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The Interrelationship between Race, Social Norms and Dietary Behaviors among College-Attending Women

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Abstract

Objective: The association between social norms and dietary behaviors is well-documented, but few studies examine the role of race. The aim of this study was to determine the interrelationships between race, social norms, and dietary behaviors.

Methods: Data from the Healthy Friends Network Study (a pilot study of women attending a southern university) was used. Dietary behaviors, social norms and self-identified race were obtained.

Results: African Americans had lower odds of daily vegetable (OR=0.55, 95% CI=0.38–0.79) and fruit consumption (OR=0.45, 95% CI=0.30–0.67), but no race difference in frequent consumption of fatty/fried/salty/sugary foods was observed in fully adjusted models. Proximal descriptive norms were associated with all dietary behaviors, but distal injunctive social norms were associated with lower odds of frequent unhealthy food consumption (OR=0.10, 95% CI=0.05–0.21). Race differences in family descriptive norms were found to mediate race differences in vegetable and fruit consumption by 7–9%. However, race differences in friend and family injunctive norms mediated 20–50% of the effects of race on frequent unhealthy food consumption.

Conclusions: Proximal injunctive norms account for race differences in unhealthy food consumption. Future studies should further explicate the mechanisms and seek to utilize social norms in behavior change interventions.

Keywords

social norms; diet; race; students; women

INTRODUCTION

The current American diet has come to consist of more than the recommended amounts of foods high in fat, salt and sugar.[1] Though most demographic groups do not meet

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recommended levels, fruit and vegetable intake and the avoidance of unhealthy foods can be comparably lower for African Americans relative to their white counterparts.[2–4] For example, African Americans are more likely to report no fruit intake,[5] and recent declines in poor dietary behaviors among whites have not been observed among African Americans.[2] This can have major public health implications as African Americans have higher rates of diseases associated with unhealthy diet,[6,7] including obesity.[8, 9] Racial disparities in obesity are most pronounced among women, such that more than half of African American women are obese compared to only one-third of white women.[8] Since, the onset of these diseases can appear earlier in adulthood for African Americans,[10] it is important to understand the factors that contribute to unhealthy diet among young adults and how it can be prevented. Only about 10% of college students consume the recommended levels of fruits and vegetables,[11, 12] and college-attending women are at greater risk of weight gain due to decreased fruit and vegetable intake.[13] Health behaviors among college students are strongly affected by social norms or perceptions about the behaviors of their peers.[14–19] This paper examines the role of social norms (specifically social distance and the type of norms) on race differences in dietary behaviors among college-attending women.

Social norms refer to “common standards for behavior, set by and for members of a social group”[20] and are included in social psychology, health behavior change, and health communication theory such as the Theory of Planned Behavior[21] and Theory of Normative Social Behavior.[22] Perkins and Berkowitz were among the first to use the social norms framework to study health behaviors among college students,[14, 15, 23] and their work inspired a proliferation of research, interventions, and policies to modify social norms and behavior change related to alcohol abuse,[14] cigarette smoking and other drug use[17] and sexual assault.[16] Studies expanded to examine the influence of social norms on dietary behaviors.[18, 19, 24–26] These studies find that social norms are predictive of dietary behaviors among young adults—that is, individual dietary behaviors tend to align with the perceptions of the dietary behaviors of others.[18, 19]

Social Norms—Social Distance and Type

Social distance is an important factor in social norms and it may illuminate our understanding of race and dietary behaviors. Social norms can be broadly defined as the shared ideals and standards that guide or regulate the behaviors of members of a group,[27] and are likely influenced by the degree to which individuals identify with others. Given the desire to belong, an individual may adopt the normative attitudes and behaviors of important or *proximal others* within their social networks.[28] Proximal others can include groups, such as family and friends, to which the individual may feel generally close and identify with. In general, family and friends tend to be influential in the dietary behaviors of young adults, [18, 19, 29, 30] potentially due to their desire to belong and maintain social cohesion.[30] For example, the social norms of friends may be more influential than family because individuals in this age group may desire closeness with peers and to distance themselves from family members.

Scholars have explored the influence of *distal others*.[31] Distal others include individuals for which there may be less social connection, such as other students. Studies on the influence

of distal others (that is, a typical student), particularly in alcohol consumption among college students, demonstrate that distal injunctive norms are less strongly associated with behaviors,[28] but are influenced by proximal and descriptive norms.[31, 32] Thus, it is important to examine the extent to which proximal and distal others affect dietary behaviors among young adults.

For African American young adults, social distance may complicate the effects of social norms because of potentially racially discordant others. Racial variation in friend groups may be important to the interrelationship between race, proximal social norms and dietary behaviors.[33, 34] Moreover, the mechanisms of social acceptance and identification could affect distal norms and dietary behaviors among African Americans, particularly on a college campus where African American students might be in the minority.

