

Original investigation

Cigarette Smoking Among Working Women of Reproductive Age—United States, 2009–2013

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Abstract

Background: Employers play a vital role in promoting and supporting tobacco use cessation among tobacco-using workers. Cigarette smoking during pregnancy is a preventable cause of complications in pregnancy and adverse infant health outcomes.

Purpose: To estimate cigarette smoking prevalence and attempts to quit among working women of reproductive age in different industries and occupations using a nationally representative survey. **Methods:** The 2009–2013 National Health Interview Survey data for women of reproductive age (18–49 years) who were working in the week prior to the interview ($n = 30\,855$) were analyzed. Data were adjusted for nonresponse and weighted to produce nationally representative estimates.

Results: During 2009–2013, among working women of reproductive age, an estimated 17.3% (95% confidence interval [CI]: 16.7–17.8) and 12.9% (95% CI: 12.4–13.4) were current and former cigarette smokers, respectively. Of women who smoke daily, 44.5% (95% CI: 42.5–46.5) had made a quit attempt for more than 1 day in the year before the interview. Cigarette smoking prevalence was highest among women working in the construction industry (29.2%; 95% CI: 22.8–35.7) and in construction and extraction occupations (34.6%; 95% CI: 23.4–45.9). Among working women who were pregnant at the time of the interview, 6.8% (95% CI: 4.4–9.2) and 20.4% (95% CI: 16.9–24.0) were current and former cigarette smokers, respectively.

Conclusions: Cigarette smoking prevalence varies by industry and occupation. Intensifying tobacco control efforts in high prevalence industries and occupations could result in higher cessation rates and improvements in health among women of reproductive age.

Implications: This study identified discrepancies in cigarette smoking among women of reproductive age across industries and occupations. In the absence of smoke-free local and state laws, employer-established smoke-free policies and workplace cessation programs are important for achieving reduction of tobacco use among women and for protecting other workers' health. Results in this report may assist in developing educational campaigns targeting women in industries and occupations with high prevalence of cigarette smoking and low percentage of ever-smokers who had quit.

Introduction

Smoking is the leading preventable cause of premature disease and death in the United States.¹ Among adult U.S. workers, an estimated (annual average) 22.8% of men and 18.3% of women were cigarette smokers during 2004–2011.² In addition, large differences exist in smoking prevalence in women by occupation with the highest

smoking prevalence among women supervising construction trades and extraction workers (38.9%) and the lowest prevalence in women working as postsecondary teachers (7.0%).²

Employers play a vital role in promoting and supporting tobacco cessation.^{3,4} For example, the work-site can be an important setting for influencing health behaviors among workers.⁵ In addition,

establishing workplace policies that prohibit or restrict tobacco use improves workers' health, increases the number of tobacco users who quit, and increases productivity and lowers business costs.^{3,5-9} Smoking restrictions in the workplace also reduce exposure to secondhand smoke among nonsmoking employees and the public.^{1,3} Recent findings from the 2009–2010 National Adult Tobacco Survey indicate that among nonsmoking employed adults, 20.4% were exposed to secondhand smoke in the prior week at their workplace.¹⁰

Women who smoke are as likely as men who smoke to develop lung cancer, heart disease, and chronic obstructive pulmonary disease.¹ Among workers, women who smoke are more likely than men who smoke to rate their physical and emotional health as poor.² In addition, cigarette smoking by women of reproductive age is a preventable cause of numerous complications in pregnancy and adverse infant health outcomes^{1,11} and children exposed to their parents' secondhand smoke have increased risk of otitis media, acute lower respiratory illness, and of developing asthma or exacerbating existing asthma.¹²⁻¹⁴ Results of the 2006 Behavioral Risk Factor Surveillance System (BRFSS) data analysis showed that an estimated 22.4% of reproductive-age women (defined as women aged 18–44 years) smoked cigarettes in 2006.¹⁵ Subsequent analysis of smoking before, during, and after pregnancy from 2000 through 2010 using Pregnancy Risk Assessment Monitoring System (PRAMS) indicated that smoking prevalence among female smokers before pregnancy has been stable, while prevalence during and after pregnancy decreased only slightly.¹⁶ Authors' recommendations to more effectively reduce smoking prevalence in this population included establishing smoke-free environments in public places and the workplace.¹⁶

