Differences in fat-related dietary patterns between black, Hispanic and white women: results from the Women's Health Trial Feasibility Study in Minority Populations

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Abstract

Objective: This report examines how sources of fat and patterns of fat-related dietary habits differed between black, Hispanic and white women participating in a randomized trial of a low-fat diet intervention.

Design: The intervention consisted of group sessions, which met weekly for 6 weeks, biweekly for 6 weeks and monthly for 9 months, and included didactic nutrition education and activities to provide motivation for sustained dietary change. Outcomes included total fat and fat from nine food groups from a food frequency questionnaire (FFQ), and a summary scale and five subscales that measure fat-related dietary habits.

Setting/subjects: Data are from 1702 post-menopausal women, recruited from clinical centres in Atlanta, Birmingham and Miami, with dietary assessments at baseline and 6 months post-randomization.

Results: Total fat intake was similar across race/ethnic groups at baseline, yet there were many differences in sources of fat and fat-related dietary habits. For example, blacks consumed less fat from dairy foods and more fat from meats than whites. Effects of the intervention on total fat intake or the summary fat-related dietary habits scale did not differ across race/ethnicity groups. There were, however, many differences in how the intervention affected sources of fat and fat-related dietary habits. For example, the intervention effect for added fats (e.g. butter and salad dressings) was −8.9 g for blacks and −12.0 g for whites ($P < 0.05$). The intervention effect for adopting low-fat meat purchasing and preparation methods was larger for blacks than whites, and the intervention effect for replacing high-fat foods with fruits and vegetables was larger for Hispanics than whites.

Conclusions: This study demonstrates that, if properly designed, a single nutrition intervention programme can work well even in groups with culturally diverse dietary patterns.

Keywords
Minority groups
Dietary intervention

One of the Healthy People Year 2000 objectives is to reduce chronic disease risk factors in minority and low-income populations[1]. There has been little research on how to adapt nutrition interventions developed for a general population for use in minority groups with different dietary patterns. In 1992, the National Heart Lung and Blood Institute and the National Cancer Institute funded the Women's Health Trial Feasibility Study in Minority Populations (WHT:FSMP)[2]. The WHT:FSMP was a randomized, clinical trial to examine the feasibility of future studies targetting black, Hispanic and low socioeconomic status (SES) women to test low-fat, high fruit and vegetable diets for prevention of cardiovascular disease and cancer. One specific aim of the WHT:FSMP was to test whether a single nutrition intervention programme would be effective among women with markedly different culturally associated dietary patterns.

A primary finding from the WHT:FSMP was that the intervention effects for percentage of energy from fat were similar among black and white women, but significantly smaller among Hispanics. The purpose of this paper is to better understand how the behavioural effects of the intervention differed across black, white and Hispanic participants. Specifically, it examines how sources of fat and patterns of fat-related dietary habits differed between racial and ethnic groups at baseline, and how dietary patterns in each racial and ethnic group changed as a result of the intervention. Results can be used to better understand how to design interventions for culturally diverse populations.

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Methods

Reports on the WHT:FSMP study design and baseline findings[2] and primary dietary[3] and serological end-points[4] have been described elsewhere. In brief, three clinical centres (Emory University in Atlanta, the University of Alabama at Birmingham, and the University of Miami in Florida), a coordinating centre (Fred Hutchinson Cancer Research Center in Seattle) and two institutes of the National Institutes of Health (National Cancer Institute and the National Heart, Lung and Blood Institute) collaborated in this trial. Each clinical centre had minority participant recruitment goals: 50% or more black women in Atlanta; 50% or more Hispanic women in Miami; and proportional representation of the local population including 29% blacks and 18% women of low SES in Birmingham. In this report, we describe women who self-identified as 'white or Caucasian, not Hispanic' as whites, 'black, not Hispanic' as blacks, and 'Hispanic, black' or 'Hispanic, white' as Hispanics. Participants were aged 50–79 years, post-menopausal and consumed at least 36% of energy from fat as estimated from a FFQ administered during screening. Exclusions included a history of major chronic diseases, mental illness, extreme obesity and an inability or unwillingness to maintain a 4-day diet record. Randomization was 60% to the dietary intervention group and 40% to the control group.

