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Race/Ethnicity, Psychological Distress, and Fruit/Vegetable Consumption: The Nature of the Distress-Behavior Relation Differs by Race/Ethnicity

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Abstract

Objective—We explored how the relation between psychological distress and fruit/vegetable consumption differed as a function of race/ethnicity.

Method—Data from the 2007 Health Information National Trends Survey was analyzed. Participants reported current psychological distress, race/ethnicity, and current fruit and vegetable consumption. Linear regression analyses were used to examine the association between race/ethnicity, distress, and their interaction and fruit and vegetable consumption.

Results—There was a significant interaction between race/ethnicity and psychological distress in predicting fruit and vegetable consumption. Follow-up analyses indicated that distress was related to fruit and vegetable consumption for White and Hispanic but not for African American respondents.

Conclusion—The association between psychological distress and fruit/vegetable consumption differs as a function of race/ethnicity. The findings have implications for understanding the role of distress in eating behavior regulation and for developing interventions to address fruit/vegetable consumption targeted to members of different race/ethnic groups.

Dietary patterns are central to the etiology of many chronic illnesses for which race/ethnic health disparities exist (Danaei et al., 2009; Mokdad, Marks, Stroup, & Gerberding, 2004). Given this, health promotion interventions to encourage healthier dietary patterns are key public health strategies for addressing chronic illness in all race/ethnic groups; the existence of health disparities in many of these illnesses makes addressing dietary behavior particularly important for minority group members. Intervening to change behavior requires knowledge of the basic self-regulation and decision-making processes underlying the behavior (Baranowski, 2006; Kiviniemi & Rothman, 2010). For many mechanisms, we lack knowledge of whether the mechanism and its relation to behavior operates equivalently across race/ethnic groups.

In recent work, we demonstrated that the relation of psychological distress to cigarette smoking differs as a function of race/ethnicity. Increasing distress was related to a greater likelihood of being a smoker and a greater number of cigarettes smoked per day for White,

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but not African American or Hispanic adults (Kiviniemi, Orom, & Giovino, in press). Given recent evidence that similar neurological processes may operate in the regulation of substance use and food intake (Frascella, Potenza, Brown, & Childress, 2010; Volkow & Wise, 2005), it is possible that similar differences as a function of race/ethnicity might be found in the relation of psychological distress to dietary behavior.

Recent research has highlighted a number of ways in which affect and affect regulation influences dietary behavior (for reviews see Gibson, 2006; Macht, 2008). Of particular importance for this paper, there is evidence that when individuals are under stress or in a negative affective state, they can engage in particular eating behaviors (e.g., eating high carbohydrate foods) which serve to reduce feelings of stress and/or negative affect (Evers, Marijn Stok, & de Ridder, 2010; Hepworth, Mogg, Brignell, & Bradley, 2010).

Psychological distress, including negative affectivity and depressive symptoms, has been shown to be related to lower levels of consumption of fruits and vegetables (e.g., Allgower, Wardle, & Steptoe, 2001; Cohen, Kristal, Neumark-Sztainer, Rock, & Neuhouser, 2002; Kontinen, Mannisto, Sarlio-Lahteenkorva, Silventoinen, & Haukka, 2010) as has aversive experiences of stress (Cartwright et al., 2003; Oliver & Wardle, 1999). However, to our knowledge no study has examined whether the relation of psychological distress to fruit and vegetable intake differs by race/ethnicity.

This study examined whether the relation between psychological distress and fruit and vegetable intake differed as a function of race/ethnicity. Using data from a national, population-representative survey of US adults, we examined whether race/ethnicity moderated the relation between distress and fruit and vegetable intake.

Methods

Data from a nationally representative survey study of US adults, the 2007 National Cancer Institute's Health Information National Trends Survey (HINTS), were analyzed. The HINTS survey design and sampling procedures are designed to provide a US population-representative sample. African Americans and Hispanics are oversampled to provide stable estimates for those racial/ethnic groups. The study was conducted from January to April 2008.

Participants were recruited in a mixed mode survey design; approximately half of the respondents (n=3,582; calculated response rate 30.1%) 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; calculated response rate 24.2%; complete details concerning calculation of response rates can be found in Cantor et al., 2009). Analyses included White, African American and Hispanic individuals with complete data for the fruit/vegetable consumption questions, the psychological distress assessment, and the relevant demographic control items (described below). The analysis sample size was 6,587.

Measures

Participants self-reported their race and, separately, Hispanic/Latino ethnicity. These responses were used to create race/ethnicity category variables: White, non-Hispanic (hereafter referred to as White); Black or African American, non-Hispanic (referred to as African American); and Hispanic.

Participants reported daily fruit and vegetable intake. Respondents to the mail survey reported how many cups of fruits and of vegetables they consumed each day on a seven category response scale with response options ranging from "none" to "4 cups or more".

