

A Motivational Interviewing Intervention to Increase Fruit and Vegetable Intake Through Black Churches: Results of the Eat for Life Trial

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Increasing Americans' intake of fruits and vegetables is a national health priority.¹⁻³ Like most other Americans, African Americans consume fewer than the recommended 5 servings per day.³⁻⁶ Whereas data regarding Black vs White differences in mean fruit and vegetable intake are inconsistent,³⁻⁸ ethnic and geographic differences regarding which fruits and vegetables are consumed and how they are prepared are well established.⁸⁻¹¹

The church represents a potentially effective channel for delivering health programs to African Americans. Many Black churches include health as part of their overall mission, offering health services and programs through special committees and ministries.¹²⁻¹⁴ Given the potential ease of participant recruitment and tracking, churches also represent an excellent research setting. Several health promotion studies—including some that have addressed dietary behavior¹³⁻¹⁸ and, more specifically, fruit and vegetable intake¹⁹—have been successfully conducted in churches. Another advantage of working in Black churches is access to African Americans of middle and upper socioeconomic levels, a group often underrepresented in health promotion studies. In this article, we report the 1-year results of the Eat for Life program, an intervention to increase fruit and vegetable intake conducted through Black churches in the metropolitan area of Atlanta, Ga.

METHODS

Design

Fourteen churches, matched by socioeconomic status (low, mixed, or high) and size, were randomly assigned to 1 of 3 treatment conditions: (1) comparison (received standard nutrition education materials initially and culturally sensitive intervention materials 1

Objectives. This study reports on Eat for Life, a multicomponent intervention to increase fruit and vegetable consumption among African Americans that was delivered through Black churches.

Methods. Fourteen churches were randomly assigned to 3 treatment conditions: (1) comparison, (2) self-help intervention with 1 telephone cue call, and (3) self-help with 1 cue call and 3 counseling calls. The telephone counseling in group 3 was based on motivational interviewing. The primary outcome, assessed at baseline and 1-year follow-up, was fruit and vegetable intake as assessed by 3 food frequency questionnaires.

Results. Change in fruit and vegetable intake was significantly greater in the motivational interviewing group than in the comparison and self-help groups. The net difference between the motivational interviewing and comparison groups was 1.38, 1.03, and 1.21 servings of fruits and vegetables per day for the 2-item, 7-item, and 36-item food frequency questionnaires, respectively. The net difference between the motivational interviewing and self-help groups was 1.14, 1.10, and 0.97 servings for the 2-item, 7-item, and 36-item food frequency questionnaires, respectively.

Conclusions. Motivational interviewing appears to be a promising strategy for modifying dietary behavior, and Black churches are an excellent setting to implement and evaluate health promotion programs. (*Am J Public Health.* 2001;91:1686-1693)

year posttest), (2) culturally sensitive multicomponent self-help intervention with 1 telephone cue call, and (3) culturally sensitive multicomponent self-help intervention with 1 cue call and 3 counseling calls. The additional 3 telephone counseling calls in group 3 employed motivational interviewing techniques, whereas the first call in both groups 2 and 3 served primarily as a cue to use intervention materials rather than an attempt to directly change fruit and vegetable consumption. The delayed-intervention group received the culturally sensitive self-help intervention materials after the 1-year posttest data collection. Church size ranged from 100 to 1500 members, with most churches in the range of 100 to 250 members.

Four churches were assigned to group 1, 4 churches to group 3, and 6 (including 2 smaller churches) to group 2. Only Baptist and Methodist (including African Methodist Episcopal [AME]) denominations were included. Baseline and 1-year follow-up data

were obtained at health fairs conducted at each church. Although children and adolescents were allowed to participate in the health fairs, the study sample included only individuals aged 18 years and older. The study was powered to detect a difference of one half serving of fruits and vegetables between groups 3 and 1, with a power of 0.80 and α of .05, with the church as the unit of analysis and after adjustment for the intraclass correlation.