The nutrition intervention goals of the WHT:FSMP were to reduce fat intake to 20% or less of total energy, to increase servings of fruits and vegetables, and to reduce saturated fat intake. The intervention was based on the programme developed in the Women's Health Trial Feasibility Study[5], with extensive modifications that included: (i) revising written materials and exercises to be at a sixth grade reading level; (ii) expanding the range of foods and preparation methods, in particular to include those of US southern blacks and Cubans; and (iii) translating all materials, exercises and assessment instruments into Cuban Spanish. The nutrition intervention was delivered in group sessions led by centrally trained registered dietitians, which met weekly for 6 weeks, biweekly for 6 weeks, monthly for 9 months, and then quarterly. Sessions integrated both nutritional and behavioural topics, and consisted of problem-solving, role playing, sharing experiences, food tasting and didactic nutrition education. Each participant received a personal goal for fat intake based on height and estimated energy intake from the FFQ at baseline, which she monitored using a self-administered and scored 'fat scan'. Participants selected the specific changes in food choices and food preparation methods that best fitted their own eating pattern, preferences and lifestyle. In Miami, participants could join intervention groups run in Spanish or English. Details of the principles and content of this intervention have been published[6].

Dietary assessment

This report uses data from two dietary assessment instruments completed at baseline and 6 months post-randomization. A self-administered, optically scanned FFQ was used to assess changes in both total fat intake and sources of fat by food group. A fat-related dietary habits questionnaire (DHQ) was used to assess changes in food purchasing, preparation and selection. These dietary assessment instruments were available in both Spanish and English, and are described below.

Food frequency questionnaire

The WHT:FSMP FFQ was based on instruments used previously in the Women's Health Trial Vanguard[6] and Full Scale[7] studies and the Working Well Trial[8], to which we added fat-modified and regionally and culturally specific foods. The WHT:FSMP FFQ consisted of 100 food items or food groups, with 19 introductory questions (e.g. 'When you ate chicken, how often did you eat the skin?') and four summary questions (e.g. 'How often did you eat fruit, not counting juices?') used to refine nutrient calculations. The time reference for all questions was 'in the last 3 months'. The nutrient database from the University of Minnesota Nutrition Coordinating Center[9] and algorithms for FFQ analysis[10] are described in detail elsewhere. We modified the software to calculate grams of fat from nine food groups, which are described in Appendix 1. Details on the validity and reliability of the WHT:FSMP FFQ are reported elsewhere[11].

Fat-related dietary habits questionnaire

The DHQ was based on an instrument originally developed to assess food purchasing and preparation patterns related to adopting a low-fat diet[12]. This instrument has been modified to measure fat-related dietary habits in clinical intervention studies[13], randomized trials of self-help nutrition interventions[14] and in telephone-based dietary surveys[15]. The DHQ used in the WHT:FSMP included 23 items, which were combined into five subscales: 'avoid fat as flavouring', 'avoid frying', 'modify meats', 'substitute lower-fat products' and 'replace with fruits and vegetables'. The summary score was calculated as the mean of the five subscale scores. Responses to the items were scored on a four-point scale ('usually or always' 'often' 'sometimes' and 'rarely or never') and were coded 1 through 4 to correlate positively with fat intake. Appendix 2 shows the five subscales, their individual items and the internal consistency and validity of the scales at baseline and 6 months post-randomization. The internal consistency of the subscales ranged from 0.46 to 0.72 at baseline and from 0.49 to 0.77 at 6 months,

and for the summary scale from 0.55 at baseline to 0.60 at 6 months, which are similar to previous results using this instrument[16]. Validity of the fat-related dietary habits scores, defined as the correlation coefficient between the DHQ summary scale score and percentage of energy from fat from the mean of FFQ and 4-day food record results, was 0.46 at baseline and at 6 months was 0.60 among intervention participants and 0.58 among controls.

