Original Investigation

Psychological Distress and Smoking Behavior: The Nature of the Relation Differs by Race/Ethnicity

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Abstract

Objective: We explored how the relation between psychological distress and smoking behavior differed as a function of race/ethnicity of respondents to a representative national survey.

Methods: Data from the 2007 Health Information National Trends Survey were analyzed. Participants reported experiences of psychological distress in the past 30 days, race/ethnicity, current smoking status (smoker/nonsmoker), and number of cigarettes smoked per day. Logistic regression and linear regression analyses were used to examine the influence of race, distress, and their interaction on smoking behavior using survey weighting techniques to account for sampling strategy and nonresponse.

Results: For current smoking status, there was a significant interaction between race and psychological distress. Follow-up analyses indicated that psychological distress was related to smoking status for White but not for Black or Hispanic respondents. Similar results were found for number of cigarettes smoked per day among current smokers.

Conclusions: The results suggest that the often-reported association between psychological distress and smoking is relatively specific to White individuals. The relation does not appear to characterize either Black or Hispanic individuals.

Introduction

Cigarette smoking is the single largest behavioral cause of death in the United States (Danaei et al., 2009; Mokdad, Marks, Stroup, & Gerberding, 2004). There are substantial disparities in tobacco use and in the consequences of tobacco use as a function of race and/or ethnicity (Fagan, Moolchan, Lawrence, Fernander, & Ponder, 2007; Fagan et al., 2004; Moolchan et al., 2007; U.S. Department of Health and Human Services, 1998). Of particular relevance, patterns of use differ by race/ethnicity, often in quite complex ways (Giovino, 2002; Kabat, Morabia, & Wynder, 1991; King, 1997). There are differences based on race/ethnicity in age of smoking initiation (Ling, Neilands, & Glantz, 2009; Trinidad, Gilpin, Lee, & Pierce, 2004; U.S. Department of Health and

Human Services, 1998), number of cigarettes smoked per day and days smoked per month (U.S. Department of Health and Human Services, 1998), and nicotine intake and metabolism (Benowitz et al., 1999; Moolchan, Franken, & Jaszyna-Gasior, 2006).

These differences are often quite complex and belie a simple “one ethnic group smokes more than another” explanation. For example, age of initiation of smoking differs among White, Black, and Hispanic adolescents (Ling et al., 2009; Trinidad et al., 2004; U.S. Department of Health and Human Services, 1998), but among adults, smoking rates are relatively comparable for Whites and Blacks and somewhat lower for Hispanics (Caraballo, Yee, Gfroerer, & Mirza, 2008; Pampel, 2008; U.S. Department of Health and Human Services, 1998). Similarly, White adolescents are more likely to become established smokers relative to their Black counterparts (Choi, Pierce, Gilpin, Farkas, & Berry, 1997; Flint, Yamada, & Novotny, 1998), but among adults, Black smokers typically report lower cessation rates relative to White smokers (King, Polednak, Bendel, Vilsaint, & Nahata, 2004). This pattern may be partly attributable to higher rates of smoking menthol cigarettes among Black smokers (Giovino et al., 2004) and higher rates of failure to quit among those who smoke menthol cigarettes (Gandhi, Foulds, Steinberg, Lu, & Williams, 2009).

The complexity of differences in patterns of tobacco use by race/ethnicity suggests the possibility that the mechanisms that drive smoking behavior may differ across race/ethnic groups. A well-established influence on smoking behavior is psychological distress. Across a range of ways of conceptualizing and assessing negative psychological and emotional states, higher levels of psychological distress are associated with higher levels of smoking and increased difficulty in quitting smoking (Chaiton, Cohen, O’Loughlin, & Rehm, 2009; Kassel, Stroud, & Paronis, 2003; Morrell & Cohen, 2006). Smoking behavior is associated with generalized psychological distress as well as classifiable psychological disorder (Hagman, Delnevo, Hrywna, & Williams, 2008; Honda, Goodwin, & Neugut, 2004; Lawrence, Mitrou, & Zubrick, 2009; McClave et al., 2009). For example, rates of depression are significantly higher in smokers relative to the general population (Covey, Glassman, & Stetner, 1998; Lasser et al., 2000), and

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there are established associations between anxiety disorders and smoking behavior (Zvolensky & Bernstein, 2005).