Formative Research

Four focus groups of African Americans who regularly attended church were conducted, with 1 group from each of the following segments: low income and low fruit and vegetable intake, low income and high fruit and vegetable intake, middle to high income and low fruit and vegetable intake, and middle to high income and high fruit and vegetable intake. Low intake was defined as 2 or fewer servings per day and high intake as 4

or more servings per day. Intake was determined during the telephone recruitment. Key findings from the focus groups included generally low awareness of fruit and vegetable serving sizes, low awareness of the National Cancer Institute's national 5 A Day campaign,²⁰ and strong perceived differences regarding the fruits and vegetables consumed by Blacks vs Whites. With regard to religion and diet, participants felt that overeating, although not necessarily a "sin," was a sign of poor discipline, whereas eating healthy was seen as "spiritually" beneficial, if not a religious imperative.

An advisory board, composed of local pastors plus several opinion leaders from the local faith community, was formed to help provide ideas for conveying health messages using religious themes and to review project artwork. Following the synthesis of initial focus group and advisory board responses, a draft of the video script was developed and reviewed by several experts in nutrition education and by the advisory board. A "rough cut" of the video was shown to 2 focus groups composed of African Americans who regularly attend church and to the advisory board. Feedback from these sources guided the final editing of the video as well as selection of the project's name and logo. Additional information regarding the development of the intervention materials can be found elsewhere.²¹

Materials

Individuals in the 2 intervention arms received a 23-minute video; an Eat for Life cookbook; printed education materials, including a quarterly newsletter; and several "cues" imprinted with the project logo and 5 A Day message (e.g., refrigerator magnet, pen, scratch pad, pot holder, and erasable writing tablet). The video developed for this project, entitled *Forgotten Miracles*, used biblical and spiritual themes to motivate healthy eating. The story involved 2 families, one with a poor diet and the other with a more optimal diet. As a result of a pastor's sermon as well as a scary dream, during which the father in the "poor diet" family has a heart attack, the father begins to modify his diet. In the second half of the video, a nutritionist, played by a well-known African American ac-

tress, conducts a workshop during which the benefits of fruits and vegetables are presented and various obstacles to their consumption (e.g., cost) are addressed.

The Eat for Life cookbook contained recipes submitted by members of the participating churches. Qualifying recipes were required to contain at least a quarter serving of fruit or vegetables per portion and to be low in fat. Recipes were analyzed with the Nutrient Data System software (University of Minnesota, Minneapolis) to determine nutrient content. Qualifying recipes were taste-tested, and the 60 most preferred recipes were included in the book. The cookbook also contained information about the health benefits of eating fruits and vegetables, tips for shopping for and storing them, and techniques for cooking them. Printed health education materials included a National Cancer Institute brochure (no. 95-3862), a food guide pyramid slide card (Positive Promotions, Brooklyn, NY), and the Soul Food Pyramid (Hebni Consultants, Orlando, Fla). With the exception of the quarterly newsletter, which was mailed to participants, all intervention materials were distributed at the health fair exit booth. Participants who completed the baseline questionnaire but did not attend the health fair received intervention materials by mail approximately 1 week after the health fair in their church. Materials for the comparison group included National Institutes of Health (NIH) brochures addressing fruit and vegetable intake (e.g., NIH publications 92-3248 and 91-3250).

Cue and Counseling Calls

Groups 2 and 3 received 1 telephone call approximately 2 weeks after their baseline health fair. This call was to cue participants to use the materials (e.g., watch the video, read the brochures, and try recipes from the cookbook).

In addition to the cue call, individuals in group 3 received 3 counseling calls that directly focused on changing fruit and vegetable intake. The counseling was based on motivational interviewing, a psychotherapeutic approach originally developed for addictive behaviors that has potential application to other health behaviors.^{22,23} Motivational interviewing is not a discrete intervention strat-

egy but an amalgamation of several principles and techniques drawn from several theoretical paradigms. It helps individuals to work through their ambivalence about behavior change and allows the counselor to tailor the content and format of the encounter to match the participant's readiness to change, subjective pros and cons for change, and level of efficacy. Motivational interviewing is centered on the client rather than the practitioner. During the motivational interviewing encounter, the client is expected to do most of the psychologic work, although this is facilitated and subtly guided by the counselor. The tone of the encounter is positive, encouraging, empathetic, and nonconfrontational. Motivational interviewing counselors are taught to avoid argumentation and to "roll with resistance" rather than contest it. As noted by Rollnick et al., a motivational interview is more like a dance than a wrestling match.²⁴ Unlike many traditional counseling and patient education paradigms, motivational interviewing rarely involves providing information or advice unless it is requested by the client. The motivational interview counselor is an engaged problem-solving partner rather than an aloof, omniscient provider of information, advice, and counsel.^{24,25}