Statistical methods

Due to the study design, in which almost all the Hispanics were recruited from the Miami clinic only, data from all the study centres cannot be combined and still allow separation of effects of clinic from those of race and ethnicity. Therefore, this report gives contrasts of black vs. white for participants in Atlanta and Birmingham combined and of Hispanic vs. white for participants in Miami only. The sample used for analyses in this report is a subset of those randomized into the WHT:FSMP. Participants who could not be classified as black, Hispanic or white ($n = 11$) and those who did not have dietary measures at both baseline and 6 months post-intervention were excluded. Analyses based on the DHQ included 88.7% of blacks and 92.6% of whites in Birmingham and Atlanta, and 43.5% of Hispanics and 64.6% of whites in Miami. In addition, analyses based on the FFQ excluded participants who did not reasonably complete this questionnaire, defined as total energy intake under 600 or greater than 5000 kcal. Analyses based on the FFQ included 70.7% of blacks and 81.0% of whites in Birmingham and Atlanta, and 35.5% of Hispanics and 56.0% of whites in Miami.

Tests for differences in age, education or income across race/ethnic groups (black vs. white and Hispanic vs. white) used Student's *t*-test and chi-square tests. Tests for differences at baseline in fat intake (from the FFQ) and in fat-related dietary habits (from the DHQ) across race/ethnic groups used Student's *t*-test. To compare the effects of the intervention across race/ethnic groups, we defined the intervention effect for a food group or diet habit scale X as:

$$(\overline{X}_b - \overline{X}_f)_I - (\overline{X}_b - \overline{X}_f)_C$$

where the subscripts b and f refer to baseline and follow-up, and the subscripts I and C refer to the intervention and control groups. In practice, intervention effects were calculated using multiple regression models. These models predicted change from baseline to 6 months, and used the baseline value as a covariate and a coefficient indicating intervention or control group membership as the measure of the intervention effect. Tests for differences in intervention effects between race or ethnic groups were based on adding an indicator variable to these regression models for race or ethnicity and its interaction with treatment group. Among intervention women only, results are given showing change from baseline to 6 months for each of the individual items from the DHQ. Tests for

Table 1 Demographic and dietary characteristics of WHT:FSMP participants at baseline, by race/ethnicity and clinic given as percentages

	Atlanta and Birmingham		Miami		
	Black ($n = 530$)	White ($n = 820$)	Hispanic ($n = 151$)	White ($n = 201$)	Total sample ($n = 1702$)
Age (years)					
Mean ± SD	59.6 ± 6.7	60.2 ± 6.6	60.2 ± 6.1	61.5 ± 6.6	60.2 ± 6.6
50–59	60.0	53.4	56.3*	46.8	54.9
60–69	31.1	37.8	37.1	40.8	36.0
70+	8.9	8.8	6.6	12.4	9.0
Education (years)					
<12	14.2*	11.7	11.9***	4.5	11.6
12	14.9	18.4	29.1	20.4	18.5
13–15	33.2	38.2	33.8	31.3	35.4
16+	36.2	30.1	24.5	43.8	33.5
Unknown	1.5	0.7	0.7	0.0	0.9
Household income (US$)					
<15 000	23.4***	7.1	20.5***	7.0	13.3
15 000–49 999	52.6	50.2	56.3	41.8	50.5
⩾50 000	16.0	30.1	10.6	36.3	24.7
Unknown	7.9	12.6	12.6	14.9	11.4
Nutrient intake†	($n = 422$)	($n = 718$)	($n = 123$)	($n = 174$)	($n = 1437$)
Energy (kcal)	1763 ± 795	1833 ± 656	2000 ± 827	1826 ± 605	1825 ± 712
Fat (g)	78.7 ± 40.2	82.3 ± 35.6	87.1 ± 43.1	82.3 ± 35.0	81.6 ± 37.6
Fat (% energy)	39.8 ± 6.7	39.8 ± 6.7	38.4 ± 6.9	39.9 ± 7.4	39.7 ± 6.8

*χ^2, $P < 0.05$, vs. white; ***χ^2, $P < 0.001$, vs. white.
† From food frequency questionnaire; means ± SD.

