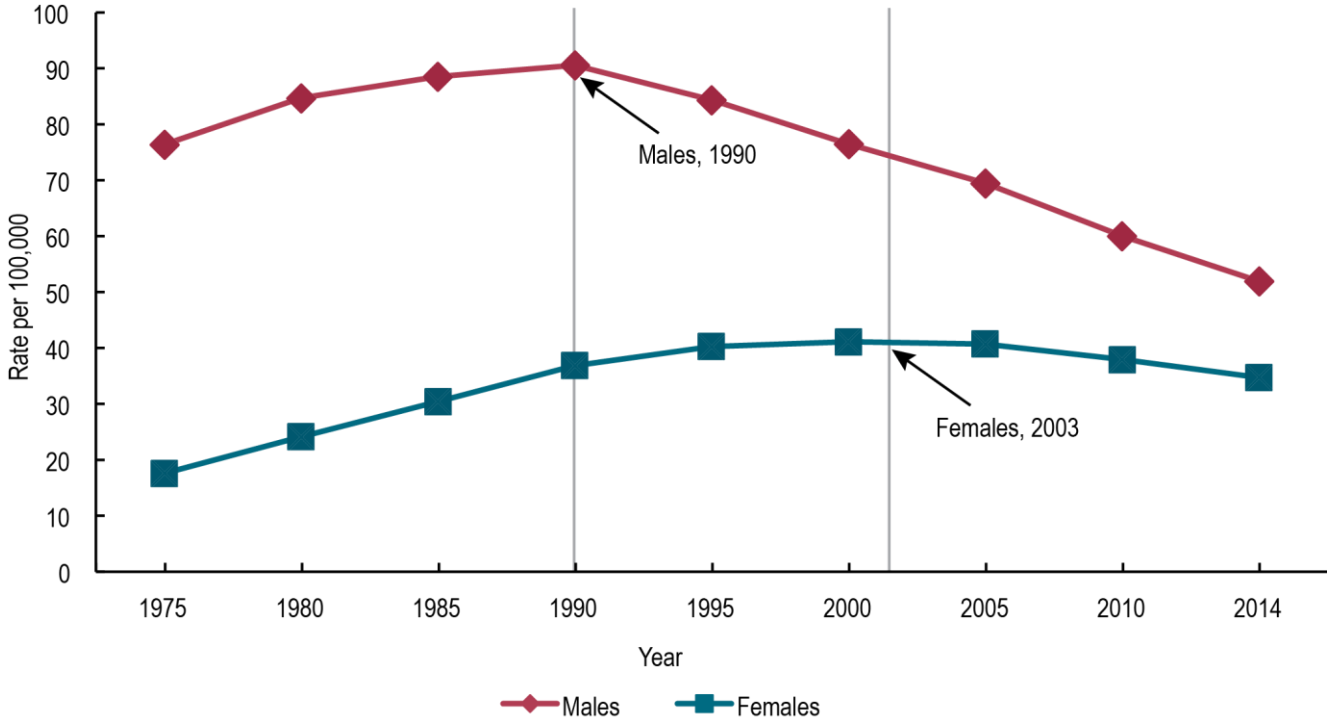
Lung cancer is the leading cause of cancer-related deaths among both men and women in the United States.[92] Lung cancer deaths also account for the largest fraction of smoking-attributable cancer deaths.[1] In 2014, lung/bronchial cancer incidence and mortality per 100,000 people were higher among men (59.3 and 51.9, respectively) than women (47.2 and 34.7, respectively).[93] (See Figure 2.22 for incidence data, and Figure 2.23 for mortality data.) However, lung cancer incidence and mortality among men have been steadily declining since the 1980s and 1990s, respectively. Lung cancer incidence and mortality among women have now begun to decrease as well. Differences in lung cancer incidence and mortality trends for males and females largely reflect historical patterns in smoking prevalence, which began falling more quickly among men than women beginning in the 1950s.

