Perceived Race Discrimination Moderates Dietary Beliefs' Effects on Dietary Intake

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Despite the recognized role diet plays in disease, health, and longevity, less than half the US population consumes the desired 5 fruit/vegetable servings a day. What accounts for the disjunction between cognition and behavior? Telephone survey data from a probability sample of 308 metropolitan Washington, DC, residents confirm the contingent consistency hypothesis as one explanation. The hypothesis suggests that optimal beliefs about health outcomes of dietary intake motivate optimal dietary intake, contingent on social structural experiences. The data show that experiences with racial discrimination can lessen the tendency for optimally healthy dietary intake to follow from belief in: 1) the benefit of eating healthy diets (or harm of unhealthy diets); and 2) self-control of health outcomes. Race (a proxy for assumed race-related social structural experiences, like race discrimination) does not demonstrate this moderating or contingency effect. (*Ethn Dis.* 2004;14:405–416).

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Introduction

Consuming primarily low fat foods could reduce cancer deaths by 35%.[1] Reducing saturated fat from the current average daily intake of 14% of total calories to 12% could cut coronary heart disease by 3%–5%.[2]

Despite the recognized role diet plays in health and disease, and despite the public's increasing awareness of the link between diet and disease,[3] less than 50% of Americans consume the ideal 5 or more fruit/vegetable servings a day.[4] The question of why behavior fails to follow knowledge, belief, or attitude more closely has long intrigued social scientists. The analyses presented in this report test whether the beliefs about diet's role and the resulting effects of dietary intake are contingent on experiences shaped by the social structure, eg, the experience of racial discrimination.

Dietary Behavior and Beliefs

Both the Health Beliefs and Reasoned Action models,[5,6] the most often cited models in the health behavior literature, emphasize a core conceptual link that is the beginning point for the research reported in this paper; behavior, in part, is a function of beliefs about the consequences of the behavior. Contento and Murphy studied beliefs about personal control of health outcomes using constructs from both the Health Beliefs and Reasoned Action models.[7] Belief in the health benefits of eating fruits and vegetables, they note, correlates positively with adapting to a healthier diet. Saunders and Rahilly found that persons who restrict their dietary intake of fat and sugar believe that such restrictions will improve their health.[8] McIntosh, however, could not demonstrate a link between reduced fat and cholesterol intake, and a belief that reducing red meat intake can enhance health.[9]

Contento and Murphy also studied beliefs and dietary intake in the context of Wallston and Wallston's health locus-of-control concept.[10] While making desirable changes in dietary intake correlated negatively with believing that health depends on chance, belief in one's internal control of health had no effect on dietary change.

Contrasting evidence on whether belief motivates behavior raises questions about potentially influential, but theoretically overlooked, variables. Beyond allowing that the social structure can influence behavior by acting indirectly (through beliefs), the popular Reasoned Action and Health Beliefs models theorize little about how the social structure (the social context in which behavior takes place) specifically influences the link between belief and behavior.[11,12] Recently developing models of food choice behavior, however, suggest that beliefs, the social structure, and dietary or food intake may interplay in a number of ways. Furst and colleagues, for example, present a constructionist model of food choice.[13] Personal beliefs (as one among other personal system variables, such as cravings, aversions, and value negotiations, eg, between quality and price) are portrayed as operating independently, reciprocally, interactively, and indirectly with the social context in which they occur. Together with other researchers,[14,15] Furst and colleagues call attention to the influence, for example, of life course experiences, social roles, and culturally related food preferences on food choice behavior.[13] An illustration of the interdisciplinary nature of food choice,[15] and the complex ways in which social and personal-level variables may work to-

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gether, might be a person who chooses to eat meat daily, simply as a reaction to an earlier point in his life when meat was unaffordable.

The recognition of dietary intake's complex relationship to social class and age, the 2 broad social context variables implicated in the research by Furst, allows us to understand that these same variables can have direct or independent links to dietary intake.[16,17] Dietary intake also covaries with gender[18] and race,[19] the 2 other major criteria typically used to set group boundaries within societies. The research reported here highlights race as one of the major social structural variables that, hypothetically, can clarify when belief predicts dietary intake behavior. The hypothesis requiring further development is that race, in particular race-related discrimination, has significance for creating contingencies in the Reasoned Action and Health Beliefs Models' posited relationship between belief and behavior. Belief may predict behavior more consistently when understanding that belief's effect is contingent on social structural experiences such as those associated with race.[11]

Race, Dietary Behavior, and Belief

Galanos, Strauss, and Pieper found that proportionately more Blacks than Whites endorsed the health benefits of self help,[20] and Swanson and associates confirmed higher Black consumption of fruits and vegetables.[21] Other data suggest that Blacks are less likely to eat fruits and vegetables,[22] and less likely to report believing that their health behavior can impact health outcomes. Snow's[23] ethnographic studies, for example, portray the distinctive low-income Black tendency to attribute poor health to God's dissatisfaction for past wrongful acts.