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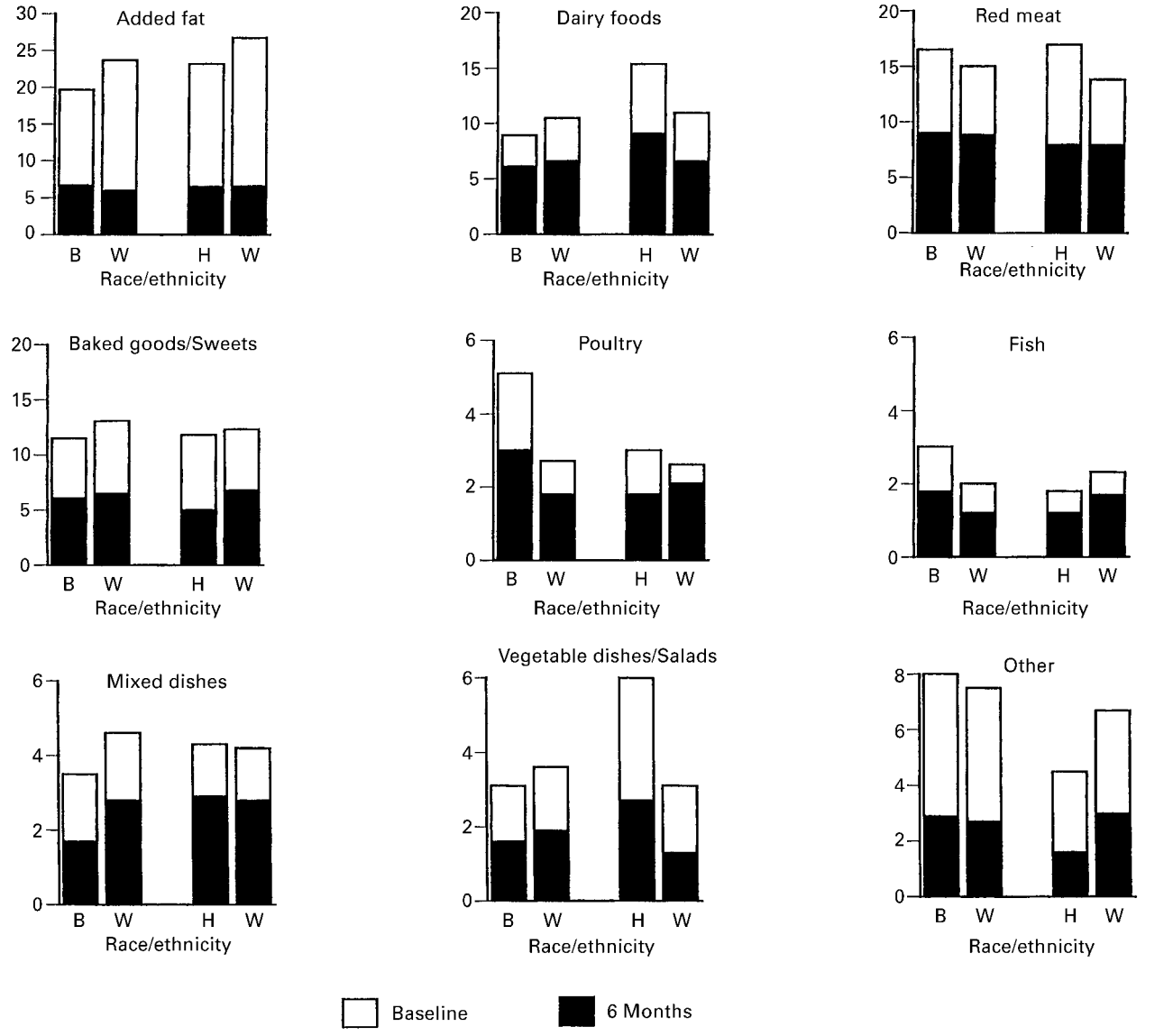

Fig. 1 Differences in sources of dietary fat intake (in grams) by WHT:FSMP intervention participants at baseline and 6 months, by race/ethnicity (B = black: W = white: H = hispanic)

changes in each DHQ item used paired *t*-tests, and tests of whether changes differed by race/ethnic group used Student's *t*-test.

