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Original article

The relationship between smoking status and serious psychological distress: findings from the 2007 Behavioral Risk Factor Surveillance System

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Abstract

Objectives: To examine the associations between smoking and quit attempts with psychological distress and also by socioeconomic groups.

Methods: Using data on 172,938 adult respondents from the 2007 Behavioral Risk Factor Surveillance System we used the Kessler-6 scale to assess psychological distress among never, former, some-day, and everyday smokers and smokers attempting to quit.

Results: Everyday smokers and attempting quitters had higher mean levels of 30-day psychological distress than never smokers. Compared with never smokers, the odds of having serious psychological distress (SPD) were: former smokers, 1.3 (95 % CI: 1.1–1.6); some-day smokers, 2.5 (95 % CI: 2.0–3.1); and everyday smokers, 3.3 (95 % CI: 2.8–3.8). As for unsuccessful quit attempts, the odds were highest for current smokers (3.3 [95 % CI: 2.8–3.8]) versus never smokers. Among current smokers, persons with less than high school education, income less than $ 50,000, or who were unemployed or unable to work had the highest odds of reporting SPD.

Conclusions: Given the association between current smoking behaviors and psychological distress, future tobacco prevention and control efforts may benefit by including components of mental health, especially for low SES populations.

Keywords: Smoking – Smoking cessation – Smoking and psychological distress – Smoking and mental health – Depression and smoking – Low SES groups.

Introduction

Smoking is the leading cause of premature death in the United States and worldwide.[1–2] Mental health and depression are also leading and growing causes of global disease burden as measured by disability adjusted life years (DALYS) and total years lived with disability (YLD)[3–5] and are increasingly recognized as being co-morbid with smoking.[6–12]

In order to assess the levels of psychological distress for everyday and some day smokers, as well as for current smokers who unsuccessfully tried to quit in the past year, we used 2007 the Behavioral Risk Factor Surveillance System (BRFSS), a large state based survey in the United States. The large sample size will allow us to examine the association among different socioeconomic groups while adjusting for the major confounders.

Methods

The BRFSS monitors the prevalence of key health- and safety-related behaviors and characteristics.[13–14] In 2007, trained interviewers in 35 states (Alaska, Arkansas, California, Colorado, Connecticut, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Texas, Vermont, Virginia, Washington, Wisconsin, Wyoming), the District of Colum-

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bia, and Puerto Rico, administered identical questionnaires, including a measurement of psychological distress over the telephone to an independent probability sample of adults aged 18 years or older. The BRFSS methods, including the weighting procedure, are described elsewhere.[15] All BRFSS questionnaires, data, and reports are available at www.cdc.gov/brfss.

Smoking Status

Two survey 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 everyday, some days, or not at all?

Based on their responses, respondents were placed in one of four categories. Respondents who reported they had not smoked 100 cigarettes in their lifetime were defined as "never smokers." Those who responded in the affirmative for having smoked 100 cigarettes in their lifetime and who also said that they do not smoke at all now were defined as "former smokers". Current smokers were categorized into two groups as follows: Respondents who reported ever smoking 100 cigarettes and responded that they now smoke some days were classified as current "some-days smokers". Respondents who reported ever smoking 100 cigarettes and also responded that they now smoke everyday were classified as current "everyday smokers".

Current smokers were defined as having a quit attempt if they reported having stopped smoking for at least a day in the past year because they wanted to quit. Smokers were defined as not attempting to quit if they reported they did not stop smoking for at least a day in the past year. Former and never smokers were defined identically to smoking status; however, in this context, former smokers may be considered "successful quitters."