Key techniques used in motivational interviewing include listening reflectively and eliciting self-motivational statements. For the latter, we adapted the protocol of Rollnick and colleagues^{26,27} that was previously applied to smoking cessation. This technique begins with 2 questions: (1) On a scale of 1 to 10 (with 10 being the highest), how motivated or interested are you in increasing your fruit and vegetable consumption? (2) On a scale of 1 to 10 (with 10 being the highest), assuming you want to, how confident are you that you could increase your fruit and vegetable consumption? Each of the 2 questions was asked separately for fruits and for vegetables. Following the client's response, the counselor followed with 2 probes: (1) "Why did you not choose a lower number, like a 1 or 2?" (to elicit positive motivational statements) and (2) "Why did you not choose a higher number?" (to elicit barriers) or "What would it take to get you to a 9 or 10?" The counselor next summarized the participant's reasons for wanting or not wanting to change

and asked if there was anything else the participant wanted to add. If barriers were presented, the counselor prompted the participant to offer solutions. After the participant exhausted his or her own solutions (or if none were offered), the counselor sought permission to list other solutions “that have worked for other people.” When appropriate, the encounter ended with a contract to try at least 1 of the solutions offered. Counselors participated in three 2-hour training sessions (conducted by K.R.) and were observed performing at least 2 phone counseling encounters before being certified. Owing to state regulations regarding the delivery of dietary counseling, counselors were either registered dietitians or dietetic interns. The 3 motivational interviewing calls were delivered 3, 6, and 10 months after baseline. This schedule was chosen to spread delivery of the intervention throughout the year.

Participant Recruitment and Retention

In each church, a liaison was hired to assist in the recruitment and retention of participants as well as the coordination of the health fairs. At baseline, the liaison was asked to provide at least 60 names and telephone numbers of participants and to distribute questionnaires approximately 3 weeks before the health fair. Participants were requested to complete their questionnaires before the health fair, but if they did not, they were allowed to complete them at the health fair. Pastors were asked to encourage congregants to attend the health fairs, which were generally conducted immediately after Sunday services. Flyers were posted and announcements were placed in church bulletins. To encourage participation, churches were provided with a \$10 donation for each adult participant (up to 60 per church) that completed the baseline assessment. To assist members who might have had limited literacy skills, staff inquired of all participants at health fairs if they would like to have someone from the program read the questionnaire with them. At posttest, liaisons were asked to assist in encouraging baseline participants to attend the follow-up health fair. Churches received incentives ranging from \$250 to \$2000, depending on the proportion of baseline participants that attended the posttest health fair.

Measures

Diet. Multiple measures of dietary intake were obtained to provide a converging (i.e., triangulated) estimate of true intake. All participants completed a 7-item food frequency questionnaire (FFQ), based on the Behavioral Risk Factor Surveillance System (BRFSS), that assessed fruit and vegetable intake in the past month.²⁸ To reduce overreporting, the response categories of 4 and 5 times per day were removed. A 2-item measure was used to assess usual fruit and vegetable intake (1 item each for fruits and vegetables consumed “each day”). The third instrument was a 36-item fruit and vegetable FFQ, based on the Health Habits and History Questionnaire,²⁹ that was developed for this study.

To improve validity, we made several modifications to the Health Habits and History Questionnaire. First, participants were asked to indicate the number of times they had consumed each item in the past week rather than the longer retrospective time frame typically employed.³⁰ Second, respondents indicated frequency of consumption by using an open-end rather than a closed-end format. Third, the portion size of each fruit or vegetable was embedded in the item (e.g., 1 whole apple). Finally, several items that were paired on the original instrument (e.g., tomato and tomato juice) were separated into individual items.

