Original Investigation

Cigarette Smoking and Serious Psychological Distress: A Population-Based Study of California Adults

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Abstract

Introduction: This study examines differences in smoking behaviors between adults with and without serious psychological distress (SPD) in California, which has the longest running comprehensive tobacco control program in the world.

Methods: Cross-sectional data from the 2007 California Health Interview Survey on 50,880 noninstitutionalized adults were used to analyze smoking prevalence, cigarette consumption, and quit ratio. Persons with SPD were identified using the K6 scale, a clinically validated psychological screening instrument.

Results: About 3.8% of California adults screened positive for SPD in the past 30 days (acute SPD) and an additional 4.8% screened positive for SPD in the past 2–12 months (recent SPD). Persons with SPD were more likely to be current smokers than those without SPD (adjusted odds ratios [AOR] = 2.54, 95% CI = 2.02−3.19 for acute SPD and AOR = 2.20, 95% CI = 1.79−2.71 for recent SPD). Current smokers with acute SPD were more likely to smoke ≥20 cigarettes daily than those without SPD (AOR = 1.59, 95% CI = 1.06−2.39). The quit rate was lower among ever-smokers with acute (AOR = 0.46, 95% CI = 0.35−0.62) or recent SPD (AOR = 0.55, 95% CI = 0.42−0.71) than those without SPD. While persons with acute or recent SPD comprised 8.6% of adults, they consumed 19.2% of all cigarettes in California.

Conclusions: In California, adults with SPD were more likely to be current smokers and to smoke heavily and less likely to quit than those without SPD. The findings underscore the need for effective smoking cessation strategies targeting this group.

Introduction

Cigarette smoking remains the leading cause of preventable mortality and morbidity in the United States, causing 443,000 premature deaths per year and leading to substantial health care costs and lost productivity (Centers for Disease Control and Prevention, 2008; V. P. Miller, Ernst, & Collin, 1999; L. S. Miller, Zhang, Rice, & Max, 1998). Although cigarette smoking prevalence in the United States declined dramatically from 42% in 1965 to 26% in 1991, the decline has stalled in the past five years from 20.9% in 2004 to 20.6% in 2009 (Centers for Disease Control and Prevention, 1994, 2010). To achieve the Healthy People 2020 national goal of reducing the adult smoking rate to less than 12% by 2020 (U.S. Department of Health and Human Services, 2010), innovative tobacco control efforts need to target subgroups that smoke at high rates.

Persons with mental illness comprise one of the largest and most vulnerable subgroup of smokers. Research that examines the association between smoking and mental illness emerged in the late 1980s. Early studies mainly focused on mental health patients selected from specific clinic settings, such as outpatient psychiatric clinics (Acton, Prochaska, Kaplan, Small, & Hall, 2001; Hughes, Hatsukami, Mitchell, & Dahlgren, 1986; Itkin, Nemets, & Einat, 2001; Vanable, Carey, Carey, & Maisto, 2003) and mental hospitals (de Leon et al., 1995; Prochaska, Gill, & Hall, 2004), or specific diagnoses, such as bipolar disorder, major depression, and panic disorder (N. Breslau & Klein, 1999; Glassman et al., 1990; Gonzalez-Pinto et al., 1998). These studies found that individuals diagnosed with various forms of mental illness smoked at very high rates. For example, a recent meta-analysis of 42 studies across 20 countries found an average current smoking prevalence of 62% among individuals diagnosed with schizophrenia (de Leon & Diaz, 2005). Neurobiological, psychosocial, and systemic factors are thought to contribute to the high rates of tobacco use among psychiatric populations. These include the reinforcing mood-altering effects of nicotine, shared environment or genetic factors, reduced ability to cope during cessation efforts, and limited access to targeted evidence-based tobacco cessation treatment (Dursun & Kutcher, 1999; Kendler et al., 1993; Ziedonis et al., 2008; Schroeder & Morris, 2010).

There have been relatively few population-based research investigations that have compared the smoking behaviors of persons with and without mental illness across the spectrum of psychiatric disorders. The first of such population-based studies was conducted by Lasser et al. (2000) analyzing data from the 1991–1992 National Comorbidity Survey. Their results showed that persons with alcohol, drug, or mental problems (ADM) in the past month comprised 28.3% of the U.S. population, were twice as likely to be current smokers as those without ADM disorders (41.0% vs. 22.5%), and accounted for 40.6% of all current smokers and 44.4% of total cigarettes sold in the United States. Using the same data, another study found that persons with nonsubstance-related mental illness in the past twelve months constituted 24% of the U.S. population but consumed about 40% of all cigarettes in the United States (Saffer & Dave, 2005). Using data from the 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions, Grant, Hasin, Chou, Stinson, and Dawson (2004) found that individuals with ADM disorders in the past twelve months made up 30.3% of the population but consumed 46.3% of all cigarettes in the United States. These three studies defined mental illness based on the *Diagnostic and Statistical Manual of Mental Disorders*, Revised third edition *DSM-III*-R or fourth edition *DSM-IV* (American Psychiatric Association, 1987, 1994), and they reached a strikingly similar conclusion that more than 40% of all cigarettes sold in the United States are consumed by individuals with mental illness. However, a recent study, which also defined mental illness according to the *DSM-IV* but focused on a nationally representative sample of Black Americans in 2001–2003, derived much lower estimates, reporting that those with mental illness in the past twelve months represented 18.1% of the sample but consumed 23.9% of all cigarettes by Blacks (Hickman, Delucchim & Prochaskam, 2010), perhaps due to the fact that Blacks have a lower prevalence of mental disorders than Whites (J. Breslau et al., 2006; Kessler et al., 1994).