Serious Psychological Distress

K6 scale consists of six questions for respondents, regarding how frequently they experienced the following symptoms of psychological distress during the preceding 30 days: a) nervous; b) hopeless, c) restless or fidgety; d) so depressed that nothing could cheer you up; e) that everything was an effort; and f) feel worthless. To create a score, the six questions on the K6 scales were coded from 0 to 4, where "all of the time" = 4, "most of the time" = 3, "some of the time" = 2, "a little of the time" = 1, and "none of the time" = 0. "Don't know" and "refuse" were coded as missing and excluded from the analyses. The response codes (0–4) were summed to yield a score range of 0–24. Scores ≥13 defined serious psychological distress.[16] A strong association between high scores (≥13) on the K6 psychological distress scale and a current Composite International Diagnostic Interview (CIDI) diagnosis of anxiety and affective disorders has been found.[16]

Sample size and analysis

Of the 220,448 respondents from 35 states the District of Columbia, and Puerto Rico who were administered the K6, 203,096 adults had complete K6 scores. Complete information for all demographic variables (sex, age, race/ethnicity, marital status, employment, education, income) and self-reported chronic diseases was available for 172,938 respondents. For the 2007 BRFSS, the median response rate was 50.6 % and the median cooperation rate (proportion of people interviewed of all eligible people who were actually contacted), was 72.1 %.[14]

All analyses were conducted using SPSS release 14.0.1 with the complex sampling module (SPSS Inc., Chicago, IL) to account for the complex survey design. All adjusted odds ratios and 95 % confidence intervals were calculated from multivariate logistic regression models; General Linear Models were used to calculate differences in mean K-6 scores by smoking status groups and quit attempt groups. All models included sex, age, race/ethnicity, marital status, employment, education, and income as covariates. We also included diabetes, high blood pressure, asthma, angina/heart attack, and stroke as covariates in our analyses. Due to the large sample size we used an alpha (α) of 0.01 for all analyses.

Results

Of the 172,938 respondents, 19 % were current smokers; 5.3 % were some day smokers and 13.7 % were everyday smokers. Close to one-quarter of the sample (24.3 %) were former smokers and over half (56.7 %) reported never having smoked. Among current smokers, 55.2 % attempted to quit in the past year. Close to three-quarters (73.9 %) of some day smokers and slightly over a half (51.3 %) of everyday smokers reported attempting to quit in the past year.

A greater proportion of never smokers and some day smokers were 18–24 years of age compared to other smoking groups (Table 1). The highest proportion of former smokers was 55+ years of age compared to other smoking groups. Everyday, some day, and former smokers had a higher proportion of men than never smokers. Each smoking group was predominantly white non-Hispanics, with former smokers having the greatest proportion of white non-Hispanics. Everyday smokers had the highest proportion of persons who did not graduate high school and persons who were unable to work. Close to one

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Table 1. Weighted distribution of sociodemographic factors by smoking status among persons 18+ years, Behavioral Risk Surveillance System 2007.