We excluded from the analysis any participant whose questionnaire was missing answers to more than half of the vegetable items (i.e., more than 10 items) or fruit items (i.e., more than 8 items) from the 36-item FFQ. Participants (31 at baseline and 42 at posttest) missing fewer than half of the fruit or vegetable items were assigned a frequency of 0 for those missing items. These 3 measures were averaged to yield a composite fruit and vegetable variable. The 7-item and 36-item measures included an item that assessed intake of French fries and fried potatoes. These items were excluded from the computation of fruit and vegetable servings. Results with these items included were virtually identical to results with them excluded in the fruit and vegetable computation, because fried potatoes contributed approximately 0.20 to 0.30 servings per day across all 3 treatment groups. The 3 FFQs assessed only fruit and vegetable intake (rather than

macronutrients), the primary outcome for the intervention trial.

The 3 FFQ methods were validated against serum total carotenoids (sum of lutein, cryptoxanthin, α -carotene, and β -carotene), which were obtained at baseline from approximately 90% of the participants.³¹ The 5 major carotenoids (lycopene, lutein, cryptoxanthin, α -carotene, and β -carotene) were measured in extracted serum with a high-performance liquid-chromatographic method.³² Assays were performed at the Centers for Disease Control and Prevention’s Nutrition Biochemistry Branch, Division of Environmental Health Laboratory Science. Correlations of total fruit and vegetable servings from the 7-item, 2-item, and 36-item FFQs with total serum carotenoids (excluding lycopene) were 0.29, 0.22, and 0.35, respectively. The correlation of dietary carotenoids based on the 36-item measure and serum carotenoids was 0.37. Additional details regarding the validity study can be found elsewhere.³¹

Psychosocial measures. *Outcome expectations* for fruit and vegetable intake were assessed with a 19-item scale (9 fruit items and 10 vegetable items; $\alpha=.88$) based on the instrument developed by Baranowski³³ (sample item: “Eating fruit gives me more energy”). *Self-efficacy to eat more fruits and vegetables* was assessed with a 10-item scale ($\alpha=.90$) based on the work of Sallis et al.³⁴ and others^{33,35} (sample item: “How confident are you that you could eat healthy foods like fruits and vegetables, when you are depressed or in a bad mood?”). Responses range from “not at all confident” to “very confident.” *Low-fat and high-fat vegetable preparation practices* were assessed with an instrument based on the work of Kristal and others.^{36,37} This instrument assesses (using the categories “never” through “always”) low-fat practices (e.g., broiling vs grilling, steaming, adding turkey bacon) and high-fat practices (e.g., adding bacon, deep frying) used in preparing vegetables; higher scores indicate more low-fat practices or more high-fat practices, respectively. *Portion size knowledge* was measured with an 8-item index that assessed awareness of standard serving sizes for fruits and vegetables. Two serving sizes were presented, and the respondent was asked to check which of the 2 represents a single serving.

Other variables assessed. Household income was assessed with an 8-category ordinal item, with answers ranging from less than \$10 000 to more than \$70 000. Values were collapsed into 3 groups (<\$20 000, \$20 000–\$39 999, >\$40 000). Education was categorized as “less than high school,” “completed high school or equivalent,” “some college,” and “completed college.” Work status was categorized as “unemployed,” “retired,” and “working part- or full-time.” Participants were also asked about marital status. Use of cigarettes and alcohol in the past 30 days was assessed with single items. Church involvement was assessed with a single open-ended item: “How many times per week do you go to your church either for services or other activities?” Exercise was assessed with a single open-ended item: “How many times per week do you exercise hard enough to make you breathe hard or sweat?” Use of vitamin supplements in the past year was assessed with a single item with 3 categories (“never,” “yes, not regularly,” and “yes, regularly”).

