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RESEARCH ARTICLE

Workplace Smoke-Free Policies and Cessation Programs Among U.S. Working Adults

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Introduction: Workplace tobacco control interventions reduce smoking and secondhand smoke exposure among U.S. workers. Data on smoke-free workplace policy coverage and cessation programs by industry and occupation are limited. This study assessed smoke-free workplace policies and employer-offered cessation programs among U.S. workers, by industry and occupation.

Methods: Data from the 2014–2015 Tobacco Use Supplement to the Current Population Survey, a random sample of the civilian, non-institutionalized population, were analyzed in 2018. Self-reported smoke-free policy coverage and employer-offered cessation programs were assessed among working adults aged ≥18 years, overall and by occupation and industry. Respondents were considered to have a 100% smoke-free policy if they indicated smoking was not permitted in any indoor areas of their workplace, and to have a cessation program if their employer offered any stop-smoking program within the past year.

Results: Overall, 80.3% of indoor workers reported having smoke-free policies at their workplace and 27.2% had cessation programs. Smoke-free policy coverage was highest among workers in the education services (90.6%) industry and lowest among workers in agriculture, forestry, fishing, and hunting industry (64.1%). Employer-offered cessation programs were significantly higher among workers reporting 100% smoke-free workplace policies (30.9%) than those with partial/no policies (23.3%) and were significantly higher among indoor workers (29.2%) than outdoor workers (15.0%).

Conclusions: Among U.S. workers, 100% smoke-free policy and cessation program coverage varies by industry and occupation. Lower smoke-free policy coverage and higher tobacco use in certain industry and occupation groups suggests opportunities for workplace tobacco control interventions to reduce tobacco use and secondhand smoke exposure.

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INTRODUCTION

Tobacco use is the single most preventable cause of disease, disability, and death in the U.S.[1,2] Smoking causes lung cancer, heart disease, and respiratory diseases, including bronchitis, chronic obstructive pulmonary diseases, and other health problems.[1,2] Nearly half a million Americans continue to die prematurely from tobacco use each year, and in the U.S. the economic costs attributable to smoking and exposure to secondhand smoke are estimated to be $300 billion annually.[2]

The workplace is an important setting for implementing tobacco control interventions.[3,4] Smoke-free policies in indoor public places, including workplaces, have been shown to substantially improve indoor air quality, reduce secondhand smoke exposure, change social norms regarding the acceptability of smoking, prevent

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smoking initiation by youth and young adults, help smokers quit, and reduce heart attack and asthma hospitalizations among nonsmokers.[2,3–9] Considerable progress has been made at the state and local level in adopting comprehensive smoke-free policies that prohibit smoking in all indoor public areas of workplaces, restaurants, and bars; the number of states with such policies increased from zero in 2000 to 27 in 2017, with 58.4% of Americans being covered by such policies at the state or local level as of January 2018.[10,11] The number of indoor workers covered by a smoke-free policy increased from 69.3% in 1999 to 82.8% in 2010–2011; however, policy coverage varies across population groups.[12,13]

In addition to smoke-free policies, employer-sponsored cessation programs (e.g., individual and group counseling, self-help materials, advice from a health professional, or extending the usefulness of cessation coverage medications through employee benefits, telephonic programs, and digital interventions) can also improve worker health, lower employees' health insurance premiums, and help reduce employee tobacco use rates.[3,14–16] Participation in workplace cessation interventions can increase quitting rates and decrease rates of smoking-related diseases.[14,16–19] In 2015, approximately 68% of adult smokers (36.5 million) reported that they wanted to quit smoking, 54% made a quit attempt, and 8% succeeded in quitting.[17] Targeted tobacco cessation treatments can also be effective and benefit different population subgroups.[18,19] When using the health promotion–health protection model for smoking cessation among blue-collar workers participating in the labor union apprenticeship programs, a threefold (OR=3.0) increase in the likelihood of quitting was observed following the intervention.[16] In addition to workers, tobacco cessation programs in the workplace benefit employers through lower employee healthcare costs, increased productivity, and reduced absenteeism.[3,17–20]

The proportion of workers covered by workplace tobacco control interventions, by industry and occupation, has not been extensively studied. Although previous studies have assessed smoke-free policies at workplaces, findings were limited to food service workers and major occupation groups.[12,13] Additionally, information on detailed industry- and occupation-specific smoke-free workplace policy and employer-sponsored cessation program coverage is limited. To fill these gaps, this study used data from the 2014–2015 Tobacco Use Supplement to the Current Population Survey (TUS-CPS) to assess the extent of combustible tobacco use, as well as coverage of smoke-free policies and employer cessation programs, among employed U.S. adults, by industry and occupation.

METHODS

Study Sample

The 2014–2015 TUS-CPS is a household survey administered routinely to the civilian, non-institutionalized population by the U.S. Census Bureau.[21] Eligible household members are interviewed by telephone or in their homes; the sample included people aged ≥18 years. During 2014–2015, a total of 163,920 respondents completed TUS-CPS (response rate of 54.2%).[21] Data analysis was conducted in 2018 for working adults (N=86,163) who were not self-employed during 2014–2015 (Table 1).

Measures

Combustible tobacco use and employer-offered cessation programs were assessed among both indoor and outdoor working adults using affirmative responses to the questions shown in Table 1. Data were stratified by indoor and outdoor worker status where possible (based on the questionnaire language), to provide greater detail on potential factors that could influence workplace policy and practice. For example, smoking rates may vary depending on whether the primary location of work is outdoors, where smoking may be seen as more socially acceptable. Smoke-free policy coverage was assessed among indoor workers only given that the questionnaire language specifically asked the respondent about a "smoking policy for indoor or common areas."

Data are also presented by current industry and occupation (Table 1). Assessing smoke-free policies by industry and occupation is important, as some occupations can exist within multiple industries. For example, a food service worker could be employed in the healthcare industry or in the food service industry. Additionally, previous research suggests that smoking prevalence and secondhand smoke exposure varies considerably by industry and occupation.

Statistical Analysis

SAS version 9.4 was used to assess combustible tobacco smoking, smoke-free workplace policy coverage, and tobacco cessation program coverage. For each outcome, estimates were calculated overall and by sociodemographic characteristics (age, sex, race, education, and U.S. region), industry, and occupation. Two-sided *t*-tests were used to determine statistically significant ($p<0.05$) differences. Bivariate logistic regression and multivariable logistic regression analysis (adjusted for age, race/ethnicity, education, income, region, and sex) were used to examine the associations of smoke-free policies, cessation programs, and combustible tobacco smoking with industry and occupation. Data were weighted to account for the complex sampling design and nonresponse. Estimates with a relative SE (calculated as SE divided by the prevalence estimates) >30% were considered unreliable and were not reported. Differences with $p<0.05$ were considered statistically significant.