To our knowledge, no previous work has directly examined whether the relation of psychological distress to smoking behavior differs as a function of race or ethnicity (although there have been examinations of specific types of distress; e.g., Berg, Choi, Kaur, Nollen, & Ahluwalia, 2009; Nezami et al., 2005). There is, however, some evidence that suggests it is at least possible that there might be differences. There is substantial evidence that nicotine metabolism differs as a function of race; for example, metabolism is typically slower in Black smokers relative to their White counterparts (Benowitz et al., 1999; Perez-Stable, Herrera, Jacob, & Benowitz, 1998). This difference in metabolism leads to differences in serum nicotine/cotinine levels as a function of cigarettes consumed (Caraballo et al., 1998) and might explain at least some of the racial variation in smoking patterns and amounts (Moolchan et al., 2006). Given that a key physiological effect of nicotine is activation of the dopamine reward pathway (Di Chiara & Imperato, 1988; Volkow & Wise, 2005; Wise & Rompre, 1989), the documented differences in nicotine metabolism by race might plausibly impact the affective effects of nicotine consumption. This could lead to differences in whether and how affective and psychological distress states influence smoking behavior by race, given that a typical hypothesis for why negative affectivity and psychological distress are associated with smoking is a mood-regulation hypothesis (Kassel et al., 2003).

Given the plausibility of a difference in the relation of psychological distress to smoking as a function of race, we tested whether the strength and/or direction of the relation between generalized psychological distress and smoking differed among White, Black, and Hispanic respondents to a nationally representative telephone survey. We explored the relation of generalized psychological distress (assessed with Kessler's K6 instrument, which has been shown to be predictive of smoking in other population representative samples; Hagman et al., 2008) to current smoking status and, for current smokers, to number of cigarettes smoked per day. We conducted moderator analyses to determine if the strength and/or direction of the relation differed by participant race/ethnicity.

Methods

The study reported here used data from the National Cancer Institute's Health Information National Trends Survey (HINTS) 2007 dataset. HINTS is a survey study of a nationally representative sample. It was designed to provide a variety of information about cancer-related behaviors, decision making, information seeking, and other variables relevant to cancer prevention and control. Additional details about the HINTS survey, sampling framework, and study purposes have been published (Hesse, Moser, Rutten, & Kreps, 2006; Nelson et al., 2004). Full reports of the methodology for the HINTS 2007 survey have been reported (Cantor et al., 2009), and a full copy of the survey is available at <http://hints.cancer.gov/instrument.jsp>

Sample, Design, and Procedure

The overall HINTS 2007 survey sample consisted of 7,674 individuals. These participants were recruited in a mixed-mode survey

design; approximately half of the respondents ($n = 3,582$) completed the survey through a mailed, paper and pencil questionnaire study design, whereas the other half of respondents completed a telephone-based survey ($n = 4,092$). The overall response rate for the mailed survey was calculated as 30.1%; for the random digit dialing survey, the response rate was 24.2% (complete details concerning calculation of response rates can be found in Cantor et al., 2009). For this study, analyses were restricted to White, Black, and Hispanic individuals who provided complete responses to the current smoking status questions, the psychological distress assessment, and the relevant demographic control items (described below). These criteria led to an analysis sample $n = 5,718$.

Full details of the HINTS 2007 study design and data collection procedures are reported elsewhere (Cantor et al., 2009). Of particular relevance to this study, the HINTS survey design and sampling procedures are designed to provide a U.S. population-representative sample. Blacks and Hispanics are oversampled to provide stable estimates for those racial/ethnic groups. As described above, HINTS 2007 used a dual-frame sampling design with a between-subjects use of either mail-based or telephone-based sampling and data collection. The study was conducted from January to April 2008.

Measures

Race

Participants self-reported their race/ethnicity. Participants were given a list of race category labels and were asked to select one or more to describe their race. Separately, participants were asked to report whether they were of Hispanic/Latino ethnicity. These responses were used to create race/ethnicity category variables: White, non-Hispanic (hereafter referred to as White; weighted percentage of sample = 68.4%); Black or African American, non-Hispanic (referred to as Black; weighted sample percentage = 11.7%); and Hispanic (weighted percentage of sample = 13.2%). Members of other racial/ethnic groups were sampled (American Indian/Alaska Native, Asian, Hawaiian/Pacific Islander, and multiracial/multiethnic), but the sample sizes for those sub groups were significantly lower and were thus not separately examined.

Smoking Behavior

Participants responded to a series of questions about their smoking behavior. They were first asked whether they had smoked at least 100 cigarettes in their lifetime. Those answering yes were then asked whether they currently smoked cigarettes every day, on some days, or not at all. Finally, those who reported currently smoking reported how many cigarettes they typically smoked on each day that they smoked.