		Smoking Status			
		Everyday (n = 24,169)	Some day (n = 7,723)	Former (n = 50,278)	Never (n = 90,768)
	n	% (95 % CI)	% (95 % CI)	% (95 % CI)	% (95 % CI)
Total	172,938	13.7 (13.4–14.0)	5.3 (5.0–5.6)	24.3 (23.9–24.7)	56.7 (56.2–57.2)
Age					
18–24	5732	10.7 (9.7–11.7)	14.2 (12.1–16.6)	3.4 (2.9–4.0)	11.9 (11.3–12.6)
25–34	19,415	21.8 (20.6–23.0)	28.1 (25.8–30.6)	13.3 (12.6–14.2)	20.8 (20.2–21.4)
35–44	29,865	22.9 (21.8–24.1)	22.6 (20.7–24.7)	16.3 (15.6–17.0)	24.2 (23.6–24.9)
45–54	38,553	24.4 (23.4–25.4)	19.0 (17.3–20.7)	20.1 (19.4–20.8)	19.0 (18.5–19.4)
≥55	79,373	20.2 (19.4–21.1)	16.2 (14.9–17.5)	46.8 (45.0–47.7)	24.1 (23.6–24.6)
Sex					
Male	66,460	52.2 (50.9–53.5)	58.3 (56.0–60.6)	56.4 (55.5–57.3)	44.9 (44.2–45.7)
Female	106,478	47.8 (46.5–49.1)	41.7 (39.4–44.0)	43.6 (42.7–44.5)	55.1 (54.3–55.8)
Race/Ethnicity					
White	136,467	74.1 (72.8–75.5)	60.9 (58.2–63.5)	76.8 (75.8–77.7)	65.4 (64.7–66.2)
Black	12,217	9.4 (8.6–10.4)	9.5 (8.2–11.0)	5.1 (4.7–5.5)	8.6 (8.2–9.0)
Hispanic	13,240	9.0 (8.1–10.1)	22.8 (20.1–25.7)	12.4 (11.5–13.3)	17.9 (17.2–18.6)
Other	11,014	7.4 (6.6–8.3)	6.8 (5.8–8.1)	5.8 (5.3–6.3)	8.1 (7.6–8.6)
Education level					
<High school	14,515	16.0 (14.9–17.0)	14.6 (12.3–17.2)	9.3 (8.6–10.0)	9.3 (8.8–9.8)
High school graduate	49,250	39.0 (37.8–40.3)	31.1 (28.9–33.4)	27.9 (27.1–28.8)	22.8 (22.2–23.4)
>High school	109,173	45.0 (43.7–46.3)	54.3 (51.7–56.8)	62.8 (61.9–63.7)	67.9 (67.2–68.6)
Marital Status					
Currently	99,752	49.4 (48.1–50.6)	52.4 (49.9–54.9)	69.8 (68.9–70.6)	64.6 (63.9–65.4)
Previously	48,722	25.1 (24.1–26.2)	16.5 (15.2–18.0)	18.9 (18.3–19.5)	13.1 (12.7–13.5)
Never	24,464	25.5 (24.3–26.8)	31.0 (28.5–33.6)	11.4 (10.7–12.2)	22.3 (21.6–23.0)
Employment Status					
Employed	100,210	63.1 (61.9–64.4)	70.6 (68.5–72.7)	58.4 (57.6–59.3)	66.2 (65.5–66.8)
Unemployed	5,915	8.9 (8.1–9.9)	6.5 (5.4–7.8)	2.9 (2.6–3.2)	3.8 (3.5–4.1)
Retired	40,317	8.5 (8.0–9.1)	6.8 (6.1–7.6)	25.4 (24.8–26.1)	11.7 (11.3–12.0)
Unable	10,136	9.8 (9.1–10.5)	7.1 (6.0–8.3)	5.2 (4.8–5.7)	3.0 (2.8–3.2)
Other	16,306	9.6 (8.9–10.4)	9.0 (7.8–10.4)	8.0 (7.5–8.5)	15.4 (14.8–16.0)
Income per year					
<$20,000	30,311	23.8 (22.6–25.0)	21.2 (19.0–23.5)	13.7 (13.1–14.5)	15.0 (14.4–15.6)
$20,000–$ 49,000	65,048	43.2 (42.0–44.5)	38.9 (36.4–41.3)	34.4 (33.6–35.3)	31.8 (31.2–32.5)
$50,000–$ 74,000	30,143	14.8 (14.0–15.7)	15.0 (13.6–16.6)	18.6 (17.9–19.2)	17.4 (16.9–17.9)
≥$75,000	47,436	18.2 (17.1–19.2)	25.0 (22.9–27.1)	33.3 (32.4–34.1)	35.8 (35.1–36.5)

quarter of current everyday smokers reported an income less than $20,000. The proportion of everyday smokers with an income greater than $75,000 was lower when compared to never smokers with the same income.