Results

Table 1 gives demographic characteristics and baseline dietary intake, comparing black with white participants in the Birmingham and Atlanta clinics, and Hispanic with white participants in the Miami clinic. In Atlanta and Birmingham, more blacks had graduated from college or had not completed high school than whites, and had lower incomes. In Miami, Hispanics were slightly younger, had less education and had lower incomes than whites. There were no differences in baseline nutrient intake across race/ethnic groups.

Figure 1 shows differences across race/ethnic groups in fat intake from nine food groups, among intervention women only. At baseline, the largest source of fat in all race/ethnic groups was from added fats; these were a larger source of fat intake for whites than for blacks or Hispanics. Other notable differences at baseline include higher fat intakes from dairy foods among Hispanics, from poultry among blacks, and from vegetables/salads among Hispanics. The largest decreases in all race/ethnic groups between baseline and 6 months were fat from added fats, red meat and baked goods. At 6 months, there were only modest differences across race/ethnic groups in sources of fat, suggesting that the intervention was effective in lowering fat from all food groups.

Table 2 gives statistical analyses of the associations of

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Table 2 Mean fat intake (g) at baseline and effects of the WHT:FSMP dietary intervention at 6 months, by food group, race/ethnicity and clinic

	Atlanta and Birmingham		Miami	
Food group[1]	Black ($n = 422$)	White ($n = 718$)	Hispanic ($n = 123$)	White ($n = 174$)
Added fat				
Baseline	19.4**	23.0	23.1	25.4
Intervention effect[2]	–8.9*	–12.0	–8.1	–9.5
Dairy foods				
Baseline	8.6**	10.3	14.9**	11.1
Intervention effect	–1.3*	–2.9	–1.5	–3.6
Red meat				
Baseline	16.3*	14.7	17.2*	13.7
Intervention effect	–5.0	–4.2	–6.6	–5.5
Baked goods				
Baseline	10.9**	12.9	10.7	11.6
Intervention effect	–2.8*	–4.4	–2.1	–2.0
Poultry				
Baseline	5.2**	2.7	3.0	2.7
Intervention effect	–2.5**	–0.5	**–0.6**	–0.7
Fish				
Baseline	3.2**	1.9	1.7**	2.5
Intervention effect	–1.0**	–0.4	**–0.4**	**–0.2**
Mixed dishes				
Baseline	3.2**	4.5	4.5	4.2
Intervention effect	–1.4	–0.9	–1.0	–1.1
Vegetables/salads				
Baseline	3.1*	3.6	6.4**	3.1
Intervention effect	–1.2	–1.2	–2.2	**–0.9**
Other				
Baseline	7.5	7.2	4.0**	6.5
Intervention effect	–3.3	–3.1	–1.7	–2.5
Total fat				
Baseline	78.7	82.3	87.1	82.3
Intervention effect	–27.4	–29.4	–24.6	–26.0
Per cent energy from fat				
Baseline	39.8	39.8	38.4	39.9
Intervention effect	–11.3	–12.1	–5.9*	–11.0

* $P < 0.05$, vs. white; ** $P < 0.01$, vs. white.
[1] See Appendix 1 for foods in each food group.
[2] From multiple regression model, controlled for baseline value. All intervention effects were statistically significant ($P < 0.05$) except those shown in bold.

race/ethnicity with fat intake at baseline. Fat intake is given as total grams and grams from each of nine food groups. There were no differences across race/ethnic groups in total fat intake at baseline, however there were many significant differences between race/ethnic groups in sources of fat. Compared with whites, blacks consumed less fat from added fat, dairy foods, baked goods, mixed dishes and vegetables/salads, and more fat from red meat, poultry and fish; Hispanics consumed more fat from dairy foods, red meat and vegetables/salads, and less from fish and 'other foods' (eggs, snack chips, nuts and cereals).

