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Behavioral Predictors of Low Fat Intake Among Economically Disadvantaged African-American Adolescents

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Abstract

Purpose—To determine whether five behaviors shown to predict low fat intake in adults predicted low fat intake among economically disadvantaged African-American adolescents.

Design—Cross-sectional.

Subjects and Measures—Recruited through youth services agencies serving low-income communities in New York and New Jersey, participants were 265 African-American adolescents aged 10 to 14 years. Participants completed the Block Fat Screener and scales for measuring the following behaviors: avoiding fat as a seasoning, modifying meat to make it lower in fat, substituting high-fat foods with manufactured low-fat equivalents, replacing high-fat foods with fruits and vegetables, and replacing high-fat foods with low-fat foods other than fruits and vegetables.

Analysis—The reliability and construct validity of the scales were assessed using internal consistency reliability and correlation analyses. Multiple regression analysis was used to determine behavioral predictors of low fat intake.

Results—Scale coefficient alphas ranged from .60 to .80. Fat avoidance, substitution, and replacement with fruits and vegetables were significantly associated with fat intake. The regression equation containing these behaviors accounted for 12% of the variance in intake. All three behaviors were significant predictors of low fat intake.

Conclusions—Fewer behaviors have salience for predicting low fat intake among economically disadvantaged African-American adolescents than among adults. Interventions to lower youths' intake should emphasize fat avoidance, substitution, and replacement with fruits and vegetables.

Keywords

Dietary Fats; Low-Fat Practices; African-Americans; Adolescents. Manuscript format: research; Research purpose: instrument development; modeling/relationship testing; Study design: nonexperimental; Setting: local community; Health focus: nutrition; Strategy: skill building/behavior change; Target population: youth; Target population circumstances: education/income, race/ethnicity

PURPOSE

The recommended total fat intake for U.S. adolescents is between 25% and 35% of energy,¹ yet national nutrition surveillance data reveal that less than one fifth of African-American adolescents have intakes that fall within these guidelines.² The total amount and types of fat in the diet raise risk for cardiovascular diseases, non-insulin-dependent diabetes, and obesity,³ and obesity raises risk for stroke, high blood pressure, and cancer.^{4,5} Because higher mortality from these conditions disproportionately affects those of lower socioeconomic status,⁶ economically disadvantaged African-American adolescents have the most to gain from intervention programs to lower their fat intake. Essential to the development of such programs is theoretical understanding of fat intake in this population.

Kristal and colleagues⁷ developed a model of behaviors related to the selection of a low-fat diet. A combination of five behaviors (avoiding fat as a seasoning, modifying meat to make it lower in fat, substituting high-fat foods with manufactured low-fat equivalents, replacing high-fat foods with fruits and vegetables, and replacing high-fat foods with low-fat foods other than fruits and vegetables) was found to predict low fat intake in a sample of adults.⁷

In our initial research,⁸ we used Kristal and colleagues' model to study fat-related dietary behaviors among economically disadvantaged African-American adolescents. Inverse relationships were found between fat intake and single-item measures of each behavior; two of the behaviors (avoiding fat as a seasoning and replacing high-fat foods with low-fat foods other than fruits and vegetables) were significant predictors of low fat intake. To gain a more thorough understanding of the model's utility for predicting low fat intake among economically disadvantaged African-American adolescents, this study developed multi-item scales for assessing to what extent youths avoided fat as a seasoning, modified meat to make it lower in fat, substituted high-fat foods with manufactured low-fat equivalents, replaced high-fat foods with fruits and vegetables, and replaced high-fat foods with low-fat foods other than fruits and vegetables. Using analyses controlled for potential confounders, we sought to determine which behaviors predicted low fat intake in this population.

METHODS

Design

We received approval from the Institutional Review Board of Columbia University before beginning this cross-sectional study. Scales for measuring adolescent fat-related dietary behaviors were then developed and pretested using procedures described below. The measures were administered to a recruited sample, and the resulting data were used to finalize the scales and to examine the relationships between fat-related dietary behaviors and fat intake.