Responses to the yes/no questions were used to categorize individuals as never-smokers (those who answered no to the ever smoked 100 cigarettes question), former smokers (those who answered yes to the ever smoked question but not at all to currently smoking), and current smokers (those who answered yes to the 100 cigarette question and either every day or some days to the current smoking question).

Current Psychological Distress

Participants reported experiences of generalized psychological distress over the past thirty days using the K6 questionnaire

(Kessler et al., 2002). Participants were given the prompt “How often did you experience each over the last 30 days?” For each of six symptoms of psychological distress (so sad that nothing could cheer you up, nervous, restless or fidgety, hopeless, that everything was an effort, and worthless), participants responded on a 5-point item response format ranging from “all of the time” to “none of the time.” These six items had good internal consistency ($\alpha = .86$). The items were reverse scored so that higher numbers indicated higher levels of psychological distress, and the mean of the six items was computed as the generalized measure of psychological distress.

Demographics

A variety of demographic features were assessed. Relevant to the analyses reported here, participants reported gender, age, education, and income (although there were missing data on the income variable [approximately 7% of the sample; the proportion of respondents missing data for income did not differ by race/ethnicity], income significantly predicted smoking variables, even with education included in the model as an additional socioeconomic status metric. Therefore, all analyses included income as a covariate. Analyses without the income variable showed the same pattern of results). Education and income both differed by race. Analysis without the demographic covariates had the same pattern of results as the analyses reported here.

Analysis Strategy

All reported analyses were conducted in STATA version 10 (STATA Corp., College Station, TX). Analyses used STATA’s survey design features to incorporate the HINTS sampling weights, which account for the sampling design, population oversampling, and nonresponse patterns in the dataset (additional information on the sampling weights can be found in Cantor et al., 2009). Prior to conducting the main data analyses reported here, we tested for differences in reported relations between variables as a function of survey mode (using techniques described by National Cancer Institute, 2009). None of the hypothesis testing analyses were influenced by survey mode. All analyses were conducted controlling for the demographic characteristics described above.

For reports of smoking behavior, we compared current smokers to those not currently smoking and never-smokers to ever-smokers. For those who reported smoking every day, we also examined the continuous measure of number of cigarettes smoked per day. Race analyses compared White participants to Black and to Hispanic participants, respectively.

Differences in psychological distress and smoking as a function of race were examined using linear regression for psychological

distress and number of cigarettes smoked per day and logistic regression for smoking status. The psychological distress and differences in the psychological distress–smoking relation as a function of race were examined using logistic regression for smoking status and linear regression for number of cigarettes smoked; in both, the key predictors were race, psychological distress, and the interaction of the two. In addition, given evidence that specific types of negative affect can have differing effects on cognition and behavior (Ellsworth & Scherer, 2003; Lerner, Gonzalez, Small, & Fischhoff, 2003; Lerner, Small, & Loewenstein, 2004), we conducted exploratory analyses using each individual K6 item rather than the overall measure in the analyses described above. Because smoking is associated with both low-arousal (e.g., depression) and high-arousal (e.g., anxiety) types of psychological distress (Covey et al., 1998; Lasser et al., 2000; Zvolensky & Bernstein, 2005), we also separately examined high- and low-arousal items.

Results

Sample Characteristics

The population-weighted sample was 51% female and had an average age of 45.8 years ($SD = 17.8$ years, range is 18–97 years; all point estimates and population proportions are based on jackknifed estimates based on sampling design weights). The weighted population proportions were 69% White, 11% Black, and 13% Hispanic (remaining participants were other non-Hispanic race/ethnic groups or multiracial and, as discussed above, were not included in analyses).

Descriptive statistics for psychological distress, smoking status, and cigarettes per day by race are presented in Table 1. Relative to White respondents, Hispanic respondents reported significantly higher levels of psychological distress (the White–Black difference was marginally significant; $p = .06$); Black and Hispanic respondents reported fewer cigarettes smoked per day. There were no differences by race in current smoking status.