Table 2 also gives the association of race/ethnicity with intervention effects, defined as the mean change in the intervention group minus the change in controls. There were no differences across race/ethnic groups in overall intervention effects on total grams of fat. The main study result, shown at the bottom of Table 2, was a significantly smaller intervention effect for percentage of energy from fat among Hispanics. In all race/ethnic groups, intervention effects were largest for added fat and red meat. Compared with whites, intervention effects were significantly larger among blacks for poultry and fish, and smaller for added fat, dairy foods and baked goods. Due to the small sample size, no differences in intervention effects were significant between Hispanics and whites, though there was a suggestion that the intervention effect for Hispanics was smaller for dairy foods and larger for vegetables/salads.

Table 3 gives the mean scores for the fat-related dietary habits scales at baseline, as well as the intervention effects at 6 months. Higher scores on the DHQ scales correspond to higher fat intakes and, based

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Table 3 Baseline mean dietary habits scale scores[1] and effects of the WHT:FSMP dietary intervention at 6 months, by race/ethnicity and clinic

	Atlanta and Birmingham		Miami	
	Black ($n = 530$)	White ($n = 820$)	Hispanic ($n = 151$)	White ($n = 201$)
Avoid fat as flavouring				
Baseline	3.10**	3.25	2.76**	3.13
Intervention effect[2]	–0.42*	–0.58	–0.31	–0.54
Avoid frying				
Baseline	2.10**	1.83	1.86***	1.64
Intervention effect	–0.36	–0.32	–0.31	–0.25
Modify meat				
Baseline	2.30**	1.94	2.08*	2.20
Intervention effect	–0.50	–0.39	–0.30	–0.43
Substitute				
Baseline	2.93***	2.79	2.95	2.84
Intervention effect	–0.80	–0.85	–0.61	–0.70
Replace with fruits/vegetables				
Baseline	2.75**	2.94	2.92	2.88
Intervention effect	–0.35	–0.26	–0.43	–0.30
Summary score				
Baseline	2.64**	2.55	2.50	2.54
Intervention effect	–0.48	–0.48	–0.39	–0.43

* $P < 0.05$, vs. white; ** $P < 0.01$, vs. white; *** $P < 0.001$, vs. white.
[1] On a 4-point scale responses were 1 = usually or always; 2 = often; 3 = sometimes; 4 = rarely or never.
[2] From multiple regression model, controlled for baseline value. All intervention effects were statistically significant at $P < 0.01$.

on earlier studies[17], a 1 unit decrease in the summary DHQ score corresponds to a 13 percentage point decrease in per cent of energy from fat. There were many differences at baseline in fat-related dietary habits across race/ethnic groups. Compared with whites, blacks had significantly higher scores on the summary score and on the subscale scores for avoid frying, modify meat and substitute, and lower scores for avoid fat as flavouring and replace with fruits/vegetables. Hispanics had significantly higher scores than whites for the avoid frying and substitute subscales, and lower scores for avoid fat as a flavouring and modify meat. Intervention effects for the summary score did not differ by race/ethnicity, and were largest in all race/ethnic groups for the substitute subscale. We interpret differences in intervention effects between race/ethnic groups of 0.10 as meaningful (though they are not necessarily statistically significant; this difference corresponds to 1.3 percentage points in per cent of energy from fat). Using this criterion, the intervention effect was smaller for blacks compared with whites for avoid fat as flavouring, and was larger for blacks for modify meats and replace with fruits/vegetables. The intervention effect for Hispanics compared with whites was larger for replace with fruits/vegetables, and smaller for avoid fat as a flavouring and modify meat.