Sample

Participants were 265 African-American adolescents, aged 10 to 14 years, residing in low-income communities in New York and New Jersey and recruited through seven youth services agencies serving these communities. The agencies were private, nonprofit organizations that provided youths with after-school recreational and educational services.

When youths presented for services, administrators from collaborating sites offered them the opportunity to participate in the study and distributed recruitment materials (i.e., a written study description and a consent form). Youths who returned the consent form with their signature and the signature of a parent or guardian were enrolled. For their participation, youths received a \$15 gift card redeemable at local bookstores, music stores, and movie theaters.

Measures

Demographic and Anthropometric Variables—Youths reported their sex, date of birth, height in feet and inches, and weight in pounds.

Fat-Related Dietary Behaviors—Scales for measuring avoiding fat as a seasoning, modifying meat to make it lower in fat, substituting high-fat foods with manufactured low-fat equivalents, replacing high-fat foods with fruits and vegetables, and replacing high-fat foods with low-fat foods other than fruits and vegetables were constructed using established guidelines.^{9,10} Each construct was defined, and item pools were written. The aim was to create items that reflected various dimensions of each behavior and were relevant to the selection of a low-fat diet. We drew from reports of food sources of total fat in adolescent diets and cross-referenced reports of high-fat foods commonly consumed by African-Americans to identify foods on which to focus.¹¹⁻¹⁴

A panel of five scientists (two research nutritionists, a nutritional epidemiologist, and two health psychologists), chosen based on their knowledge of Kristal and colleagues' model, reviewed the scales and suggested ways to improve items' representativeness, developmental appropriateness, and the degree to which they reflected youths' food preferences and eating habits.¹⁰ Items were revised based on these suggestions.

To reduce the likelihood of response error due to misinterpretation, cognitive testing interviews were conducted with 20 youths.¹⁵ Retrospective probing techniques were used to elicit information about youths' ability to interpret questionnaire items as intended.¹⁶ Conducted on a one-to-one basis, the interviews consisted of two parts: First, the participant completed the scales. Next, the interviewer reviewed questionnaire items with the participant and discussed the responses. The participant was asked to describe what each question meant and to indicate why he or she provided the answer given. If the participant misunderstood an item, the interviewer explained the intended meaning and asked for suggestions about how the language could be improved. Items were revised based on youths' input.

The items were arranged in a consistent questionnaire format and prefaced with "Over the past month, how often did you...?" Response options were on a 4-point scale (rarely or never, sometimes, often, usually or always). A "does not apply" option was also provided to allow respondents to identify practices that were related to foods they were not in the habit of eating. Items so marked were excluded from subsequent analyses.

Fat Intake—The Block Fat Screener was used to measure fat intake.¹⁷ This 17-item instrument includes the top sources of fat in American diets as determined by national surveys and research. Correlations between fat in-take estimates derived from the screener and estimates derived from a food frequency questionnaire were at or above .60; sensitivity, specificity, and positive predictive value were .52, .93, and .57, respectively. Respondents reported their intake of each item using response options ranging from 0 (once a month or less) to 4 (five or more times a week). Item ratings were summed, resulting in scores ranging from 0 to 68, and then converted to percentage of energy from fat using prediction equations.¹⁷

Analysis

Correlation and internal consistency reliability analyses informed the selection of items to retain in each of the five scales. Items were selected in a two-step process.⁹ First, the correlation between the item and fat intake was examined. Items for which an inverse correlation was found were retained at this step. Second, internal consistency reliability analysis was performed to examine the degree to which items in each of the scales formed an internally consistent

whole. Items were deleted if their item-remainder coefficient was below .40 and their removal increased coefficient alpha for the scale.

Scale scores were calculated as the sum of item scores divided by the number of items, so that all scores ranged from 1 to 4. We calculated youths' age in years. Weight status was measured using body mass index (BMI), defined as weight in kilograms divided by height in meters squared. Sex was dichotomously coded (0 = male, 1 = female).