Another key contribution of the social norms literature that could complicate the associations between race, social norms and dietary behaviors is the distinction between descriptive and injunctive norms.[35] Descriptive norms refer to perceptions of others' behaviors. Injunctive norms denote the common attitudes shared by group members about whether a particular behavior. Injunctive norms are guiding collective ideals about what behaviors are regarded as acceptable or unacceptable. In the case of dietary social norms, descriptive norms (such as daily consumption of fruit and vegetables) are positively associated with diet.[25, 36–42] In general, injunctive norms (eg belief that it is important to eat fruit and vegetables daily) are not associated with dietary behaviors.[25, 38, 39, 41] However, a few studies have found that subjective norms (measured as perceptions of others' expectations) are associated with dietary behaviors among African Americans.[43, 44] Though perceptions of others' expectations (subjective norms) differ from perceptions of others' attitudes (injunctive norms), the observation that these types of norms are associated with behaviors among African Americans and associations among whites have not been observed warrants an examination of these types of norms with regard to race and dietary behaviors.

The overall aim of this study is to determine the interrelationship between race, social norms and diet among college-attending women. To do so, race differences in dietary behaviors will be assessed, and the potential mediating effects of social norms will be assessed by social norms type and social distance. It is hypothesized that African Americans will have less healthy dietary behaviors and proximal social norms will mediate the effects of race differences. Understanding these relationships could help public health practitioners and policymakers better address race disparities in dietary behaviors and obesity by potentially modifying social norms.

METHODS

Data

Data for the Healthy Friends Network (HFN) Study was collected in April 2016. The study population included undergraduate women attending a large public university in a southern U.S. state. Fruit and vegetable intake is lower in Southern states[5] and allows for examination of the role of race and social norms on dietary behaviors in the population. The HFN Study was approved by the Institutional Review Board in February 2016. During a 30-day period, a

recruitment email was sent 3 times to students who met the inclusion criteria: an undergraduate student who identified as female. The email included a description of the study and a link to an online questionnaire through Qualtrics. Following the link, subjects completed an informed consent document, and the need for documentation of consent was waived. Subjects then completed the online survey and no identifying information was collected. After survey completion, subjects were directed to complete an online form with their name and contact information. This information could not be connected to survey responses, but was collected so that a gift card drawing could be completed. Gift cards were distributed to 15 randomly selected recipients in May 2016. The recruitment email was sent to 10,241 students, and the online survey was initiated 1,956 times. There were 230 incomplete survey responses and 227 surveys completed by repeated subjects, resulting in a study sample of 1,499 responses. Only non-Hispanic African American and white respondents who were included in the current study (N = 1,278).

Variables

Three dependent variables measured dietary behaviors as respondents were asked how often do they ate fruits, vegetables, and fried/fatty/salty/sugary foods. Response categories included: never; 1–2 days per week; 3–5 days per week; or 6–7 days per week. Variables to represent daily fruit and vegetable consumption were created where “1” represented those who responded “6–7 days per week” and a value of “0” for all other responses. A variable to represent frequent unhealthy food consumption was created where “1” represented those who responded “3–5 days per week” or “6–7 days per week” regarding frequency of fried/fatty/salty/sugary food consumption. A value of “0” was given for all other responses.

The main independent variable, race/ethnicity, was self-reported. Respondents were asked “Do you consider yourself Latino or Hispanic?” and “Which racial group(s) do you identify with?” A variable was created which included those who responded that they do not consider themselves Latino/Hispanic and their race was white or black/African American.

Potential mediating variables included social norms toward dietary behaviors. Both descriptive and injunctive norms were assessed using measures adapted from previous studies[25, 29] and are displayed in Table 1. Descriptive norms assessed the respondents’ perceptions of the actual dietary behaviors of both proximal (friends and family members) and distal (students on campus) others. Dichotomous variables were created to represent those who perceived others consumed fruits and vegetables or unhealthy foods at least once per day. Injunctive norms assessed the respondents’ perceptions of others’ attitudes toward dietary behavior by assessing perceived importance of daily fruit and vegetable consumption and avoidance of unhealthy foods. Individual attitudes of respondents toward fruit, vegetable and unhealthy food consumption were also assessed. Dichotomous variables for injunctive norms and individual attitudes were created to represent those who agree or strongly agree with the statements.

Covariates were included. Age was measured in years and continuously. Class standing was measured categorically and included freshman, sophomore, junior, senior or other. Two variables to represent parents’ socioeconomic status were included using dummy variables. Mother’s and father’s educational attainment was assessed and categorized as less than high

school graduate, high school graduate or equivalent, some college or associate degree and a bachelor's degree or more. Respondents were asked how many of their friends were of the same race. Race-concordant friendships were measured using dummy variables to represent more than half, about half or less than half of friends were of the same race.