Tobacco control programs can increase their efficiency if they are focused on populations with a high prevalence of tobacco use and low rates of quitting. Syamlal et al.² recently reported results of the 2004–2011 National Health Interview Survey (NHIS) data analysis on gender differences in cigarette smoking among working adults (aged ≥ 18 years). The authors provided detailed descriptions of cigarette smoking among working men and women by occupation that can inform interventions targeting specific work-sites. To our knowledge, no previous studies have addressed cigarette smoking among working women of reproductive age. To address this deficit, we estimated cigarette smoking prevalence and quit ratios among working women of reproductive age (18–49 years) and those who were pregnant by industry and occupation using data from the 2009–2013 NHIS.

Materials and Methods

Data Source

The NHIS data are collected annually from a nationally representative sample of the noninstitutionalized U.S. civilian population through a personal interview. During 2009–2013, 156 984 adult respondents participated in NHIS. The final response rates for the Adult Sample Person component ranged from 60.8% in 2010 to 65.4% in 2009.¹⁷ For this study, data for 30 855 currently working women of reproductive age (18–49 years) were analyzed.

Measurements

Employment

Survey participants were considered currently working if they responded affirmatively to any of the following questions when asked about their employment status during the week before their

interview: “working at a job or business,” “with a job or business but not at work,” or “working, but not for pay, at a family-owned job or business.” Verbatim responses from employed adult respondents regarding their current industry (employer's type of business) and occupation (employee's type of work) were coded by trained specialists.¹⁷ For analyses, simple two-digit recodes for 21 industry groups and 23 occupation groups provided in the NHIS dataset were used.

Health and Pregnancy Status

Self-reported general health status categories were collapsed into excellent/very good, good, and fair/poor. Pregnancy status was assessed with the question “Are you currently pregnant?” which was administered to all female survey participants aged 18–49 years.

Smoking Behavior

We followed previously established definitions for classifying cigarette smoking behavior.^{15,18,19} Current cigarette smokers were those who reported having smoked at least 100 cigarettes during their lifetime and reported smoking every day or some days at the time of interview. Former smokers were those who reported having smoked at least 100 cigarettes during their lifetime but not smoking at the time of the interview. Ever-smokers were current and former smokers combined. Never-smokers were those who reported not smoking at least 100 cigarettes during their lifetime. The percentage of ever-smokers who had quit (quit ratio) was calculated by dividing the number of former smokers by the number of ever-smokers. The percentage of daily smokers who made a quit attempt was the number of smokers who had stopped smoking for more than 1 day in the past year because they were trying to quit smoking divided by the number of daily smokers.¹⁵ Respondents who reported having smoked at least 100 cigarettes were asked “How old were you when you first started to smoke fairly regularly?” Responses (age in years and “never smoked regularly”) were used to calculate the age at which smokers started smoking regularly or percentage of ever-smokers who never started to smoke regularly.

Statistical Analysis

We used SAS software version 9.2 (SAS Institute Inc, Cary, NC) for analyses. To improve the precision and reliability of the estimates, 2009–2013 NHIS data were combined. Aggregated data were examined to determine the prevalence (annual average) of current smokers, the percentage of ever-smokers who had quit, and the percentage of daily smokers who had made one or more quit attempts in the last year. Data were adjusted for nonresponse and weighted to be nationally representative; 95% confidence intervals (CIs) were calculated. To achieve annualized results, weights provided on the 2009–2013 sample adult files were adjusted for the number of years combined for the analysis (ie, divided by 5).¹⁷ The survey design variables STRAT_P and PSU_P were used to adjust the standard errors (SEs) for the complex survey design. Subpopulation analyses (ie, for currently employed women aged 18–49 years) were done using the full combined data file and the DOMAIN option (or an equivalent procedure). Prevalence estimates with relative standard error (calculated as SE of the estimate divided by the estimate) more than or equal to 30% were considered unreliable and are not reported.