Statistical Analyses

Outcomes were analyzed with a mixed-model, repeated-measures, analysis of variance program, SAS PROC MIXED (SAS Institute Inc, Cary, NC), that allows for adjustment of the clustering of measurements within churches.³⁸ The initial multivariate model included fixed-effect terms for experimental condition and the covariates age, sex, income, church attendance, education, smoking, vitamin use, alcohol use, and exercise habits, as well as random-effect terms for church, nested in treatment condition, and individual nested within church. Among those enrolled in the study, approximately 220 individuals, usually spouses, were from the same household as another participant. Because the majority of “family” units comprised a single individual, individuals were not nested within families within the repeated-measures model.³⁹

Models including 3-way group \times time \times covariate interaction terms for age, sex, income, and education were also run. These interaction terms were selected because they have been shown to be effect modifiers in prior interventions. Covariates not associated ($P > .20$) with the dependent variable (e.g., sex,

TABLE 1—Eat for Life Trial: Sample Description and Attrition Analysis

	Cohort (n = 861)	Dropouts (n = 150)
Mean age, y (range)	43.9 (18–87)**	39.5 (18–81)
Female, %	73.3	67.8
Married or living with partner, %	53.6**	36.0**
Income, %		
< \$20 000	23.4	25.9
\$20 000–\$39 999	31.7	35.8
> \$39 999	44.9	38.3
Education, %		
< High school	9.3	5.7
Completed high school or vocational school	34.9	33.3
Some college	22.9	25.3
Completed college or higher	33.0	35.6
No. times attended church per week (SD)	1.8 (0.98)**	2.3 (1.3)**
Used cigarettes in past 30 days, %	10.4	17.2
Used alcohol in past 30 days, %	32.0*	44.9*
FV intake (servings/day), by FFQ (SD)		
2-item FFQ	3.6 (1.9)	3.5 (1.9)
7-item FFQ	3.5 (2.7)	3.4 (2.8)
36-item FFQ	4.3 (2.8)	4.0 (2.4)

Note. FV = fruit and vegetables; FFQ = food frequency questionnaire.
* $P < .05$, ** $P < .01$ for difference between 2 groups.

education, smoking, and alcohol use) were removed from the model. The primary test of intervention effects was the group \times time interaction. When omnibus differences were obtained, contrasts were run to determine which groups differed as well as the pattern of change. Servings of fruits and vegetables from the FFQs were transformed by natural log to better normalize their distribution. Tables present untransformed values, whereas P values are based on analyses using transformed values.

RESULTS

Sample

At baseline, a total of 1011 individuals were recruited across the 14 churches. The number of participants per church averaged 72 (range = 53–130). Of the initial sample, 861 (85%) were assessed at the 1-year follow-up. Follow rates for groups 1, 2, and 3 were 84%, 85%, and 87%, respectively. As shown in Table 1, dropouts did not differ from cohort members by sex, income, education, cigarette use, or fruit and vegetable in-

take (based on any of the 3 FFQs). Dropouts were, however, significantly younger, less likely to be married, to attend church more times per week, and more likely to report alcohol use in the past 30 days. With regard to differential attrition, dropouts across the 3 groups did not differ regarding any of the variables listed in Table 1, with the exception of smoking; dropouts in group 3 were significantly more likely to report smoking than those in groups 1 and 2 (33% vs 6% and 18%, respectively).

As shown in Table 1, the cohort was predominantly female, with a mean age of 44 years. Approximately 54% of the cohort members were married or living with a partner, about 45% reported an income of \$40 000 or more, and more than half had at least some college education. Baseline fruit and vegetable intake ranged from 3.5 to 4.3 servings per day, depending on the FFQ method. The 3 groups were equivalent with regard to sex, marital status, education, and fruit and vegetable intake. Comparison group members were slightly younger and attended church more times per week; group

2 members were more likely to smoke, and group 3 members were more likely to report alcohol use (data not shown). These latter variables were included as covariates in outcome analyses.

Completion of Telephone Counseling

In groups 2 and 3, the initial telephone call intended to cue use of the materials was completed for 90% of participants. In group 3, the 3 counseling calls were completed for 86%, 79%, and 82% of participants, respectively. A total of 6425 calls were attempted, yielding 1266 (20%) completed encounters. The primary reason for incomplete calls was an inability to reach the participant. Up to 7 calls, which included at least 1 daytime, evening, weekday, and weekend call, were attempted before the participant was considered unreachable. The mean length of calls 1 through 4 was 15.5, 14.2, 12.3, and 11.2 minutes, respectively.