Respondents to the telephone survey answered an open-ended question asking how many ½ cup servings of fruits and of vegetables they consumed each day. Telephone survey responses were recoded into the 7 response categories used in the mail survey (e.g., a telephone participant reporting 3 servings of ½ cup each was coded into the “1 to 2 cup” response category).

Participants completed the Kessler K6 measure of generalized psychological distress experienced over the previous 30 days (Kessler et al., 2002). For each of six descriptions of psychological distress (e.g., so sad that nothing could cheer you up; restless or fidgety; $\alpha=0.86$) participants responded on a 5-point item response format ranging from “all of the time” to “none of the time”. The items were reverse scored so that higher numbers indicated higher levels of psychological distress and the mean of the six items was computed and used as the index of psychological distress.

Demographic characteristics were assessed. Relevant to the analyses reported here, participants reported gender, age, and education level.

Analysis Strategy

All reported analyses were conducted in STATA version 11 (STATA Corp., College Station, TX) using STATA's survey design features to incorporate sampling weights, which account for the sampling design, population oversampling, and non-response patterns in the dataset (additional information on the sampling weights can be found in Cantor et al., 2009). All analyses were conducted controlling for demographic characteristics and for survey mode.

Race/ethnicity analyses separately compared White participants to African American and to Hispanic participants. Differences in psychological distress and fruit/vegetable intake as a function of race/ethnicity were examined using linear regression; fruit/vegetable intake was modeled as the outcome variable and the key predictors were race/ethnicity, psychological distress, and the interaction of the two.

Results

The population weighted sample was 52% female and had an average age of 45.7 years (SD=17.7 years; all point estimates and population proportions are jackknifed estimates based on sampling design weights). Descriptive statistics for psychological distress and fruit/vegetable intake by race/ethnicity are presented in Table 1. Hispanic respondents reported lower vegetable consumption; $t=3.13$, $p < .01$. No other group differences were significant.

Race/Ethnicity, Psychological Distress, and Fruit/Vegetable Intake

We begin by examining the relation of psychological distress to daily consumption of fruits and vegetables. As described above, all reported analyses controlled for gender, age, and education. Table 2 reports the linear regression slopes for the relation of psychological distress to fruits and vegetable consumption for each demographic group. When the entire HINTS population was included in the analysis there was a significant relation between psychological distress and fruit/vegetable intake, such that higher levels of psychological distress were associated with lower consumption; $b = -0.29$ (95% CI = -0.43, -0.17). Consumption of fruit and vegetable consumption decreases for each 1 point increase in psychological distress, with those averaging 1 on the distress measure consuming an average of 4.78 servings, those averaging 3 on distress consuming 4.33 servings, and those averaging 5 consuming 4.07 servings.

However, this overall effect was qualified by a race $\times$ psychological distress interaction for comparisons of White and African American respondents; White/African American interaction $t(49) = 2.09, p < .05$. To examine the nature of this interaction, we conducted separate subgroup analyses to examine the relation between psychological distress and fruit/vegetable intake for each race/ethnic group. As can be seen in Table 2, in these analyses the psychological distress -fruit/vegetable intake relation was significant for White respondents to the survey but not for African American respondents.

By contrast, there was no significant interaction when comparing White to Hispanic respondents; White/Hispanic interaction $t(49)=0.83, ns$. As can be seen in Table 2, the relation of psychological distress and fruit/vegetable intake was significant for Hispanic respondents.

We also conducted analyses separately examining reported fruit and reported vegetable intake. In both cases, the results matched those for the combined measure. Both fruit and vegetable consumption were significantly related to psychological distress for the overall sample; $bs=-0.15$ (CI=-0.23, -0.09) and -0.13 (-0.20, -0.07), respectively. The overall effects were qualified by race $\times$ psychological distress interactions for White versus African American respondents; the interaction was significant for fruits, $t(49)=2.11, p<.05$, and marginally significant for vegetables, $t(49)=1.74, p=0.088$. There was no evidence for interaction effects for White versus Hispanic respondents for either fruits or vegetables, both interaction $ts < 1.5, ns$.

Discussion

Analysis of the relation of psychological distress to fruit and vegetable consumption in this nationally-representative survey study revealed that the inverse relation between psychological distress and intake of both fruits and vegetables differs as a function of participant race/ethnicity. Whereas the inverse relation between distress and fruit/vegetable intake was observed for White and Hispanic respondents, there was no relation observed for African American respondents.

Why might the race-related difference in the relation of psychological distress to fruit and vegetable consumption exist? There are two plausible explanations, both rooted in the idea that individuals in negative and distressed moods seek to consume foods (and engage in other behaviors) which will increase mood positivity and alleviate distress.