RESULTS

During 2014–2015, of the estimated 132 million currently working U.S. adults, 106 million (80.2%) were indoor and 26 million (19.8%) were outdoor workers (Table 2). Overall, 15.5% of working adults were current combustible tobacco smokers. Combustible tobacco

Table 1. Definitions for the Variables Used in Analysis —TUS–CPS, 2014–2015

Variables	Definitions
Working adults	Included all civilians who, during the survey week, did any work at all as paid employees or in their own business or profession, or on their own farm, or who work 15 hours or more as unpaid workers on a farm in a business operated by a member of the family; and (2) those who have jobs but who are not working because of illness, bad weather, vacation, or labor–management dispute, or because they are taking time off for personal reasons, whether or not they are seeking other jobs.
Outdoor workers	Those employed in the last week at the time of interview and were working outdoors or in a motor vehicle, or were working inside their home, or were working in someone else's home (n=16,430).
Indoor workers	Those working outside their home but not working outdoors or in a motor vehicle, not working in someone else's home, and not serving in the armed forces.
Industry and occupation groups	The 2010 Census occupational classification and 2012 Census industry classification codes, derived from the 2010 Standard Occupational Classification (SOC) and the 2012 North American Industry Classification System (NAICS) were used to create the 21 industry and 23 occupations that were assessed in this study. Industry and occupation information applies to the current job held in the reference week.
Combustible tobacco product smoking	Smoking ≥100 cigarettes, ≥50 cigars/cigarillos/filtered little cigars, ≥1 regular pipes, or ≥1 water pipes/hookahs during their lifetime, and now using these respective products 'everyday' or 'some days' at the time of survey.
Smoke-free policy coverage	Assessed by using the question, *Does your place of work have an official policy that restricts smoking in any way?* Respondents who answered *Yes* were then asked the following two questions: (1) *Which of these best describes your place of work's smoking policy for indoor or common areas, such as lobbies, rest rooms, and lunch rooms?*, with the response options *Not allowed in ANY public areas*, *Allowed in SOME public areas*, *Allowed in ALL public areas*, and *Not Applicable*; and (2) *Which of these best describes your place of work's smoking policy for work areas?*. Response options included *Not allowed in ANY work areas*, *Allowed in SOME work areas*, *Allowed in ALL work areas*, and *Not Applicable*. Those who reported having a policy at their workplace that did not allow smoking in indoor public areas and work areas were considered to have a 100% smoke-free policy; those reporting a policy at their workplace that allowed smoking, either in some work areas or public areas, were considered to be covered by a partial policy; and those reporting smoking was allowed in all public area and work areas were considered to have no smoke-free policy.
Employer-sponsored cessation	Assessed using the question *Within the past 12 months, has your employer offered any stop smoking program or any other help to employees who want to quit smoking?* Respondents who answered *yes* were considered to be covered by an employer-sponsored cessation program.

TUS-CPS, Tobacco Use Supplement to the Current Population Survey.

smoking was higher among outdoor workers (20.1%) than indoor workers (14.3%, $p<0.05$; Table 2). Among indoor workers, prevalence was highest among males (16.6%), those aged 18–24 years (16.6%), those with a high school education or less (21.9%), those with annual household income <$35,000 (21.1%), those in the Midwest (17.6%), those in the accommodation and food services industry (23.8%), and those in construction and extraction occupations (24.6%) and food preparation and serving related occupations (24.3%; Tables 2 and 3).

Among outdoor workers, prevalence was highest among males (22.0%), those aged 25–44 years (21.5%), those with a high school education or less (24.4%), those with annual household income <$35,000 (24.9%), those in the Midwest (23.9%), those in the accommodation and food services industry (29.2%), and those in food preparation and serving related occupations (29.5%; Tables 2 and 3).

The odds of using combustible tobacco was significantly lower (prevalence OR=0.7) among indoor workers reporting a 100% smoke-free policy than those reporting a partial/no smoke-free policy at their workplaces, both overall and for all sociodemographic characteristics (Table 2).

The proportion of indoor workers reporting 100% smoke-free (80.3%, 84.0 million), partial smoke-free (10.7%, 11.1 million), and no smoke-free (9.0%, 9.2 million) policy in their workplace varied by sociodemographic characteristics, industry, and occupation (Tables 2 and 4). By sociodemographic characteristics, the lowest proportion of workers covered by a 100% smoke-free policy were those aged 18–24 years (76.0%), males (77.6%), Hispanics (74.3%), those with a high school education or less (74.9%), those with annual household income <$35,000 (75.5%), and those living in the South (77.3%; Table 2).

By industry, the proportion of indoor workers reporting a 100% smoke-free policy at their workplace was highest in the education services industry (90.6%) and lowest in the agriculture, forestry, fishing, and hunting industry (64.1%). The proportion of indoor workers reporting a partial smoke-free policy in the workplace ranged from 23.4% in the mining industry to 3.9% in the education services industry. Indoor workers who

Table 2. Combustible Tobacco Use Prevalence, Cessation Programs, and Smoke-free Policy Coverage by Indoor[a]/Outdoor[b] Worker Characteristics —TUS–CPS, 2014–2015

Selected characteristics	Indoor workers, N/*n* × 1000	Outdoor workers, N/*n* × 1000	Combustible[c] tobacco smoking		Cessation program[d] offered by employers		100% smoke-free policy,[e] indoor workers	
			Indoor workers, Prev (95% CI)	Outdoor workers, Prev (95% CI)	Indoor workers, Prev (95% CI)	Outdoor workers, Prev (95% CI)	% (95% CI)	POR[f] (95% CI)
Total (100%)	106,275	26,213	14.3 (14.0, 14.7)	**20.1 (19.4, 20.8)**	**29.2 (28.7, 29.6)**	15.0 (14.2, 15.8)	80.3 (80.0, 80.7)	**0.7 (0.6, 0.7)**
Age group, years								
≥18–24	14,850	3,213	16.6 (15.5, 17.8)	**21.4 (18.6, 24.1)**	**16.8 (15.6, 18.1)**	7.6 (5.3, 9.8)	76.0 (74.7, 77.4)	**0.7 (0.6, 0.8)**
25–44	47,874	11,464	15.0 (14.6, 15.4)	**21.5 (20.4, 22.6)**	**29.9 (29.3, 30.5)**	15.0 (13.7, 16.2)	79.5 (79.0, 80.0)	**0.7 (0.6, 0.8)**
45–64	39,344	10,191	13.3 (12.9, 13.8)	**19.2 (18.1, 20.2)**	**33.4 (32.7, 34.0)**	17.9 (16.5, 19.3)	82.6 (82.0, 83.1)	**0.7 (0.6, 0.8)**
≥65	4,208	1,344	8.2 (7.2, 9.2)	12.6 (10.3, 14.8)	**26.1 (24.3, 27.9)**	13.4 (9.9, 16.8)	84.2 (82.8, 85.6)	**0.6 (0.4, 0.8)**
Sex								
Male	50,977	18,309	16.6 (16.1, 17.1)	**22.0 (21.1, 23.0)**	**29.5 (28.8, 30.1)**	14.7 (13.8, 15.6)	77.6 (77.0, 78.2)	**0.8 (0.7, 0.8)**
Female	55,298	7,903	12.2 (11.8, 12.6)	**15.6 (14.5, 16.8)**	**28.9 (28.3, 29.5)**	16.9 (14.6, 19.1)	82.8 (82.4, 83.3)	**0.7 (0.6, 0.7)**
Race[g]								
Hispanic	15,792	6,111	9.6 (8.8, 10.4)	**13.2 (11.7, 14.6)**	**19.9 (18.8, 21.0)**	8.5 (7.1, 9.9)	74.3 (73.1, 75.4)	**0.8 (0.7, 1.0)**
Non–Hispanic white	69,040	15,626	16.1 (15.7, 16.5)	**23.2 (22.3, 24.2)**	**32.0 (31.4, 32.5)**	18.0 (16.9, 19.1)	82.2 (81.8, 82.6)	**0.7 (0.6, 0.7)**
Non–Hispanic black	12,270	3,013	13.4 (12.5, 14.4)	**17.8 (15.6, 19.9)**	**27.2 (25.9, 28.6)**	15.7 (12.7, 18.6)	78.9 (77.7, 80.0)	**0.8 (0.6, 0.9)**
Other race	7,726	1,105	8.7 (7.7, 9.6)	**16.7 (13.1, 20.2)**	**25.3 (23.6, 27.1)**	14.3 (9.5, 19.2)	78.4 (76.8, 79.9)	**0.7 (0.5, 0.9)**
Multiple race	1,448	358	21.9 (18.2, 25.6)	32.4 (23.7, 41.2)	**35.0 (30.5, 39.5)**	15.1 (7.1, 23.0)	78.2 (74.5, 81.8)	0.8 (0.5, 1.3)
Education								
≤High school, GED	30,104	12,210	21.9 (21.2, 22.6)	**24.4 (23.3, 25.6)**	**20.6 (19.9, 21.3)**	10.6 (9.6, 11.6)	74.9 (74.1, 75.7)	**0.8 (0.7, 0.9)**
>High school	76,171	14,002	11.3 (11.0, 11.7)	**16.3 (15.4, 17.2)**	**32.7 (32.1, 33.2)**	20.2 (18.6, 21.6)	82.5 (82.1, 82.9)	**0.6 (0.6, 0.7)**