There were 5 participants (4 from group 2 and 1 from group 3) who did not provide a phone number. Consistent with the intent-to-treat principle, these individuals were included in the main outcome analyses.

The call completion rate did not differ by level of education or income in group 2 or by education in group 3. However, in group 3, the completion rate was significantly ($\chi^2_{16}=21.9; P<.01$) associated with income, with higher completion rates in higher income brackets. For example, among those reporting annual income of \$40 000 or more, the completion rate for all 4 telephone calls was 77%, while among those reporting annual incomes of less than \$20 000, the rate was 64%.

Fruit and Vegetable Intake

As shown in Table 2, across the 3 FFQs, the change in fruit and vegetable intake was largest in group 3, with group \times time effects significantly different from those for both groups 1 and 2. In groups 1 and 2, change in fruit and vegetable intake did not differ across the 3 FFQs. The net difference (subtracting the pretest–posttest changes in fruit and vegetable intake) between group 3 and group 1 was 1.38, 1.03, and 1.21 daily servings of fruits and vegetables for the 2-item, 7-item, and 36-item FFQs, respectively. The net

difference between group 3 and group 2 was 1.14, 1.10 and 0.97 servings for the 2-item, 7-item, and 36-item FFQs, respectively.

Fruit intake. As shown in Table 3, across the 3 FFQs, the change in fruit intake was largest in group 3, with group \times time effects significantly different from those for both groups 1 and 2. For groups 1 and 2, change in fruit intake did not differ across the 3 FFQs. The net difference between group 3 and the comparison group was 0.79, 0.60, and 0.58 servings for the 2-item, 7-item, and 36-item FFQs, respectively. The net difference between groups 3 and 2 was 0.70, 0.57, and 0.46 servings for the 2-item, 7-item, and 36-item FFQs, respectively. Increase in fruit juice intake accounted for approximately half of the increase in total fruit intake in group 3 vs groups 1 and 2 (data not shown).

Vegetable intake. As shown in Table 3, across the 3 FFQs, the change in vegetable intake was largest in group 3, with group \times time effects significantly different from those for both groups 1 and 2. There was no difference at posttest between groups 1 and 2. The net difference between groups 3 and 1 was 0.56, 0.41, and 0.56 servings for the 2-item, 7-item, and 36-item FFQs, respectively. The net difference between groups 3 and 2 was 0.38, 0.51, and 0.48 servings for the 2-item, 7-item, and 36-item FFQs, respectively.

Subgroup Analyses

For fruits, vegetables, and fruits plus vegetables, interaction terms for sex, age, education, and income with treatment group \times time were all nonsignificant, indicating that the intervention did not have a differential impact across these subgroups.

Secondary Outcomes

Low-fat vegetable preparation practices improved significantly in group 3 vs group 1 (data not shown). There were no significant treatment \times time effects for knowledge of portion size, self-efficacy, outcome expectations, or high-fat practices.

Use of Materials

Individuals in group 3 were significantly more likely to report using the cookbook than those in group 2 (68% vs 55%; $\chi^2=8.2; P<.001$). They were marginally more likely to

report watching some or most of the video (71% vs 65%; $\chi^2_1=2.2; P=.13$).

DISCUSSION

The group that received 3 motivational interviewing calls reported increases in fruit and vegetable intake that were significantly greater than those reported by the groups that received only the self-help kit or standard health education materials. There were no significant changes in the self-help group vs the standard materials group.

The net effect on fruit and vegetable intake—an increase of approximately 1.1 servings per day—in this church-based intervention was similar in magnitude to the effect in the Black Churches United for Better Health (BCUBH) project of Campbell et al.,¹⁹ where a net difference of 0.85 servings in the treatment vs comparison communities was observed. The interventions and study populations were, however, considerably different. The current intervention focused almost exclusively on individual-level behavior change, whereas the BCUBH intervention included both institutional-level changes (e.g., changes in food preparation and availability at the church) and individual-level changes (e.g., tailored bulletins). Our study sample was primarily urban, whereas the BCUBH sample was primarily rural. The Eat for Life motivational interviewing intervention used here was somewhat more intensive than the individual intervention provided in the BCUBH program. Together, these 2 studies suggest a role for both environmental and individual-level intervention in churches.