Descriptive statistics were used to characterize the sample. Correlation analysis was used to identify demographic and anthropometric variables significantly associated with fat intake and to assess the construct validity of the scales using fat intake as the validation measure. Scales that evidenced construct validity were included in a multiple regression analysis used to identify behavioral predictors of low fat intake. The analysis was controlled for demographic and anthropometric variables found to be significantly associated with fat intake. All analyses were conducted using SPSS (Version 12.0.1, SPSS Inc., Chicago, Illinois).

RESULTS

Shown in Table 1, item analyses resulted in a 2-item measure of avoiding fat as a seasoning ($\alpha = .60$), a 9-item measure of substituting high-fat foods with manufactured low-fat equivalents ($\alpha = .80$), a 5-item measure of modifying meats to make them lower in fat ($\alpha = .66$), a 3-item measure of replacing high-fat foods with fruits and vegetables ($\alpha = .60$), and an 8-item measure of replacing high-fat foods with low-fat foods other than fruits and vegetables ($\alpha = .73$). The scales differed from Kristal and colleagues' measures in some respects. For example, our avoidance scale was specific to cooked vegetables, whereas in the adult measure practices relating to other foods are also assessed. Similarly, the modification scale reflected practices specific to chicken but did not assess such practices as trimming the visible fat from red meat and eating only small portions of meat, as measured by the adult scale. Our measures of substitution and replacement with low-fat foods other than fruits and vegetables described practices pertaining to higher-fat meats (i.e., hot dogs, hamburgers), snacks, French fries, and pizza—items not found in the adult measures.

Participants had a mean age of 11.59 (SD = 1.22) years and were 57% female. According to the BMI-for-age weight status categories established by the Centers for Disease Control and Prevention,¹⁸ 7% of youths were underweight; 51% were a healthy weight; 23% were at risk for overweight; and 19% were overweight. Youths' mean percentage of energy from fat was 40.39 (SD = 6.37), a value indicative of a diet very high in fat.

Sex was a significant correlate of fat intake ($r = .26, p < .001$), with girls reporting higher intake than boys, as were measures of avoiding fat as a seasoning ($r = -.16, p < .010$), substituting high-fat foods with manufactured low-fat equivalents ($r = -.15, p < .018$), and replacing high-fat foods with fruits and vegetables ($r = -.13, p < .036$). We modeled the relationship between these three behaviors and fat intake using regression analysis controlled for sex. Age, weight status, and the two remaining behaviors were unrelated to intake and were therefore excluded from the model. The model was significant, $F_{4, 251} = 9.77, p < .001$, accounting for 14% of the variance in fat intake, adjusted $R^2 = .12$ (Table 2). All three behaviors were significant predictors of low fat intake.

DISCUSSION

Summary

This study examined whether behaviors shown to predict low fat intake in adults predicted low fat intake among economically disadvantaged African-American adolescents. Scales for

measuring the behaviors evidenced fair to moderate internal consistency and reliability, with alpha coefficients ranging from .60 to .80. The coefficients were slightly larger than reported coefficients for adult measures of these behaviors (range = .54–.76).⁷ Fat avoidance, substitution, and replacement with fruits and vegetables were significantly associated with low fat intake, providing evidence of the construct validity of scales for measuring these behaviors.

These three behaviors were also significant predictors of low fat intake. The fact that in our earlier research⁸ avoidance and replacement behaviors were also significant predictors of low fat intake enhances our confidence in the validity of these findings. Although the combination of all five behaviors predicted low fat intake in Kristal and colleagues' research with adults,⁷ our findings suggest that fewer behaviors have salience for predicting low fat intake among economically disadvantaged African-American adolescents.

Limitations

The use of a self-selected sample limits the generalizability of study findings. The relationships between fat-related dietary behaviors and fat intake were examined in a cross-sectional design; thus, the temporal order of these variables cannot be established. Items in the Block Fat Screener and the scales were focused on similar high-fat foods, possibly explaining the correlations found between the scales and fat intake. Although this concern cannot be dismissed entirely, if the correlations were an artifact of the overlap between measures, all five scales would have been significantly and moderately associated with intake. This, however, was not the case. The small proportion of variance accounted for by the model used to predict low fat intake suggests that other variables not measured in this study are important for understanding variation in youths' intake.