Figure 2.22 Age-Adjusted U.S. Incidence of Lung and Bronchus Cancers, by Sex, 1975–2014



Note: Vertical lines denote the year in which incidence peaked, by sex.
Source: Based on data from the National Cancer Institute, Surveillance, Epidemiology, and End Results Program 1975–2014.[93]

Figure 2.23 Age-Adjusted U.S. Mortality from Lung and Bronchus Cancers, by Sex, 1975–2014



Note: Vertical lines denote the year in which mortality peaked, by sex.
Source: Based on data from the National Cancer Institute, Surveillance, Epidemiology, and End Results Program 1975–2014.[93]

Tobacco-Related Cancer Incidence and Mortality, by Race/Ethnicity

The 1998 Surgeon General's report concluded that African Americans currently bear the greatest health burden of disease and death from cigarette smoking.[59] In 2014, African American men had the highest incidence of and mortality from several tobacco-related cancers, including cancers of the lung and bronchus, kidney and renal pelvis, pancreas, and larynx, compared with men from other racial/ethnic backgrounds (Tables 2.6 and 2.7).[93] As noted in the 1998 Surgeon General's report, "the higher lung cancer incidence and death rates among African American men have not been fully explained,"[59,p.140] and this remains true today. Factors that have been proposed to explain the higher rate of tobacco-related cancer mortality in African American men, given their lower level of cigarette smoking than men of other races/ethnicities, include: historical patterns of cigarette smoking[59,94]; genetic factors (discussed in chapter 3); smoking topography[59]; the disproportionate use of mentholated cigarettes by African Americans[95,96]; barriers to receiving timely, appropriate, and high-quality medical care[97]; as well as the many other social and environmental factors discussed in this monograph. However, DeSantis and colleagues[97] note that disparities in lung cancer death rates between African American men and white men have decreased substantially over time (from >40% in the early 1990s to 20% in 2012) and have been eliminated in adults younger than 40. In 2014, white women had a higher lung cancer incidence and death rate than African American women, and both had higher rates than women of other races/ethnicities (Table 2.7).[93]

Table 2.6 Tobacco-Related Cancer Incidence per 100,000 People in the United States, by Race/Ethnicity and Sex, 2014

	White (Non-Hispanic)		African American		Hispanic/Latino		Asian/Pacific Islander		American Indian/ Alaska Native*	
Cancer Type	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Lung and bronchus	66.4	53.8	79.0	46.9	32.5	22.4	41.6	26.9	39.5	22.8
Bladder	39.1	9.5	19.8	6.5	18.8	4.7	14.5	3.9	16.1	~
Kidney and renal pelvis	22.2	10.8	25.2	12.1	20.7	11.2	10.9	6.0	17.3	10.7
Pancreas	14.7	11.1	17.4	14.4	12.1	10.1	10.3	8.8	11.4	7.7
Cervix/uterus	N/A	7.1	N/A	8.2	N/A	8.8	N/A	6.0	N/A	7.4
Oral cavity and pharynx	19.7	6.9	14.0	5.1	9.5	4.1	10.7	4.9	9.6	4.4
Stomach	7.9	3.5	13.5	7.1	12.6	8.2	13.7	7.3	13.0	7.8
Esophagus	8.0	1.9	5.8	2.0	4.6	1.1	3.5	0.8	5.2	~
Acute myeloid leukemia	5.5	3.9	4.6	3.1	3.9	2.9	3.7	3.1	~	~
Larynx	5.2	1.3	8.5	1.5	3.1	0.4	1.5	~	~	~

Notes: Rates are per 100,000 population and are age-adjusted to the 2000 U.S. Standard Population (19 age groups – Census P25-1130). N/A = not applicable. ~Indicates less than 16 cases; statistic not displayed.
*Rates are higher for American Indians/Alaska Natives when analyses are restricted to Contract Health Service Delivery Areas (CHSDA).[147]
Source: Based on data from the National Cancer Institute Surveillance, Epidemiology, and End Results Program 2014.[93]