The magnitude of the effects in the motivational interview group were only marginally stronger for fruits than vegetables, with net increases in the range of 0.46 to 0.79 servings for fruit and 0.38 to 0.56 servings for vegetables across the 3 FFQs. This is in contrast to the BCUBH project, which found that most of the effects on fruit and vegetable intake were due to increased fruit intake (0.66 servings) rather than vegetable intake (0.19 servings).¹⁹

Outcomes were not modified by income, education, age, or sex, indicating that the intervention worked similarly across these various sociodemographic groups. This finding is

TABLE 2—Baseline and Posttest Mean Numbers of Fruit and Vegetable Servings per Day: The Eat for Life Trial

Group	2-Item FFQ		7-Item FFQ		36-Item FFQ		Mean of 3 FFQs	
	Baseline	Posttest	Baseline	Posttest	Baseline	Posttest	Baseline	Posttest
1	3.50	3.76	3.18	3.52	4.43	4.52	3.64	3.91
2	3.77	4.27	3.76	4.03	4.46	4.79	3.97	4.38
3	3.46	5.10 ^{ab}	3.44	4.81 ^{ab}	4.32	5.62 ^{ab}	3.78	5.17 ^{ab}

Note. FFQ = food frequency questionnaire. Group 1 was the control group; group 2 received a self-help intervention with 1 telephone cue call; group 3 received a self-help intervention with 1 telephone cue call and 3 counseling calls.

^a*P* < .01 for difference between group 1 and group 3.

^b*P* < .01 for difference between group 2 and group 3.

TABLE 3—Baseline and Posttest Mean Numbers of Fruit and Vegetable Servings per Day: The Eat for Life Trial

Group	2-Item FFQ		7-Item FFQ		36-Item FFQ		Mean of 3 FFQs	
	Baseline	Posttest	Baseline	Posttest	Baseline	Posttest	Baseline	Posttest
Fruit								
Group 1	1.45	1.60	1.78	1.99	2.19	2.24	1.79	1.95
Group 2	1.71	1.95	1.98	2.22	2.17	2.34	1.94	2.17
Group 3	1.49	2.43 ^{ab}	1.96	2.77 ^{ad}	2.12	2.75 ^{ad}	1.85	2.64 ^{ab}
Vegetables								
Group 1	2.04	2.13	1.39	1.52	2.19	2.25	1.88	1.98
Group 2	2.08	2.35	1.78	1.81	2.32	2.46	2.04	2.20
Group 3	2.02	2.67 ^{ab}	1.49	2.03 ^{ad}	2.22	2.84 ^{cd}	1.93	2.53 ^{ab}

Note. Group 1 was the control group; group 2 received a self-help intervention with 1 telephone cue call; group 3 received a self-help intervention with 1 telephone cue call and 3 counseling calls.

^a*P* < .01 for difference between group 1 and group 3.

^b*P* < .01 for difference between group 2 and group 3.

^c*P* < .05 for difference between group 1 and group 3.

^d*P* < .05 for difference between group 2 and group 3.

important, as it suggests that tailoring by these parameters may not be needed, at least with regard to the motivational interviewing component, which appeared to account for the change in fruit and vegetable intake.

The lack of effects in the self-help group (group 2) vs the comparison group (group 1) was somewhat surprising, if not disappointing. Considerable efforts (e.g., formative evaluation and pretesting) were undertaken to maximize the cultural sensitivity and salience of the self-help materials developed for this project (e.g., the video, cookbook, and newsletter). The lack of effects in group 2 can be attributed at least in part to lower rates of use of the self-help materials than in the motivational interviewing group (group 3). In group 3, self-reported use of the video was 71%, compared with 65% in group 2, and use of at

least 1 cookbook recipe was 68% in group 3 vs 55% in group 2. Among group 2 and 3 participants, use of the video and use of the cookbook were both significantly (*P* < .05) correlated with change in fruit and vegetable intake from baseline (*r* = 0.10 and 0.14, respectively).