Significance

Kristal and colleagues' model has been used to examine fat-related dietary practices in diverse samples of adults.¹⁹⁻²³ To our knowledge, this is the first application of the model to economically disadvantaged African-American adolescents. Health promotion practitioners who work with this population can use study findings to educate youths about behaviors found effective in lowering fat intake. They can also use the measures developed to identify behaviors most in need of change and develop individualized interventions to address them.

Findings can also aid health promotion researchers in designing group intervention programs. Such programs should emphasize the benefits of making simple dietary changes, for example, not seasoning foods with butter, sour cream, cheese, and gravy; choosing fruits and vegetables instead of higher-fat foods (e.g., ice cream); and topping foods with fruits and vegetables instead of higher-fat alternatives (e.g., bacon bits and cheese). The consumption of manufactured low-fat forms of the high-fat foods youths are in the habit of eating (e.g., lower-fat meats, salad dressings, snacks, and dairy products) should also be encouraged. Because the success of such programs depends on the availability and affordability of fruits, vegetables, and lower-fat foods, broader-scale initiatives are also needed to increase youths' access to these foods. Encouraging local market owners to increase healthier food availability and requiring stores that participate in the Food Stamp program to stock healthier types of foods through a policy change or targeted incentive program are recommended strategies for accomplishing this goal.²⁴

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Table 1**Items Selected for Scales of Fat-Related Dietary Practices**

Scale/Item *	Cronbach α
Avoid fat as a seasoning	0.60
Put butter or margarine on cooked vegetables [†]	
Put sour cream, cheese, or gravy on cooked vegetables [†]	
Substitute high-fat foods with manufactured low-fat equivalents	0.80
Have lower-fat instead of regular hot dogs	
Use light or low-fat instead of regular dressing on salad	
Drink low fat (1%) or nonfat milk instead of whole milk	
Put low-fat (1%) or nonfat milk instead of whole milk on cereal	
Put low-fat (1%) or nonfat milk instead of whole milk on oatmeal	
Use low-fat or nonfat yogurt instead of sour cream in recipes	
Eat low-fat or nonfat instead of regular ice cream	
Eat reduced-fat or part-skim instead of regular cheese	
Have low-fat or fat-free instead of regular cookies	
Modify meats	0.66
Have chicken that was not fried	
Take the skin off of chicken before eating it	
Remove the crust from fried chicken before eating it	
Order chicken that was grilled instead of fried	
Avoid fried meats	
Replace with fruits and vegetables	0.60
Have frozen juice bars instead of ice cream for dessert	
Top salad with dried or fresh fruits instead of bacon bits or cheese	
Top pasta with cooked vegetables instead of meat sauce	
Replace with low-fat foods other than fruits and vegetables	0.73
Order a burger without cheese or bacon	
Instead of French fries/fried potatoes, have baked or boiled potatoes	
Instead of sour cream, top a baked potato with spices, salsa, or low-fat yogurt	
Use lemon juice instead of regular dressing on salad	
Put vinegar dressing instead of creamy dressing on salad	
Order pasta served with meatless sauce	
Instead of meat toppings, have pizza with mushrooms, onions, or peppers	
Have pasta without cheese	

* Item stem shortened to fit tabular format.

[†] Direction reversed.

Table 2

Summary of Multiple Regression Analysis for Variables Predicting Fat Intake*

Source of Variance [†]	β	SE β	95% CI	t	p
Sex [‡]	3.01	0.76	1.51 to 4.51	3.96	0.000
Avoid [§]	-1.43	0.45	-2.31 to -0.55	-3.12	0.002
Substitute [§]	-1.47	0.73	-2.91 to -0.03	-2.02	0.045
Replace with fruits and vegetables [§]	-1.33	0.60	-2.52 to -0.15	-2.22	0.027

* SE indicates standard error; CI, confidence interval.

[†] For the overall model, $F_{4, 251} = 9.77, p < 0.001$; $R^2 = 0.14$, adjusted $R^2 = 0.12$.

[‡] Dichotomously coded (0 = male, 1 = female).

[§] Measured on a 4-point scale (1 = rarely or never, 4 = usually or always).