Table 2.7 Tobacco-Related Cancer Mortality per 100,000 People in the United States, by Race/Ethnicity and Sex, 2014

	White (Non-Hispanic)		African American		Hispanic/Latino		Asian/Pacific Islander		American Indian/ Alaska Native*	
Cancer Type	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Lung and bronchus	54.6	38.4	62.5	32.8	25.4	13.4	29.7	17.6	44.3	29.5
Bladder	8.3	2.2	5.6	2.5	3.7	1.2	2.8	1.0	2.8	2.3
Kidney and renal pelvis	5.7	2.3	5.9	2.2	5.0	2.2	2.8	1.2	8.0	3.1
Pancreas	12.9	9.6	15.0	11.8	9.3	7.5	7.8	7.2	9.9	7.5
Cervix/uterus	N/A	2.1	N/A	3.6	N/A	2.6	N/A	1.5	N/A	2.3
Oral cavity and pharynx	4.1	1.4	4.9	1.3	2.4	0.8	3.2	0.9	4.2	~
Stomach	3.3	1.7	8.2	3.7	6.7	4.0	6.5	4.1	8.7	3.9
Esophagus	7.9	1.5	5.5	1.8	3.9	0.8	2.9	0.7	7.3	~
Acute myeloid leukemia	3.8	2.4	2.8	1.8	2.5	1.7	2.4	1.6	~	~
Larynx	1.7	0.4	3.3	0.5	1.4	0.1	0.6	~	2.5	~

Notes: Rates are age-adjusted to the 2000 U.S. Standard Population (19 age groups - Census P25-1130). N/A = not applicable. ~Indicates less than 16 cases; statistic not displayed.
*Rates are higher for American Indians/Alaska Natives when analyses are restricted to Contract Health Service Delivery Areas (CHSDA).[147]
Source: Based on data from the National Cancer Institute Surveillance, Epidemiology, and End Results Program 2014.[93]

Lung cancer incidence and mortality were lowest among Hispanic/Latino men and women in 2014 (Tables 2.6 and 2.7). However, lung cancer was the leading cause of cancer death for Hispanic men and the second leading cause of cancer death for Hispanic women.[98] In addition, a larger fraction of lung cancers are diagnosed at distant stage among Hispanics (59%) than among non-Hispanic whites (52%), and fewer cases are diagnosed at localized stage among Hispanics (13%) than among non-Hispanic whites (17%), contributing to a lower survival rate for Hispanics than for non-Hispanic whites.[98]

Lung cancer incidence rates among American Indian/Alaska Native and Asian/Pacific Islander men were 39.5 and 41.6, respectively, in 2014 (Table 2.6), but mortality was higher among American Indian/Alaska Native males (43.9) than Asian/Pacific Islander males (29.7) (Table 2.7). After Hispanic women, lung cancer incidence and mortality were lowest among Asian/Pacific Islander women, and Indian/Alaska Native women.[93] Despite lower lung cancer incidence, the 5-year survival rate was lower among American Indian/Alaska Natives than non-Hispanic whites, and American Indian/Alaska Native populations were more likely to be diagnosed with advanced stage cancers and less likely to undergo resection compared with whites.[99]

As discussed earlier in the chapter, smoking prevalence may vary significantly among populations within the broad categories of Hispanics/Latinos, Asian Americans, and American Indian/Alaska Native populations, a fact that has important implications for the burden of tobacco-related cancer.