Instead of using the diagnostic criteria such as those in the *DSM-IV*, Hagman, Delnevo, Hrywna, and Williams (2008) defined mental illness with a clinically validated brief psychological screening instrument, the K6 scale (Kessler et al., 2002, 2003), designed to screen populations for serious psychological distress (SPD). Using the 2002 National Survey of Drug Use and Health data, they found that 8.3% of U.S. adults had SPD in the past twelve months, and those with SPD had higher rates of current cigarette smoking than those without SPD (44.9% vs. 26.0%). Based on the K6 scale data from the 2007 National Health Interview Survey, McClave, McKnight-Eily, Davis, and Dube (2010) estimated that current smoking prevalence was 38.1% for adults with SPD compared with 18.3% for adults who had no lifetime diagnosis of five specific mental illnesses. Neither of these two studies examined the proportions of all current smokers and total cigarettes accounted for by persons with mental illness.

Although the above-mentioned population-based studies indicate that persons with mental illness smoke at higher rates than those without, all but one of these studies were based on national data collected from 1991 to 2003 when the overall smoking prevalence in the United States was relatively high, ranging from 26% to 22% (Centers for Disease Control and Prevention, 1994, 2005). It is unknown whether this association still exists at a lower level of national smoking prevalence.

California has the longest running and largest comprehensive tobacco control program in the world and is recognized internationally for its success in tobacco control (Roeseler & Burns, 2010). In 2009, California's current smoking prevalence was one third lower than the national average (12.9% vs. 20.6%; Centers for Disease Control and Prevention, 2009, 2010). Yet there are still approximately 3.6 million current adult smokers in the state. Given California's leading role in national and international tobacco control efforts, its low smoking prevalence, and its large and diverse population, California provides an exemplary case study for informing future trends in the association between smoking and mental illness.

The objective of this study is to examine differences in the smoking prevalence, cigarette consumption, and quit ratios between persons with and without SPD in California. We hypothesized that California adults with SPD have a lower smoking prevalence than U.S. adults with SPD and that within California, adults with SPD have a higher smoking prevalence than those without SPD, constitute a disproportionately high proportion of all current smokers, and consume a disproportionately high proportion of total cigarettes in California. The identification of population subgroups that remain at elevated risk for tobacco use in California will provide useful information on the future direction of tobacco control strategies for other states, the United States, and other countries.

Methods

Data Source

This study used data from the 2007 California Health Interview Survey (CHIS). The CHIS, conducted biennially since 2001, is the largest state-level health survey and one of the largest health surveys in the United States (Brown, Holtby, Zahnd, & Abbott, 2005). CHIS is a random-digit dialing telephone survey of California's civilian noninstitutionalized population living in households and uses a multistage stratified sampling design. Beginning in 2007, CHIS also includes a sample of cell phone–only households. Within each sampled household, one adult aged ≥18 years is randomly selected for an extended adult interview (Adult File) to obtain detailed information on demographic and socioeconomic characteristics, smoking behavior, other risk behaviors, access to and use of health care services, health conditions, and mental health. Proxy interviews are allowed for frail and ill persons aged ≥65 years. After excluding proxy interviews ($N = 168$), the final unweighted sample from the 2007 CHIS Adult File contained 50,880 adults.

Serious Psychological Distress (SPD)

We defined SPD using the K6 scale, a short but broad-gauged screening measure of nonspecific psychological distress rather than a disorder-specific diagnostic measure. The K6 scale was originally developed by Kessler et al. (2002) based on item response theory models to be used in population-based surveys to screen for individuals who are likely to meet diagnostic criteria for "serious mental illness" in a given year, which was estimated by previous studies to constitute about 6% of the U.S. adult population (Kessler et al., 1996). The K6 scale has been clinically validated to be an accurate screening scale for serious mental illness. In a methodological study comparing the performance

of four different screening scales in predicting "serious mental illness," defined as having at least one *DSM-IV* disorder other than substance use disorders in the past twelve months and having serious impairment with a Global Assessment of Functioning score of less than 60, the K6 scale was the most efficient screening scale with a sensitivity of 0.36, specificity of 0.96, and a total classification accuracy of 0.92 (Kessler et al., 2003). Its brevity, accuracy, and ability to discriminate *DSM-IV* cases from noncases make the K6 scale a popular screening instrument for serious mental illness in population-based health surveys (Kessler et al., 2003; Furukawa, Kessler, Slade, & Andrews, 2003; Veldhuizen, Cairney, Kurdyak, & Streiner, 2007).