Statistical Analyses

Mean and percent differences by race were evaluated using Student's *t* for continuous variables and chi-square tests for categorical variables. Multivariate logistic regressions were used to determine the associations between race and descriptive and injunctive social norms with dietary behaviors. The potential mediation of race differences in dietary behaviors by social norms was determined using Sobel testing.[45] Race differences in descriptive and injunctive social norms regarding diet were assessed. Associations between race and dietary behaviors were determined without accounting for social norms and compared to associations that do account for social norms. The indirect effect, direct effect and total effect on dietary behaviors were calculated using bootstrapping. The percentage of the total effect that was mediated by a particular social norm is reported (only for social norms for which a racial difference was observed). All regression analyses accounted for covariates. P-values less than 0.05 were considered statistically significant and all t-tests were two-sided. All statistical procedures were performed using STATA statistical software, Version 14 (StataCorp LP, College Station, TX).

RESULTS

Table 2 displays descriptive statistics by race. No race differences were observed in age, class standing and mother's educational attainment. However, African Americans (67.9%) were less likely to report that their father had a bachelor's degree or more compared to whites (76.4%, $p < .01$). More African Americans reported that less than half of their friends were of the same race (24.8% versus 8.3%, $p < .001$). Approximately 2 in 5 respondents reported daily consumption of vegetables (43.0%) and fruits (38.2%), and about 35% reported infrequent consumption of unhealthy foods. African Americans (29.5%) were less likely to consume vegetables daily compared to whites (48.4%, $p < .001$). African Americans were also less likely to consume fruits daily compared to whites (25.9% versus 43.2%, $p < .001$), and less likely to consume unhealthy foods infrequently (27.2% versus 37.8%, $p < .01$). More than half of students perceived that friends (53.3%) and family (64.9%) consumed fruits and vegetables daily, while only about one in 5 perceived daily fruit and vegetable consumption among other students (42.7%). There were no race differences in perceptions of others' daily consumption of fruits and vegetables or unhealthy foods with one exception. African Americans (55.5%) were less likely to perceive that their family members consumed fruits and vegetables daily (67.5%, $p < .001$). About half of respondents perceived daily consumption of fried/fatty/salty/sugary (or "unhealthy") food consumption among family members, while higher percentages of respondents perceived daily consumption of unhealthy foods among friends (61.3%) and other students (75.2%). About one in 5 (20.3%) respondents agreed that daily fruit and vegetable consumption was important, while rates were lower for friends (11.9%) and other students (8.9%), but higher for family (29.3%). African Americans (14.8%) were less likely to agree that daily

consumption of fruits and vegetables was important to oneself compared to whites (22.8%, $p < .01$). African Americans were also less likely to agree that consuming fruits and vegetables daily was important to their family (22.4% versus 30.4%, $p < .05$). Two-thirds of respondents agreed that avoiding unhealthy foods was important, with higher rates perceived for family (71.9%) and lower rates for friends (49.9%) and other students (31.9%). The importance of avoiding unhealthy food for oneself (57.9% versus 68.9%, $p < .001$), and among family (62.1% versus 73.9%, $p < .001$) and friends (43.6% versus 52.5%, $p < .01$) was less frequent among African Americans.

Table 3 shows associations between race, descriptive and injunctive norms with dietary behaviors accounting for covariates. Model 1 individually regressed each variable on the 3 dietary behaviors and Model 2 simultaneously regressed race and social norms on the dependent variables. In Models 1, race and all social norms are associated with dietary behaviors with the exception of student descriptive norms and daily vegetable consumption. In fully adjusted models, African Americans had lower odds of consuming vegetables (OR=0.53, 95% CI=0.37–0.77) and fruits (OR=0.44, 95% CI=0.30–0.66) daily, but there was no race difference in frequent unhealthy food consumption. Descriptive norms appeared to have more associations with dietary behaviors than injunctive norms. Those who perceived that their friends consumed fruits and vegetables daily had 55% higher odds of daily vegetable consumption (OR=1.55, 95% CI=1.09–2.21) and 72% higher odds of daily fruit consumption (OR=1.72, 95% CI=1.19–2.48). Perception of daily fruit and vegetable consumption among family was associated with higher odds of daily vegetable (OR=1.48, 95% CI=1.03–2.12), but not daily fruit consumption. Distal descriptive norms (that is, among students on campus) were not associated with dietary behaviors, however distal injunctive norms were associated with unhealthy food consumption. Those who perceived that other students on campus tried to avoid unhealthy foods had lower odds of frequently consuming unhealthy foods (OR=0.50, 95% CI=0.33–0.75). Attitude (or one's own views on the importance of daily fruit and vegetable consumption or avoiding unhealthy foods) was associated with higher odds of vegetable (OR=5.13, 95% CI=2.73–9.64) and fruit consumption (OR=8.76, 95% CI=4.45–17.25), and lower odds of frequent unhealthy food consumption (OR=0.10, 95% CI=0.05–0.20).