Table 4 gives the mean changes among intervention women in individual items from the DHQ. The numbers of women answering each item varies, because respondents skip over any item that asks about a food they do not eat. For example, if a women does not eat chicken, she will not respond to questions on how often she removes the skin or eats chicken fried. The largest change made by all race/ethnic groups, though based only on the 26% who baked at home, was to use less fat in baking. Other dietary habits with at least a mean 1.0 decreased score in all race/ethnic groups included using low-fat or non-fat mayonnaise, low-fat cheese, non-stick cooking spray and low-calorie salad dressing. Compared with whites, blacks made smaller changes in using low-fat cheese, adding fat to vegetables, potatoes and breads, using meatless spaghetti sauce and eating salads without dressing, and larger changes in eating fried fish, taking skin off chicken and trimming fat off meat. Compared with whites, Hispanics made smaller changes in adding fat to potatoes and breads, taking skin off chicken and using meatless spaghetti sauce.

Discussion

There were many differences in the ways that black, Hispanic and white participants adopted a low-fat diet. Below we discuss how dietary patterns and intervention effects differed across race/ethnic groups, the limitations to these analyses and the implications of the results to the design of future dietary interventions.

There were two substantial differences in sources of fat and in dietary patterns between blacks and whites. At baseline, blacks consumed more fat from meat,

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Table 4 Mean changes from baseline to 6 months in individual items[1] from the fat-related dietary habits questionnaire, intervention group only, by race/ethnicity and clinic[2]

	Atlanta and Birmingham		Miami	
	Black ($n = 256–326$)[3]	White ($n = 431–494$)[3]	Hispanic ($n = 81–100$)[3]	White ($n = 108–133$)[3]
Use less fat in baked items[4]	–1.3	–1.5	–1.8	–1.5
Eat low-fat cheese	–1.1**	–1.4	–1.1	–1.2
Use low-fat/non-fat mayonnaise	–1.2	–1.2	–1.0	–1.2
Use non-stick spray to sauté foods[4]	–1.0	–1.2	–1.1	–1.1
Eat vegetables with added fat[5]	–1.1	–1.2	–0.9	–1.0
Eat potatoes without added fat	–0.8***	–1.3	–0.7*	–1.1
Eat non-fat frozen desserts	–0.8***	–1.2	–0.9	–1.0
Use low-calorie (diet) salad dressing	–1.0	–1.0	–1.0	–1.0
Trim fat from meat before cooking	–0.9	–0.9	–0.8	–1.1
Eat bread/rolls without butter or margarine	–0.5***	–1.0	–0.5**	–1.1
Eat fried fish[5]	–0.9*	–0.7	–0.7	–0.7
Use low-fat or non-fat milk	–0.9	–0.7	–0.5	–0.6
Take skin off chicken	–1.0***	–0.5	–0.4*	–0.8
Trim visible fat from red meat	–0.8***	–0.5	–0.4	–0.6
Eat fried chicken[5]	–0.6	–0.5	–0.6	–0.5
Eat fruit for dessert	–0.6	–0.5	–0.6	–0.6
Eat fried potatoes[5]	–0.5	–0.5	–0.5	–0.5
Eat extra-lean ground beef	–0.4	–0.5	**–0.3**	–0.7
Use meatless spaghetti sauce	–0.2**	–0.5	**–0.2***	–0.6
Eat fruit for snacks	–0.4	–0.4	–0.6	–0.3
Eat vegetables for snacks	–0.3	–0.4	–0.4	–0.4
Eat fried vegetables[5]	–0.3	–0.3	–0.4	–0.3
Eat salads with no dressing	–0.1*	–0.3	**–0.2**	–0.2

* $P < 0.05$, vs. white; ** $P < 0.01$, vs. white; *** $P < 0.001$, vs. white.
[1] On a 4-point scale responses were 1 = usually or always; 2 = often; 3 = sometimes; 4 = rarely or never.
[2] All changes in dietary habits were statistically significant ($P < 0.05$) except those shown in bold.
[3] Range of number of responses (excluding items with superscript of 4). Numbers vary because participants skip items for foods they do not eat.
[4] Sample size considerably smaller for these items.
[5] Item score reversed before analysis.