Tobacco-Related Cancer Incidence and Mortality, by SES

Significant disparities in lung cancer incidence/mortality also exist by SES. Analysis of data from the SEER–National Longitudinal Mortality Study (NLMS) project show that between 1979 and 1998, men with a high school education or less had significantly higher lung cancer incidence rate ratios (high school, 2.32; less than high school, 3.01) than men with a college education.[100] Women who had a high school education or less had significantly higher lung cancer incidence rate ratios (high school, 1.74; less than high school, 2.02) compared with women with at least a college degree.[100] According to national data for 2003–2007 for all major cancers combined, the largest SES disparity was seen for lung cancer.[101] Among all races, people who completed 12 years or less of high school were much more likely to develop lung cancer (five times more likely for men, and four times more likely for women) than those who completed a college degree or more.[101] Other research indicates that lung cancer incidence increases with decreasing SES, except among Hispanic men and women, where there is an inverse effect of SES.[102]

NLMS data also show that people with lower incomes are at higher risk of lung cancer. Incidence of lung cancer among men and women with annual family incomes of less than $12,500 was more than 1.7 times higher than lung cancer incidence among those with incomes of $50,000 or higher.[100] Unemployed men and women also had a higher lung cancer incidence than employed people (rate ratios = 1.83 and 2.09, respectively).[100] Research also shows that low SES is associated with lower survival rates among lung cancer patients.[103,104] The disparities in smoking prevalence between low SES and high SES undoubtedly contribute to disparities in rates of lung and other tobacco-related cancers.

Tobacco-Related Cancer Incidence and Mortality and HIV

Infections such as HIV are associated with certain cancers, which may also contribute to TRHD. Data from the United States suggest that tobacco use is higher among persons living with HIV/AIDS (PLWHA) compared with their uninfected counterparts.[105,106] Smoking is also more prevalent among

population subgroups that are highly affected by the HIV epidemic. For example, lower SES, including lower income and education, is associated with both HIV morbidity and mortality[107–111] and with tobacco use. Additionally, men who have sex with men are the population most affected by HIV in the United States[112,113]; they also have high smoking rates.[114,115] This convergence of smoking and HIV among vulnerable populations could further contribute to cancer-related health disparities. As the use of highly active antiretroviral therapy has significantly prolonged the lives of PLWHA, more PLWHA are reaching ages where chronic diseases such as cancer are more common. Moreover, lung cancer is the leading cause of cancer death in HIV-infected individuals.[113] This is largely due to higher smoking rates in PLWHA, but even after controlling for smoking status, HIV-infected individuals still have a 2 to 3 times higher risk of developing lung cancer than the overall population.[116–119] Evidence also suggests that HIV-related immunosuppression and inflammatory processes can further increase cancer risk in PLWHA.[118–124]