Race differences in social norms are shown in Table 4. African Americans had 33% lower odds of perceiving that their family consumed fruits and vegetables daily (OR=0.67, 95% CI=0.50–0.91). With regard to personal attitudes, African Americans had lower odds of agreeing that it was important to consume 5 servings of fruits and vegetables daily (OR=0.57, 95% CI=0.38–0.86) and agreeing that it is important to avoid unhealthy foods (OR=0.64, 95% CI=0.47–0.88). There were also racial differences in some proximal injunctive norms. African Americans had lower odds of perceiving that their friends (OR=0.73, 95% CI=0.54–0.99) and family (OR=0.66, 95% CI=0.46–0.94) try to avoid unhealthy foods.

The potential mediating effects of social norms on race differences in dietary behaviors are displayed in Table 5 by examining race disparities before (Model 1) and after (Model 2) accounting for social norms for which race differences were observed. With regard to descriptive family norms as potential mediators of race differences in daily vegetable

consumption, in Models 1 (OR=0.47, 95% CI=0.34–0.64) and 2 (OR=0.48, 95% CI=0.35–0.67), race differences in daily vegetable consumption were observed before and after adjusting for descriptive family norms. However, indirect effects of descriptive family norms were significant (OR=0.98, 95% CI=0.97–0.99), but only accounted for about 9% of the race difference. Similar mediating effects were observed for daily fruit consumption as race disparities were observed in Models 1 (OR=0.42, 95% CI=0.31–0.60) and 2 (OR=0.44, 95% CI=0.44, 95% CI=0.31–0.62), but indirect effects of descriptive family norms were significant (OR=0.99, 95% CI=0.98–0.99) accounting for about 7% of the race difference. The indirect effects of injunctive friend (OR=1.02, 95% CI=1.01–1.04) and family norms (OR=1.04, 95% CI=1.01–1.08) of unhealthy food consumption were also significant and accounted for 21% and 50% of the race differences, respectively. Race differences in frequent unhealthy food consumption in Model 1 (OR=1.63, 95% CI=1.17–2.26) were reduced in Models 2 after accounting for injunctive friend norms (OR=1.48. 95% CI=1.06-2.08) and injunctive family norms (OR=1.27, 95% CI=0.87–1.86). Personal attitudes also mediated race differences in dietary behaviors as indirect effects were significant for daily vegetable (OR=0.95, 95% CI=0.95–0.98) and fruit consumption (OR=0.95, 95% CI=0.92–0.99) as well as frequent unhealthy food consumption (OR=1.05, 95% CI=1.02–1.09). Personal attitudes accounted for 29.4% of the race difference in daily vegetable consumption, 23.1% of the race difference in daily fruit consumption and 44.1% of the race difference in frequent unhealthy food consumption.

DISCUSSION

This study sought to determine whether social norms mediate race differences in dietary behaviors and if mediation varies by social distance of norm referent group (proximal versus distal other) and social norm type (descriptive versus injunctive). In the Healthy Friends Network Study, we found that race differences in daily vegetable and fruit consumption were partially mediated by descriptive family norms and personal attitudes. Race differences in frequent unhealthy food consumption were partially mediated by injunctive friend norms and personal attitudes, and fully mediated by race differences in injunctive family norms.

Though no previous studies, to our knowledge, have sought to determine the mediating role of social norms on race differences in dietary behaviors, results from the current study align with the findings of other studies which suggest that both friend and family descriptive social norms were associated with dietary outcomes.[36, 39] While personal attitudes were associated with dietary behaviors, only one injunctive norm (ie perception of others' attitudes) was associated with dietary behavior in the current study. Women who perceived that avoiding unhealthy foods was important to other students on campus were less likely to be frequent unhealthy food consumers. However, no other injunctive norms were associated with dietary behaviors such as the consumption of daily recommended fruit and vegetables. This result is supported by literature that finds that injunctive norms are not influential on dietary behavior,[25, 38, 39, 41, 46] particularly in the Theory of Planned Behavior,[21, 25, 47, 48] and especially when accounting for attitudes as the current study does. Previous studies that found no association between injunctive norms and dietary behaviors tended to examine consumption of fruits and vegetables,[25, 38, 39, 41, 46] while the current study observed associations between injunctive norms and frequent consumption of unhealthy foods.

Though few injunctive norms were associated with dietary behaviors, race disparities in frequent unhealthy food consumption were mediated by proximal injunctive norms and/or personal attitudes. African Americans had lower odds of reporting that avoiding unhealthy food was important to themselves, friends or family. These race differences in attitudes and injunctive norms in proximal others accounted for 20% to 50% of the race difference in frequent unhealthy food consumption. African Americans were just as likely to perceive frequent consumption of unhealthy foods among friends and family as whites, but they were less likely to perceive disapproval of unhealthy food consumption. It is possible that the effects of proximal injunctive norms[25, 38, 39, 41, 44] vary by race, and the mediating effects of injunctive norms of friends and family on race differences in frequent unhealthy food consumption could reflect this.

