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Sex Differences in the Association of Psychological Distress and Tobacco Use

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Abstract

Objectives—To examine sex differences in the relationship between serious psychological distress (SPD) and tobacco use.

Methods—The 2010 National Health Interview Survey data (N = 26,907) were examined to assess tobacco use among adults with and without SPD. Prevalence and odds ratios (OR) were calculated. The possible moderating effect of sex was examined.

Results—Lifetime and current use of cigarettes, cigars and smokeless tobacco (SLT) was more prevalent among those with SPD. Sex interaction terms were significant when modeling lifetime and current cigar and SLT use. The adjusted OR for all tobacco outcomes was greater for women than for men.

Conclusions—Findings suggest a stronger association of SPD and tobacco use for women.

Keywords

tobacco; serious psychological distress; National Health Interview Survey; sex

Tobacco use remains the single most preventable cause of premature illness and death in the United States.¹ Cigarette smoking and use of other tobacco products (OTP) such as cigars and smokeless tobacco (SLT) is responsible for nearly one out of every 4 deaths in the United States² and is associated with cardiovascular and respiratory diseases as well as many types of cancer and adverse reproductive effects.³ Although overall cigarette smoking prevalence continues to decline, the reduction has leveled off in recent years,^{4,5} while the consumption of cigars^{6,7} and SLT^{8,9} has increased. Meanwhile, geographic and sociodemographic disparities in smoking persist.^{4,5} In particular, some subpopulations continue to have high rates of tobacco use despite the lowest overall cigarette prevalence documented in the United States in the last 50 years.

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Human Subjects Statement

This study was exempt from institutional review.

Conflict of Interest Statement

The authors declare no conflicts of interest.

Tobacco use is particularly prevalent among individuals with mental illness. Population-based studies concerning tobacco use and mental illness have reported elevated smoking rates as well as greater nicotine dependence in persons suffering from poor mental health.^{10–15} Indeed, individuals with past-month mental disorders are approximately twice as likely to smoke as other persons and consume an estimated 44.3% of the cigarettes in the United States.¹⁴ Though little research has examined the relationship between mental illness and OTP, a study by Hagman et al¹³ suggests that the association between mental illness and smoking extends to OTP as well.

High prevalence disorders like depression, anxiety, and psychological distress affect women to a greater extent than men¹⁶ and because tobacco use rates are elevated among those with mental health problems,¹⁴ women may be overrepresented among tobacco users with mental health problems. Women are also less successful at quitting smoking and have more severe withdrawal symptoms.¹⁷ Goodwin et al¹⁸ conducted a multi-wave study documenting that depression and anxiety disorders predict the persistence of nicotine dependence and that women were more vulnerable to persistent nicotine dependence. Subsequently, the effect of nicotine and tobacco use among women with mental health disorders should be of particular concern. Women who smoke also face specific threats to health, including but not limited to, increased risk of adverse cardiovascular events, female cancers, and bone fractures.¹⁷ Identifying the groups at highest risk for tobacco use is essential to informing clinical and policy interventions and improving public health. Yet, there is limited research specifically examining the role of sex in the relationship between mental health and tobacco use in population-based samples. In addition, few studies report the use of tobacco products other than cigarettes.

Since the creation of the K6 scale,^{19,20} a brief survey to measure for serious psychological distress (SPD) in the general population, several population-based surveys such as the National Survey of Drug Use and Health (NSDUH) and the National Health Interview Survey (NHIS) have measured both tobacco use prevalence and SPD. Some researchers have used these data to examine the relationship between mental health and tobacco use behavior but did not consider whether sex may influence this relationship.^{15,21} To date, only one previous study has examined the relationships between current tobacco use and past year psychiatric morbidities, including SPD, by sex. Using data from 4 successive samples of the NSDUH, Peiper and Rodu²² found statistically significant differences for current tobacco use and SPD among women as well as consistently stronger associations for major depressive episode and anxiety disorder. However, unlike Hagman et al,¹³ they found no association between SLT use among adults and past year mental health problems. These findings underscore the need for additional research to explore the sex-specific effects of mental health on tobacco use behavior. Accordingly, this study uses the 2010 NHIS to examine the relationship between SPD and tobacco use behavior, including OTP, and explore whether sex moderates the strength of the relationship between SPD and tobacco use.