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Table 2. Combustible Tobacco Use Prevalence, Cessation Programs, and Smoke-free Policy Coverage by Indoor[a]/Outdoor[b] Worker Characteristics —TUS–CPS, 2014–2015 (*continued*)

Selected characteristics	Indoor workers, N/*n* × 1000	Outdoor workers, N/*n* × 1000	Combustible[c] tobacco smoking		Cessation program[d] offered by employers		100% smoke-free policy,[e] indoor workers	
			Indoor workers, Prev (95% CI)	Outdoor workers, Prev (95% CI)	Indoor workers, Prev (95% CI)	Outdoor workers, Prev (95% CI)	% (95% CI)	POR[f] (95% CI)
Income, $								
≤34,999	25,706	8,215	21.1 (20.3, 21.9)	**24.9 (23.5, 26.4)**	**18.4 (17.6, 19.1)**	7.7 (6.6, 8.8)	75.5 (74.7, 76.4)	**0.8 (0.7, 0.9)**
35,000–74,999	35,993	9,580	15.3 (14.7, 15.8)	**21.3 (20.1, 22.6)**	**28.9 (28.2, 29.6)**	15.4 (14.0, 16.7)	79.6 (79.0, 80.3)	**0.7 (0.6, 0.8)**
≥75,000	44,576	8,418	9.7 (9.3, 10.1)	**14.0 (12.9, 15.1)**	**35.8 (35.1, 36.5)**	22.4 (20.6, 24.2)	83.6 (83.1, 84.2)	**0.7 (0.7, 0.8)**
U.S. Census region								
Northeast	19,675	4,406	13.6 (12.8, 14.3)	**19.4 (17.5, 21.3)**	**29.8 (28.8, 30.9)**	14.8 (12.5, 17.0)	82.8 (82.0, 83.7)	**0.8 (0.7, 0.9)**
Midwest	24,409	4,914	17.6 (16.9, 18.3)	**23.9 (22.2, 25.6)**	**33.6 (32.7, 34.5)**	18.8 (16.7, 20.8)	84.2 (83.6, 84.9)	**0.7 (0.6, 0.8)**
South	38,520	10,041	14.6 (14.1, 15.1)	**21.5 (20.3, 22.7)**	**26.9 (26.2, 27.6)**	13.6 (12.3, 14.9)	77.3 (76.6, 77.9)	**0.7 (0.6, 0.8)**
West	23,671	6,852	11.2 (10.6, 11.8)	**15.8 (14.5, 17.1)**	**27.9 (27.0, 28.8)**	14.7 (13.1, 16.3)	79.2 (78.4, 80.0)	**0.7 (0.6, 0.9)**

Note: Boldface indicates statistical significance ($p<0.05$). Reference group: outdoor workers.

[a]Adults aged ≥18 years who reported that they worked indoors in an office building or in another non-residential place at the time of the interview, were not self-employed, were not working in someone else's or their own home, and were not working in more than one building or in a motor vehicle.

[b]Adults aged ≥18 years who reported that they worked outdoors, and not in an office building or in another non-residential place at the time of the interview; were not self-employed; were not working in someone else's or their own home; and were not working in more than one building or in a motor vehicle.

[c]Current combustible tobacco smoking is defined as those who reported ever using cigarettes (had smoked 100 cigarettes), cigars, cigarillos, little filtered cigars, or any pipes filled with tobacco during their lifetime and currently use them every day or some days (*n*=20,444,000; 15.5%).

[d]Responded *yes* to employer offering any stop smoking program or any other programs that help employees who want to quit smoking (*n*=29,306,000; 27.2%).

[e]100% smoke-free was determined by *yes* response to the presence of a smoke-free workplace policy at their place of work that did not permit smoking in indoor work areas and any public and common areas (such as lobbies, rest rooms, and lunch rooms). Smoke-free policies were assessed only among indoor workers.

[f]Adjusted for age, sex, race, education, income, and region; odds of smoking combustible tobacco among those covered under 100% smoke-free policy as compared with the odds of combustible tobacco smoking among those covered partial/no smoke-free policies.

[g]In the 2014–2015 TUS-CPS, "white" equals non-Hispanic, only white race reported; "black" equals non-Hispanic, only black race reported; "American Indian/Alaska Native" equals non-Hispanic, only American Indian/Alaska Native race reported; "Asian/Pacific Islander" equals non-Hispanic, only Asian/Native Hawaiian and other Pacific Islander race reported; "2 or more races reported" equals non-Hispanic, 2 or more races reported. Note more than half of this last category is composed of non-Hispanic American Indian/Alaska Natives also reporting one or more other races. Also, non-Hispanic Asian/Native Hawaiian and other Pacific Islanders reporting some other race(s) make up the next largest subcategory within this grouping (mainly the Native Hawaiian and other Pacific Islanders). Those excluded from analysis were self-employed and not paid adults (estimated *n*=15,095,000).

n, estimated number of workers; Prev, prevalence; POR, prevalence OR; TUS-CPS, Tobacco Use Supplement to the Current Population Survey.