The K6 consists of six questions asking respondents to rate on a Likert scale how frequently they experienced the following symptoms: felt nervous, hopeless, restless or fidgety, worthless, sad or depressed, and that everything was an effort within a particular reference period, for example, the past thirty days. For each question, a value of 0, 1, 2, 3, or 4 was assigned to the answer: *none of the time*, *a little of the time*, *some of the time*, *most of the time*, or *all of the time*, respectively. Responses to the six items were summed to yield a K6 score between 0 and 24, with higher scores indicating a greater tendency toward mental illness. Following the literature (Hagman et al., 2008; Kessler et al., 2003), we defined a person as having SPD if the K6 score was ≥13.

The 2007 CHIS included two sets of K6 questions in the Adult File that referenced the 30-day and 12-month periods prior to the date of interview. For this study, we classified respondents based on their past thirty-day and past twelve-month K6 scores into three mutually exclusive groups: acute SPD, recent SPD, and no SPD. Acute SPD referred to those respondents who were screened for SPD in the past thirty days. Recent SPD referred to those respondents who were screened for SPD in the past twelve months but not in the past thirty days. No SPD referred to those respondents without SPD in the past twelve months.

Smoking Outcome Measures

Ever-smokers were defined as having smoked at least 100 cigarettes in their lifetime. Current smokers were defined as having smoked 100 cigarettes in their lifetime and now smoking cigarettes daily (daily smokers) or some days (someday smokers). Daily smokers were asked how many cigarettes they smoked per day on average. Someday smokers were asked how many cigarettes they smoked per day in the past thirty days when they smoked; however, the CHIS did not ask how many days they smoked in the past thirty days. We categorized current smokers as heavy smokers (current daily smokers who smoked ≥20 cigarettes/day) or moderate/light smokers (current someday smokers or daily smokers who smoked <20 cigarettes/day). Former smokers were defined as those who smoked ≥100 cigarettes in their lifetime but reported not smoking now. The quit ratio, considered a measure of total cessation in a population, was calculated as the ratio of former smokers to ever-smokers.

We estimated the proportion of all cigarettes smoked by persons with SPD in California by calculating the following ratio: $(N_1 \times C_1 \times 365)/(N_1 \times C_1 \times 365 + N_2 \times C_2 \times 365)$, where N_1 and N_2 represent the total number of current daily smokers with and without SPD in the past twelve months, respectively; C_1 and C_2 denote the mean number of cigarettes per day by current daily smokers with and without SPD, respectively (Lasser et al., 2000).

Covariates

Based on literature review, we included the following covariates. Sociodemographic characteristics included age, gender, race/ethnicity, education level, poverty level, employment status, and marital status. Based on federal poverty level (FPL) guidelines and self-reported household annual income, the CHIS classified poverty level into four categories: <100%, 100%–199%, 200%–399%, and ≥400% of the FPL. Other risk behaviors included body weight status defined by body mass index (underweight <18.5 kg/m^2; normal = 18.5–24.9 kg/m^2; overweight = 25.0–29.9 kg/m^2; obesity ≥30.0 kg/m^2) and binge drinking status defined as those who drank ≥5 alcoholic drinks for males or ≥4 alcoholic drinks for females in a single episode in the past year.

Statistical Analysis

Cross-tabulations were used to calculate the prevalence of acute SPD and recent SPD by all the covariates, including sociodemographic characteristics and other risk behaviors. A multivariate multinomial logistic regression model including all the covariates evaluated the odds of acute SPD and recent SPD, with "no SPD" as the reference group. This allowed us to simultaneously evaluate the odds of acute SPD and recent SPD in a single model.

Then, we analyzed the impact of SPD status on smoking behaviors with multivariate regression models by controlling for all the covariates described above. For the impact of SPD status on the prevalence of ever smoking and current smoking among all adults, the proportion of daily smokers or heavy smokers among current smokers, and the quit ratio among ever-smokers, we used multivariate logistic regression models to estimate adjusted odds ratios (*AOR*) and their 95% *CI*s for each explanatory variable. For the impact of SPD status on the average number of cigarettes smoked per day for current daily smokers and current someday smokers, we used multivariate linear regression models to estimate the coefficient and *p* value for each explanatory variable.