We used bivariable logistic regression to assess factors associated with cigarette smoking, quitting smoking, and making a quit attempt and multivariable logistic regression to calculate adjusted prevalence odds ratios (PORs). Responses with missing values were excluded from analyses. Variables associated with cigarette smoking, quitting

smoking, and making a quit attempt in bivariable analyses at P value $< .2$ were selected for the multivariable logistic regression models to calculate adjusted PORs by industry and occupation. The independent variables for the models were selected using a backward selection process. The least significant variable was removed and the model was refit until the resulting regression coefficients for remaining independent variables were significant at P value $< .05$. The independent variables associated with cigarette smoking and quitting smoking (age, race, ethnicity, education level, family income, marital status, health insurance, health status, pregnancy status, and U.S. census region) were included in the initial models and remained in the models. Of the independent variables associated with making a quit attempt (age, race, ethnicity, and education level at P value $< .05$, and marital status, health insurance at P value $< .2$) and included in the initial models, two variables (marital status and health insurance) were removed. The referent group was all other currently employed women aged 18–49 years who were not in the industry/occupation of interest. The mean age at which current and former smokers started smoking regularly was calculated and compared using the t test. All tests were two-sided, and differences were considered significant at $\alpha = 0.05$.

Results

During 2009–2013, of the estimated 232 million adults aged 18 years and older, approximately 44.7 million (19.3%) were currently working women of reproductive age (18–49 years). Cigarette smoking prevalence, percentage of ever-smokers who had quit, and percentage of daily smokers who made a quit attempt by demographic characteristics are shown in [Supplementary Table 1](#). Of currently working women, an estimated 17.3% were current cigarette smokers; 75.5% (95% CI: 74.0–77.0) of current smokers were daily smokers. Smoking prevalence was greater than 20% among women who were White (21.0%), American Indian/Alaska Native (21.2%); who reported multiple race (22.9%); had 0–12 years of education (24.6%); whose highest education was a General Educational Development (GED) (45.6%) or high school diploma (25.0%); whose family income was less than \$35 000 (24.3%); who were widowed, divorced, separated (25.7%); who had no health insurance (26.6%); who reported good (23.8%) or fair/poor health (30.1%); and who lived in the Midwest (21.3%). In bivariable analyses, current cigarette smoking was significantly ($P < .05$) associated with age, race/ethnicity, education, income, marital status, health insurance, health status, pregnancy status, and region ([Supplementary Table 1](#)).

An estimated 12.9% (95% CI: 12.4–13.4) of all working women aged 18–49 years were former cigarette smokers. Overall, 42.7% of ever-smokers had quit ([Supplementary Table 1](#)); of these 84.4% have quit 6 months or more prior to the interview. The percentages of ever-smokers who had quit were highest among women aged 35–49 years (47.5%), Asian women (50.9%), those with graduate degree (71.3%), and those with family income more than \$100 000 (61.9%), and married women (48.1%) and were lowest among women aged 18–24 years (27.2%), Black women (30.6%), those with 0–12 years of education (21.3%), whose family income was less than \$35 000 (28.8%), and who were not insured (26.1%). In bivariable analyses, former smoking was significantly ($P < .05$) associated with age, race/ethnicity, education, income, marital status, health insurance, health status, pregnancy status, and region.

Among working women of reproductive age, the proportion who were daily cigarette smokers was 13.0% (95% CI: 12.5–13.5). Among daily smokers, the mean number of cigarettes smoked per

day was 12.4 (SE : 0.13; 25th, 50th, 75th percentile: 7.5, 9.7, 18.1, respectively). Overall, less than half (44.5%) of daily smoking women had made a quit attempt for more than 1 day in the year before the interview ([Supplementary Table 1](#)). In bivariable analyses, having made a quit attempt was significantly ($P < .05$) associated with age, race/ethnicity, and educational level.