METHODS

Data Source

The NHIS is a multistage cross-sectional household interview sample survey designed to provide nationally representative estimates of self-reported health information for the non-institutionalized civilian adult population. Demographic characteristics and other health-related information were collected via in-person interviews conducted by trained staff and via computer-assisted technology. We utilized the 2010 NHIS survey data because of its inclusion of the cancer control module, which asked detailed tobacco-related questions, in addition to basic cigarette smoking prevalence. Additional demographic variables were obtained from other files and merged with the cancer control module according to published National Center for Health Statistics guidelines. Data from 26,907 responding adults of the 2010 NHIS were included in the present study.²³

Measures

SPD was measured by the Kessler-6 Scale (K6),^{19,20} a 6-item screener for non-specific psychological distress, in which respondents are asked to rate how often in the preceding 30 days they have felt “so sad that nothing could cheer them up,” “nervous,” “restless or fidgety,” “hopeless,” “that everything was an effort,” and “worthless.” Each item was rated on a Likert scale where “all of the time” was coded as 4, “most of the time” was coded as 3, “some of the time” was coded as 2, “a little of the time” was coded as 1, and “none of the time” was coded as 0. In accordance with Kessler scoring guidelines, SPD was indicated if the sum of all 6 items exceeded a score of 12.²⁰ The validity, reliability, and internal consistency of the K6 scale in the general population has been demonstrated in previous research.^{19,20}

Demographics and tobacco use characteristics were examined. In accordance with standard practice in tobacco research, lifetime cigarette smoking was defined as having smoked at least 100 cigarettes; lifetime cigar smoking was defined as having smoked at least 50 cigars; and lifetime SLT use was defined as having used snuff and/or chew at least 20 times. Current tobacco use (cigarettes, cigars, or SLT) was defined as now using the product daily or some days. Poly-tobacco use was defined as current use of more than one tobacco product.

Analysis

Sample weights, provided by the National Center for Health Statistics, were applied to adjust for nonresponse and the varying probabilities of selection, including those resulting from oversampling. SUDAAN 11.0.0,²⁴ which corrects for the complex sample design of the NHIS, was used to calculate prevalence estimates and 95% confidence intervals as well as crude and adjusted odds ratios.

Differences in SPD prevalence by sociodemo-graphic characteristic were tested using Wald-F chi-square tests, with p-values less than .05 considered statistically significant. Current and lifetime use of cigarettes, cigars and SLT, as well as poly-tobacco use, were modeled to generate unadjusted odds ratios. To examine the unique contribution of SPD status with respect to ever and past month use of each type of tobacco products, multiple logistic

regression analyses were conducted adjusting for age, sex, race/ethnicity, educational level, and household income. Covariates were selected based on findings of significant bivariate associations with SPD or tobacco use as well as prior literature. Subsequently, an interaction term (ie, sex*SPD) was added to each adjusted model to test for the possible moderating effect of SPD and sex, and the tobacco use outcomes were modeled again, stratified by sex, to generate sex-specific crude and adjusted odds ratios. Model parameter estimates were considered statistically significant if the Wald-F chi-square p-value was less than .05.

RESULTS

Overall, 3.3% of adults in the US were found to have SPD in the preceding month. Individuals with and without SPD differed significantly on a number of demographic variables (Table 1). SPD was significantly associated with sex ($p = .0018$), age ($p < .0001$), race/ethnicity ($p = .0119$), marital status ($p < .0001$), education ($p < .0001$) and income ($p < .0001$). Compared to those without SPD, adults with SPD were more likely to be women (58.4% vs. 51.5%), aged 45 to 64 years (46.7% vs. 34.6%), Black/African American (13.9% vs. 11.9%) or Hispanic (15.3% vs. 14.0%), unmarried (52.4% vs. 38.3%), have attained a high school diploma or less (59.4% vs. 40.4%), and report an annual household income of less than \$35,000 (63.2% vs. 33.3%).