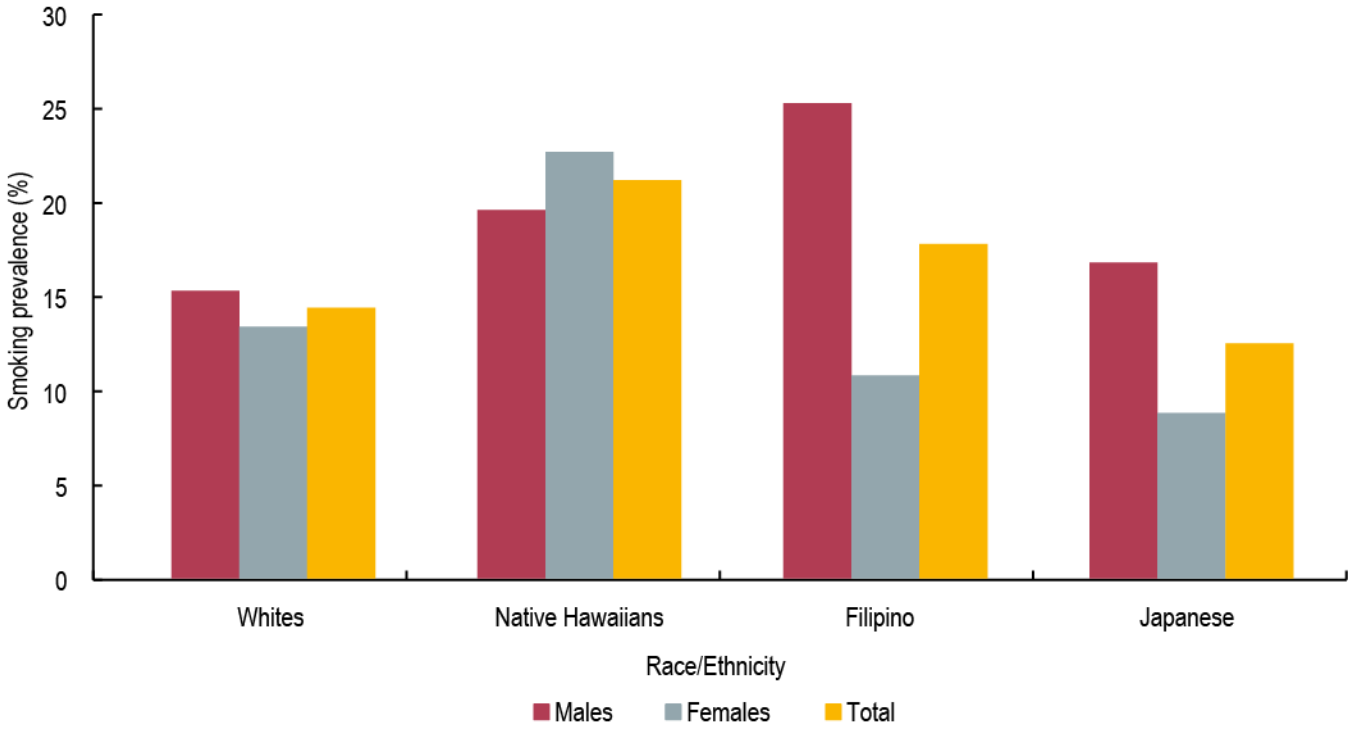
Methodological Limitations and Challenges in the TRHD Literature

The 1998 Surgeon General's report delineated four main categories of methodological limitations in the TRHD literature: (1) nongeneralizability, (2) noncomparability, (3) sample size and aggregation problems, and (4) nonreporting.[63] These and other methodological limitations and challenges remain relevant today, as discussed below.

Aggregate data can mask significant disparities in smoking prevalence and cancer outcomes both within and across racial/ethnic and other population groups. National data are not available in disaggregate form for some races/ethnicities, and for many populations trend data cannot be reported. A lack of disaggregated data often makes it difficult to report TRHD by sex, race/ethnicity, and sexual orientation, or stratified by SES indicators such as poverty status, education, and occupation. In some cases, surveillance data for groups known to be at higher risk of tobacco use, such as LGBT groups, are limited.

Examples of disaggregated data show the type and value of the information that can be gained. For example, Hawaii's Behavioral Risk Factors Surveillance System (BRFSS) surveys are unique because they disaggregate race/ethnicity and report smoking by Native Hawaiians, Filipinos, and Japanese as separate groups. The data show marked differences in smoking prevalence between males and females in non-white racial/ethnic groups, with Filipino males and Native Hawaiian females reporting the highest smoking prevalence, and Japanese women and Filipino women reporting the lowest smoking prevalence (Figure 2.24). Disaggregated data show that lung cancer incidence and mortality rates in Hawaii are higher among Native Hawaiians and Filipinos than among whites.[125] In addition, data from the Multiethnic Cohort Study of Diet and Cancer show that Native Hawaiians and African Americans have an elevated risk of lung cancer compared with other racial/ethnic groups when light smoking (fewer than 10 cigarettes a day) is considered.[126]

Figure 2.24 Smoking Prevalence in Hawaii, by Ethnicity and Sex, 2008



Source: Adapted from Pobutsky and Lowery St. John 2010.[125]

Confidence intervals may be wide for some populations when group-specific data are reported. Wide confidence intervals reflect a lack of precision of the population parameter estimate, such that if the survey were conducted again in a different sample of the population, a different estimate might be observed, resulting in diminished reliability of the findings. In addition, the data are subject to misinterpretation if a finding is not statistically significant when it is (or vice versa). Regional survey data may result in better estimates for some aggregate and disaggregated groups, and may reflect more stable estimates of tobacco use and a more accurate picture of the presence or absence of disparities, but these advantages come at the cost of being representative of only that region. One strategy to report data on small populations and increase statistical stability is to collect and combine survey data across years, but this strategy has limitations as well.