There were few race differences in fruit and vegetable social norms, but African Americans had lower odds of perceiving that their family members consumed fruits and vegetables daily. Family descriptive norms partially mediated race differences in daily vegetable and fruit consumption. No race differences in friend descriptive norms were detected. These analyses were adjusted for race concordance of friends, and accounting for racial composition of friends among college-attending women could have eliminated race differences in perceptions of fruit and vegetable consumption among others. This demonstrates the potential importance of racial composition of friends to descriptive norms of fruit and vegetable consumption and potentially individual behaviors.

There was variation in associations between social norms and dietary behaviors by social norm type. Descriptive norms were associated with every type of dietary behavior, but injunctive norms were only associated frequent consumption of unhealthy foods. Descriptive norms, or perceptions of the actual behaviors of others, allow individuals to determine what is safe and what is “right” in a particular social context.[49] Injunctive norms suggest, in addition to increased identification with and desire to belong to the group referenced by the social norm, a moral judgement on behaviors and potential social sanctioning from performing such behaviors.[50] Descriptive norms lack the moral overtones,[50] but still suggest social acceptance. Not based on a moral judgement, social acceptance derived from adhering to descriptive dietary social norms may be based on a need for belonging and identifying with the reference group.[50] Therefore, perceiving that others daily consume vegetables or fruits or that others frequently consume unhealthy foods is associated with individual dietary behaviors due to social acceptance. Injunctive norms were only associated with frequent unhealthy food consumption. The moral judgement inherent in injunctive norms may not apply to consumption of healthy foods, but rather to unhealthy dietary behaviors.

There were also differences in associations with dietary behaviors and social norms regarding social distance. Proximal social norms, such as those of family or friends, were more often associated with dietary behaviors and only proximal social norms mediated any racial differences in dietary behaviors, though distal injunctive norms were associated with frequent consumption of unhealthy foods. There may not be a perceived moral judgement or negative repercussions from proximal others (family or friends) toward unhealthy food consumption, but frequent unhealthy food consumption could be perceived as a barrier to

belonging or perceived as incurring moral judgement when applied to perceptions of norms among more distal others (that is, other students on campus).

Though distal injunctive norms were associated with frequent unhealthy food consumption, family descriptive norms were also associated with this dietary behavior. As the perceived frequency of unhealthy food consumption among family members increased, the odds of infrequent unhealthy food consumption decreased. Unhealthy food consumption may be a part of cultural norms in the regional context of this study, and consumption of unhealthy foods could increase positive emotion and identification with family, particularly among college students who may be away from their families. Alternatively, frequent unhealthy food consumption was fairly prevalent in this sample. Increased unhealthy food consumption among family members may further encourage individuals to consume unhealthy foods in a context where a large percentage of their peers is consuming unhealthy foods frequently.

Both family and friend descriptive norms were also associated with daily vegetable consumption, while only friend norms were associated with daily fruit consumption. Family descriptive norms may suggest learned behaviors, particularly in this college-attending sample, but both family and friend descriptive norms likely point to social acceptance. Daily fruit consumption may be associated with only friend descriptive norms because consuming fruit, a positive (or healthy) dietary behavior that has a particularly low prevalence in this population, could increase perceived identity with friends. Moreover, because daily fruit consumption has a relatively low prevalence in this population, the positive feelings derived from this uncommon, healthy behavior may be further amplified by the increased social identification with friends who also do this positive, yet rare behavior.

The results of this study have potential implications for research and public health interventions that address racial disparities in dietary behavior. The lack of an association between proximal injunctive norms and frequent unhealthy food consumption in this and other studies may lead some to consider only attitudes instead of injunctive norms.[25, 38, 48] However, proximal injunctive norms mediated between 20% and 50% of the race difference in frequent unhealthy food consumption. Descriptive social norms partially mediated race differences in fruit and vegetable consumption. Though improving fruit and vegetable consumption among college-attending women and their family members would be beneficial, it may not fully address race differences in these behaviors. Given the mediating effects of injunctive norms on race disparities in frequent unhealthy food consumption as well as studies of food environment[51–54] and cultural norms,[55, 56] factors beyond the individual and descriptive social norms are likely important to dietary behaviors among African American college-attending women. Changing perceptions and attitudes of individuals as well as their friends and family members toward unhealthy food consumption could reduce racial differences in frequent unhealthy food consumption among college-attending women and potentially address racial disparities in other demographic groups.