All the analyses were based on weighted analyses conducted by applying the sample weights from the CHIS data to adjust for nonresponse and unequal probabilities of sample selection and thus to derive unbiased estimates for the California population. We conducted all the analyses using the SAS procedures that take into consideration the design effects of complex sample surveys to produce accurate *SE*s and *CI*s (SAS Institute Inc., 2009). We considered estimates to be statistically significant if the *p* value from a two-tailed test was <.05.

Results

Prevalence of SPD

Applying the sample weights, the unweighted sample of 50,880 adult respondents is equivalent to the weighted total of 26.8 million adults. In 2007, nearly 2.3 million adults or 8.6% of the 26.8 million adults in California were screened positive for SPD in the past twelve months, including 3.8% with acute SPD and 4.8% with recent SPD. Compared with never-smokers, current

smokers were more likely to have acute SPD (7.8% vs. 2.9%, $p <$ .01) and recent SPD (9.0% vs. 4.2%, $p < $ .01), whereas former smokers did not show statistical differences in SPD prevalence. Table 1 shows that all the covariates considered in this study were significantly correlated with SPD status. The multivariate multinomial logistic regression results show that Hispanics, non-Hispanic Asians, and non-Hispanic Blacks were less likely to have recent SPD compared with non-Hispanic Whites.

Table 1. Prevalence of SPD by Sociodemographic Characteristics and Risk Behaviors and the Estimated Multivariate Multinomial Logistic Model for Having Acute SPD or Recent SPD, California, 2007

Characteristics	Unweighted sample size	Prevalence of SPD (%)		Multinomial logistic model *AOR* (95% *CI*)	
		Acute SPD[a]	Recent SPD[b]	Acute SPD[a]	Recent SPD[b]
All adults	50,880	3.8	4.8		
Age (years)					
18–25 (reference)	3,181	3.1	10.5		
26–34	4,632	4.0	5.7	1.80 (1.12–2.89)*	0.66 (0.50–0.87)*
35–49	12,801	4.0	4.4	2.09 (1.37–3.18)*	0.57 (0.41–0.78)*
50+	30,266	3.7	2.3	1.35 (0.94–1.95)	0.25 (0.18–0.35)*
Gender					
Male (reference)	20,410	3.1	3.4		
Female	30,470	4.4	6.1	1.19 (0.98–1.45)	2.07 (1.74–2.47)*
Race/ethnicity					
Non-Hispanic White (reference)	33,193	3.1	5.1		
Hispanic	9,067	4.7	4.6	0.88 (0.68–1.14)	0.62 (0.48–0.80)*
Non-Hispanic Asian	4,332	2.7	3.3	0.90 (0.59–1.36)	0.61 (0.43–0.88)*
Non-Hispanic Black	2,391	5.6	4.8	1.10 (0.78–1.54)	0.65 (0.43–0.97)*
Non-Hispanic American Indians/Alaska	419	12.3	5.0	2.85 (1.45–5.59)*	0.88 (0.54–1.46)
Non-Hispanic other	1,478	5.1	7.6	1.35 (1.02–1.77)*	1.18 (0.77–1.80)
Education status					
<High-school degree	4,924	7.1	3.9	1.43 (1.11–1.85)*	0.91 (0.64–1.31)
High-school graduate (reference)	11,333	4.0	5.5		
Some college	14,415	4.0	6.2	1.13 (0.87–1.46)	1.09 (0.90–1.32)
College or more	20,208	1.7	3.6	0.62 (0.46–0.84)*	0.85 (0.68–1.08)
Poverty level					
<100% FPL (reference)	7,094	7.0	6.7		
100%–199% FPL	8,307	5.8	4.7	0.88 (0.71–1.09)	0.76 (0.57–1.03)
200%–399% FPL	12,640	3.1	5.6	0.56 (0.43–0.72)*	0.97 (0.72–1.30)
≥ 400% FPL	22,839	2.0	3.6	0.46 (0.34–0.64)*	0.72 (0.54–0.95)*
Employment level					
Full-time (reference)	25,446	2.3	4.7		
Part-time	3,950	2.5	6.4	1.02 (0.68–1.53)	1.05 (0.77–1.42)
Employed but not work	169	12.4	3.3	4.12 (0.98,17.30)	0.76 (0.28–2.06)
Unemployed and look for work	1,232	7.8	9.6	2.78 (1.89–4.07)*	1.58 (1.09–2.28)*
Unemployed but not look for work	20,083	6.4	3.9	2.62 (2.05–3.35)*	1.05 (0.81–1.36)
Marital status					
Married (reference)	26,088	2.8	2.7		
Never married	7,771	4.3	8.2	1.75 (1.33–2.31)*	1.80 (1.41–2.28)*
Other	17,021	5.6	6.3	1.61 (1.32–1.95)*	2.21 (1.79–2.73)*
Body weight status					
Underweight	1,229	4.8	5.1	1.28 (0.66–2.48)	0.89 (0.56–1.42)
Normal (reference)	20,331	3.0	4.9		
Overweight	18,040	3.2	4.5	1.02 (0.81–1.28)	1.26 (1.02–1.55)*
Obesity	11,280	5.9	4.9	1.65 (1.36–2.01)*	1.37 (1.11–1.68)*
Binge drinking status					
No (reference)	39,010	3.9	3.9		
Yes	11,870	3.5	6.8	1.24 (0.97–1.59)	1.46 (1.20–1.79)*

Note. All the estimates are based on weighted analyses accounting for complex survey design. *AOR* = adjusted odds ratios; FPL = federal poverty level; SPD = serious psychological distress.