Table 3. Prevalence of Combustible Tobacco Smoking, Employer Offered Cessation Programs Among Indoor[a]/Outdoor[b] Workers by Industry/Occupation —TUS–CPS, 2014–2015

Industry and occupation groups[c]	Indoor workers			All outdoor workers		
	Estimated *n* (%) of workers, *n* × 1000 (%)	Combustible[d] tobacco users, Prev (95% CI)	Employer offered cessation[e] program, Prev (95% CI)	Estimated *n* (%) of workers, *n* × 1000 (%)	Combustible tobacco smoking, Prev (95% CI)	Employer-offered cessation program, Prev (95% CI)
Industry						
Accommodation and food services	8,423 (92.3)	23.8 (22.3, 25.3)	8.1 (7.1, 9.1)	705 (7.7)	29.2 (23.6, 34.9)	–[f]
Construction	2,862 (41.0)	20.2 (18.0, 22.4)	14.6 (12.6, 16.5)	4,124 (59.0)	**26.6 (24.5, 28.7)**	6.8 (5.4, 8.1)
Management, administration, and waste management services	3,395 (61.5)	18.6 (16.6, 20.5)	17.3 (15.2, 19.5)	2,124 (38.5)	21.7 (19.0, 24.5)	7.1 (5.1, 9.2)
Manufacturing–durable goods	8,389 (88.7)	18.4 (17.2, 19.6)	38.4 (36.8, 40.0)	1,068 (11.3)	23.6 (19.6, 27.5)	23.6 (18.6, 28.7)
Retail trade	12,817 (89.7)	18.3 (17.3, 19.3)	23.8 (22.6, 25.0)	1,477 (10.3)	22.6 (19.3, 25.8)	13.8 (10.5, 17.1)
Manufacturing—non-durable goods	4,747 (89.4)	17.6 (16.0, 19.2)	35.2 (33.1, 37.3)	565 (10.6)	20.2 (15.4, 25.0)	28.5 (21.5, 35.6)
Transportation and warehousing	2,767 (51.2)	16.9 (14.8, 19.0)	29.5 (26.8, 32.3)	2,638 (48.8)	20.0 (17.7, 22.2)	18.2 (15.9, 20.5)
Agriculture, forestry, fishing, and hunting	341 (26.7)	16.8 (10.9, 22.6)	18.0 (11.8, 24.2)	934 (73.3)	20.3 (16.3, 24.4)	5.2 (3.1, 7.2)
Real estate and rental and leasing	1,634 (69.9)	15.2 (12.7, 17.7)	18.9 (16.0, 21.8)	703 (30.1)	21.5 (17.0, 26.0)	6.5 (2.6, 10.4)
Wholesale trade	2,658 (76.3)	15.2 (13.2, 17.3)	27.4 (24.7, 30.1)	828 (23.7)	18.4 (14.5, 22.3)	19.4 (14.5, 24.2)
Other services, except private households	4,033 (81.8)	14.8 (13.2, 16.5)	8.9 (7.5, 10.2)	895 (18.2)	19.1 (15.2, 23.1)	6.7 (3.4, 9.9)
Arts, entertainment, and recreation	1,795 (75.2)	14.5 (12.1, 17.0)	20.3 (17.3, 23.2)	593 (24.8)	20.1 (14.7, 25.4)	8.4 (4.7, 12.1)
Mining	495 (51.9)	13.2 (8.9, 17.5)	36.2 (29.7, 42.6)	460 (48.1)	**25.8 (20.3, 31.3)**	24.4 (18.3, 30.4)
Public administration	5,955 (79.6)	11.7 (10.6, 12.9)	43.1 (41.1, 45.0)	1,526 (20.4)	**15.1 (12.5, 17.7)**	29.9 (25.7, 34.1)
Health care and social services	15,815 (85.7)	11.3 (10.6, 12.0)	45.4 (44.2, 46.6)	2,647 (14.3)	**16.7 (14.6, 18.7)**	27.4 (21.5, 33.3)
Financial and insurance	6,218 (90.0)	10.8 (9.7, 11.9)	40.3 (38.4, 42.2)	689 (10.0)	**16.6 (12.7, 20.6)**	22.5 (12.8, 32.1)
Information	2,342 (80.7)	10.8 (8.9, 12.7)	33.5 (30.4, 36.5)	561 (19.3)	16.3 (11.3, 21.3)	28.1 (20.2, 36.0)
Professional and technical services	7,895 (85.6)	10.8 (9.8, 11.8)	22.9 (21.4, 24.4)	1,328 (14.4)	**14.0 (11.3, 16.7)**	15.3 (10.0, 20.6)

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Table 3. Prevalence of Combustible Tobacco Smoking, Employer Offered Cessation Programs Among Indoor[a]/Outdoor[b] Workers by Industry/Occupation —TUS–CPS, 2014–2015 (*continued*)