Studies may not adequately examine how contextual factors contribute to disparities in tobacco use and related disease outcomes. For example, American Indians/Alaska Natives have had consistently higher smoking prevalence and longer durations of smoking compared with blacks/African Americans.[41] Other intrapersonal, interpersonal, community/neighborhood, or societal/policy-level factors may help explain the disparities that exist between racial/ethnic groups.[127,128] The constructs of race/ethnicity and culture may differentially influence psychosocial processes that lead to harmful health behaviors or outcomes.[129,130]

Studies may not collect adequate data on aspects of tobacco use that are important or unique to specific groups, or collect adequate data among specific populations, such as LGBT groups. Researchers have recently (2015) suggested expanding data collection on cigarette type (menthol vs. non-menthol) to improve our understanding of how menthol tobacco products may contribute to disparities among

youths and adults.[33,131] National surveys have recently begun collecting data on emerging tobacco products, including e-cigarettes. In addition, national data are increasingly being collected on flavors in tobacco products, especially related to premium cigars, LFCs, cigarillos, and hookah. However, not all national surveys collect data on these products, distinguish by type of product, or monitor the type of flavors used by different racial/ethnic or socioeconomic groups.

Chapter Summary

This chapter presents information on tobacco use behaviors among youths and adults, including young adults and pregnant women, using data from a number of state and national surveys. Cigarette smoking has declined substantially over time among adults of both sexes, among all racial/ethnic groups, and among adults at all poverty and educational levels. However, there are approximately 40 million current smokers in the United States, and significant disparities in prevalence persist by race/ethnicity, level of educational attainment, income, sexual orientation, and other factors.

Among youth, cigarette smoking prevalence has steadily declined since the mid-1990s, but the research still finds evidence of disparities by race/ethnicity and SES. For example, pooled NSDUH data from 2013 to 2015 show that the prevalence of current cigarette smoking among youth ages 12–17 was highest among American Indians/Alaska Natives (7.0%) followed by non-Hispanic whites (6.3%), Native Hawaiians or Other Pacific Islanders (3.4%), Hispanics (3.4%), non-Hispanic blacks/African Americans (2.7%), and Asians (1.6%). Cigarette smoking prevalence is also far higher among youth who do not plan to complete 4 years of college compared with those who do (19.2% vs. 8.4% in 2016). Additionally, nationally representative data from the PATH study show that gay/lesbian and bisexual youth ages 14–17 have a significantly higher prevalence of cigarette smoking and of any tobacco use, compared with heterosexual youth.[25] Patterns of cigarette smoking among young adults (ages 18–25) are generally similar to patterns found among youth. In addition to differences by race/ethnicity, substantial differences by poverty level are found among young adults.

Use of other tobacco products, including e-cigarettes, cigars, hookah, and smokeless tobacco, is also found among youth. Research suggests that flavored tobacco products (including menthol), are especially attractive to youth and young adults; indeed, a majority of youth who have ever used tobacco report that their first tobacco product was flavored.[32] Based on NSDUH data from 2004 to 2010, menthol cigarette use is especially common among youths and young adult cigarette smokers (56.7% and 45.0%, respectively), compared with adult cigarette smokers over the age of 25 (range 30.5% to 34.7%).[35] (Menthol as a tobacco flavorant is discussed in chapter 4.)

