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Influenza and pneumococcal vaccination rates among smokers: Data from the 2006 Behavioral Risk Factor Surveillance System ☆

William S. Pearson [a,*], Shanta R. Dube [b], Earl S. Ford [a], Ali H. Mokdad [c]

[a] Behavioral Surveillance Branch, Division of Adult and Community Health, Centers for Disease Control and Prevention, 4770 Buford Highway, N.E. MS K-66, Atlanta, GA 30341, USA
[b] Epidemiology Branch, Office on Smoking and Health, Centers for Disease Control and Prevention, Atlanta, USA
[c] Institute for Health Metrics and Evaluation, University of Washington, Seattle, USA

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ABSTRACT

Objective. Smoking is associated with increased risk for respiratory infections. The objective of this study was to determine if differences in influenza and pneumoccocal vaccination rates exist based on smoking status.

Methods. Data from the 2006 Behavior Risk Fact Surveillance System (BRFSS) were used to examine Influenza vaccinations among respondents 50-years-old and older (n=198,500) and pneumococcal vaccinations among adults 65-years-old and older (n=61,894). Differences in vaccination rates were tested among current smokers, former smokers and never smokers using chi-square analyses and multivariate logistic regression models.

Results. Current smokers were found to have lower influenza and pneumoccocal vaccination rates compared to former smokers and never smokers in bi-variate associations (p<.01). Current smokers had decreased odds of receiving influenza vaccinations compared to never smokers (O.R. 0.75, 95% C.I. 0.71–0.80), and former smokers had increased odds of receiving influenza vaccinations compared to never smokers (O.R. 1.17, 95% C.I. 1.12–1.22). Former smokers had greater odds of receiving pneumococcal vaccinations compared to never smokers (O.R. 1.32, 1.24–1.41).

Conclusions. It is important for current smokers to receive both influenza and pneumococcal vaccinations. Health care providers should assess and advise current smokers to quit, as well as promote receipt of vaccinations among current smokers to help prevent respiratory infections.

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Introduction

Both influenza and pneumonia have consistently been listed as leading causes of death among persons in the United States. The latest mortality data from the Centers for Disease Control and Prevention (CDC) state that influenza and pneumonia combined were ranked as the eighth leading cause of death in the U.S. in 2004 ((1)Heron, 2007), falling one spot from the seventh leading cause of death in 2003 ((2) Herron and Smith, 2007).

These diseases have a serious impact on the U.S. health care system. It is estimated that there are nearly one million cases of community-acquired pneumonia among seniors each year in the United States (Jackson et al., 2004). Of those cases that require hospitalization, each admission costs between $7000 and $8000 (De Graeve and Beutels, 2004). The Centers for Disease Control and Prevention estimates that each year in the United States, pneumococcal disease accounts for 500,000 cases of pneumonia (MMWR, 1997). For influenza, it is estimated that there are over a quarter of a million hospitalizations annually (Thompson et al., 2004) and that direct medical costs because of influenza infection average $10.4 billion (Molinari et al., 2007). Vaccinations against these diseases are recommended to help prevent infection and reduce complications, and are particularly recommended for at-risk groups such as those with chronic diseases (USPSTF, 2006; MMWR, 1997; MMWR, 2007).

Persons who smoke cigarettes are especially vulnerable to developing influenza- and pneumonia-related complications, such as respiratory infections. Smoking creates structural changes in the respiratory tract and also decreases the immune response making respiratory infections more likely to occur (Arcavi and Benowitz, 2004). Smoking has been identified in population-based studies as a risk factor for the development of community-acquired pneumonia (Ortqvist et al., 2005; Almirall et al., 1999) and influenza (Razani-Boroujerdi et al., 2004), and is also associated with increased morbidity and mortality from secondary infections because of influenza and pneumonia (Murin and Biello, 2005). Furthermore, the CDC has reported that from 2001 through 2004, there have been on average, approximately 9000 smoking-attributable deaths per year from influenza and pneumonia among persons fifty years of age and older ((1)CDC, 2008a,b).

☆ Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

* Corresponding author. Fax: +770 488 8150.
E-mail address: Wpearson@cdc.gov (W.S. Pearson).

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Studies conducted in countries other than the United States have indicated that persons who smoke are less likely to receive influenza and pneumococcal immunizations, especially among the elderly (Lopez de Andres et al., 2007; Nicholson et al., 1999). Currently, *The Guide to Preventive Clinical Services* does not recommend that smokers receive these vaccines (USPTF, 2006). Given that persons who smoke have a susceptibility to respiratory infections related to influenza and pneumonia, it is important to better understand if smoking status could be a barrier to preventive health care, such as receipt of immunizations in the United States. Therefore, the purpose of this study was to assess if influenza and pneumococcal vaccination rates differ among never smokers, former smokers, and current smokers using a pooled, U.S. sample.

Methods

Data for this study were taken from the 2006 Behavioral Risk Factor Surveillance System (BRFSS) survey. The BRFSS is an ongoing, state-based, landline telephone survey that collects information on health risk behaviors, preventive health practices, and access to and use of health services related to chronic conditions among adults aged ≥ 18 years. In 2006, a total of 355,710 participants from all 50 U.S. states, plus Puerto Rico and the U.S. Virgin Islands, responded to this survey. Data are collected through a random sample of adults within households and are weighted to adjust for the probability of selection and non-response as well as the lack of telephone coverage for households within each state. The median cooperation rate for this survey, defined as the proportion of people interviewed of all eligible people who were actually contacted, was 74.5% ((2)CDC, 2007).