The study also has implications for work that seeks to improve dietary behaviors in general. Descriptive social norms are utilized in health behavior change interventions, most famously for drinking on college campuses.[14, 15, 17] College students overestimate their peers' alcohol consumption, and social norms interventions seek to correct perceptions and lower drinking

descriptive norms, and thus decrease drinking prevalence.[14, 17] However, this approach would not be appropriate for improving dietary behaviors among college students because daily fruit and vegetable consumption is low and unhealthy food consumption is high. Therefore, it would be counterproductive to correct perceptions of dietary behaviors.

However, frequent unhealthy food consumption may be addressed by manipulating distal injunctive norms. Injunctive norms and associated health behavior change theories have been discounted by some researchers,[21, 48] and it has been suggested that they may be more associated with intentions rather than behaviors.[57] Furthermore, the Theory of Normative Social Behavior and other studies suggest injunctive norms as an effect modifier of the association between descriptive norms and behaviors.[22, 58, 59] However, considering social distance in injunctive norms could be associated with behavior change and interventions to address unhealthy food consumption should consider perceptions of disapproval of frequent unhealthy food consumption among distal others.

This study is strengthened by a diverse study sample. This study also disaggregates social norms reference groups which differs from other studies.[60] There are some limitations. First, this was a college-aged, female sample, and the results may not be generalizable to older populations or men. Second, this study was performed on a predominately white college campus and in a particular regional context that may render the results less generalizable as well. The college is located in the Southern U.S. and this may affect the generalizability of the dietary behaviors and race differences given the higher prevalence of and relatively smaller race differences in obesity observed in this region. There may also be fewer racial differences in dietary behaviors in these particular contexts. However, studies have demonstrated the effects of attending a predominately white institutions on stress coping and other health issues.[61]

Only African Americans and non-Hispanic whites were included in this study. Other racial/ethnic groups were not included because of small sample sizes and potential differences in the manner in which race/ethnicity, social norms and dietary behaviors may operate due to potential cultural differences. Because of this, the complexity of the potential differences in the interrelationship between race/ethnicity, social norms and dietary behaviors would have been beyond the scope of this study of racial/ethnic groups other than non-Hispanic whites and African Americans were included. Another limitation of the study is that the survey question about frequency of unhealthy food consumption did not differentiate between types of healthy foods. The mediating effects of proximal injunctive norms on race differences could vary by type of unhealthy food. The survey did not include measures of food insecurity and other socioeconomic status measures that could have affected these relationships. Obesity was not included in this study. Weight and height would have been self-reported, and weight, height and weight status are frequently inaccurately reported in surveys with potential race differences,[62] however accounting for these could have affected the relationships measured in the analyses. Measures such as students' income, perceived access to fruits and vegetables, meal plans or a vehicle were not included and these could have altered the results.[13, 63] Previous studies have shown that students with meal plans consume more fat, but also more fruits and vegetables.[63] However, parental education is

often used as measure of socioeconomic status in studies among college-attending young adults.

In summary, race disparities in frequent unhealthy food consumption were mediated by proximal injunctive norms and disparities in vegetable and fruit consumption were partially mediated by proximal descriptive norms. The results of this study demonstrate the importance of disaggregating social norms by social distance and norms type. The effects of injunctive norms on behaviors may been previously underestimated or misunderstood. The results of this study also suggest that interventions can address racial disparities in dietary behaviors and dietary behaviors among college students through social norms. Given the low prevalence of daily fruit and vegetable consumption and frequent consumption of unhealthy foods among young adults as well as the population overall, it is imperative that practitioners and researchers address this public health problem and the racial disparities in dietary behavior.

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Table 1:

Description of Social Norms of Dietary Behaviors by Type and Social Distance, Healthy Friends Network Study

Norm	Survey question	Response choice	Dichotomization
Descriptive			
Fruits and vegetables			
Friends (proximal)	How often do you think the following groups of people, on average, eat fruits and vegetables: your friends?	Never once a week 2–3 times per week 4–6 times per week once per day 2 times per day 3 times per day ≥4 times per day	0 = never, once a week, 2–3 times per week, or 4–6 times per week 1 = once per day, 2 times per day, 3 times per day, 4 or more times per day, 3 times per day, or ≥4 times per day
Family (proximal)	How often do you think the following groups of people, on average, eat fruits and vegetables: your family members?		
Students (distal)	How often do you think the following groups of people, on average, eat fruits and vegetables: students on campus?		
Unhealthy foods			
Friends (proximal)	How often do you think the following groups of people, on average, eat fried/fatty/salty/sugary foods: your friends?		
Family (proximal)	How often do you think the following groups of people, on average, eat fried/fatty/salty/sugary foods: your family members?		
Students (distal)	How often do you think the following groups of people, on average, eat fried/fatty/salty/sugary foods: students on campus?		
Injunctive			
Fruits and vegetables			
Friends (proximal)	How much do you agree or disagree with the following statement: In general, I think that my friends make sure they eat at least 5 servings of fruits and vegetables every day?	Strongly disagree Disagree Neither agree nor disagree Agree Strongly agree	0 = strongly disagree, disagree or neither agree nor disagree 1 = agree or strongly agree
Family (proximal)	How much do you agree or disagree with the following statement: I think that most members of my family make sure they eat at least 5 servings of fruits and vegetable every day?		
Students (distal)	How much do you agree or disagree with the following statement: I think that most students on campus make sure they eat at least 5 servings of fruits and vegetables every day?		
Attitude	How much do you agree or disagree with the following statement: I always make sure I eat 5 servings of fruits and vegetables every day?		