[a]Screened for SPD in the past thirty days.

[b]Screened for SPD in the past twelve months but not past thirty days.

*Statistically significant at $p < .05$, two-tailed test.

Non-Hispanic American Indians/Alaska Natives and non-Hispanic other racial group were more likely to have acute SPD compared with non-Hispanic Whites. Moreover, compared with the relative reference groups, acute SPD was significantly more likely among middle-aged adults (26–49 years old); those without a high-school degree; and those who were the poorest (<100% FPL), unemployed, unmarried, and obese. Recent SPD was significantly more likely among women; young adults (18–25 years old); and those who were the poorest (<100% FPL), unemployed, unmarried, overweight or obese, and binge drinkers.

Smoking Prevalence by SPD Status

According to the 2007 CHIS data, 38.0% of adults in California were ever-smokers and 14.4% were current smokers (Table 2). Smoking prevalence increased with the acuity of SPD status. For adults without SPD, ever smoking prevalence was 37.0% compared with 45.4% for adults with recent SPD and 52.4% for adults with acute SPD. Current smoking prevalence was 13.1% for adults without SPD compared with 27.2% and 30.1% for adults with recent SPD and acute SPD, respectively. After controlling for other covariates, the positive relationship between smoking rates and the acuity of SPD status was still statistically significant. Adults with recent SPD were approximately two times as likely to be ever-smokers ($AOR = 1.81$, 95% $CI = 1.51–2.17$) and current smokers ($AOR = 2.20$, 95% $CI = 1.79–2.71$) as those without SPD. This relationship was slightly stronger among those with acute SPD ($AOR = 1.84$, 95% $CI = 1.53–2.20$ for ever-smokers; $AOR = 2.54$, 95% $CI = 2.02–3.19$ for current smokers). As for the impact of other covariates, it is worth noting that binge drinkers were more likely to be ever-smokers and current smokers, and underweight was positively associated with the odds of being a current smoker, while obesity had the opposite effect.

Among current smokers without SPD, 66.0% were daily smokers compared with 68.8% for those with recent SPD and 75.4% for those with acute SPD (Table 3). After controlling for other covariates, the differences observed in the proportion of current smokers who were daily smokers by SPD status were not statistically significant. The proportion of heavy smokers among current smokers was 17.6%, 15.5%, and 27.7% for those without SPD, with recent SPD, and with acute SPD, respectively. After controlling for other covariates, the multivariate logistic regression results indicated that those current smokers who had acute SPD were more likely to be heavy smokers than those without SPD ($AOR = 1.59$, 95% $CI = 1.06–2.39$), while those with recent SPD did not significantly differ from those without SPD in the proportion of heavy smokers.

Cigarette Consumption by SPD Status

Daily smokers without SPD smoked on average 12.7 cigarettes a day (standard error of the mean [SEM] = 0.3) in contrast to 12.4 cigarettes/day ($SEM = 0.5$) for those with recent SPD and 15.2 cigarettes/day ($SEM = 0.6$) for those with acute SPD (Table 4). Someday smokers smoked on average 4.0 cigarettes/day ($SEM = 0.2$) on those days when they smoked for those without SPD, 4.5 cigarettes/day ($SEM = 0.7$) for those with recent SPD, and 5.8 cigarettes/day ($SEM = 1.4$) for those with acute SPD. After controlling for other covariates, daily smokers who had acute SPD smoked 2.0 cigarettes/day more than those without SPD

($p < .01$); those with recent SPD did not significantly differ from those without SPD. For someday smokers, the difference in the number of cigarettes smoked per day between those with and without SPD was not statistically significant. Based on current smoking rates, the proportions of daily smokers among current smokers, and average numbers of cigarettes smoked per day as presented above, we estimated that 19.2% of all cigarettes smoked by daily smokers in California were consumed by those who had SPD in the past twelve months (i.e., acute and recent SPD groups combined).

Quit Ratio by SPD Status

The overall quit ratio for adults in the generation population in California was 0.62, meaning that 62.0% of ever-smokers no longer smoked at the time of the survey. The quit ratio differed by SPD status: 0.65 for those without SPD, 0.40 for those with recent SPD, and 0.43 for those with acute SPD (data not shown). The multivariate logistic regression results indicated that persons with either type of SPD were significantly less likely to be a former smoker compared with those without SPD ($AOR = 0.46$, 95% $CI = 0.35–0.62$ for acute SPD and $AOR = 0.55$, 95% $CI = 0.42–0.71$ for recent SPD).