Two questions were used to determine respondents' smoking status: 1) "Have you smoked at least 100 cigarettes in your entire life?" 2) "Do you now smoke cigarettes every day, some days, or not at all?" Respondents were placed in one of three categories. Never smokers were defined as respondents who indicated that they had not smoked 100 cigarettes in their lifetime. Current smokers were defined as those who responded "yes" to having smoked 100 cigarettes in their lifetime and who reported smoking every day or some days. Former smokers were defined as respondents who reported smoking 100 cigarettes in their lifetime, but "not at all" to current frequency of smoking

Respondents were asked three questions regarding influenza and pneumococcal vaccinations. Two questions addressed receiving an influenza vaccine:

1) "A flu shot is an influenza vaccine injected in your arm. During the past 12 months, have you had a flu shot"? and 2) "During the past 12 months, have you had a flu vaccine that was sprayed in your nose? The flu vaccine that is sprayed in the nose is also called FluMist™." Respondents who affirmatively responded to either question were defined as having received the influenza vaccine. The third question addressed receiving a pneumoccocal vaccination: 3) "Have you EVER had a pneumonia shot? A pneumonia shot or pneumococcal vaccine is usually given only once or twice in a person's lifetime and is different from the flu shot." Persons who answered affirmatively were defined as having received a pneumococcal vaccine.

Demographics of the sample population aged 50 years and greater were examined and included: age, sex, education, race/ethnicity, having health insurance, and having health a care provider. In addition to demographics, five chronic medical conditions including angina/coronary heart disease, heart attack, stroke, diabetes, and asthma were assessed and were chosen based on availability in the dataset as well as their known contribution to disease burden among smokers. Affirmative responses to items that asked if a doctor had ever told them that they had diabetes (excluding gestational diabetes), angina/coronary heart disease, heart attack, a stroke, or asthma defined the presence of these conditions. Estimates for all characteristics were stratified by the respondents' smoking status.

Statistical analyses

Analysis of influenza vaccination included adult survey participants ≥ 50-years, based on age recommendations for this vaccination, and who had complete data for smoking status (N = 198,500). Analysis of pneumococcal vaccination was limited to respondents ≥ 65 years, based on age recommendations for this vaccination, and who had complete data for smoking status (N = 61,894). Chi-square analyses were used to examine differences in immunization rates for both vaccines among the three smoking groups. Multivariate logistic regression models were used to further test the association between smoking status and receipt of vaccinations, adjusting for the demographic characteristics listed above. When controlling for the presence of the five medical conditions, (diabetes, angina/coronary heart disease, heart attack, stroke, or asthma) an integer count was created (range: 0–5) and included as a covariate in the models. All estimates presented are weighted and all analyses were conducted in SUDAAN (RTI, 2007) to account for the complex sampling design of the survey.

Results

Of the 198,500 survey respondents, 48.5% were never smokers (n = 96,282), 36.6% were former smokers (n = 72,557), and 14.9% were current smokers (29,661). Differences in demographics were found among the three smoking groups. The average age of never smokers was 64.1 years; 65.4 years for former smokers, and 59.7 years for current smokers. Former smokers had the lowest proportion of females compared to both current and never smokers. Each smoking classification was predominantly white with former smokers having the largest proportion of white persons. Never smokers had the lowest proportion of persons with college or technical school completion.

Table 1
Description of population by smoking status for persons 50 years of age and older, U.S., 2006*

	Never smoker n = 96,282	Former smoker n = 72,557	Current smoker n = 29,661
Average age (years)	64.1, (63.9–64.3)	65.4, (65.2–65.6)	59.7, (59.5–59.9)
Sex (%)			
Female	63.4, (62.6–64.2)	43.7, (42.9–44.5)	48.8, (47.6–50.0)
Race/Ethnicity (%)			
White, non-Hispanic	75.4, (74.6–76.2)	81.5, (80.7–82.3)	75.0, (73.8–72.6)
Black, non-Hispanic	8.4, (8.0–8.8)	6.9, (6.5–7.3)	11.4, (10.6–12.2)
Other race/multi-race	5.4, (5.0–5.8)	4.3, (3.9–4.7)	5.7, (5.1–6.3)
Hispanic	10.9, (10.3–11.5)	7.3, (6.7–7.9)	7.8, (6.8–8.8)
Education (%)			
Completing college or technical school	64.1, (63.5–64.7)	68.4, (67.6–69.2)	80.2, (79.2–81.2)
Health insurance (%)			
With health insurance coverage	92.7, (92.3–93.1)	94.5, (94.1–94.9)	85.3, (84.5–86.1)
Healthcare provider (%)[a]			
Yes, only one	82.3, (81.7–82.9)	82.1, (81.5–82.7)	75.8, (74.6–77.0)
Yes, more than one	9.2, (8.8–9.6)	10.3, (9.9–10.7)	8.1, (7.5–8.7)
Chronic conditions (%)			
Angina/CHD	7.3, (6.9–7.7)	13.2, (12.6–13.8)	9.7, (9.1–10.3)
Heart attack	6.7, (6.3–7.1)	12.3, (11.7–12.9)	11.2, (10.4–12.0)
Stroke	4.7, (4.5–4.9)	6.0, (5.6–6.4)	6.8, (6.2–7.4)
Diabetes	14.5, (13.9–15.1)	18.0, (17.4–18.6)	13.0, (12.2–13.8)
Asthma	12.0, (11.6–12.4)	12.9, (12.5–13.3)	15.3, (14.7–15.9)

Source: 2006 Behavioral Risk Factor Surveillance System.
*All estimates are weighted with 95% confidence intervals.
[a] Do you have one person that you think of as your personal doctor or healthcare provider?