Norm	Survey question	Response choice	Dichotomization
Unhealthy foods			
Friends (proximal)	How much do you agree or disagree with the following statement: In general, I think my friends do their best to try to avoid eating unhealthy foods regularly?		
Family (proximal)	How much do you agree or disagree with the following statement: I think most members of my family do their best to try to avoid eating unhealthy foods regularly?		
Students (distal)	How much do you agree or disagree with the following statement: I think most students on campus try their best to avoid eating unhealthy food regularly?		
Attitude	How much do you agree or disagree with the following statement: I try my best to avoid eating unhealthy foods regularly?		

Table 2:

Demographics and Descriptive Statistics, Healthy Friends Network Study (N = 1,278)

	Total	White	Black	
	N = 1,278	**N = 985**	**N = 293**	**p-value**
Demographics				
Age (years), mean ± S.E.	22.2 ±0.1	22.2	22.7	> .05
Class standing, %				
Freshman	14.5	14.6	15.1	> .05
Sophomore	19.2	18.6	19.6	
Junior	30.4	30.2	30.9	
Senior	33.7	34.5	32.7	
Other	2.2	2.1	1.7	
Mother's educational attainment, %				
Less than high school graduate	3.7	1.9	2.4	> .05
High school graduate	17.0	16.3	17.0	
More than high school	79.3	81.8	80.6	
Father's educational attainment, %				
Less than high school graduate	6.6	4.4	7.7	< .01
High school graduate	20.6	19.2	24.5	
More than high school	72.9	76.4	67.9	
Percentage of friends who are of the same race, %				
More than half	60.0	68.7	55.5	< .001
About half	21.6	23.0	19.7	
Less than half	18.4	8.3	24.8	
Individual behaviors				
Daily consumption of vegetables, %	43.0	48.4	29.5	< .001
Daily consumption of fruits, %	38.2	43.2	25.9	< .001
Frequent consumption of unhealthy foods, %	64.5	62.2	72.8	< .01
Descriptive Norms				
Daily consumption of fruits and vegetables, %				
Friends	53.3	55.4	49.2	> .05
Family	64.9	67.5	55.5	< .001
Students	42.7	42.4	41.5	> .05
Daily consumption of unhealthy foods, %				
Friends	61.3	61.2	62.8	> .05
Family	48.2	48.0	53.1	> .05
Students	75.2	76.5	74.3	> .05
Injunctive Norms				
Importance of daily fruit and vegetable consumption, %				
Self	20.3	22.8	14.8	< .01

	Total	White	Black	
	N = 1,278	N = 985	N = 293	p-value
Friends	11.9	11.9	11.3	> .05
Family	29.3	30.4	22.4	< .05
Students	8.9	8.4	8.9	> .05
Importance of avoiding unhealthy foods, %				
Self	66.6	68.9	57.9	< .001
Friends	49.9	52.5	43.6	< .01
Family	71.9	73.9	62.1	< .001
Students	31.9	32.8	32.8	> .05

Table 3:

Association between African American Race, Social Norms and Diet, Healthy Friends Network Study (N = 1,278)

	Daily vegetable consumption		Daily fruit consumption		Frequent unhealthy food consumption	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
African American	0.47 (0.34–0.64)	0.55 (0.38–0.79)	0.43 (0.31–0.60)	0.45 (0.30–0.67)	1.63 (1.17–2.26)	1.17 (0.77–1.77)
Descriptive norms						
Friends	1.80 (1.44–2.27)	1.56 (1.10–2.21)	1.87 (1.48–2.37)	1.73 (1.20–2.49)	1.75 (1.38–2.22)	1.50 (0.96–2.34)
Family	2.11 (1.65–2.70)	1.47 (1.03–2.10)	1.82 (1.42–2.34)	1.11 (0.77–1.61)	2.37 (1.87–3.01)	1.82 (1.21–2.74)
Students	1.25 (1.00–1.57)	0.82 (0.59–1.14)	1.43 (1.14–1.81)	0.95 (0.68–1.34)	1.32 (1.01–1.73)	0.73 (0.46–1.14)
Injunctive norms						
Friends	3.59 (2.45–5.26)	0.88 (0.45–1.74)	3.20 (2.23–4.59)	0.54 (0.26–1.13)	0.38 (0.30–0.48)	1.05 (0.66–1.66)
Family	3.17 (2.44–4.13)	1.36 (0.92–1.99)	2.78 (2.14–3.61)	1.27 (0.85–1.89)	0.13 (0.09–0.20)	1.49 (0.70–3.19)
Students	3.33 (2.16–5.13)	1.53 (0.76–3.08)	3.73 (2.45–5.68)	1.44 (0.71–2.91)	0.37 (0.29–0.47)	0.51 (0.34–0.76)
Attitude	9.13 (6.47–12.88)	5.18 (2.76–9.73)	6.68 (4.91–9.09)	8.84 (4.49–17.39)	0.13 (0.09–0.18)	0.10 (0.05–0.21)