Among working women of reproductive age who had ever smoked cigarettes, 2.8% (95% CI: 2.4–3.2) never smoked regularly. The mean age at which ever smoking women began to smoke regularly was 17.5 years (SE : 0.05); 69.8% of ever smoking women started to smoke regularly at age 18 years and younger. There was no significant difference between current and former cigarette smokers in the mean age when at which they first started to smoke regularly (17.6 vs. 17.4 years, $P = .09$).

An estimated 1.2 million (2.8%) working women of reproductive age were pregnant at the time of the interview; their mean age was 29 years. Of pregnant women, an estimated 6.8% were current cigarette smokers (4.3%; 95% CI: 2.4–6.1 were daily smokers) and 20.4% (95% CI: 16.9–24.0) were former smokers. The mean age of currently smoking pregnant women was 28.3 years (SE : 0.37); 62.5% (95% CI: 49.8–75.2) were daily smokers. Among pregnant daily smokers, the mean number of cigarettes smoked per day was 12.6 (SE : 0.62; 25th, 50th, 75th percentile: 8.0, 9.8, 14.6, respectively). Among pregnant working women, the proportion of ever-smokers who had quit was 75.0%. Of former cigarette smokers who were pregnant at time of interview, 40.6% (95% CI: 30.7–50.6) quit smoking within a year prior to the interview.

Among ever cigarette smoking working women who were pregnant at the time of interview, the mean age at which they began to smoke regularly was 17.3 years (SE : 0.23); 68.6% of ever smoking pregnant women started to smoke regularly at age 18 years and younger. Among ever smoking women who were pregnant at the time of interview, the mean age at which they began to smoke regularly significantly differed between current and former smokers (18.1 vs. 17.1 years, $P = .01$).

When the data were examined by study participants' industry, the prevalence of current cigarette smoking among reproductive-age women was highest for those working in construction (29.2%), accommodation and food services (26.2%), and mining (24.7%) ([Supplementary Table 2](#)). When examined by occupation, the prevalence of cigarette smoking was highest among women working in construction and extraction (34.6%), transportation and material moving (28.6%), and food preparation and serving related (26.8%). After adjusting for covariates, women working in the construction industry and in protective service occupations had the highest odds (POR = 1.68 and 1.65, respectively) and those working in educational services and education, training, and library occupations had the lowest odds of being a current smoker (POR = 0.58 and 0.63, respectively) ([Supplementary Table 3](#)).

The accommodation and food services industry and the food preparation and serving related occupations had the lowest percentages of ever-smokers who had quit (27.3% and 25.8%, respectively) ([Supplementary Table 2](#)). After adjusting for covariates, women working in other services (except public administration) industry and in personal care and service occupations had the highest odds (POR = 1.45 and 1.40, respectively) and those working in protective service occupations had the lowest odds of quitting smoking (POR = 0.52) ([Supplementary Table 3](#)).

The agriculture, forestry, fishing, and hunting industry and the arts, design, entertainment, sports, and media occupations had the

lowest percentages of daily cigarette smokers who had made an attempt to quit (32.4% and 28.3%, respectively) (Supplementary Table 2). After adjusting for covariates, women working in the retail trade industry and in arts, design, entertainment, sports, and media occupations had the lowest odds of making an attempt to quit (POR = 0.77 and 0.47, respectively) (Supplementary Table 3).