Industry and occupation groups[c]	Indoor workers			All outdoor workers		
	Estimated *n* (%) of workers, *n* × 1000 (%)	Combustible[d] tobacco users, Prev (95% CI)	Employer offered cessation[e] program, Prev (95% CI)	Estimated *n* (%) of workers, *n* × 1000 (%)	Combustible tobacco smoking, Prev (95% CI)	Employer-offered cessation program, Prev (95% CI)
Utilities	837 (64.9)	10.7 (7.9, 13.5)	52.5 (47.5, 57.5)	453 (35.1)	**23.8 (18.3, 29.3)**	33.3 (26.6, 40.0)
Educational services	12,825 (91.9)	6.6 (6.0, 7.3)	26.6 (25.4, 27.8)	1,132 (8.1)	**11.1 (8.5, 13.6)**	20.9 (16.3, 25.5)
Household	32 (4.0)	–	–	764 (96.0)	10.7 (7.5, 13.9)	–
Occupation						
Construction and extraction	1,778 (32.5)	24.6 (21.6, 27.6)	16.9 (14.3, 19.6)	3,686 (67.5)	26.5 (24.3, 28.7)	9.0 (7.5, 10.5)
Food preparation and serving related	6,777 (94.4)	24.3 (22.6, 26.0)	9.5 (8.2, 10.7)	404 (5.6)	29.5 (21.8, 37.2)	6.9 (1.7, 12.0)
Installation, maintenance, and repair	2,866 (65.5)	24.0 (21.7, 26.3)	27.1 (24.5, 29.6)	1,507 (34.5)	28.5 (24.9, 32.1)	19.2 (15.8, 22.5)
Production	7,045 (87.5)	22.3 (20.8, 23.8)	28.5 (26.8, 30.1)	1,002 (12.5)	26.9 (22.7, 31.0)	20.0 (15.6, 24.3)
Transportation and material moving	3,554 (45.9)	21.9 (19.8, 24.1)	26.0 (23.6, 28.4)	4,182 (54.1)	21.7 (19.8, 23.5)	15.8 (14.1, 17.6)
Building and grounds cleaning and maintenance	2,685 (56.9)	20.2 (17.9, 22.5)	20.7 (18.3, 23.1)	2,036 (43.1)	19.0 (16.4, 21.6)	6.3 (4.3, 8.2)
Sales and related	10,741 (85.7)	16.8 (15.7, 17.9)	21.6 (20.4, 22.9)	1,798 (14.3)	19.2 (16.4, 22.0)	16.8 (13.1, 20.6)
Protective service	1,998 (62.3)	16.7 (14.2, 19.2)	34.4 (31.2, 37.7)	1,207 (37.7)	14.9 (11.7, 18.0)	24.9 (20.7, 29.1)
Healthcare support	2,561 (77.5)	16.3 (14.3, 18.4)	32.2 (29.4, 35.0)	745 (22.5)	**23.0 (18.6, 27.3)**	16.2 (4.3, 28.2)
Farming, fishing, and forestry	243 (25.3)	16.0 (9.5, 22.4)	**16.1 (9.1, 23.1)**	718 (74.7)	19.0 (14.4, 23.5)	4.6 (2.4, 6.8)
Personal care and service	2,404 (61.3)	14.9 (12.7, 17.0)	11.4 (9.5, 13.3)	1,518 (38.7)	15.2 (12.6, 17.8)	11.3 (4.4, 18.2)
Office and administrative support	15,564 (89.5)	14.2 (13.4, 15.0)	**29.4 (28.3, 30.5)**	1,823 (10.5)	**19.6 (16.7, 22.4)**	20.4 (16.5, 24.4)
Management	11,598 (87.1)	12.6 (11.7, 13.5)	**34.0 (32.7, 35.2)**	1,714 (12.9)	**17.5 (14.8, 20.2)**	15.8 (12.1, 19.4)
Legal	1,405 (92.1)	11.5 (9.0, 13.9)	23.7 (20.2, 27.2)	121 (7.9)	18.9 (8.7, 29.0)	23.9 (20.0, 59.0)
Arts, design, entertainment, sports, and media	1,855 (83.6)	10.8 (8.4, 13.1)	24.1 (20.7, 27.4)	364 (16.4)	14.1 (8.6, 19.5)	16.5 (7.1, 25.8)

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Table 3. Prevalence of Combustible Tobacco Smoking, Employer Offered Cessation Programs Among Indoor[a]/Outdoor[b] Workers by Industry/Occupation —TUS–CPS, 2014—2015 (*continued*)

Industry and occupation groups[c]	Indoor workers			All outdoor workers		
	Estimated *n* (%) of workers, *n* × 1000 (%)	Combustible[d] tobacco users, Prev (95% CI)	Employer offered cessation[e] program, Prev (95% CI)	Estimated *n* (%) of workers, *n* × 1000 (%)	Combustible tobacco smoking, Prev (95% CI)	Employer-offered cessation program, Prev (95% CI)
Business and financial operations	6,330 (90.1)	10.4 (9.3, 11.4)	**34.8 (32.9, 36.6)**	696 (9.9)	11.4 (8.1, 14.6)	21.7 (12.4, 30.9)
Computer and math science	4,371 (89.3)	9.0 (7.7, 10.3)	42.7 (40.2, 45.2)	526 (10.7)	13.6 (9.4, 17.8)	35.2 (19.1, 51.3)
Architecture and engineering	2,721 (88.6)	8.3 (6.8, 9.7)	**41.4 (38.4, 44.4)**	349 (11.4)	**16.0 (10.6, 21.3)**	23.7 (14.8, 32.6)
Healthcare practitioner and technical	7,420 (91.8)	7.9 (7.1, 8.8)	**54.5 (52.8, 56.2)**	665 (8.2)	10.9 (7.7, 14.0)	29.7 (20.6, 38.9)
Community and social service	2,338 (85.3)	7.4 (5.9, 8.8)	30.4 (27.6, 33.2)	403 (14.7)	11.2 (6.9, 15.5)	29.6 (16.6, 42.7)
Education, training, and library	8,736 (93.9)	5.7 (5.0, 6.4)	**22.4 (21.1, 23.8)**	567 (6.1)	8.3 (5.0, 11.5)	11.3 (4.9, 17.6)
Life, physical, and social science	1,284 (87.5)	5.4 (3.7, 7.0)	**45.7 (41.3, 50.1)**	183 (12.5)	11.1 (4.4, 17.7)	24.8 (11.7, 38.0)
Total	106,275 (72.0)	14.3 (14.0, 14.7)	**29.2 (28.7, 29.6)**	26,213 (19.8)	**20.1 (19.4, 20.8)**	15.0 (14.2, 15.8)

Note: Boldface indicates statistical significance ($p<0.05$). Excluded from analysis were self-employed adults, non-paid workers (estimated n=15,095,000), and workers in the Private household industry (n=32,000).

[a]Adults aged ≥18 years who were employed in the last week at the time of interview and were working outside their home, but not working outdoors or in a motor vehicle, not working in someone else's home, not serving in the armed forces, and not self-employed.

[b]Adults aged ≥18 years who were employed in the last week at the time of interview and were working outdoors or in a motor vehicle, or were working inside their home or in someone else's home, and not self-employed.

[c]2010 Census occupation and 2012 Census industry classification codes were used to define industry and occupation groups.

[d]Current combustible tobacco smoking is defined as those who reported ever using cigarettes (had smoked 100 cigarettes), cigars, cigarillos, little filtered cigars, or any pipes filled with tobacco during their lifetime and currently use them every day or some days (n=20,444,000; 15.5%).

[e]Responded *yes* to employer offering any stop smoking program or any other programs that help employees who want to quit smoking (n=29,306,000; 27.2%).

[f]Estimates suppressed because relative SE for the estimate was ≥30%.

n, estimated number of workers; Prev, prevalence; TUS-CPS, Tobacco Use Supplement to the Current Population Survey.

Table 4. Proportion of Indoor Workers[a] Covered Under Smoke-free Workplace Policy by Industry/Occupation—TUS–CPS, 2014–2015