Mean K6 score was lowest for never smokers, (3.1; 95 % CI: 3.0–3.1) compared to 3.2 (95 % CI: 3.2–3.3) for former smokers, 4.1 (95 % CI: 3.9–4.3) for some day smokers, and 4.7 (95 % CI: 4.6–4.8) for everyday smokers ($p < .05$) (Figure 1). Smokers who made a quit attempt had the highest mean K6 score 4.7 (95 % CI: 4.6–4.9) compared to all other quit attempt groups; smokers who made no attempt to quit reported a slightly lower mean (4.2; 95 % CI: 4.1–4.4) than smokers who made a quit attempt ($p < .01$) (Figure 1).

A strong dose-response increase in the odds for serious psychological distress was found by smoking status even after controlling for sociodemographic variables and diagnosed chronic diseases (Table 2). Compared to never smokers, the odds of having serious psychological distress was 1.3 (95 %

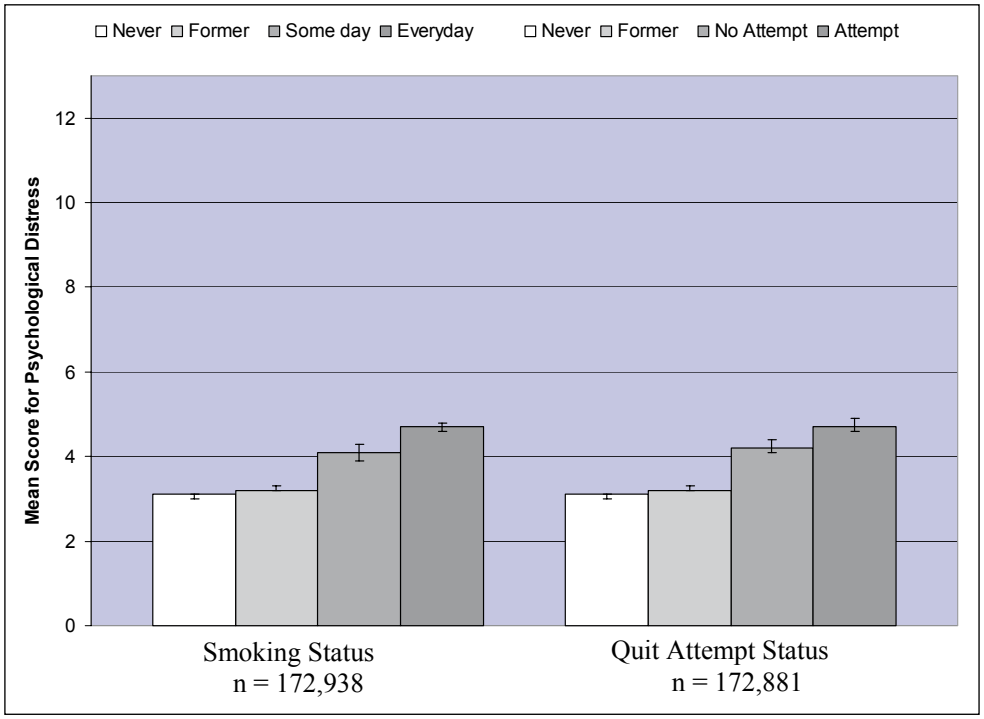

Figure 1. Mean score for psychological distress by smoking and quit attempt status, Behavioral Risk Surveillance System 2007.

*Source: Centers for Disease Control and Prevention, Behavior Risk Factor Surveillance System 2007.

Table 2. Adjusted logistic regression models for serious psychological distress by smoking status among persons 18+ years, Behavioral Risk Surveillance System 2007.

	Serious Psychological Distress				
	%	Adjusted Odds Ratio (95 % CI)*		%	Adjusted Odds Ratio (95 % CI)*
Smoking Status (n = 172,938)			**Quit Attempt Status**[a] (n = 172,881)		
Never	2.4	1.0 (referent)	Never	2.4	1.0 (referent)
Former	3.3	1.3 (1.1–1.6)	Former	3.3	1.3 (1.1–1.5)
Some day	6.5	2.4 (2.0–3.1)	No quit attempt	7.2	2.8 (2.4–3.4)
Everyday	9.3	3.3 (2.8–3.8)	Unsuccessful quit attempt	9.5	3.2 (2.8–3.8)

*Controlling for age, race, sex, education, marital status, employment, income, and diagnosed chronic diseases: diabetes, angina/cardiovascular disease, high blood pressure, and history of heart attack or stroke.
[a]Sample size reduced because 57 current smokers did not respond about quitting.