Discussion

Our findings indicate that the adult current smoking prevalence rate was lower among California's general population compared with the U.S. general population (14.4% vs. around 20%) and also lower among those with SPD in California (27.2%–30.1%) compared with those with SPD in the United States (44.9%; Hagman et al., 2008). Given that the estimated prevalence of 12-month SPD by Hagman et al. (2008) was very similar to our estimate (8.3% vs. 8.6%), the finding suggests that California's tobacco control program may have contributed to the relatively lower smoking prevalence even among persons with SPD. Nevertheless, California's adults with SPD were more than twice as likely to be current smokers and about 50% less likely to have quit smoking compared with those without SPD, consistent with findings from previous U.S. population–based studies (Lasser et al., 2000; Hagman et al., 2008). In summary, persons with SPD in California smoked at a lower prevalence than those with SPD nationally; nonetheless, they smoked at a higher prevalence than the California general population.

While persons with SPD in the past twelve months comprised 8.6% of adults in California, they accounted for 16.8% of all current smokers (7.8% with acute SPD and 9.0% with recent SPD) and consumed 19.2% of all cigarettes smoked by daily smokers. Our estimated proportion of cigarette consumption by persons with SPD (19.2%) is lower than the widely cited figure in the literature that nearly half of all cigarettes in the United States are consumed by persons with mental illness (Grant et al., 2004; Lasser et al., 2000; Saffer & Dave, 2005; Ziedonis & Williams, 2003). This discrepancy is due to differences in mental illness measurement. The previous studies estimated that persons with mental illness comprised over 24% of U.S. adults based on a wide range of mental disorder diagnoses, including alcohol/drug abuse or dependence and phobias (Grant et al., 2004; Saffer & Dave, 2005). In this study, 8.6% of adults were screened positive for SPD based on the K6 scale, which is a non-specific psychological distress measure not based on diagnoses

Table 2. Smoking Prevalence by SPD Status and the Estimated Multivariate Logistic Regression Models for Smoking Status, California, 2007

Characteristics	Unweighted sample size	Ever smoking prevalence % (95% CI)	Current smoking prevalence % (95% CI)
All adults	50,880	38.0 (37.3–38.6)	14.4 (13.8–15.1)
Acute SPD[a]	1,876	52.4 (48.3–56.4)	30.1 (25.9–34.3)
Recent SPD[b]	2,134	45.4 (41.4–49.5)	27.2 (23.3–31.1)
No SPD[c]	46,870	37.0 (36.2–37.7)	13.1 (12.6–13.7)
Multivariate logistic regression model:		AOR (95% CI)	AOR (95% CI)
SPD status			
Acute SPD[a]		1.84 (1.53–2.20)*	2.54 (2.02–3.19)*
Recent SPD[b]		1.81 (1.51–2.17)*	2.20 (1.79–2.71)*
No SPD[c] (reference)			
Age (years)			
18–25 (reference)			
26–34		2.60 (2.16–3.13)*	2.01 (1.60–2.53)*
35–49		2.93 (2.47–3.46)*	1.88 (1.49–2.38)*
50+		5.05 (4.26–5.99)*	1.60 (1.27–2.01)*
Gender			
Male (reference)			
Female		0.45 (0.42–0.48)*	0.54 (0.49–0.59)*
Race/ethnicity			
Non-Hispanic White (reference)			
Hispanic		0.47 (0.42–0.52)*	0.50 (0.42–0.58)*
Non-Hispanic Asian		0.57 (0.51–0.64)*	0.89 (0.74–1.07)
Non-Hispanic Black		0.89 (0.76–1.03)	1.28 (1.06–1.54)*
Non-Hispanic American Indians/Alaska		1.43 (0.92–2.21)	1.44 (1.02–2.03)*
Non-Hispanic other		0.99 (0.82–1.20)	1.34 (1.05–1.71)*
Education level			
<High-school degree		1.02 (0.90–1.16)	1.11 (0.94–1.30)
High-school graduate (reference)			
Some college		0.89 (0.83–0.96)*	0.78 (0.69–0.88)*
College or more		0.48 (0.45–0.52)*	0.32 (0.28–0.36)*
Poverty level			
<100% FPL (reference)			
100%−199% FPL		0.98 (0.86–1.11)	0.85 (0.71–1.02)
200%−399% FPL		1.00 (0.89–1.14)	0.89 (0.74–1.07)
≥400% FPL		0.91 (0.80–1.04)	0.68 (0.56–0.82)*
Employment status			
Full-time (reference)			
Part-time		0.92 (0.81–1.04)	0.68 (0.56–0.82)*
Employed but not work		1.18 (0.65–2.14)	0.95 (0.43–2.10)
Unemployed and look for work		1.19 (0.99–1.44)	1.29 (1.03–1.61)*
Unemployed but not look for work		1.05 (0.97–1.14)	0.79 (0.70–0.89)*
Marital status			
Married (reference)			
Never married		1.09 (0.96–1.24)	1.65 (1.38–1.98)*
Other		1.61 (1.49–1.75)*	2.07 (1.84–2.34)*
Body weight status			
Underweight		1.00 (0.81–1.24)	1.47 (1.03–2.09)*
Normal (reference)			
Overweight		0.96 (0.89–1.03)	0.93 (0.83–1.04)
Obesity		1.02 (0.95–1.11)	0.83 (0.72–0.94)*
Binge drinking status			
No (reference)			
Yes		2.26 (2.09–2.44)*	2.38 (2.16–2.62)*