Recent trend analyses using the US Department of Agriculture's Nationwide Food Consumption Survey (1965), and the Continuing Survey of Food Intake by Individuals (1994–1996), demonstrate that while the overall quality of Black Americans' diet has improved since 1965, the gap in quality relative to that of the diet of their White counterparts has widened since 1965.[19] Based on a Diet Quality Index score, to summarize overall dietary intake, the data show a diet quality score in 1965 of 53 (with higher scores indicating higher diet quality) among White women with some college education. Similarly educated Black women had a score of 52. Thirty years later, scores for these two groups were 71 and 67.[19]

Obviously, it is not possible to draw a clear conclusion about the relationships between race and dietary intake, or race and beliefs about whether health outcomes can be controlled. While some of the confusion about race and dietary intake appear attributable to the time of the observation, an equally useful judgment of emerging literature on race with control-related beliefs and race with dietary behavior points to the noncumulativeness of the findings. In particular, the race effect, or lack thereof, is undefined and ambiguous. No theory is presented in this literature to account for race's presumed effect on dietary behavior, nor is it possible to determine the mechanism by which race could exert such an effect. However, Snow's samples provide an example of a tendency among Blacks to persist in attributing health status to forces outside the self, despite the established role played by personal health behavior. This persistence draws attention to the special, yet undefined, significance of race-related circumstances underlying such beliefs. Similarly, what are the race-related circumstances potentially underlying race differences in dietary intake behavior?

Two conceptual challenges confront us in understanding race's social significance in this context. First, it is necessary to untangle the conceptual confusion surrounding the meaning of a race effect. Second, once untangled, credible reasoning is needed to describe how the effect may operate to influence dietary intake behavior.

Untangling Race's Ambiguous Conceptualization

Differences between groups based on racial group labels are interpreted biologically, socially, culturally, and for their economic and political significance. For example, a Black disadvantage in fruit and vegetable consumption may indicate racial discrimination in the availability of large, well-stocked supermarkets in Black neighborhoods.[24] Williams and colleagues observed that race/ethnic differences in food choice, on the other hand, could not be attributed to experiences of racism,[25] leaving open the possibility that the differences in food choice between South Asians, Italians, and the general Glaswegian (Scotland) population are, perhaps, culturally based food preferences. Alternatively, a race difference may simply reflect a class difference, with race highlighted only because of the disproportionate number of Blacks, for example, in lower class strata. Racial group label differences, where it is impossible to distinguish these, too easily give rise to a literature that is contradictory (as exemplified above), and to ambiguous findings.

In order to reduce this source for measurement error in the meaning of data on race, LaVeist[26] urges investigators to interpret, explicitly, the meaning of the race differences they observe. Ultimately, LaVeist continues, researchers need to measure (not assume) the specific structural, cultural, or biological referent of interest. The research reported here contributes to this goal.

Race-related discrimination offers one dimension by which to begin to understand the meaning of a race effect. Socially structured, institutionalized, and customary behaviors that exclude persons from full participation in the society, because of their race, constitute both a sociological and a social psychological reality. Sociologically, the lack of public and private services, including large well-stocked supermarkets in Black neighborhoods,[24] illustrates how the social context can limit food choices, thereby creating a race and dietary intake effect. The social context results in a set of experiences for the victimized race that can help define a race effect, social psychologically. Seventy-one percent of Black Americans report experiencing race discrimination daily,[27] suggesting the potential importance of perceived discrimination as a dimension for observing the social significance of race. Here, race discrimination has most often been conceived as a stressful life event accompanied by the deleterious health outcomes typically associated with stressors.[27,28]

Whether studied sociologically, or social psychologically (as in this report on perceived racial discrimination), discrimination is clearly not the only interpretation of race's significance. Discrimination, however, is often the primary referent that investigators have in mind when writing about the social significance of race. The observation of race discrimination, rather than simply racial group membership, will permit us to begin to untangle the complex and ambiguous nature of data on race and dietary intake.

Race Discrimination and the Contingency of Dietary Beliefs and Behavior

Research suggests that race/ethnic differences in food choice, and other health-related outcomes, may have a more complex basis than being simply attributable to structurally related discriminatory practices, such as the dearth of supermarkets in Black neighborhoods, or perceived experiences of racism and discrimination. After finding that racism, alone (conceptualized, social psychologically, as a social stressor), could not account for race differences in depression, Taylor and Turner observed that the outcomes of racism must be considered in the context of other stressors.[28] Possibly racism, combined with the burden of other stressors, influences deleterious health outcomes.

In a similar manner, the contingent consistency hypothesis[11] predicts that social structural influences, like race discrimination, may exert their greatest effect by interplaying with other influences. Discrimination may create contingencies for understanding, for example, when beliefs influence behavior. The contingent consistency hypothesis, the rationale by which we earlier critiqued existing studies of dietary behavior as simply a function of beliefs, invites consideration of the multiple pathways by which discrimination and belief may work together to influence dietary intake. The hypothesis allows us to connect the discussion on the relationship between race discrimination and dietary intake behavior, with the discussion on the role beliefs about dietary intake play on dietary intake. Accordingly, the effects of beliefs about the outcomes of health and diet-related behavior on dietary intake may be contingent on race-related experiences of discrimination.

Peterson and Stunkard reviewed literature describing how a history of successfully negotiated challenges contributes to a sense of competence, coherence, mastery, and power.[29] Conversely, people conditioned to the expectation that life is uncontrollable lack this sense of personal control. Ross and Mirowsky articulately illustrated this point relative to age by documenting the negative effects of aging on beliefs about perceived personal control as a function of experiences with declining health.[30] Similarly, routine experiences of culturally ingrained racism, and socially structured race-linked discrimination, potentially condition the belief that much in life, including control of health outcomes, is beyond personal control.