Industry and occupation groups[b]	100% smoke-free[c] policy, % (95% CI)	Partial coverage, % (95% CI)	No policy, % (95% CI)	100% smoke-free policy vs partial/no policy: Combustible[d] tobacco users, POR (95% CI)	100% smoke-free policy vs partial/no policy: Employer- offered cessation[e] program, POR[f] (95% CI)
Industry					
Agriculture, forestry, fishing, and hunting	64.1 (56.5, 71.7)	12.3 (7.2, 17.3)	23.6 (16.8, 30.4)	0.8 (0.3, 1.8)	0.9 (0.4, 2.3)
Mining	64.5 (58.5, 70.5)	23.4 (18.0, 28.9)	12.0 (8.3, 15.8)	0.6 (0.3, 1.2)	1.7 (0.9, 3.2)
Arts, entertainment, and recreation	66.6 (63.3, 70.0)	18.0 (15.4, 20.6)	15.4 (12.7, 18.0)	**0.5 (0.3, 0.8)**	**0.6 (0.4, 0.8)**
Construction	67.1 (64.4, 69.7)	15.4 (13.4, 17.5)	17.5 (15.4, 19.6)	0.8 (0.6, 1.1)	**1.8 (1.2, 2.6)**
Transportation and warehousing	72.5 (70.0, 75.1)	16.5 (14.4, 18.5)	11.0 (9.1, 12.8)	**0.7 (0.5, 0.9)**	**1.3 (1.0, 1.7)**
Manufacturing–non-durable goods	73.6 (71.7, 75.5)	16.4 (14.8, 17.9)	10.1 (8.7, 11.4)	0.9 (0.7, 1.1)	**1.2 (1.0, 1.5)**
Manufacturing–durable goods	74.7 (73.3, 76.1)	17.0 (15.8, 18.2)	8.3 (7.4, 9.2)	**0.9 (0.7, 1.1)**	**1.3 (1.1, 1.6)**
Wholesale trade	74.9 (72.3, 77.5)	13.7 (11.6, 15.8)	11.4 (9.5, 13.3)	**0.7 (0.5, 0.9)**	**1.7 (1.2, 2.3)**
Management, administration, and waste management services	75.0 (72.7, 77.3)	14.4 (12.5, 16.2)	10.6 (9.0, 12.2)	**0.6 (0.5, 0.8)**	**1.6 (1.1, 2.3)**
Real estate and rental and leasing	76.4 (73.2, 79.6)	13.4 (10.8, 16.0)	10.2 (7.9, 12.4)	0.8 (0.5, 1.3)	1.1 (0.7, 1.8)
Utilities	77.1 (72.9, 81.3)	15.9 (12.2, 19.7)	7.0 (4.6, 9.3)	1.0 (0.5, 2.2)	1.5 (0.9, 2.4)
Accommodation and food services	77.1 (75.6, 78.6)	11.7 (10.5, 12.8)	11.2 (10.0, 12.3)	0.9 (0.7, 1.1)	0.9 (0.7, 1.3)
Other services, except private households	77.7 (75.8, 79.7)	8.5 (7.3, 9.8)	13.8 (12.1, 15.4)	0.8 (0.6, 1.1)	1.4 (0.9, 2.3)
Retail trade	77.7 (76.6, 78.9)	11.4 (10.5, 12.2)	10.9 (10.0, 11.8)	**0.7 (0.6, 0.8)**	**1.3 (1.1, 1.6)**
Information	81.7 (79.3, 84.0)	11.6 (9.7, 13.5)	6.7 (5.2, 8.3)	0.8 (0.5, 1.3)	1.0 (0.7, 1.5)
Professional and technical services	82.5 (81.2, 83.8)	10.1 (9.0, 11.1)	7.4 (6.5, 8.3)	**0.6 (0.4, 0.7)**	**1.4 (1.1, 1.8)**
Public administration	82.7 (81.3, 84.2)	10.6 (9.5, 11.8)	6.6 (5.7, 7.6)	0.9 (0.7, 1.2)	1.1 (0.9, 1.3)
Financial and insurance	84.4 (83.0, 85.7)	8.2 (7.2, 9.1)	7.5 (6.5, 8.5)	**0.7 (0.5, 0.9)**	**1.5 (1.2, 1.9)**

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Table 4. Proportion of Indoor Workers[a] Covered Under Smoke-free Workplace Policy by Industry/Occupation—TUS–CPS, 2014–2015 (*continued*)

Industry and occupation groups[b]	100% smoke-free[c] policy, % (95% CI)	Partial coverage, % (95% CI)	No policy, % (95% CI)	100% smoke-free policy vs partial/no policy: Combustible[d] tobacco users, POR (95% CI)	100% smoke-free policy vs partial/no policy: Employer- offered cessation[e] program, POR[f] (95% CI)
Health care and social services	86.3 (85.5, 87.1)	6.7 (6.1, 7.2)	7.0 (6.4, 7.6)	**0.8 (0.6, 0.9)**	**1.7 (1.5, 2.1)**
Educational services	90.6 (89.9, 91.4)	3.9 (3.4, 4.4)	5.5 (4.9, 6.1)	0.8 (0.6, 1.2)	0.9 (0.7, 1.1)
Occupation					
Farming, fishing, and forestry	63.6 (54.8, 72.4)	14.9 (8.7, 21.0)	21.5 (14.0, 29.0)	0.5 (0.2, 1.4)	–[g]
Construction and extraction	63.9 (60.4, 67.4)	17.1 (14.3, 19.8)	19.0 (16.1, 21.9)	**0.7 (0.6, 0.8)**	**1.4 (1.1, 1.7)**
Installation, maintenance, and repair	66.4 (63.8, 69.0)	18.9 (16.7, 21.0)	14.7 (12.7, 16.7)	**0.7 (0.6, 0.8)**	**1.3 (1.1, 1.5)**
Transportation and material moving	69.0 (66.5, 71.5)	17.3 (15.3, 19.2)	13.7 (11.8, 15.7)	0.9 (0.5, 1.6)	1.2 (0.7, 1.9)
Production	71.3 (69.6, 72.9)	17.2 (15.9, 18.6)	11.5 (10.3, 12.7)	1.1 (0.8, 1.5)	**1.6 (1.1, 2.4)**
Building and grounds cleaning and main	76.5 (74.2, 78.9)	12.5 (10.6, 14.3)	11.0 (9.2, 12.8)	**0.6 (0.4, 0.8)**	**1.7 (1.2, 2.1)**
Protective service	76.9 (74.0, 79.7)	13.7 (11.4, 16.0)	9.5 (7.5, 11.4)	0.9 (0.6, 1.2)	1.2 (0.8, 1.8)
Food preparation and serving related	77.5 (75.8, 79.2)	10.9 (9.7, 12.2)	11.6 (10.3, 12.9)	0.9 (0.7, 1.2)	1.2 (0.9, 1.6)
Architecture and engineering	77.6 (75.1, 80.1)	15.0 (12.9, 17.1)	7.4 (5.8, 9.1)	0.7 (0.5, 1.0)	0.8 (0.5, 1.2)
Personal care and service	78.2 (75.6, 80.7)	9.6 (7.9, 11.3)	12.2 (10.1, 14.4)	1.0 (0.8, 1.2)	**1.3 (1.1, 1.6)**
Sales and related	78.5 (77.3, 79.8)	10.3 (9.4, 11.2)	11.2 (10.2, 12.2)	**0.8 (0.6, 0.8)**	1.1 (0.7, 1.5)
Office and administrative support	80.2 (79.2, 81.1)	11.3 (10.5, 12.0)	8.5 (7.9, 9.2)	1.3 (0.6, 2.7)	1.6 (0.9, 2.9)
Healthcare support	81.2 (78.9, 83.5)	10.2 (8.4, 12.0)	8.6 (6.9, 10.3)	0.9 (0.6, 1.4)	1.0 (0.8, 1.4)
Life, physical, and social science	81.4 (78.2, 84.5)	9.7 (7.3, 12.1)	8.9 (6.6, 11.3)	1.0 (0.5, 1.9)	1.1 (0.7, 1.1)
Arts, design, entertainment, sports, and media	81.9 (79.1, 84.6)	9.2 (7.2, 11.2)	8.9 (6.8, 11.0)	0.8 (0.6, 1.2)	**1.4 (1.2, 1.8)**
Business and financial operations	82.2 (80.8, 83.6)	10.3 (9.2, 11.4)	7.5 (6.5, 8.5)	0.8 (0.6, 1.2)	**2.6 (1.8, 3.9)**