The prevalence and crude and adjusted odds of each tobacco use outcome (ie, lifetime use of cigarettes, cigars, and SLT; current use of cigarettes, cigars, and SLT; and poly-tobacco use) for those with SPD as compared to those without SPD are displayed in Table 2. The prevalence of lifetime and current use of cigarettes, cigars, and SLT was greater among adults with SPD than among adults without SPD. When controlling for age group, sex, race/ethnicity, education, marital status, and income, the presence of SPD was significantly associated with greater odds of lifetime cigarette smoking ($p < .0001$), lifetime cigar smoking ($p = .0095$), lifetime SLT use ($p = .0041$), current cigarette smoking ($p < .0001$), current cigar use ($p = .0048$), and current poly-tobacco use ($p = .0014$).

When each adjusted logistic regression model was repeated to include an interaction term combining sex and SPD status, sex was found to be a significant effect modifier in the relationships between SPD and lifetime cigar use ($p = .0058$), lifetime SLT use ($p = .0493$), current cigar use ($p = .0198$), and current SLT use ($p = .0044$), but not lifetime cigarette use ($p = .9723$), current cigarette use ($p = .6709$), or current poly-tobacco use ($p = .0938$) (data not shown). Subsequently, lifetime and current use of cigars and SLT were each modeled again, stratified by sex (Table 3). The adjusted odds of lifetime and current cigarette, cigar, and SLT use for those with SPD as compared to those without SPD was greater among women than among men, and the relationship between SPD and ever SLT use, as well as current cigar and SLT use, was significant only for women. Among men, the adjusted odds ratios (AOR) of lifetime cigar smoking, lifetime SLT use, current cigar smoking, and current SLT use were 1.14 (95% CI, 0.83–1.56), 1.48 (1.05–2.08), 1.24 (0.8–1.93) and 1.10 (0.68–1.77), respectively; among women, the AORs of lifetime cigar smoking and SLT use and current cigar smoking and SLT use were 2.00 (95% CI, 1.10–3.61), 2.60 (1.19–5.68), 2.21 (1.23–3.96) and 4.28 (1.20–15.32), respectively.

DISCUSSION

The prevalence of lifetime and current use of cigarettes, cigars, and SLT was higher among adults with SPD than among adults without SPD. These results are consistent with previously published research that have reported increased smoking prevalence among people with mental health disorders.^{11,12,15,25,26} The relationship between SPD and current and lifetime use of cigars and SLT was modified by sex. Compared to women without SPD, women with SPD had greater odds of current cigar and SLT.

The present study adds to the existing research on mental health and smoking by examining the role of sex in the relationship between SPD and tobacco use, including non-cigarette tobacco products, in a nationally representative sample. We found that sex was a significant effect modifier in the relationship between SPD and use of cigars and SLT, but not in the relationship between SPD and cigarette smoking. The association between SPD and cigar and SLT use was stronger for women, and the relative magnitude of the association between tobacco use and SPD was not as consistent among men, suggesting that the relationship between SPD and tobacco use may be different for men and women. Although SPD was not a significant predictor of current cigar and SLT use among men, women with SPD were significantly more likely to report current use of cigars and SLT, respectively, than women without SPD. This finding is of particular concern given the diversity of tobacco products whose appeal may be increasing among women (eg, flavored cigars, favored “spit-less” SLT). This finding contrasts with the results from Pieper and Rodu²² who reported no significant association between SLT use and past year psychiatric disorders, including SPD, for both men and women. However, both studies demonstrate that sex may influence the relationship between SPD and tobacco use, specifically, that the impact on women may be stronger than for men.

Cigar and SLT use is predominately a behavior of males. Indeed, these data showed that the use of these products, in particular SLT, among women without SPD was low. Consequently, there is limited literature on cigar and SLT use among women, and the mechanisms behind the association between OTP use and women with SPD are not clear. McKee, Maciejewski, Falba, and Mazure²⁷ found that stressful life events had a greater negative impact on women’s smoking status (ie, relapse to smoking, less likely to quit) compared to men’s, even when controlling for other factors such as depression. Combined with a high risk for persistent nicotine dependence,¹⁸ women may be more likely to cope with stressors by using tobacco and may seek OTP when not able to smoke cigarettes (eg, affordability, clean indoor air laws).