Discussion

This report provides national estimates on the prevalence of cigarette smoking among working women of reproductive age by occupation and industry of employment. Approximately one in six working women of reproductive age reported being a current cigarette smoker. Consistent with previous reports, cigarette smoking status was significantly associated with age, race, educational level, marital status, health status, and income level and, after adjusting for demographic characteristics, with certain industries and occupations.^{20–24}

The cigarette smoking prevalence estimate for working women of reproductive age reported here for 2009–2013 (17.3%) is similar to the 18.3% prevalence reported for all working women aged 18 years and older based on 2004–2011 NHIS data.² Also, the percentage of daily cigarette smokers with recent quit attempts in the current study (44.5%) was similar to the percentage reported from the 2004–2011 NHIS (46.2%) study.² These results are consistent with the overall decline in cigarette smoking prevalence among adult women between 2005 and 2013,²⁵ and the overall lower smoking prevalence observed among employed women than unemployed women.^{26,27}

In the current study, an estimated 6.8% of working women aged 18–49 who were pregnant at the time of the interview were current cigarette smokers. This finding was lower than the proportion (10.7%) reported from 27 areas included in PRAMS in 2010.¹⁶ However, these findings may not be comparable because PRAMS collected data from women with a recent live birth, included employed and unemployed women, and only assessed cigarette smoking during the last 3 months of pregnancy. National prenatal smoking estimates are not currently available. The standard birth certificate was revised in 2003 and questions assessing prenatal smoking status were changed and is a potential source of this information.²⁸ However, not all states have implemented the 2003 revision. Thus, there is not a consistent method for assessing prenatal smoking status across all states.

Previous reports have indicated that smoking prevalence among blue-collar workers is higher than among white-collar workers.^{24,29} Likewise, current cigarette smoking prevalence and behavior in this analysis varied by industry and occupation with the highest prevalence among the construction, accommodation and food services, and mining industry, and construction and extraction, transportation and material moving, and food preparation and serving related occupations. These proportions are 4.2–6.0 times greater than those reported by life, physical, and social services workers, the occupation group with the lowest reported smoking prevalence. These discrepancies may be explained, in part, by social and cultural norms regarding tobacco use in different types of work places (eg, smoking workers may feel a sense of belonging with a group of smoking coworkers),³⁰ access to quitting assistance,³¹ and variation in implementation of tobacco-free workplace policies at the state and local levels.^{32,33} For example, since 1990, nearly 700 local municipalities have implemented comprehensive smoke-free laws (ie, laws that prohibit smoking in all indoor areas of work-sites, restaurants, and

bars) that cover 49.5% (151.5 million) of U.S. residents.^{10,34,35} As of March 2015, 26 states and the District of Columbia have comprehensive smoke-free laws.³⁶ Using the 2010 NHIS data, Yong et al. found that more than 65% of smoking workers were interested in quitting, and more than 53% made a quit attempt. However, only 7% successfully quit smoking.³⁷ The authors reported that smokers were less likely to successfully cease smoking if they had frequent exposure to others smoking at work but more likely if they had health insurance.

Despite the increase in comprehensive smoke-free laws coverage, substantial proportion of workers are exempt from these laws, in particular those who work outdoors.^{33,38,39} For example, in states with laws that prohibit smoking in all indoor areas of restaurants, some workers (eg, wait staff) might be exposed to secondhand smoke on an outdoor patio or deck. Some municipalities started enacting regulations that prohibit smoking in outdoor deck and patio areas at bars and restaurants.⁴⁰ Also, in many states smoke-free laws are not comprehensive, that is, exclude restaurants or bars.³⁴ Other outdoor workers are also not covered. Using the 2010 NHIS data, Calvert et al.³⁸ reported that the three occupations with the highest proportion of outdoor workers were farming (90.1%), construction and extraction occupations (79.5%), and protective service occupations (ie, police, firefighters, and guards, 59.3%). The authors found that the prevalence of workplace exposure to secondhand smoke was 14.9% for all workers and 10.0% for nonsmokers. The top three occupations with highest proportion of nonsmokers frequently exposed to secondhand smoke were construction and extraction (28.5%), protective service (20.2%), and transportation and material moving (16.9%).³⁸ Johnson et al.⁴¹ also analyzed the 2010 NHIS data and found that among nonsmoking working women of reproductive age (18–44 years), an estimated 9% were exposed to secondhand smoke at work with the highest proportions among women working in the accommodation and food services industry (19%) and in food preparation and serving related occupations (19%). Because implementation of smoke-free policies that prohibit or restrict tobacco use increases tobacco cessation rates,^{3,5–9} the exclusion of outdoor workers from these laws may partially explain the high smoking prevalence in certain occupations reported here (ie, construction and extraction; installation, maintenance, and repair; production; transportation and material moving; and food preparation and serving related occupations).