One explanation is based on social-cognitive processes involved in decision making about food intake. Affective associations, the feelings and emotions individuals associate with a given behavior, are related to engagement in a behavior; individuals who associate a given behavior with more positive feelings are more likely to engage in the behavior (Kiviniemi & Bevins, 2007; Kiviniemi, Voss-Humke, & Seifert, 2007); this relation has been shown for fruit and vegetable consumption (Kiviniemi & Duangdao, 2009). The negative affect-mood repair hypothesis described above would suggest that individuals in negative moods should be most likely to consume the foods they most associate with positive affect (i.e., the foods they believe to be most likely to restore positive mood) and least likely to consume those foods they most strongly associate with negative affect (i.e., foods which would not repair and might even exacerbate negative mood).

Given this affective associations account for food consumption in negative mood, the overall inverse relation between psychological distress and fruit/vegetable consumption would imply that individuals are either actively avoiding fruits/vegetables because of negative affective associations with them or are more passively reducing fruit/vegetable consumption in favor of active selection of other foods for which affective associations are more positive

(e.g., higher fat or complex carbohydrate “comfort foods”). Thus, to the extent that affective associations with fruits and with vegetables differ by race/ethnicity, one would expect differences in the strength and potentially the direction of the negative affect-fruit/vegetable intake relation.

The significant inverse relation for White and Hispanic respondents and the finding of no relation for African American respondents would suggest that White and Hispanic affective associations might be more negative (or, conversely that African Americans’ affective associations are more positive). Under this explanation, the underlying affective mechanisms (negative affect leading to mood repair behaviors) is the same across race/ethnic groups, but the content of inputs to that mechanism (affective associations with potential behavioral actions) differs in ways that influences individuals’ behavioral choices.

A second plausible explanation is that there are differences in the nature and operation of involved affective mechanisms as a function of race/ethnicity. In another health behavior domain, cigarette smoking, there is evidence that the relation between negative affect and behavior differs as a function of race/ethnicity. Similar to dietary behavior, associations between smoking and negative affect can be accounted for in terms of mood repair for negative affect regulation (Pomerleau & Pomerleau, 1984), positing that nicotine is reinforcing due to attenuation of aversive feelings (e.g., negative affect, stress).

Recent work has demonstrated that there may be differences by race in negative affect reduction as a reinforcer of nicotine use. White smokers may be more motivated to smoke by negative affect reduction than African American smokers (Lam et al., 2008). Work on the genetics of smoking behavior has shown that smaller percentage of African Americans than Whites possessed a genotype variant associated with smoking to reduce negative affect and increase stimulation (Lerman et al., 1998).

Thus, the second plausible hypothesis would be that, similar to the findings for negative affect and smoking behavior, the nature of the relation between food intake and affect regulation may differ as a function of race, leading to the observed differences in relation of psychological distress to fruit/vegetable consumption. This would be consistent with growing recent research suggesting that common reward pathways are involved in drug use and food intake (Frascella et al., 2010; Volkow & Wise, 2005) and would also account for the fact that the White versus African American contrasts in the present study are identical to those in our earlier work examining the relation of psychological distress and smoking as a function of race/ethnicity (Kiviniemi et al., in press).

These hypotheses concerning underlying mechanisms also have implications for understanding the generalizability of the results. The hypothesis that affective associations with fruits and vegetables differ across race/ethnic groups primarily involves group-level norms and acculturation mechanisms. One would not expect those group norms and common cultural experiences to necessarily generalize to other population groups. Thus, if the differences in affective associations hypothesis is correct, one would not necessarily expect to see the same pattern of results in comparison of other race/ethnic groups (e.g., White Europeans versus Europeans of sub-Saharan African descent). On the other hand, the hypothesis about differences in underlying operation of affective mechanisms primarily involves neurological/biological mechanisms. If this hypothesis is correct, one would expect to see the same patterns in individuals sharing a common ancestral genetic heritage. Thus, one would expect to see patterns similar to those found for White individuals in the US in other groups sharing a European ancestral heritage and patterns similar to those found for African Americans in other groups sharing an ancestral heritage in sub-Saharan Africa.

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 fruit/vegetable intake and differences in association by race/ethnicity, rather than interpreted as patterns of causal relations. Second, it is important to note that the K6 measure assesses specific types of psychological distress, particularly those associated with depressive symptomology and other psychiatric concerns. There are other dimensions of negative affect and distress which are not well assessed by the measure (e.g., stress, anxiety; see Collins & Lepore, 2009; Webb & Carey, 2008). Future research should examine a broader spectrum of affect states in relation to fruit/vegetable consumption. Similarly, the questionnaire only included questions about overall fruit and overall vegetable consumption. Given that a variety of different specific fruits and vegetables exist and that there may be race/ethnic differences in which specific fruits and vegetables are consumed, future research should examine whether the effects reported here are consistent over different types of fruits and vegetables. More in-depth assessment of dietary intake would also allow future researchers to examine whether the effects related to overall changes in caloric intake as a result of psychological distress. Finally, as described above, the degree to which these results generalize to other populations depends on which underlying mechanisms account for the results reported here. Future research should examine whether these findings replicate in other population groups.