CI: 1.1–1.6) for former smokers; 2.5 (95 % CI: 2.0–3.1) for some day smokers; and 3.2 for everyday smokers (95 % CI: 2.8–3.8) (Table 2). Differences were also noted by quit attempt status. Compared to never smokers, the odds of having serious psychological distress was 1.3 (95 % CI: 1.1–1.5) for former smokers (successful quitters); 2.8 (95 % CI: 2.4–3.4) for current smokers who made no quit attempts in the past year; and 3.2 (95 % CI: 2.8–3.8) for current smokers who made an unsuccessful quit attempt in the past year (Table 2). Among current smokers, the odds of reporting serious psychological distress was 1.8 (95 % CI: 1.4–2.4) for persons with less than high school education compared to persons with greater than high school education (Table 3). Among current smokers, the adjusted odds ratios increased in a dose-response manner. Compared to persons with an income greater than $ 74,000 the odds ratio for SPD was 1.3 (95 % CI: 0.8–2.0) for persons with income of $ 50,000–$ 74,000; 2.2 (95 % CI: 1.5–3.3) for persons with an income of $ 20,000–$ 49,000 and 4.3 (95 % CI: 2.8–6.4) for persons with an income less than $ 20,000 (Table 3). Compared to current smokers who reported being employed, current smokers who reporting being unemployed had an odds ratio of 2.2 (95 % CI: 1.7–3.0) for reporting SPD and those reporting the inability to work had an odds ratio of 5.3 (95 % CI:4.0–7.0) for SPD (Table 3).

Table 3. Adjusted logistic regression models for serious psychological distress by socioeconomic status among current smokers 18+ years, Behavioral Risk Surveillance System 2007.

		Serious Psychological Distress
Socioeconomic Status	**%**	**Adjusted Odds Ratio (95 % CI)***
Education level		
> High school	6.2	1.0 (referent)
High school graduate	8.7	1.1 (0.9–1.3)
< High school	16.4	1.8 (1.4–2.3)
Employment Status		
Employed	4.8	1.0 (referent)
Unemployed	14.8	2.2 (1.7–3.0)
Retired	5.1	0.8 (0.5–1.2)
Unable	33.5	5.3 (4.0–7.0)
Other	8.5	1.4 (1.1–1.9)
Income per year		
≥ $ 75,000	2.8	1.0 (referent)
$ 50,000–$ 74,000	3.7	1.3 (0.8–2.0)
$ 20,000–$ 49,000	7.8	2.2 (1.5–3.3)
< $ 20,000	18.4	4.2 (2.8–6.5)

*Controlling for age, race, sex, marital status, and diagnosed chronic diseases: diabetes, angina/cardiovascular disease, high blood pressure, and history of heart attack or stroke.

Discussion

Our study provides information about patterns of current smoking behaviors and levels of psychological distress. In particular, mean levels of psychological distress in the past 30 days differed between everyday and some day smokers, with everyday smokers having higher levels of psychological distress and also higher levels of serious psychological distress than persons in the other categories of smoking status. Current smokers in low SES subgroups (low education, low income, and unemployment) had an increased odds of reporting serious psychological distress. Moreover, current smokers who made an unsuccessful quit attempt in the past year reported higher levels of psychological distress.