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Table 4. Proportion of Indoor Workers[a] Covered Under Smoke-free Workplace Policy by Industry/Occupation—TUS–CPS, 2014–2015 (*continued*)

Industry and occupation groups[b]	100% smoke-free[c] policy, % (95% CI)	Partial coverage, % (95% CI)	No policy, % (95% CI)	100% smoke-free policy vs partial/no policy	
				Combustible[d] tobacco users, POR (95% CI)	Employer- offered cessation[e] program, POR[f] (95% CI)
Computer and math science	82.7 (80.9, 84.4)	12.0 (10.5, 13.5)	5.3 (4.3, 6.4)	0.9 (0.6, 1.4)	1.0 (0.7, 1.4)
Management	83.3 (82.3, 84.3)	9.7 (8.9, 10.5)	7.0 (6.3, 7.7)	**0.7 (0.7, 0.8)**	**1.3 (1.1, 1.5)**
Legal	83.6 (80.8, 86.5)	8.5 (6.4, 10.6)	7.9 (5.7, 10.0)	0.9 (0.7, 1.1)	**1.3 (1.1, 1.6)**
Community and social service	87.6 (85.7, 89.5)	5.0 (3.8, 6.3)	7.4 (5.9, 8.9)	**0.7 (0.5, 0.9)**	1.3 (1.0, 1.7)
Healthcare practitioner and technical	88.2 (87.1, 89.3)	5.7 (4.9, 6.4)	6.2 (5.4, 7.0)	0.5 (0.5, 1.1)	1.3 (0.8, 2.1)
Education, training, and library	92.2 (91.3, 93.0)	3.0 (2.5, 3.5)	4.8 (4.2, 5.5)	0.7 (0.4, 1.0)	**1.8 (1.3, 2.4)**
Total	80.3 (80.0, 80.7)	10.7 (10.4, 10.9)	9.0 (8.7, 9.3)	**0.7 (0.7, 0.8)**	1.4 (1.3, 1.4)

Note: Boldface indicates statistical significance ($p<0.05$). Excluded from analysis were self-employed adults (estimated n=15,095,000) and workers in the Private household industry (n=32,000).
[a]Adults aged ≥18 years who were employed in the last week at the time of interview and were working outside their home, but not working outdoors or in a motor vehicle, not working in someone else's home, not serving in the armed forces, and not self-employed.
[b]Based on 2010 Census occupation and 2012 Census industry classification codes.
[c]Smoke-free policies were assessed by asking *Is smoking restricted in ANY WAY at your place of work?*; *Which of these best describes the smoking policy at your place of work for indoor public or common areas, such as lobbies, rest rooms, and lunch rooms?* and *Which of these best describes the smoking policy at your place of work for work areas* [with response categories: *Not allowed in any (public/work) areas/Allowed in some (public/work) areas/Allowed in all (public/work) areas*]. Percentages represent those reporting smoking is *not allowed in any public area* and *not allowed in any work area*; if allowed in some areas then partial smoke-free.
[d]Current combustible tobacco smoking is defined as those who reported ever using cigarettes (had smoked 100 cigarettes), cigars, cigarillos, little filtered cigars, or any pipes filled with tobacco during their lifetime and currently use them every day or some days. PORs were adjusted for age, race, sex, education, income, and region.
[e]Responded *yes* to employer offering any stop smoking program or any other programs that help employees who want to quit smoking.
[f]Reference group includes those with partial/no smoke-free polies and is the odds of using combustible tobacco among those with 100% smoke-free policy vs those with partial or no policy and the odds of having a cessation program among those with those with 100% smoke-free policy vs those with partial or no policy. PORs were adjusted for age, race, sex, education, income, and region.
[g]Estimates suppressed because relative SE for the estimate was ≥30%.
%, proportion of workers; POR, prevalence OR; TUS-CPS, Tobacco Use Supplement to the Current Population Survey.

reported having no smoke-free policy in their workplace ranged from 23.6% in the agriculture, forestry, fishing, and hunting industry to 5.5% in the education services industry (Table 4).

By occupation, the proportion of indoor workers reporting a 100% smoke-free policy was highest in education training and library occupations (92.2%) and lowest in the farming, fishing, and forestry occupations (63.6%). Indoor workers reporting a partial smoke-free policy in their workplace ranged from 18.9% in the installation, maintenance, and repair occupations to 3.0% in the education library and training occupations. Indoor workers who reported having no smoke-free policies in their workplace ranged from 21.5% in farming, fishing, and forestry occupations to 4.8% in education, library, and training occupations.

Overall, indoor workers who reported having a 100% smoke-free policy had significantly lower odds (prevalence OR=0.7) of smoking combustible tobacco than those reporting a partial or no smoke-free policy (Table 4).

Overall, 27.2% of all working adults reported having employer-offered cessation programs. Having a cessation program at the workplace was higher ($p<0.05$) among indoor workers (29.2%) than outdoor workers (15.0%), and among indoor workers reporting 100% smoke-free policies (30.9%) than those reporting partial or no policies (23.3%; Table 2). The highest prevalence of having a cessation program at the workplace was among indoor workers aged 45–64 years (33.4%), non-Hispanic whites (32.0%), those with more than a high school education (32.7%), those with annual household income ≥$75,000 (35.8%), and those in the Midwest (33.6%; Table 2).

The odds of having an employer-offered cessation program was higher among workers who reported having a 100% smoke-free policy than those reporting a partial or no policy (prevalence OR=1.4; Table 4).

DISCUSSION

During 2014–2015, approximately four of five (80.3%) indoor U.S. workers were covered by a 100% smoke-free workplace policy at their workplace, whereas only one of four (27.2%) working adults reported having an employer cessation program. Moreover, 15.5% of working adults were current combustible tobacco product smokers, with prevalence varying by sociodemographic group, industry, and occupation. Although considerable progress has been made in reducing cigarette smoking and protecting workers from secondhand smoke, marked disparities in coverage of evidence-based tobacco control interventions were apparent across sociodemographic groups. Because the workplace can serve as an important venue for the promotion of evidence-based tobacco prevention and control strategies,[1,3,4,14,16] opportunities exist to enhance the extent of smoke-free policy and cessation program coverage among U.S. working adults.