The stress and coping literature clarifies that the effects of stressors on outcomes depends on the coping response to the stressor. Active (rather than passive) coping responses attenuate the deleterious effects of stress on physical and mental health outcomes[31]—including, presumably, race discrimination's impact (as a stressor) on beliefs about the amount of personal control individuals have over life outcomes. The data for this report cannot test the mechanism linking discrimination to coping response, and coping response to the effects of beliefs on behavior. The argument now is simply that relative degrees of perceived racial discrimination constitute varying contingencies under which health control beliefs have varying impact on dietary intake behavior. It is clear, however, that while reactions to discrimination range from legal, verbal, and physical confrontation (active) to withdrawal and resigned acceptance (passive), the costs in lost energy and time associated with confrontation make resigned acceptance a common reaction to experiences of discrimination.[32]

The central hypothesis, then, is that race discrimination decreases the tendency for optimally healthy dietary intake to follow belief in: 1) the benefits of eating healthy diets (or the harmfulness of unhealthy diets); and 2) the fact that individuals are in control of their own health outcomes.

Four additional hypotheses have evolved, implicitly, in the process of logically deriving this central idea. First, optimally healthy dietary intake is predictable from belief in: 1) the benefits of eating healthy diets (or the harmfulness of unhealthy diets); and 2) the fact that individuals are in control of their own health outcomes. Both of the most often cited health behavior models (Reasoned Action and Health Beliefs) express this underlying, base idea upon which this research builds: belief influences behavior.

Belief inconsistently correlates with behavior, however. A contingent consistency hypothesis, expressed earlier as the central hypothesis for the research reported, posits that the consistency between dietary-related beliefs and dietary intake behavior, in part, may be contingent on the social context of behavior. Empirical evidence has shown, unambiguously, that major contextual variables like social class, age, and gender, independently influence dietary intake. As a secondary hypothesis, we expect to corroborate this observation. Expectations about race's effects on dietary intake differ from those for the other major social stratifying variables of class, age, or gender. Because of the measurement error inherent in observing a race effect, it is expected (hypothesis 3) that race (measured as a set of racial category labels) will not influence dietary intake. If the effect is present, it will appear inconsistently, as shown in the literature, with no identifiable pattern underlying its appearance.

The observation of perceived race discrimination offers one approach by which to reduce the error in understanding race's effect. Nevertheless, it is not expected (fourth hypothesis) that race discrimination will independently influence dietary intake. Rather, the contingent consistency hypothesis, the hypothesis expressed above as our central hypothesis, is necessary: discrimination's effect on dietary intake is most useful as it acts conjointly with belief, creating contingent conditions in which belief is predictive of behavior.

Methods

Data Source and Collection

The data came from the 1988 Health Beliefs and Health Practices Survey. The probability telephone survey operationalized concepts from the Theory of Reasoned Action[6] in the context of a variety of health-related psychosocial variables. The analytic (as opposed to descriptive) focus of the research makes the survey data as useful today as in 1988. Moreover, no other data set exists, to the writer's knowledge, to permit study of the hypotheses reported here.

Following Waksberg's method,[33] random 7 digit numbers, associated with each of the 3-digit geographically defined telephone exchanges in the Washington, DC, metropolitan area, yielded a sample of households having at least one resident aged 30 years or older. The final sample of 308 persons, aged 30 years or older, had a 64% response rate. Table 1 shows the major demographic characteristics of the sample, revealing a slight over-representation of females and the highly educated, and an under-representation of older persons and married persons.

The sample, while probability-based, is small and generalizable only to metropolitan Washington, DC. Therefore, the ultimate interest in this report was not to produce definitive and generalizable conclusions beyond the sampling frame, but to establish initial and reasonable evidence for the relatively novel analytical aims of this theory.

Measurement

Multiple indicators existed for the key variables. Table 1 summarizes the measurement-related statistics for each indicator and the key variables (that is, constructs, resulting from creating summative indexes of respective sets of the indicators). Indicators constituting the 2 dependent variables (Healthy Food Intake and Unhealthy Food Avoidance) were adapted from existing indicators in the literature. The first of these, the Healthy Food Intake Index, represented the average score from 3 self-report responses to the question: "How frequently, during the past 14 days, did you: 1) eat fresh, raw or steamed green vegetables; 2) eat fresh uncooked fruits; and 3) eat whole grain breads/cereals/etc." Respondents reported whether they ate each item every day, almost every day, several times a week, 1 to 2 times a week, or never. Rather than asking about food-specific intake, respondents were asked about the intake of these 3 food groups that, according to the USDA's Food Guide Pyramid, represent those food groups that should be consumed in the greatest daily quantities for optimal health.

The Unhealthy Food Avoidance Index also represented an average of the scores from questions about the intake frequency from 3 food groups or sources: red meats, fried foods, and fast foods—food types individuals are generally advised to eat infrequently, if at all.

The 2-week food recall time period was unconventional, whether considering the usual longer report periods in typical food frequency questionnaires, or the shorter report period of 24-hour diet recalls. The 2-week time frame permitted the study of *typical* dietary intake (as sought in food frequency questionnaires), but minimized recall errors, a weakness of longer time-frame food frequency methodologies. This focus, along with the emphasis on food group intake (rather than food-specific serving or nutrient gram intake) coincided with the analytic need of the research to rank subjects according to generally acknowledged healthy and non-healthy food intake. This was not a study to describe prevalence or level of food, food group, or nutrient intakes.