Indeed, everyday smokers may have stronger dependence on nicotine than some day smokers. For example, higher nicotine dependence has been observed among daily smokers than non-daily smokers.[17] Yet it is also true that a greater percentage of smokers with serious psychological distress are nicotine dependent compared to smokers without serious psychological distress.[18]

Our findings also indicate that mean levels of psychological distress differ between current smokers who made an unsuccessful quit attempt in the past year with those who did not attempt to quit. This finding is not surprising for several reasons. First, depressed smokers are less likely to quit than smokers who are not depressed.[19] Smoking cessation often times requires numerous attempts and may be accompanied by anxiety and depression during the quit attempt, in part, due to nicotine withdrawal symptoms.[20–23]

Compared to never smokers, the odds of serious psychological distress was highest for everyday smokers followed by some day and former smokers. Substance use such as smoking tends to be co-morbid with psychiatric disorders, depression, and anxiety.[24–25,19] Our study of daily smokers suggests that this group of smokers experience far more distress symptoms relative to other smoking and non-smoking groups, providing further evidence of the association between and poor mental health and smoking. Important to note is that our findings demonstrated that former smokers had lower odds for serious psychological distress, suggesting that health of persons who quit smoking may extend to mental well-being.[26] Thus, while the physical health benefits of smoking cessation have been well established, our data suggest that the psychological well-being of former smokers is worthy of further exploration.

We also observed that the magnitude of the association between patterns of smoking behaviors and serious psychological distress that we report persisted even after controlling for self-reported diagnosed chronic diseases. Individuals with chronic diseases often have concomitant mental health problems and psychiatric disorders[27] which may either be moderated or mediated by existing health risk behaviors.[28–29] Our findings suggest that regardless of disease status, persons who smoke everyday or some day, and those who made an unsuccessful quit attempt had an increased odd for serious psychological distress.

We examined the relationship of select socioeconomic variables to serious psychological distress among current smokers and found that for current smokers with less than high school education, the odds of reporting serious psychological distress was almost two times compared to persons with greater than high school education. For current smokers, we also found a dose-response relationship between income and serious psychological distress; compared to current smokers with an income greater than $ 74,000 per year, those current smokers with an income of less than $ 20,000 had the highest odds of reporting serious psychological distress. Our findings underscore that for smokers in low socioeconomic strata, tobacco cessation efforts may also need to address their mental health needs.

Several limitations of the present study must be taken into consideration when interpreting these findings. First, all data collected in the BRFSS are self-reported. As a result, there is the potential for self-report bias. However, measures on the

BRFSS, such as smoking, have high validity and reliability.[30] Second, these data are from a cross-sectional survey, therefore no causal inferences can be made. No information was collected on how long ago former smokers quit smoking or when current smokers attempted to quit in the past year, thus, temporality of quit behaviors cannot be established. Information on COPD and diagnosed cancer were not collected and could not be included when controlling for chronic diseases. Despite these limitations, the present findings provide further evidence that smokers may be experiencing psychological distress in relation to unsuccessful quitting and daily smoking behaviors.

While our measure of non-specific serious psychological distress using the K-6 cannot provide psychiatric diagnosis, it does provide a measure of unpleasant affective symptoms, as well as, symptoms of anxiety and depression. Including this brief instrument on a national behavioral surveillance such as BRFSS provided the opportunity to explore and understand the emotional health of current and former smokers and also by specific socioeconomic subgroups. Such information is invaluable, as it affords exploration of potential novel approaches to the prevention and control of tobacco use. In particular, our findings suggest that further studies are needed to examine the mental health and affective states and symptoms of everyday and occasional smokers. Moreover, our findings also suggest that smoking cessation programs, such as the quitlines, may benefit by incorporating approaches that address psychological distress. Finally, interventions are needed for specific socioeconomic subgroups who may be experiencing marked distress in conjunction with smoking. Addressing the mental health needs of individuals who smoke and particularly for vulnerable populations, such as persons with low socioeconomic status may contribute to the efforts of further reducing the burden of smoking and promoting the physical and psychological health and well-being of individuals worldwide.

Disclaimer:

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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