Conclusion

The relation of psychological distress to fruit and vegetable consumption differed based on race/ethnicity; the results reported here suggest that psychological distress and fruit and vegetable consumption relations are relatively specific to White and Hispanic individuals. The relation does not appear to characterize African Americans. Understanding race/ethnic similarities and differences in determinants of fruit and vegetable consumption may aid in elucidating the nature of race/ethnic differences in eating behavior regulation and for developing interventions to address fruit/vegetable consumption targeted to members of different race/ethnic groups.

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Table 1

Characteristics of the Sample

	Full Sample	White	African American	Hispanic
Fruits: Amount Consumed Per Day	% of sample [95% CI]	% of sample [95% CI]	% of sample [95% CI]	% of sample [95% CI]
None	9.0% [8.1, 9.9]	8.8% [7.6%, 9.9%]	11.5% [7.7, 15.4]	8.3% [5.2, 11.3]
½ c or less	25.4% [24.1, 26.7]	24.3% [22.9, 25.7]	22.2% [17.2, 27.2]	30.6% [24.9, 36.3]
1/2c to 1c	23.4% [21.9, 24.8]	24.5% [22.8, 26.1]	21.8% [17.4, 26.2]	22.1% [16.7, 27.5]
1c to 2c	28.3% [26.9, 29.8]	28.8% [27.3, 30.3]	28.0% [23.5, 32.6]	26.3% [19.9, 32.7]
2c to 3c	9.5% [8.5, 10.5]	9.6% [8.4, 10.7]	10.9% [7.7, 14.1]	7.7% [4.9, 10.5]
3c to 4c	3.1% [2.3, 3.8]	3.0% [2.1, 3.9]	3.8% [1.2, 6.3]	3.4% [2.0, 4.9]
4c or more	1.3% [0.9, 1.7]	1.1% [0.7, 1.5]	1.7% [0.2, 3.1]	1.6% [0.6, 2.6]
Vegetables: Amount Consumed Per Day	% of sample [95% CI]	% of sample [95% CI]	% of sample [95% CI]	% of sample [95% CI]
None	5.4% [4.5, 6.3]	4.1% [3.3, 5.1]	6.4% [4.0, 8.8]	10.9% [7.3, 14.4]
½ c or less	24.3% [22.9, 25.7]	21.1% [19.6, 22.5]	25.4% [20.0, 30.8]	35.0% [38.5, 41.6]
1/2c to 1c	25.7% [24.2, 27.1]	27.6% [25.8, 29.3]	22.7% [18.7, 26.6]	21.9% [17.3, 26.5]
1c to 2c	27.9% [26.5, 29.2]	29.4% [28.1, 30.8]	27.8% [23.1, 32.4]	21.2% [16.0, 26.5]
2c to 3c	11.1% [10.1, 12.2]	12.3% [10.9, 13.7]	9.4% [6.9, 12.0]	7.2% [4.6, 9.8]
3c to 4c	4.3% [3.6, 4.9]	4.2% [3.5, 4.9]	5.9% [3.1, 8.6]	2.5% [1.2, 3.8]
4c or more	1.4% [0.9, 1.8]	1.3% [0.8, 1.8]	2.5% [1.0, 4.0]	1.2% [0.2, 2.2]
Psychological Distress: Mean Score (95% CI)	1.87 (1.84, 1.90)	1.82 (1.79, 1.85)	1.92 (1.82, 2.01)	1.98 (1.89, 2.08)

Table 2

Relation of Psychological Distress to Fruit/Vegetable Intake

Race/Ethnicity	Psychological Distress – Fruit/ Vegetable Combined Consumption b (95% CI)	Psychological Distress - Fruit Consumption b (95% CI)	Psychological Distress – Vegetable Consumption b (95% CI)
Overall Sample	b=-0.29 (-0.42, -0.17)	b=-0.15 (-0.23, -0.09)	b=-0.13 (-0.20, -0.07)
White	b=-0.36 (-0.51, -0.20)	b=-0.20 (-0.28, -0.11)	b=-0.16 (-0.24, -0.07)
African American	b=0.06 (-0.43, 0.31)	b=-0.02 (-0.23, 0.19)	b=-0.03 (-0.21, 0.16)
Hispanic	b=-0.28 (-0.54, -0.03)	b=-0.10 (-0.26, 0.05)	b=-0.19 (-0.34, -0.04)

Note: reported slopes are adjusted for age, education, and gender. Reported relations between variables and significant findings are identical for unadjusted slopes.