This study is subject to limitations that are common to survey research. The data presented here are based on self-report, which may be subject to under-or over-reporting. However, previous studies have established the use of self-report as an accurate assessment of tobacco use,²⁸ and the K6 has been a consistently useful tool for assessing SPD in survey populations.^{13,20} Moreover, the overall SPD prevalence of 3.3% in our study compares to the prevalence of past-month SPD found in previously published studies using NHIS.¹⁵ It should be noted that SPD is measured differently in the NHIS and NSDUH, with NHIS measuring past month SPD and NSDUH measuring past year SPD; thus, estimates of SPD

prevalence will be higher in the NSDUH. The cross-sectional nature of the NHIS survey presents an additional limitation, as it does not allow for temporal or causal assessment. Additionally, the NHIS protocol excludes institutionalized populations, which may affect generalizability of these findings. Finally, this study relied on the K6 scale as a proxy for mental illness, which, although a validated instrument for determining SPD in general^{19,20} and strongly associated with mental disorders of long duration,²⁰ cannot distinguish specific mental health diagnoses.

Our study has several important implications. Our findings support examining the role of sex in the association of SPD and tobacco use. In particular, this work suggests that sex-specific analyses may be a more valuable method of investigation than adjustment for the impact of sex. Like other studies, our findings also highlight the need to assess mental health status adequately and routinely in both clinical settings and population-based tobacco surveillance.^{11,13,15} It is also essential that continued surveillance of tobacco use include the use of all tobacco products, including new and emerging products. This study is one of the few to examine sex's role in the relationship between mental health status and tobacco use behavior. Further research, in particular, sex-specific analyses, is critical to improve understanding of these variables on women.

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Table 1Demographic Distribution by SPD^a Status and Prevalence of SPD by Demographic Group, NHIS 2010

	No SPD (N = 25,884)		SPD (N = 1,023)		Prevalence of SPD		p-value ^d
	%	(95% CI) ^c	%	(95% CI)	%	(95% CI)	
Overall	100.0	---	100.0	---	3.3	(3.0–3.6)	-
Sex							.0018
Male	48.5	(47.8–49.3)	41.6	(37.9–45.4)	2.8	(2.5–3.2)	
Female	51.5	(50.7–52.3)	58.4	(54.6–62.1)	3.7	(3.4–4.1)	
Age							<.0001
18–24 years old	13.0	(12.4–16.6)	8.9	(6.9–11.4)	2.3	(1.7–3.0)	
25–44 years old	35.5	(34.8–36.3)	33.4	(30.1–36.9)	3.1	(2.7–3.5)	
45–64 years old	34.6	(33.8–35.3)	46.7	(42.9–50.6)	4.4	(3.9–5.0)	
65 or Older	16.9	(16.3–17.6)	11.0	(9.0–13.3)	2.1	(1.8–2.6)	
Race/Ethnicity							.0119
White	68.6	(67.6–69.5)	67.5	(64.1–70.8)	3.3	(2.9–3.6)	
Black/African American	11.9	(11.2–12.6)	13.9	(11.6–16.5)	3.8	(3.2–4.5)	
Hispanic	14.0	(13.4–14.6)	15.3	(12.9–18.1)	3.6	(3.1–4.3)	
Other	5.6	(5.2–6.0)	3.3	(2.2–4.8)	1.9	(1.3–2.9)	
Marital Status							<.0001
Married or living w/partner	61.7	(60.9,62.6)	47.6	(43.8–51.5)	2.6	(2.3–2.9)	
Divorced, widowed, or separated	16.9	(16.4,17.4)	29.8	(26.7–33.2)	5.7	(5.1–6.5)	
Single, never married	21.4	(20.7,22.1)	22.6	(19.7–25.7)	3.5	(3.0–4.1)	
Education							<.0001
< High school	13.8	(13.2–14.4)	27.5	(24.4–30.7)	6.3	(5.5–7.2)	
High school diploma or GED	26.6	(25.9–27.3)	31.9	(28.7–35.3)	3.9	(3.5–4.5)	
Some college	30.5	(29.7–31.2)	29.6	(26.3–33.1)	3.2	(2.8–3.7)	
College graduate	28.8	(27.9–29.7)	10.8	(8.4–13.8)	1.3	(1.0–1.6)	
Annual Income							<.0001