As seen in Table 1, similar and high factor loadings from a principal-components factor analytic solution applied to the indicators provided credible evidence for the construct and convergent validity of the 2 dietary intake indexes. Factor loadings ranged between 0.58 and 0.71 for the Healthy Food Intake Index, and between 0.65 to 0.69 for the Unhealthy Food Avoidance Index, thus exceeding the conventionally accepted

Table 1. Descriptive data for the sample (N=308) and variables in the analysis

Variables: Constructs (Indexes)/Indicators	Sample %	Pop.* %	Factor Loading	Mean(s) (N=308)†‡	Score Range
1. Age (≥65)	8%	14%			
2. Gender (female)	63%	51%			
3. Education (HS+)	96%	85%			
4. Race (non-White)	31%	27%			
5. Race discrimination (workplace)				1.5 (.7)	1–4
Denied job promotion			.87	1.6 (1.0)	1–4§
Excluded from job/group incrowd			.79	1.5 (1.0)	1–4
Denied job			.58	1.6 (1.0)	1–4
6. Race discrimination (exclusivity)					1–4
Played down achievement			.60	1.7 (1.1)	1–4§
Not invited to social function			.80	1.6 (1.0)	1–4
Denied group membership			.77	1.5 (1.0)	1–4
7. Belief in the benefit of healthy food intake				3.7 (.5)	1.3–4.0
Vegetables			.74	3.7 (.7)	1–4‖
Fruits			.59	3.8 (.6)	1–4
Whole grains			.69	3.6 (.8)	1–4
8. Belief in the harm of unhealthy food intake				2.9 (.5)	1.0–4.0
Red meats			.67	2.9 (.7)	1–4¶
Sweets			.63	2.8 (.7)	1–4
Butter			.62	2.9 (.7)	1–4
Fried foods			.51	3.2 (.6)	1–4
9. Belief about internality of health control				2.8 (.7)	1.0–4.0
Sickness is unavoidable			.82	2.8 (.8)	1–4**
Sickness is predetermined			.83	2.8 (.8)	1–4
10. Unhealthy food avoidance				3.9 (.7)	1.3–5.0
Red meats			.65	3.6(1.0)	1–5††
Fried foods			.69	4.0 (.9)	1–5
Fast foods			.65	4.1 (.9)	1–5
11. Healthy food intake				3.6 (.9)	1.3–5.0
Vegetables			.59	3.6 (1.2)	1–5††
Fruits			.58	3.9 (1.2)	1–5
Whole grains			.71	3.6 (1.4)	1–5

* Population (Pop.): Washington, DC Metropolitan Area.
† Standard deviation(s), per indicator, shown in parentheses; *N* is number of cases.
‡ Index scores, per construct, represent the respondent's mean score on the indicators constituting the construct. Higher scores correspond to higher endorsement of the construct label.
§ Score ranges correspond to response alternatives: never, rarely, sometimes, frequently.
‖ Score ranges correspond to: very harmful, harmful, beneficial, very beneficial.
¶ Score ranges correspond to: very beneficial, beneficial, harmful, very harmful.
** Score ranges correspond to responses: strongly agree, agree, disagree, strongly disagree.
†† Score ranges correspond to: never (during the last 2 weeks), 1–2 times a week, several times a week, almost everyday, everyday.

minimum level of 0.40 for establishing indicator reliability (internal consistency) and construct validity. Each set of observed indicators appeared to converge to measure a similar underlying, albeit not directly observed, factor or construct. The similarity of the assumed underlying information (ie, the factor or construct) was labeled, the Healthy Food Intake Index and the Unhealthy Food Avoidance Index, respectively.

The independent variables for the study were operationalized in a similar manner. Two of the 3 primary independent belief variables (constructs) were additionally constructed to follow Ajzen and Fishbein's[6] call for parallel operations of the indicators for belief and behavior measures. A query about frequency of eating vegetables, one of the indicators in the Healthy Food Intake Index, for example, had its parallel in a belief indicator about the extent of belief in the health benefit of eating vegetables. This was one of the indicators constituting the Belief in the Benefit of Healthy Food Intake Index (see Table 1). The Index included information derived from asking respondents to indicate "how strongly you believe that doing each of the following (eating fresh uncooked fruit, eating whole grain breads/cereals/etc)" is harmful or beneficial (very harmful somewhat harmful, somewhat beneficial, very beneficial) to your health." Two limitations in these data are noteworthy. First, the 4-category response mode of these items limited possible response variations. Second, with such a small overall sample size, efforts were made to maximize the effective sample size for the analyses. Therefore, the rare occurrence of persons responding that they "don't know" to these items was tallied in the "harmful" response category. Reasonably, "don't know" represents a non-optimal response to belief about these foods generally acknowledged to be desirable for optimal health. The second belief construct, Belief in the Harmfulness of Unhealthy Food Intake, summarized data from indicators about belief in the harm of eating red meat and fried food, and also sweets and butter. To the extent possible, indicators constituting the Belief in the Harmfulness of Unhealthy Food Intake Index have a parallel in the corresponding behavioral construct, the Unhealthy Food Avoidance Index. The restriction that indicators must minimally load at 0.40 on their factor (for acceptable reliability) dictated some adjustment to this ideal, however. While fast food intake was an indicator on the Unhealthy Food Avoidance Index, it was not an indicator on the corresponding belief index. Indicators for belief about the harmfulness to health of eating butter and sweets were substituted for the indicator on belief about the harmfulness of fast foods, each having a correlation (loading) with the factor (belief construct) meeting the reliability criterion. Table 1 shows descriptive information for each indicator and construct.

Indicators of belief about personal control over health outcomes, the third belief construct, were adapted from Wallston and Wallston's[10] well known Multi-dimensional Health Locus of Control concept. Two-factor analytic-based indicators [belief that sickness is: 1) unavoidable; and 2) predetermined (see Table 1)] were selected for an index measure of an internal locus of control (internality). The factor analytic-based (2-item) index, Belief about the Internality of Health Control, ensured having a one-dimensional measurement of a multi-dimensional concept, and that the index was based on indicators with loadings equal to or exceeding .40.