Note. All the estimates are based on weighted analyses accounting for complex survey design. *AOR* = adjusted odds ratios; FPL = federal poverty level; SPD = serious psychological distress.

[a]Screened for SPD in the past thirty days.

[b]Screened for SPD in the past twelve months but not past thirty days.

[c]No SPD in the past twelve months.

*Statistically significant at $p < .05$, two-tailed test.

Table 3. Proportion of Current Smokers Who Are Daily or Heavy Smokers by SPD Status and the Estimated Odds Ratios from Multivariate Logistic Regression Models for Daily or Heavy Smoking Status, California, 2007

Characteristics	Unweighted sample size	Proportion of daily smokers (%)	Proportion of heavy smokers (%)
All current smokers	6,611	67.0 (64.8–69.2)	18.2 (16.7–19.7)
Acute SPD[a]	602	75.4 (67.0–83.9)	27.7 (20.4–35.0)
Recent SPD[b]	551	68.8 (61.4–76.2)	15.5 (11.5–19.5)
No SPD[c]	5,458	66.0 (63.7–68.4)	17.6 (16.1–19.1)
Multivariate logistic regression model[d]		AOR (95% CI)	AOR (95% CI)
SPD status			
Acute SPD[a]		1.33 (0.80–2.21)	1.59 (1.06–2.39)*
Recent SPD[b]		1.21 (0.85–1.73)	0.96 (0.66–1.40)
No SPD[c] (reference)			

Note. All the estimates are based on weighted analyses accounting for complex survey design. *AOR* = adjusted odds ratio; SPD = serious psychological distress.

[a]Screened for SPD in the past thirty days.

[b]Screened for SPD in the past twelve months but not past thirty days.

[c]No SPD in the past twelve months.

[d]Other covariates, which are included in the logistic regression model but are not shown in this table, include age, gender, race/ethnicity, education level, poverty level, employment status, marital status, body weight status, and binge drinking status.

*Statistically significant at $p < .05$, two-tailed test.

or impairment but has great precision in identifying "serious mental illness" in the past twelve months, estimated to afflict about 6% of U.S. adults (Kessler et al., 1996, 2001). Given that the K6 scale has low sensitivity but high specificity for serious mental illness (Kessler et al., 2003), persons identified with SPD would appear to be a subset of those with serious mental illness. On the other hand, our results indicate a greater degree of smoking disparity among persons with SPD in terms of two measures. The first, the ratio of the proportion of all cigarettes smoked by persons with SPD and the prevalence of SPD, was 2.2 (=19.2/8.6) in our study compared with 1.6 (=44.4/28.3) in the study by Lasser et al. (2000). The second, the ratio of the proportion of current smokers with SPD and the prevalence of SPD, was 2.0 (=16.8/8.6) in our study compared with 1.4 (=40.6/28.3) in the

Table 4. Average Number of Cigarettes Smoked Per Day by SPD Status and the Estimated Coefficients From Multivariate Linear Regression Models Among Current Smokers, California, 2007

Characteristics	Daily smokers			Someday smokers		
	Unweighted sample size	Average number of cigarettes per day (95% CI)		Unweighted sample size	Average number of cigarettes per day (95% CI)	
All current smokers	4,756	12.9 (12.4–13.4)		1,855	4.2 (3.8–4.6)	
Acute SPD[a]	483	15.2 (14.0–16.4)		119	5.8 (2.9–8.7)	
Recent SPD[b]	413	12.4 (11.4–13.5)		138	4.5 (3.0–6.0)	
No SPD	3,860	12.7 (12.2–13.3)		1,598	4.0 (3.7–4.4)	
Linear regression model[c]	Coefficient	*p* value			Coefficient	*p* value
SPD status						
Acute SPD[a]	2.01	<0.01*			0.96	0.44
Recent SPD[b]	−0.08	0.88			0.58	0.44
No SPD (reference)						

Note. All the estimates are based on weighted analyses accounting for complex survey design. SPD = serious psychological distress.

[a]Screened for SPD in the past thirty days.

[b]Screened for SPD in the past twelve months but not the past thirty days.