In 2015, 21.9% of American Indian/Alaska Native adults reported current smoking compared with 16.7% of non-Hispanic blacks, 16.6% of non-Hispanic whites, 10.1% of Hispanics, and 7.0% of Asian adults.[41] Significant disparities in cigarette smoking also persist among adults with lower educational attainment compared to those with higher educational attainment. Smoking prevalence is also higher and is declining at a slower pace among adults living below the poverty level, compared with adults living at or above poverty. In 2015, 26.1% of adults living below the poverty level smoked cigarettes compared to 13.9% of adults living at or above poverty.[41]

Among adults, light and intermittent (non-daily) smoking is increasingly common in the United States. A trend towards light smoking ($\leq$ 9 or 10 cigarettes per day) is seen among all racial/ethnic groups, with levels of light smoking highest among racial/ethnic minorities. Additionally, it is estimated that

approximately one-third (32.5%) of all adult smokers use menthol-flavored cigarettes, and African American cigarette smokers report the highest prevalence of menthol cigarette smoking of any racial/ethnic group, with levels of menthol smoking consistently exceeding 70%.[13] About two-thirds of all adult smokers are interested in quitting, but rates of recent smoking cessation (≥6 months during the past year) were lower among non-Hispanic blacks (4.9%; 95% CI 3.2–6.6) compared with non-Hispanic Asians (17.3%; 95% CI 10.1–24.5), Hispanics (8.2%; 95% CI 5.5–10.9), and non-Hispanic whites (7.1%; 95% CI 6.0–8.2) in 2015.[62] Quit rates were also lower among low-income smokers and those with lower levels of educational attainment, compared with their more advantaged counterparts.

Secondhand smoke exposure is causally linked to premature death and disease in nonsmoking youths and adults.[73] Although SHS exposure has been decreasing overall, a disproportionate burden of SHS exposure remains among nonsmoking racial/ethnic minority groups and people from low-SES backgrounds, including nonsmoking pregnant women, as detected by biomarkers of exposure (e.g., cotinine). These disparities are particularly evident among children and adolescents compared with adult nonsmokers. In 2014, an estimated 8.4% of mothers smoked at some time during their pregnancy, but higher rates of maternal smoking were seen among less-educated and low-income women, young women, American Indian/Alaska Native women, and white women, compared with women overall.[77]

As summarized in the 2010 Surgeon General's report, "inhaling the complex chemical mixture of combustion compounds in tobacco smoke causes adverse health outcomes—particularly cancer, and cardiovascular and pulmonary disease—through mechanisms that include DNA damage, inflammation, and oxidative stress"[83,p.9] and "through multiple defined mechanisms, the risk and severity of many adverse health outcomes caused by smoking are directly related to the duration and level of exposure to tobacco smoke."[83,p.9]

Lung cancer deaths comprise the largest fraction of smoking-attributable cancer deaths. Largely because of declines in smoking prevalence, lung cancer incidence and mortality among men have been steadily declining since the 1980s and 1990s, respectively, and have recently begun to decline among women as well. However, disparities persist in tobacco-related cancer incidence and mortality by race/ethnicity, SES, and other factors. As noted in the 1998 Surgeon General's report, "the higher lung cancer incidence and death rates among African American men have not been fully explained,"[59,p.140] and this remains true today. In 2014, African American men had the highest incidence of and mortality from several tobacco-related cancers including cancers of the lung and bronchus, kidney and renal pelvis, pancreas, and larynx. However, disparities in lung cancer death rates between African American men and white men have decreased substantially over time (from >40% in the early 1990s to 20% in 2012) and have been eliminated in adults younger than 40 years.[97]

Finally, this chapter points to a number of methodological limitations and challenges in the TRHD literature: aggregate data can mask significant disparities in prevalence and cancer outcomes both within and across racial/ethnic and other population groups; confidence intervals may be wide for some populations when group-specific data are reported; studies have not adequately examined how contextual factors (e.g., community/neighborhood factors) contribute to disparities in tobacco use and related disease outcomes; and studies may not collect adequate data on aspects of tobacco use that are important or unique to specific population groups, such as use of menthol versus non-menthol tobacco products, or on specific populations, such as LGBT groups.

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