The racial discrimination indicators were selected to focus as narrowly as possible on job and employment-related discrimination, one setting for racial discrimination. Respondents were asked: "Thinking back on your life experiences, how often (never, rarely, sometime, frequently) would you say that you have felt that it was because of your race that you, for example, were not promoted on your job." Table 1 shows the full set of these 6 job-related indicators. A confirmatory factor analysis of the indicators for a 2-dimensional concept (Table 1) yielded loadings, per factor, varying from 0.82 to 0.84 (Workplace Discrimination), and from 0.78 to 0.98 (Social Network Exclusivity, or, simply, Exclusivity Discrimination). While no other published information is available on the validity or reliability of these indicators, the factor loadings suggested the construct and convergent validity of the respective indicator sets, and the reliability of each indicator as a measure of its underlying construct.

Analytic Plan

A couple of additional methods-related concerns arose in assessing the cross-product interaction effects associated with the use of the ordinary least squares (OLS) regression framework. To minimize the potential effects of multicollinearity and measurement error on the power of statistical testing, Jaccord, Turrisi, and Wan[34] have suggested centering scores (subtracting the raw score for key predictor variables from their respective means). Additionally, the variances and covariances of the discrimination and belief constructs were adjusted for their known reliability. Specifically, rather than basing the analyses on the observed score variances of the independent variables, the true score (reliable) variances were used. The true score variance is the observed score variance in a variable, minus its error component, the latter a function of the reliability of the measure.[35]

Because most people were found to believe that health benefits accrued from optimal diets (and did not report experiencing discrimination), the corresponding frequency distributions, per indicator, were routinely skewed. The mean score of the 4 point Likert scale of these indicators hovered close to the extremes, 1 or 4 (Table 1). To introduce negligible random variation in these and the criterion variables, thereby reducing methodologically based constrictions on the size of correlations involving these constructs,[36] random jitter (randomly adding a $\pm$.01 to $\pm$.05 to each raw score, per construct)[34] was applied to the scores before centering and testing the models.

RESULTS

Hypothesis 1: Dietary Intake and Beliefs about Diet and Health Outcomes

Table 1 shows the score range and mean score for each indicator and construct (index). The sample typically avoided unhealthy foods and ate healthy foods. The score on vegetable intake, for example, fell between 2.4 (somewhat more than "1 or 2 times a week") and 4.8 (approximately "every day") 68% of the time (3.6 $\pm$ 1.2). Table 1 also reveals that the sample, typically, strongly believed in the benefits of healthy food intake (mean=3.7; range 1.3–4.0), but was slightly less likely to endorse belief in the harm of unhealthy foods, or the belief that they could control their own health outcomes.

More often than not, the data in Table 2 supported the first hypothesis. Dietary intake was predictable from beliefs about dietary intake, and health control outcomes. Four of the 6 full-effect models (Model 3) supported the hypothesis, showing statistical ($P \leq .05$) and sub-

Table 2. Regression models for unhealthy food avoidance and healthy food intake as a function of beliefs about food intake and health control

	Unhealthy Food Avoidance									Healthy Food Intake								
	Model 1			Model 2			Model 3§ Hyp. 1–3‖			Model 1			Model 2			Model 3§ Hyp. 1–3‖		
Model Variables	b 1	s 2	β 3	b 4	s 5	β 6	b 7	s 8	β 9	b 10	s 11	β 12	b 13	s 14	β 15	b 16	s 17	β 18
Panel A: Belief in the Benefit of Healthy Food Intake (BBHF)																		
BBHF	.29‡	.08	.22	.29‡	.08	.22	.28‡	.08	.21	.13	.11	.07	.12	.11	.07	.07	.10	.04
Race				−.01	.09	−.00	.08	.09	.05				−.09	.12	−.05	.03	.11	.02
Age							.05†	.03	.11							.13‡	.03	.20
Gender							.16*	.08	.11							.47‡	.11	.25
Class							.12‡	.03	.21							.17‡	.04	.22
R^2			.04‡			.04‡			.09‡			.00			.00			.12‡
Panel B: Belief in the Harmfulness of Unhealthy Food Intake (BHUF)																		
BHUF	.33‡	.08	.22	−.33‡	.09	.21	.34‡	.09	.22	.24*	.12	.12	.23*	.12	.11	.26†	.11	.12
Race				−.03	.09	−.02	.06	.09	.04				−.10	.12	−.05	.04	.11	.02
Age							.06†	.03	.13							.13‡	.03	.22
Gender							.19‡	.08	.13							.47‡	.10	.25
Class							.12‡	.03	.20							.17‡	.04	.22
R^2			.04‡			.04‡			.10‡			.01*			.01*			.14‡
Panel C: Belief about the Internality of Health Control (BIHC)																		
BIHC	.22‡	.05	.23	.22‡	.06	.23	.18‡	.06	.19	.07	.07	.06	.07	.08	.05	−.00	.08	−.00
Race				−.00	.09	−.00	.05	.09	.04				−.10	.12	−.05	.02	.11	.01
Age							−.05*	.03	.11							.12‡	.03	.20
Gender							.19*	.08	.14							.49‡	.10	.26
Class							.09†	.03	.15							.17‡	.04	.22
R^2			.05‡			.05‡			.08‡			.00			.00			.12‡

* $P<.05$, † $P<.01$, ‡ $P<.001$ (one-tail).