[c]Other covariates, which are included in the linear regression model but are not shown in this table, include age, gender, race/ethnicity, education level, poverty level, employment status, marital status, body weight status, and binge drinking status.

*Statistically significant at $p < .05$, two-tailed test.

study by Lasser et al. (2000). The difference is likely due to a greater degree of mental illness severity captured by the K6 scale.

This study contributes to the literature by including two mutually exclusive levels of SPD acuity—"acute SPD" in the past thirty days and "recent SPD" in the past two to twelve months. We observed that current smoking prevalence increased from 13.1% for persons without SPD to 27.2% for those with recent SPD and to 30.1% for those with acute SPD. This study also extends existing research by examining the proportion of heavy smokers conditional on current smoking. We found that persons with acute SPD not only were more likely to be current smokers but also tended to be heavy smokers once they smoked. Heavier smoking suggests higher nicotine dependence (Diaz et al., 2005). Therefore, this result suggests that persons with SPD in the most recent 30 days should be particularly aided by their clinicians and other professional providers with smoking prevention and cessation efforts (Schroeder, 2009). Individuals with SPD also were less likely to quit smoking after starting. The findings highlight the need for health policy interventions to limit the exposure to tobacco use among those with SPD.

A critical policy intervention to reduce smoking among persons with SPD or other serious mental disorders would be broadening the restriction on tobacco use in hospital settings mandated by the Joint Commission on Accreditation of Hospital Organization to include psychiatric and addictive treatment settings (Prochaska, 2009). Since 1992, U.S. hospitals have banned tobacco use following this mandate, the exceptions being psychiatric and addiction treatment settings. Psychiatric inpatient settings that have voluntarily adopted smoke-free policies have done so with little to no disruption in clinical care (Lawn & Pols, 2005). Incorporating evidence-based tobacco treatment curriculum in psychiatry and psychology residency training programs would provide increased delivery of cessation interventions for smokers with mental illness because it has been shown to improve residents' knowledge, attitudes, confidence, and behaviors for treating tobacco dependence among patients with mental illness (Prochaska, Fromont, et al., 2008). Also, enhancing quitline counseling protocols to best meet the needs of smokers with mental illness would provide an opportunity to improve successful quitting among this group as a recent study indicated that about 25% of smokers who called a large state quitline had major depression in the past two weeks, and they had lower successful quit rates than nondepressed smokers (Hebert, Cummins, Hernández, Tedeschi, & Zhu, 2011). Increasing cigarette taxes could be effective in reducing smoking prevalence among this group based on previous research that smoking participation for individuals with mental illness was significantly sensitive to cigarette prices (Ong, Zhou, & Sung, 2010; Saffer & Dave, 2005).

Our study has several limitations. First, we used cross-sectional data and hence could not examine the trends in the association between SPD and smoking over time or directly test whether the implementation of a comprehensive tobacco control program results in increasing or decreasing smoking disparities between those with and without SPD. Second, as with previous population-based studies (Grant et al., 2004; Hagman et al., 2008; Hickman et al., 2010; Lasser et al., 2000; McClave et al., 2010; Saffer & Dave, 2005), our data only focused on civilian noninstitutionalized populations, and hence, our

results may not generalize to institutionalized or homeless adults. Third, because the CHIS did not ask someday smokers how many days they smoked in the past thirty days, we could not include someday smokers in the calculation of the proportion of all cigarettes consumed by Californians with SPD. Fourth, the 2007 CHIS did not collect other mental health measures, such as the *DSM-IV* diagnoses of mental disorders; therefore, we could not directly assess how the greater degree of smoking disparity found in this study might result from the difference in mental illness measurement.

In conclusion, this case study confirms that disproportionately high smoking prevalence and cigarette consumption among persons with mental illness also exist in California, a state where the smoking prevalence among both the general population and those with SPD is relatively lower than national estimates due to the long-running comprehensive tobacco control program. This finding underscores the need to implement more effective smoking cessation interventions targeting this group, such as integrating tobacco treatment into mental health settings and comprehensive tobacco control programs (Prochaska, 2010). Given the low quit rate among persons with mental illness and the fact that the tobacco industry has designed products and marketing strategies to target consumer segments with mental illness (Cook, Wayne, Keithly, & Connolly, 2003; Prochaska, Hall, & Bero, 2008), it is important to conduct research to examine the effectiveness of potential tobacco control policies, in addition to individual treatment approaches (Schroeder, 2009), in reducing smoking among this subgroup. Also, many mental health providers and administrators believe that tobacco cessation treatment is unrealistic for their clients and will negatively effect on psychiatric symptoms or management (Schroeder & Morris, 2010). Future research evaluating the health and economic burden of smoking for those with mental illness is needed to motivate mental health providers and policy makers to promote and fund smoking cessation treatment for this subgroup.

Declaration of Interests

None declared.

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