Assuming that the measures for these constructs were valid, the effects of the motivational interviewing intervention cannot be attributed to changes in efficacy or outcome expectations, as these parameters were not significantly affected by the intervention in either group 2 or group 3. There are several other possible pathways by which the motivational interviewing intervention may have influenced behavior. First, the calls may have changed behavior indirectly by increasing use of the video and cookbook. The calls may

also have served as cues or reminders to eat more fruits and vegetables, or to alter associated shopping and cooking behaviors. The motivational interviewing counseling, which is structured to help participants resolve their ambivalence and barriers, may have helped participants develop more intrinsic motivation to eat more fruits and vegetables. Neither of these pathways would necessarily have been reflected in the efficacy or outcome expectancy measures. Studies to better understand the pathways by which motivational interviewing operates are needed.

A final note regarding the motivational interviewing intervention: researchers and practitioners have begun to distinguish full-blown motivational interviewing from briefer interventions, such as the one described here.^{24,26,27,40} Our intervention, though

rooted in motivational interviewing, should perhaps be more accurately labeled “brief negotiation” or “motivational interviewing informed,” rather than classic motivational interviewing, which entails greater training and supervision of counselors as well as a more intensive client contact.

This study had several limitations and threats to its validity. It is possible that the reported increase in fruits and vegetables was an artifact of social desirability bias among the motivational interviewing group. Two findings suggest that self-reported fruit and vegetable intake was largely valid. First, self-reported fruit and vegetable intake was significantly associated with serum carotenoids at baseline; second, the change in intake was consistent across 3 different FFQ measures. Nonetheless, social desirability bias cannot be dismissed entirely, and it remains a limitation of the study.

Second, liaisons recruited participants in each church by using a quota sampling framework (i.e., first come, first served). Therefore, it is possible that study participants were not representative of the entire church population. We do not have sufficient information from the participating churches to empirically examine the issue of sampling bias and representativeness, and this question of external validity remains a concern.

Finally, if participants in the treatment groups overestimated portion size at baseline, but learned from the intervention that a single portion was smaller than they previously thought, fruit and vegetable intake could spuriously increase owing to more accurate reporting of portion size at follow-up. However, knowledge of portion size did not change differentially across treatment groups, which suggests that increased fruit and vegetable intake was not the result of participants in the treatment groups becoming more skilled at estimating portion size. Despite these mitigating factors, the impact of response bias cannot be entirely dismissed.

Another problem with the study is that the promising effects in the group that received the motivational interviewing intervention may not have been due to motivational interviewing per se, but rather to generic effects from contact with a health counselor (i.e., attention effects). To better determine the inde-

pendent effects of motivational interviewing vs attention, it would be useful to test the effects of a motivational interviewing–based intervention against traditional counseling, holding constant the number of contacts.

The promising results from this trial suggest that motivational interviewing techniques, previously used for addiction counseling, may have a role in altering chronic disease risk behaviors. The current project used trained dietitians. Future studies are needed to determine the feasibility and impact of using other health professionals or paraprofessionals to deliver motivational interview interventions. The public health impact of the intervention tested here will largely depend on the feasibility of using other professionals or appropriately trained lay personnel to deliver such counseling. If the intervention proves to be cost-effective, managed care or other health care delivery systems may be willing to provide similar services to affect chronic disease behaviors among their members.

The study also has several strengths, including the relatively high cohort retention rate, the large proportion of telephone calls completed, and the inclusion of lower-, middle-, and upper-income African Americans. The success in recruiting and retaining participants, coupled with the positive outcomes observed from this study, adds to the growing body of studies that indicate that churches are an excellent setting in which to implement and evaluate health promotion programs for the African American community. ■

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K. Resnicow, the principal investigator for the study, was responsible for designing and implementing the study and did most of the manuscript preparation. A. Jackson, the project director, was responsible for design-

ing the study and, in particular, recruiting participants and conducting the health fairs; she also contributed to the writing of the manuscript. T. Wang and W.N. Dudley assisted in designing evaluation instruments, managing and analyzing data, and writing the manuscript. A.K. De and F. McCarty assisted in data analysis and preparing the manuscript. T. Baranowski, the project's chief outside consultant, assisted in designing the study, developing the evaluation instruments, and preparing the manuscript.

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