Note: Reference group for odds ratios for African American is whites. Models 1 regress race, descriptive norms, injunctive norms and attitude on the dependent variables individually. Models 2 regress independent variables on dependent variables simultaneously. Analyses were adjusted for age, class standing, father's educational attainment, mother's educational attainment, and percentage of race-concordant friends.

Table 4:

Race Differences in Descriptive and Injunctive Social Norms of Dietary Behaviors, Healthy Friends Network Study (N = 1,278)

Descriptive Norms	**OR (95% CI)**
Daily consumption of fruits/vegetables	
Proximal (friends)	0.82 (0.61–1.11)
Proximal (family)	0.67 (0.50–0.91)
Distal (students)	1.10 (0.81–1.48)
Daily consumption of unhealthy foods	
Proximal (friends)	1.17 (0.86–1.60)
Proximal (family)	1.27 (0.94–1.72)
Distal (students)	0.90 (0.64–1.27)
Injunctive Norms	
Important to consume fruits/vegetables daily	
Attitude (self)	0.57 (0.38–0.86)
Proximal (friends)	0.92 (0.57–1.49)
Proximal (family)	0.71 (0.49–1.02)
Distal (students)	1.01 (0.59–1.73)
Important to avoid unhealthy foods	
Attitude (self)	0.64 (0.47–0.88)
Proximal (friends)	0.73 (0.54–0.99)
Proximal (family)	0.66 (0.46–0.94)
Distal (students)	0.99 (0.72–1.35)

Notes: Odds ratios displayed such that whites are the reference group and the odds of social norms among African Americans are modeled. Analyses were adjusted for age, class standing, father's educational attainment, mother's educational attainment, and percentage of race-concordant friends.

Table 5:

Associations between African American Race, Social Norms and Dietary Behaviors, Healthy Friends Network Study (N = 1,278)

	Daily vegetable consumption		Daily fruit consumption		Frequent unhealthy food consumption	
	Model 1	**Model 2**	**Model 1**	**Model 1**	**Model 2**	**Model 1**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
African American	0.47 (0.34–0.64)	0.48 (0.35–0.67)	0.42 (0.31–0.60)	0.44 (0.31–0.62)		
Descriptive family norm		2.02 (1.54–2.64)		1.76 (1.34–2.31)		
Indirect effect		0.98 (0.97–0.99)		0.99 (0.98–0.99)		
Direct effect		0.85 (0.79–0.91)		0.83 (0.77–0.90)		
Total effect		0.84 (0.78–0.90)		0.82 (0.76 (0.88)		
% of total effect mediated		8.7%		6.9%		
African American					1.63 (1.17–2.26)	1.48 (1.06–2.08)
Injunctive friend norm						0.37 (0.28–0.48)
Indirect effect						1.02 (1.01–1.04)
Direct effect						1.08 (1.01–1.17)
Total effect						1.10 (1.02–1.19)
% of total effect mediated						20.7%
African American					1.63 (1.17–2.26)	1.27 (0.87–1.86)
Injunctive family norm						0.15 (0.10–0.23)
Indirect effect						1.04 (1.01–1.08)
Direct effect						1.04 (0.96–1.13)
Total effect						1.09 (1.00–1.18)
% of total effect mediated						50.1%
African American	0.47 (0.34–0.64)	0.52 (0.37–0.73)	0.42 (0.31–0.60)	0.46 (0.32–0.66)	1.63 (1.17–2.26)	1.43 (1.01–2.02)
Attitude		9.31 (6.40–13.55)		6.90 (4.93–9.64)		0.13 (0.09–0.19)
Indirect effect		0.95 (0.95–0.98)		0.95 (0.92–0.99)		1.05 (1.02–1.09)
Direct effect		0.87 (0.81–0.94)		0.85 (0.79–0.92)		1.06 (0.98–1.15)
Total effect		0.83 (0.76–0.90)		0.81 (0.75–0.88)		1.12 (1.03–1.21)

	Daily vegetable consumption		Daily fruit consumption		Frequent unhealthy food consumption	
	Model 1	Model 2	Model 1	Model 1	Model 2	Model 1
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
% of total effect mediated		29.4%		23.1%		44.1%