§ Data for responding to hypotheses (Hyp.) 1–3 are in columns 7, 8, 9 when the dependent variable is Unhealthy Food Avoidance and columns 16, 17, 18 when the dependent variable is Healthy Food Intake. See text for statement of the hypotheses.

‖ b=unstandardized regression weight; s=standard error of the unstandardized weight; β=standardized regression weight; R^2=model variance explained, adjusted for the number of independent variables.

stantive (β≥0.10) significance for the belief constructs, even after adjusting for age, sex, class, and race. Belief that eating unhealthy food was harmful to health predicted both unhealthy food avoidance and healthy food intake (panel B); however, belief in the benefit of healthy eating (panel A) predicted only unhealthy food avoidance. Beliefs endorsing personal responsibility for the control of one's own health outcomes (panel C) also motivated the avoidance of unhealthy foods, but was not related to healthy food intake.

Belief consistently predicted unhealthy food avoidance. Healthy food intake, on the other hand, was largely not predictable from the belief constructs, excepting beliefs about the harmfulness of unhealthy foods.

Hypotheses 2, 3, and 4: The Social Structure and Dietary Intake

Age, gender, and class consistently (across the 6 analyses for Model 3 in Table 2) influenced dietary intake. Females, older individuals, and those of higher status, were found to be more likely to eat optimally healthy foods and to avoid non-optimal, unhealthy foods.

Dietary intake, however, did not covary significantly with race (hypothesis 3) in any of the analyses of Table 2. Additionally supportive of the reasoning underlying hypothesis 3, Table 3 shows that race did not interact with belief. The tendency for optimal food intake to follow optimal beliefs about food intake, or control of health, did not differ for the Black and White subsamples. Race, *assuming* its proxy representation for variation in the experience of discrimination, in short, was neither independently nor interactively related to dietary intake.

In addition, the data in Table 4 largely confirm hypothesis 4, that the study of the social structural significance of race (studied now as race discrimination) did not predict dietary intake. In 9 of the 12 analyses, race discrimination, alone, was not a significant variable. Perceived exclusivity discrimination was the variable linked to efforts made to avoid unhealthy foods in each of the 3 statistically significant cases, regardless of how belief was conceived, it was perceived exclusivity discrimination that reduced efforts to avoid unhealthy foods.

Table 3. Regression models for unhealthy food avoidance and healthy food intake as a function of the interaction of race with dietary-related beliefs

Model Variables	Unhealthy Food Avoidance		Healthy Food Intake	
	b§	s§	b§	s§
Panel A: Belief in the Benefit of Healthy Food Intake (BBHF)				
BBHF	.27‡	.09	.01	.11
Race	.02	.09	.05	.12
Age	.05*	.03	.12‡	.03
Gender	.15*	.09	.42‡	.11
Class	.12‡	.04	.17‡	.05
BBHF by Race	−.19	.14	.16	.19
R^2 (ΔR^2)‖	.07‡ (.01)		.11‡ (.00)	
Panel B: Belief in the Harmfulness of Unhealthy Food Intake (BHUF)				
BHUF	.27‡	.09	.19*	.12
Race	.01	.09	.05	.12
Age	.05*	.03	.13‡	.03
Gender	.19†	.09	.44‡	.11
Class	.12‡	.04	.18‡	.05
BHUF by Race	−.24	.16	−.18	.21
R^2 (ΔR^2)‖	.06‡ (.01)		.11‡ (.00)	
Panel C: Belief about the Internality of Health Control (BIHC)				
BIHC	.14*	.07	−.06	.09
Race	.02	.09	.03	.12
Age	.05*	.03	.12‡	.03
Gender	.18†	.09	.44‡	.11
Class	.10‡	.04	.18‡	.05
BIHC by Race	−.08	.12	−.00	.15
R^2 (ΔR^2)‖	.05‡ (.00)		.10‡ (.00)	

* $P<.05$, † $P<0.01$, ‡ $P<0.001$ (one-tail).
§ b=unstandardized regression weight; s=standard error of the regression weight.
‖ R^2=model variance explained, adjusted for number of independent variables. ΔR^2 is the change in R^2 made by the interaction term.

Hypothesis 5: Race Discrimination: The Contingency of Belief's Effect on Dietary Intake

Table 4 shows that perceived race discrimination often interacted with the belief-related constructs to influence dietary intake. Perceived race discrimination moderated the influence of belief on dietary intake, confirming that belief's effects on dietary intake is, at least to a degree, contingent on perceived race discrimination.

The interaction effect reported in Table 4 demonstrates that the tendency for optimal dietary belief to motivate optimal dietary behavior decreased with increases in perceived race-linked discrimination. With each unit increase in the experience of exclusivity discrimination, the positive impact of believing in the benefits of eating healthy foods decreased 0.19 units, on average, as it related to avoidance of unhealthy foods ($b=-0.19$, $P<.001$). [A unit on the Unhealthy Food Avoidance Index, the Index of Belief in the Benefit of Healthy Food Intake, or the Exclusivity Discrimination Index refers to a unit on the distribution of averaged indicator scores constituting each index. (See Table 1 for the range of these index scores in the sample.)] The finding supported the hypothesis. The magnitude of this statistically significant effect was not impressive, however ($R^2=0.02$). Only 2% of the variance in unhealthy diet avoidance behavior was explained by the interaction.

Discrimination, as measured by indicators of exclusivity, interacted with 2 of the 3 belief measures to influence unhealthy food avoidance (Table 4). Exclusivity discrimination did not interact with belief about the harmfulness of unhealthy diets. The hypothesized interaction between exclusivity and belief showed consistently in each of the analyses for healthy food intake (Table 4).