The findings in this report are subject to some limitations. For this study, NHIS general population sample weights were used to examine smoking behavior of reproductive-age women. Selecting women aged 18–49 years might result in estimates that are biased by the values at the beginning or end of the age range and may not correctly represent women who are more likely to give birth.⁴² Johnson et al.⁴¹ adjusted NHIS weights using age- and race/ethnicity (four groups)-specific live birth rates. Although, the use of live birth certificates was intended to better reflect the age distribution of pregnant women the authors recognized the limitation of their approach—“substantial proportion of pregnancies do not end in live birth, and characteristics of mothers and their occupations might differ between mothers who have live births and those who have other birth outcomes.” No studies are available that assessed the impact of weights adjustment on the smoking estimates for women aged 18–49 years. Second, while our objective was to examine smoking status among working women of reproductive age, some working women, including those who were pregnant, might have temporarily left the workforce at the time of the survey. Third, estimates for cigarette smoking and

smoking cessation are based on self-report and are not biochemically validated. Previous research has documented that 22.9% of pregnant women who smoke and 9.2% of nonpregnant women of reproductive age do not disclose their smoking status in survey questionnaires⁴³; thus, this report likely underestimates actual smoking prevalence, especially among pregnant women. Fourth, no data were available on pregnant women's gestational age at the time of the interview. Pregnant women's smoking status can fluctuate across pregnancy, and this study did not assess smoking status across the entire pregnancy.⁴⁴ Finally, no information on forms of tobacco use other than cigarettes was assessed. An analysis of the 2012–2013 National Adult Tobacco Survey data indicated that among all women aged 18 years and older, 1.5% smoked cigars, cigarillos, or filtered little cigars and 3.6% used electronic cigarettes.¹⁸

CDC recommends that employers establish and maintain smoke-free workplaces, promote comprehensive tobacco cessation support to all tobacco-using workers and, where feasible, to their dependents.³ Smoking in workplaces can be successfully addressed through a worker health program that combines health promotion with occupational safety and health prevention.⁵ A respiratory protection program and its components in the occupational settings are discussed elsewhere.^{45–48}

Pregnancy offers an exceptional opportunity to encourage women to quit smoking. Pregnant smokers are generally aware that tobacco use can be harmful to the fetus and so are highly motivated to quit.⁴⁹ The Affordable Care Act includes provisions to provide counseling services for pregnant tobacco users and full coverage for tobacco cessation services for pregnant women in states' Medicaid programs.⁵⁰ In addition, women who quit during pregnancy are more likely to be abstinent in later life compared with women who continue to smoke during pregnancy.⁵¹

Conclusions

This study identified discrepancies in cigarette smoking among women of reproductive age across industries and occupations. Interventions to reduce smoking tailored to specific occupations are effective.^{52,53} The prevention and reduction of tobacco use among women of reproductive age are essential to reduce the burden of pregnancy complications from cigarette smoking and adverse health effects of children's exposure to secondhand smoke.¹⁵ In the absence of smoke-free local and state laws, employer-established smoke-free policies and workplace cessation programs are important for achieving this goal and for protecting other workers' health. Results in this report may assist in developing educational campaigns targeting women in industries and occupations with high prevalence of cigarette smoking and low percentage of ever-smokers who had quit.

Supplementary Material

Supplementary Tables 1–3 can be found online at <http://www.nt.oxfordjournals.org>

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Declaration of Interests

None declared.

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