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	No SPD (N = 25,884)		SPD (N = 1,023)		Prevalence of SPD		p-value ^d
	%	(95% CI) ^c	%	(95% CI)	%	(95% CI)	
Less than \$35,000	33.3	(32.3–34.3)	63.2	(59.1–67.2)	6.3	(5.7–6.9)	
\$35,000 – \$49,999	14.8	(14.3–15.4)	12.4	(10.0–15.2)	2.9	(2.3–3.6)	
\$50,000 – \$74,999	18.2	(17.6–18.8)	11.4	(9.1–14.4)	2.2	(1.7–2.7)	
\$75,000 or More	33.7	(32.5–34.9)	12.9	(10.1–16.4)	1.3	(1.0–1.7)	

Note.

Column percentages may not total 100% due to item non-response

^a Past-month serious psychological distress

^b National Health Interview Survey

^c Confidence interval

^d Wald-F chi square Test

Table 2
Prevalence and Relative Odds of Tobacco Use Outcomes by SPD^a Status, NHIS^b 2010

	No SPD (N = 25,884)	SPD (N = 1023)	UOR ^c	(95% CI) ^d	AOR ^e	(95% CI)
Lifetime Use						
Cigarettes ^f	40.3	58.8	2.11	(1.79–2.50)	1.77	(1.52–2.08)
Cigars ^g	6.7	8.5	1.28	(0.99–1.66)	1.44	(1.09–1.89)
SLT ^h	6.7	9.7	1.50	(1.17–1.93)	1.52	(1.14–2.01)
Current Useⁱ						
Cigarettes	18.6	39.6	2.88	(2.44–3.34)	2.00	(1.71–2.34)
Cigars	4.0	5.6	1.40	(1.01–1.95)	1.61	(1.16–2.23)
SLT	2.6	3.4	1.33	(0.90–1.96)	1.21	(0.78–1.87)
Poly-tobacco Use	2.4	5.5	2.34	(1.58–3.47)	1.88	(1.28–2.77)

Note.

^aPast-month serious psychological distress

^bNational Health Interview Survey

^cUnadjusted Odds Ratio

^dConfidence interval

^eAdjusted odds ratio (adjusted for age group, sex, race/ethnicity, education, marital status, and income)

^fSmoked at least 100 cigarettes in lifetime

^gSmoked at least 50 cigars in lifetime

^hUsed smokeless tobacco (snuff or chew) at least 20 times in lifetime

ⁱNow use product every day or some days

Table 3

Prevalence and Odds of Tobacco Use Outcomes by Sex and SPD^a Status, NHIS^b 2010

	Male (N = 11,870)			Female (N = 15,037)		
	No SPD (N = 11,498)	SPD (N = 372)	AOR ^c (95% CI) ^d	No SPD (N = 14,386)	SPD (N = 651)	AOR (95% CI)
Lifetime Use						
Cigars ^e	12.8	15.8	1.14 (0.83–1.56)	1.0	3.2	2.00 (1.10–3.61)
SLT ^f	13.0	19.9	1.48 (1.05–2.08)	0.7	2.5	2.60 (1.19–5.68)
Current Use^g						
Cigars	7.2	9.1	1.24 (0.80–1.93)	1.0	3.1	2.21 (1.23–3.96)
SLT	5.1	6.3	1.10 (0.68–1.77)	0.2	1.3	4.28 (1.20–15.32)

Note.

^aSerious Psychological Distress

^bNational Health Interview Survey

^cAdjusted odds ratio (adjusted for age group, race/ethnicity, education, marital status, and income)

^dConfidence interval

^eSmoked at least 50 cigars in lifetime

^fUsed smokeless tobacco (snuff or chew) at least 20 times in lifetime

^gNow use product every day or some days