Table 4 also presents data for workplace discrimination. Regardless of how belief was measured, belief and workplace discrimination did not interact to influence the avoidance of unhealthy foods. Two of the 3 possible interactions were significant for healthy food intake.

Overall, the results confirmed the hypothesized contingent effect of beliefs on behavior. The effects were not strong, however, explaining less than 5% of the variance in the dietary measures (see R^2 in Table 4). Although the total variation explained in the models is low ($R^2=.06$ to .16), the hypothesized effects in some of these models can account for a sizable part of the total effect. The interaction of exclusivity discrimination with belief internality, for example, accounted for almost a third of the explained variation [$(\Delta R^2=.05/R^2=.16)=.31$] in healthy food intake.

DISCUSSION

The finding that optimal dietary-related beliefs can predict optimal dietary intake, coincides with existing data.[37,38] Behavior and beliefs do not consistently coincide, however. Data examined in this report help explain why. First, the data show that beliefs and behavior coincide to explain unhealthy food avoidance, but largely fail to coincide in explaining healthy food intake. Presumably, belief is sufficiently salient for passively avoiding non-optimal foods, but is less influential in the proactive pursuit of optimal food intake. Refusing the fatty or fast foods in the nearby street vendor's wagon involves less effort than that needed, for instance, to find a market for the purchase of vegetables, not to mention preparing the vegetables pur-

Table 4. Regression models for unhealthy food avoidance and healthy food intake as a function of race discrimination's moderating influence on dietary-related beliefs

	Unhealthy Food Avoidance				Healthy Food Intake			
	Exclusivity Discrimination (Disc.)		Workplace Discrimination (Disc.)		Exclusivity Discrimination (Disc.)		Workplace Discrimination (Disc.)	
Independent Variables	b§ 1	s§ 2	b 3	s 4	b 5	s 6	b 7	s 8
Panel A: Belief about the Benefit of Healthy Food Intake (BBHF)								
BBHF	.33‡	.08	.30‡	.08	.20*	.11	.17	.11
Disc.	−.21†	.07	−.03	.06	.00	.08	.11	.09
Age	.04*	.03	.05*	.03	.12‡	.03	.13‡	.03
Gender	.11	.09	.12	.09	.39‡	.11	.39‡	.11
Class	.12‡	.03	.12‡	.03	.18‡	.04	.20‡	.04
BBHF by Disc.	−.19‡	.07	−.10	.09	−.32‡	.09	−.31†	.11
R^2 (ΔR^2)‖	.12‡ (.02†)		.08‡ (.00)		.13‡ (.03‡)		.13‡ (.02‡)	
Panel B: Belief about the Harmfulness of Unhealthy Food Intake (BHUF)								
BHUF	.24†	.09	.25†	.09	.13	.11	.17	.11
Disc.	−.19†	.07	−.03	.07	.09	.09	.11	.09
Age	.04	.03	.05*	.03	.13‡	.03	.13‡	.03
Gender	.18*	.08	.19†	.09	.46‡	.11	.42‡	.11
Class	.12‡	.03	.12‡	.03	.16‡	.04	.18‡	.04
BHUF by Disc.	−.08	.15	−.08	.11	−.36*	.19	.03	.14
R^2 (ΔR^2)‖	.09‡ (.00)		.06‡ (.00)		.12‡ (.01*)		.11‡ (.00)	
Panel C: Belief about the Internality of Health Control (BIHC)								
BIHC	.20‡	.08	.20†	.08	−.03	.10	−.05	.10
Disc.	−.23†	.07	.03	.06	−.06	.09	.12	.08
Age	.04*	.03	.05*	.03	.13‡	.03	.13‡	.03
Gender	.16*	.08	.18†	.09	.43‡	.11	.46‡	.11
Class	.09*	.04	.09†	.04	.18‡	.05	.19‡	.05
BIHC by Disc.	−.24‡	.07	−.11	.06	−.42‡	.09	−.18†	.08
R^2 (ΔR^2)‖	.11‡ (.03†)		.06‡ (.01)		.16‡ (.05‡)		.12‡ (.01*)	

* $P<.05$, † $P<.01$, ‡ $P<0.001$ (one-tail).
§ b=unstandardized regression weight; s=standard error of the regression weight.
‖ R^2=model variance explained, adjusted for number of independent variables. ΔR^2 is the change in R^2 made by the interaction term.

chased. Optimal food intake requires more than the avoidance of non-optimal foods, and may depend on more than personal-level cognitive resources.

Prior research has demonstrated that supermarket availability in US communities increased the likelihood of fruit and vegetable consumption in those communities.[24] Research from the United Kingdom confirms that fruit and vegetable consumption increased in a community, previously served by small corner-store type establishments, once a large, well-stocked supermarket opened nearby, making fruits and vegetables more available.[39] Although lacking information on specific social structural influences, such as the neighborhood availability of desirable foods, the data in this report show that social contextual processes, especially the major group-stratifying processes in society, directly influence both optimal and non-optimal dietary intake. The direct effects for social class, gender, and age match findings in the literature reinforcing Andersson and Stanich[40] observation that life events (which often derive from the societal roles played) cannot be dismissed as simply unimportant, or only indirectly important for behavior, as is often implied by current health behavior models. Research on food choice behavior, for example, shows that optimal dietary intake increases directly in response to life events (such as having had a garden at one time[41]), and circumstances, such as perceiving one's job as demanding but manageable, rather than as demanding and limited.[42]

. . . data show that beliefs and behavior coincide to explain unhealthy food avoidance, but largely fail to coincide in explaining healthy food intake.