When compared with previous research,[12] the findings from this study indicate a 17% increase in the proportion of indoor workers covered by a 100% smoke-free workplace policy from 1999 (68.6%)[12] to 2014–2015 (80.3%). These findings are largely consistent with a recent study by Babb et al.,[13] which found that 82.8% of U.S. indoor workers reported having a 100% smoke-free policy at their workplace during 2011–2012. The slightly lower proportion (80.3%) observed in this study could be partly explained by the variation in sample selection criteria; specifically, the current study included all currently employed adults, whereas the prior study assessed only workers in certain occupational groups and excluded those who were workers in farming, fishing, and forestry; construction and extraction; and transportation and material moving occupations.[13] The current study results show that less than 70% of workers in these three occupational groups reported 100% smoke-free policies in their workplaces. Additionally, 54%–75% of workers in these occupations were outdoor workers, and therefore may not have been covered under these policies, making them susceptible to secondhand smoke exposure in the workplace. Addressing secondhand smoke exposure in outdoor environments is important because the U.S. Surgeon General has concluded that there is no risk-free level of secondhand smoke exposure,[22] and levels of secondhand smoke exposure in certain outdoor settings may be the same or at times even higher than those observed in indoor settings where smoking has occurred in close proximity.[23] The current study findings, in addition to the prior research, suggest the importance of 100% smoke-free policies in indoor areas of workplaces, including the expansion of such policies to include restrictions to prevent employees and others from involuntary exposure to secondhand smoke in outdoor settings.[1,3,23,24]

The extent of 100% smoke-free policy coverage varied by occupation. Direct comparisons with previous research were not possible due to variation in occupation groupings and changes in the occupation codes and selected occupation classification groups. However, generally consistent with previous research, the extent of 100% smoke-free policy coverage in this study was greater among workers in professional and specialty occupations (e.g., engineers, healthcare professionals, and education services occupations) than workers in service occupations (e.g., food preparation and serving

related, personal care).[12] Overall, occupational disparities in reported coverage has narrowed over time, with improvements for categories of workers that were less likely to be covered by smoke-free workplace policies. For example, in 1999, a total of 42.9% of food service workers reported smoke-free policy coverage, whereas current findings indicate that 77.5% of workers in the food preparation and serving related occupations reported smoke-free policy coverage.[12] These changes may be the result of increases in widespread implementation of comprehensive state and local smoke-free laws that include restaurants and bars, adoption of voluntary smoke-free policies by employers, overall reductions in smoking rates at the population level, and the denormalization of tobacco smoking over time.[1,3,4,14,15,22] Comprehensive smoke-free laws have also been shown to reduce cigarette smoking and hospital admissions for myocardial infarction, asthma, and chronic obstructive pulmonary disease.[5–7] However, the present findings indicate that an estimated 20.3 million indoor workers continue to report having a partial smoke-free policy or no smoke-free policy at their workplace. Accordingly, opportunities exist to enhance smoke-free policy coverage among all U.S. workers, particularly among occupations with the lowest levels of coverage.

The current study also noted several variations in smoke-free policy coverage by industry. Workers in certain industry groups had less than 70% of workers reporting smoke-free policies at their workplaces (e.g., construction), and a higher proportion of these workers reported that they worked outdoors. Previous studies have indicated that the prevalence of combustible tobacco smoking and exposure to secondhand smoke among workers in the construction and mining industry workers is high,[23–27] and that the implementation of smoke-free policies can eliminate or substantially decrease exposure to secondhand smoke in workplaces.[4,9,23,24,27] Therefore, tailored efforts to identify barriers to quitting, creating 100% smoke-free environments, and integrating tobacco cessation programs with health promotion activities could help reduce combustible tobacco smoking and existing smoking disparities, particularly among industries with the greatest burden of tobacco usage.[3,18–20,28]

Tobacco dependence treatment is one of the most cost-effective preventive services and has been shown to provide substantial return on investment in the short and long term because of the enormous costs of smoking on society and employers, including direct healthcare costs and lost productivity.[2] For most smoking cessation treatments, the benefits of providing such treatments significantly outweigh the cost to employers to provide these treatments. For example, a comprehensive cessation benefit that includes both counseling and medication typically costs less than $0.50 per member per month, whereas the cost per quit for smoking cessation interventions ranges from a few hundred to a few thousand dollars.[29] By contrast, the average initial cost for treating a single case of lung cancer is approximately $40,000.[29] Therefore, employer-offered cessation programs can be a cost-effective intervention to help reduce tobacco smoking in the workplace and society more broadly.[15,18–20] However, the present findings indicate that only an estimated 15% of outdoor workers and 29% of indoor workers reported having employer cessation programs. Prevalence was particularly low among indoor workers in the accommodation and food service industry, food preparation and serving related occupations, and among outdoor workers in real estate and rental and leasing industries, the construction industry, and farming, fishing, and forestry occupations. Lower prevalences in certain groups may be partly because of workplace culture and job characteristics.[26,27] Previous studies have shown that targeted strategies can increase the impact of health information by increasing its relevance to a given audience.[18,19] For example, among construction workers, union-based cessation programs that address both family and work considerations have been successful.[16,19] The lower coverage of employee cessation programs, coupled with correspondingly higher prevalence of combustible tobacco smoking among many of these groups, highlights opportunities to target specific groups through employer-offered cessation programs, especially those who are harder to reach with such interventions, including outdoor workers, temporary workers, and others.

Limitations

This study is subject to at least six limitations. First, the data are cross-sectional, which does not allow for determination of causal inferences. Second, combustible tobacco product smoking, smoke-free workplace policies, and employer-offered cessation programs were self-reported; however, previous research showed that self-reported information on tobacco use is correlated with biological measures and established ordinances, thereby supporting the validity of self-reported indicators.[30] Self-reported smoke-free workplace policies and employer-offered cessation programs could also introduce bias if workers respond to questions on smoke-free policies and cessation programs based on their knowledge of what is being legislated and not the documented restrictions.[31] Third, it is possible that respondents were unaware of their workplace's current status with regard to a smoke-free workplace policy or cessation program. Fourth, the collected employment information applied

only to the week during the interview, whereas the employer-offered cessation programs applied to the last 12 months. Therefore, the temporal relationship between the respondent's current job and the presence of a workplace cessation program could not be established. Fifth, the questionnaire language used to assess smoke-free policy coverage did not specifically reference outdoor environments. Therefore, it is possible that respondents may or may not have included outdoor environments in their response. Finally, some workers might have changed jobs, and thus, may not have correctly reported on policies and workplace cessation programs.

CONCLUSIONS

This study showed that approximately 80% of U.S. indoor workers reported being covered by smoke-free workplace policies, and 29% reported being covered by employer-sponsored cessation programs. The prevalence of having an employer-offered cessation program varied among workers by indoor and outdoor status. Moreover, marked disparities in coverage were observed by sociodemographic, industry, and occupation groups. These findings highlight the importance of continued efforts to reduce tobacco use and secondhand smoke exposure at workplaces through the implementation of evidence-based interventions, particularly in industries and occupations with higher rates of combustible tobacco smoking. Smoke-free workplace policies and employer-sponsored cessation programs can benefit both workers and employers by creating a healthier workforce through reduced smoking and smoking-attributable healthcare costs and lost productivity, reduced exposure to secondhand smoke, and reduced risks of fire and other hazards.[1,3,4,22,28]

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