Race, Psychological Distress, and Smoking Status

We begin by examining predictors of whether a person was currently a smoker or a nonsmoker (never-smoker or former smoker). As described above, all reported analyses controlled for gender, age, household income, and education. Table 2 reports the odds ratios for the relation of psychological distress to smoking status for the overall sample and each demographic group. When the entire HINTS population was included in the analysis, there was a significant relation between psychological

Table 1. Characteristics of the Sample

	Psychological distress mean (95% CI)	% Current smokers (95% CI)	Cigarettes/day, mean (95% CI)
Overall Sample ($N = 5,718$)	1.87 (1.84–1.90)	21.4 (20.0–22.9)	15.50 (14.50–16.51)
White ($n = 4,588$)	1.82 (1.79–1.85)	21.3 (19.7–22.9)	17.25 (16.11–18.39)
Black ($n = 580$)	1.92 (1.82–2.01)	23.8 (18.7–29.0)	10.59 (9.36–11.81)
Hispanic ($n = 550$)	1.98 (1.89–2.08)	21.4 (16.0–26.9)	9.69 (6.83–12.56)

distress and current smoking status such that higher levels of psychological distress were associated with a greater likelihood of current smoking.

However, this overall effect was qualified by a Race $\times$ Psychological Distress interaction for both comparisons of White and Black and of White and Hispanic respondents; White/Black interaction $t(49) = -2.34, p < .05$; White/Hispanic interaction $t = -2.36, p < .05$. To examine the nature of this interaction, we conducted separate subgroup analyses to examine the relation between psychological distress and smoking status for each race/ethnic group. As can be seen in Table 2, in these analyses, the psychological distress–smoking status relation was significant for White respondents to the survey but not for either Black or Hispanic respondents.

We also conducted analyses comparing current smokers to never-smokers. The results were consistent with those reported above for current smoking versus nonsmoking; in both cases, there was a significant Race $\times$ Distress interaction (both interaction $ps < .05$). As can be seen in Table 2, follow-up analyses showed a significant distress–smoking status relation for White respondents but not for either Black or Hispanic respondents.

Race, Psychological Distress, and Current Smoking Behavior

As with smoking status, analyses of all current smokers revealed a significant relation between psychological distress and number of cigarettes smoked per day. Consistent with the smoking status analyses, higher levels of psychological distress were associated with a greater number of cigarettes per day, $b = 1.30, t = 2.69, p < .01$ (95% $CI = 0.33$ – 2.28).

However, the overall sample relation was again qualified by Race $\times$ Psychological Distress interactions. For Whites versus Hispanics, there was a significant interaction, $t = -3.24, p < .002$; for Whites versus Blacks, the interaction was of the same direction but was marginally significant, $t = -1.60, p = .11$. To elucidate the nature of the interactions, we again conducted subgroup analyses. For Whites, there was a marginally significant relation between psychological distress and number of cigarettes smoked per day; $b = 1.13, t = 1.68, p = .07$ (95% $CI = -.09$ to 2.35). There was no relation between distress and number of cigarettes for either the Black or the Hispanic respondents; Black: $b = 1.11, t = 1.25, p = .23$ (95% $CI = -0.68$ to 2.92) and Hispanic: $b = -0.71, t = -.57, p = .57$ (95% $CI = -3.23$ – 1.81). We also conducted analyses examining whether daily versus occasional smoking moderated the relation between psychological distress and cigarettes per day; there were no significant interactions.

Additional Analyses

We also conducted analyses examining each of the six psychological distress items separately and examining items indexing high-arousal psychological distress (e.g., restless/fidgety) separately from those assessing low-arousal psychological distress (e.g., depressed). Results were consistent with those reported above for the full psychological distress scale.

Discussion

The results reported showed a pattern in which the relation of psychological distress to smoking behavior differed as a function of a participant's self-reported race. For White participants, psychological distress was associated with both smoking status, with greater psychological distress associated with current smoking, and with number of cigarettes smoked per day, with higher psychological distress associated with more smoking. By contrast, there was not a relation between psychological distress and either smoking status or cigarettes per day for Black or Hispanic survey respondents.

Implications

The finding that the psychological distress–smoking relation differs by race/ethnicity leads to several interesting questions. First, how might one explain the different relations of smoking and psychological distress as a function of race? Although the data presented here do not allow us to directly address this question, current theorizing on the interrelations of psychological and affective states and smoking provides some plausible explanations. For example, the relationship between negative affectivity and smoking may be bidirectional (Koob & Le Moal, 2008; Parrott & Kaye, 1999). One of the ways that smoking could increase negative affect and psychological distress and along with it the motivation to regulate affective and psychological states is nicotine withdrawal (Parrott & Kaye, 1999). If Blacks are less likely than Whites to experience withdrawal symptoms, this could at least partly account for weaker correlations between smoking and psychological distress. Furthermore, as Lam et al. (2008) reasoned, faster metabolism of nicotine by Whites might result in more frequent experiences of withdrawal among Whites than among Blacks and a pattern of withdrawal escape that leads to contingencies between smoking and negative affect reduction that are more common among Whites than among Blacks. Similarly, it has been suggested that slower nicotine metabolism could account for reports of less severe nicotine withdrawal among Blacks than among Whites (Breslau, Kilbey, & Andreski, 1992; Riedel, Robinson, Klesges, & McLain-Allen, 2003).