Dietary intake, however, did not vary across groups stratified by racial category labels. Race, studied simply as a group category difference (White and non-White), may be too ambiguously measured to reflect any single aspect of race's social significance. Contradictory findings on the relationship between race and fruit/vegetable intake[17,43] raise questions about the actual meaning of data on racial group membership, and whether the meanings are cumulative from one study to the next.

Observing the effects of race discrimination provides one way to see more specific data for a less ambiguous interpretation of race's social significance for dietary intake. Dibsdall and colleagues, however, caution that ensuring social structural-related access and availability is only one part of the effort to increase optimal food intake.[44] Individual-level variables, like motivation, as Dibsdall's collaborators found, and beliefs, as emphasized in this report, must reasonably interplay with the social context.

Accordingly, perceived race discrimination was found to operate as a contingency factor in the relationship between dietary intake and beliefs about personal control over health outcomes. Eleven of the 12 separate tests for the hypothesized interaction effect (Table 4) showed that the tendency for optimal behavior to follow optimal belief decreases with increases in discrimination. Of these 11 tests for the interaction of belief with discrimination, 7 of the interaction terms are statistically significant ($P<.05$).

Patterns in the consistency (and inconsistency) of the data, across the 2 conceptions of dietary behavior or the 3 conceptions of belief, provide insight and direction for more refined research. With one exception, the expected interaction effect appeared consistently in the 6 tests for healthy food intake (Table 4). The expected effect was statistically significant in only 2 of the 6 tests for unhealthy food avoidance, although each of the interaction effects is in the predicted direction. Race discrimination dampens the tendency for optimal beliefs to motivate optimal behavior more consistently for healthy food intake, suggesting that the latter's more difficult implementation is less responsive simply to beliefs. It more readily involves (as reasoned in discussing Table 2) extra-belief circumstances including, as emphasized here, belief acting in conjunction with experiences of racial discrimination.

The role played by race discrimination on belief's influencing behavior also depends on the nature of the discrimination. The effects of exclusivity and workplace discrimination for belief's effects on behavior is similar in 3 of the 6 comparisons (Table 4). Workplace discrimination did not interact with belief (while exclusivity discrimination did) in the case of: 1) unhealthy food avoidance in relation to belief in the benefit of healthy food intake and belief in the internality of health control; and 2) healthy food intake and belief in the harmfulness of unhealthy food intake. Future research of the belief, behavior, and discrimination causal nexus should systematically consider the complexity associated with observing discrimination. Does the hypothesized effect depend on the type of discrimination conceptualized and, therefore, the indicators used to measure discrimination? A more refined study of these ideas will call for a larger sample size in order to increase the variation in responses to perceptions about discrimination, however measured. A larger sample size would also increase the power of statistical tests of the hypothesized effects.

While the overall findings, and their implications for additional research, are intriguing, the hypothesized statistically significant interactive effects are not particularly strong, typically explaining less than 5% of the variance in dietary intake (see R^2 in Table 4). Therefore, caution should be exercised in drawing conclusions about the theoretical or practical significance of the findings.

From an alternative perspective, however, the full models in Table 4 explain an average of 13% of the variance in healthy food intake, and 9% of the variance in unhealthy food intake. These figures are comparable to the average variances reported at around 16%, for dietary intake in the literature on beliefs, attitudes, and dietary intake.[45] In comparison, psychosocial variables characteristically predict less than 30% of the variance in studies of fruit and vegetable consumption.[46] Baranowski and colleagues noted that higher predictability depends on research that tests models reflecting multiple theories of interlocking effects.[46] Therefore, the support found for the hypothesized interaction accounting for less than 5% of the total variance in the data (and, as previously noted, up to a third of the variance that is explained in the data), is useful for telling us that dietary intake has a multifaceted explanation. One small part, among probably numerous small parts, of its explanation appears related to the interaction of race discrimination with beliefs about dietary and health behavior outcomes. Booth and colleagues introduced an ecologic model of food choice, alerting us to the large array of psycho-biologic (eg, hierarchy of needs), cultural (beliefs and values), and social (roles and experiences) factors influencing dietary intake.[14]

In conclusion, data existed for this report sufficient only to test a reasonably credible model of the ideas expressed here. The primary effort here was to provide a small piece of the puzzle to which future research can add. In practical terms, accumulating evidence of race discrimination's moderating role for the belief/behavior link would have implications for the type of effort needed to reduce the nearly $200 billion now spent each year on diet-related diseases.[47] The importance of litigation and governmental action to eliminate race discrimination (thus increasing the tendency for optimal health beliefs to motivate optimal health behavior) obviously remains.

Additionally, health education messages seeking to influence beliefs about health responsibility for the purpose of motivating dietary change may be more effective if combined with existing beliefs and perceptions deriving from social structural experiences, the latter which could reduce the expected connection between belief and behavior. Potential benefits may accrue, for example, if dietary promotional messages, especially within minority communities, raise consciousness about one's personal capacity to control dietary intake. Suggestive recommendations, albeit needing additional study for their efficacy, include: 1) the creation of possibilities for short-term successes in optimal food choices; 2) the use of naturally existing resources in the target community as role models for more optimal dietary intake choices; and 3) the education of community activists and advocates on the need for sensitivity, in promotional efforts, to their target group's history and culture (including the social psychological impact of race discrimination). Each of these recommendations incorporates the recognition of our central finding, that beliefs about personal control and experiences of discrimination may act together to influence dietary intake behavior. The task of educational promotional efforts includes helping individuals realize that personal control over health outcomes is possible and has positive consequences.

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