Table 2. Relation of Psychological Distress to Smoking Status

Race/ethnicity	Psychological distress—smoking status	Psychological distress—smoking status
	Nonsmokers vs. current smokers, OR (95% CI)	Never smokers vs. current smokers, OR (95% CI)
Overall sample	1.52 (1.32–1.75)	1.51 (1.31–1.75)
White	1.66 (1.41–1.94)	1.63 (1.37–1.96)
Black	1.02 (0.72–1.46)	0.97 (0.63–1.49)
Hispanic	1.27 (0.92–1.76)	1.34 (0.97–1.87)

Note. ORs are adjusted for gender, age, education, and income. OR = odds ratio.

A second question concerns the nature of race/ethnicity in the context of these findings. It is important to note that the findings reported are all based on individuals' self-description of themselves in terms of one or more categorical race/ethnic group memberships. The race construct is multifaceted and potentially incorporates both biological and sociocultural components (Fernander, Shavers, & Hammons, 2007; Rebbeck & Sankar, 2005). The discussion of negative affect, withdrawal, and smoking above describes ways in which biological aspects of race might elucidate the findings reported here. However, given that race is also a sociocultural construct, it is also important to consider how sociocultural aspects of race might be related to the findings. For example, experiences of discrimination are associated with negative affect (e.g., Brondolo et al., 2008) and with smoking (e.g., Landrine & Klonoff, 2000). Given this, one might argue that the discrimination–smoking relation might be mediated by psychological distress. However, the analyses reported here show no relation of psychological distress and smoking for Blacks and Hispanics. It may be that the facets of distress captured by the K6's focus on overall psychological distress are separate and distinct from those aroused by experiences of discrimination (for an example of specific types of affect having different effects on substance use in the context of discrimination, see Gibbons et al., 2010). Future research is needed to address the role of sociocultural aspects of race, including discrimination, in the relation of psychological distress to smoking behavior.

Finally, the findings about the relation between psychological distress and smoking behavior raise interesting questions about the potential nature of race and ethnic differences in smoking cessation. Success at quitting smoking may differ as a function of race and ethnicity, with Blacks being less likely to maintain abstinence (King et al., 2004; Messer, Trinidad, Al-Delaimy, & Pierce, 2008). Understanding factors contributing to that relationship potentially have implications for how we design targeted intervention programs. Negative affect is associated with smoking relapse (Shiffman & Waters, 2004); the findings concerning differences in the relation of psychological distress to smoking suggest that research examining differences by race in triggers of relapse should be conducted.

Limitations

There are, of course, limitations to the study, which should be addressed. First, it is important to note that the study is cross-sectional, so the findings should be properly interpreted as associations between distress and smoking and differences in association by race rather than as patterns of causal relations. Second, it is important to note that the K6 measure is a measure of overall psychological distress. There are specific dimensions of negative affect, which are not well assessed by the measure (e.g., stress, anger; see Collins & Lepore, 2009; Webb & Carey, 2008). Future research should examine a broader spectrum of distress and affective states in relation to smoking status. Finally, although the study is designed as a population-representative sample, the nature of survey design is such that there may be elements of the population who are not well represented (e.g., individuals without landline telephones, including those with cell phones and low SES individuals) and the point estimates in the survey may not fully mesh with those of other population representative reports (e.g., smoking rates in the National Health Interview Study; Centers for Disease Control and Prevention, 2008).

Conclusions

The relation of psychological distress to smoking behavior differed based on race/ethnicity; the results reported here suggest that psychological distress and smoking relations are relatively specific to White individuals. The relation does not appear to characterize either Black or Hispanic individuals. Understanding race/ethnic similarities and differences in determinants of smoking behavior may aid in elucidating the nature of race/ethnic differences in tobacco use and in outcomes related to smoking behavior.

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Declaration of Interests

None declared.

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