poultry and fish, and they used high-fat preparation methods such as frying, not removing skin from chicken and not trimming excess fat. Whites ate more fat added to foods as flavouring, such as fats added to vegetables or on breads. Consistent with these baseline differences, intervention effects were larger for whites for avoiding fat as a flavouring and for blacks for modifying meat to be lower in fat. There were three notable differences in dietary patterns between Hispanics and whites at baseline. Hispanics added less fat to foods as a flavouring, but ate more fat from fried vegetables and high-fat salads. Hispanics also consumed more fat from meat, though they were more likely to use low-fat techniques for its preparation. Again, differences in intervention effects were consistent with differences at baseline, as effects in each race/ethnic group tended to be larger for those foods and dietary habits that accounted for more fat at baseline. There was an additional important difference between Hispanics and others in the way they made dietary changes. Though reductions in total fat were similar across race/ethnic groups, Hispanics replaced a smaller proportion of energy from fat with energy from other macronutrients. Thus, the reduction in percentage of total energy from fat in Hispanics was smaller than for blacks or whites. Overall, these results suggest that the intervention was successful in helping participants with diverse dietary patterns identify and change those dietary patterns that provided significant amounts of fat. The intervention was not successful among Hispanics, however, in promoting increased intake of energy from non-fat sources to compensate for reduced fat intake.

There are few studies that have directly compared food use patterns across race/ethnic groups that can be used for comparison. In a detailed analysis of the National Health Interview Survey comparing US blacks, Hispanics and whites, several differences in fat-related food consumption were found[18]. Compared with other women, blacks ate more fried poultry and fish, and Hispanics ate less breakfast and lunch meats. White women consumed more milk, though they were more likely to use low-fat varieties. Use of fats as spreads was highest among whites, intermediate among blacks, and lowest among Hispanics. Patterson and colleagues[19] analysed data from a large sample of women screened to participate in the Women's Health Initiative. Compared with white women, blacks and Hispanics practised fewer low-fat food preparation methods, such as trimming meats or not frying, and used fewer specially manufactured reduced-fat products. There is some consistency with the findings reported here, in particular higher use of added fats by white women and higher use of fried foods by black women. We know of

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no intervention studies that have examined how changes in dietary patterns differed across race/ethnic groups.

We believe that there are several reasons why the WHT:FSMP dietary intervention was successful in all race/ethnic groups. One important reason was that the intervention programme was broadly inclusive of culturally diverse dietary and lifestyle patterns. With the exception of groups conducted in Spanish, all intervention groups included women of different ethnic, racial and socioeconomic backgrounds. Another key reason was that the intervention was designed to accommodate individual dietary patterns and food preferences. The intervention gave principles on how to lower fat in food purchasing and preparation, and focused on enhancing motivation to reach and maintain a personalized 'fat gram goal'. This is in contrast to interventions that prescribe specific foods or menus. Results of this study are consistent with a perspective that considers both planned menus and prohibited foods inappropriate for achieving long-term dietary change.

The most important limitation to this study is that results may not be generalizable to representative samples of black, Hispanic and white women. Participants in the WHT:FSMP had high fat intakes at baseline, were interested in nutrition and health, and were highly motivated to participate in nutrition research. In addition, most Hispanic participants were Cuban-Americans, and dietary patterns differ among Hispanic subgroups[20]. Another limitation is that the sample for the analyses reported here was a select group of WHT:FSMP participants who had completed both baseline and 6-month dietary assessments. The generalizability of Hispanic vs. white comparisons is particularly weak, because only 36% of Hispanics had completed two valid FFQs. This was due, in part, to the disruption to Miami clinic operations caused by Hurricane Andrew in August 1992. Strengths of this report include the use of two validated instruments to measure dietary patterns[11,12], and the large numbers of minority participants available for analysis.

We conclude that a single dietary intervention programme can work well in culturally diverse groups. The intervention approach used in the WHT:FSMP was to educate participants about how to choose a low-fat diet and motivate them to do so, without prescribing specific foods or meal patterns. This approach may be effective for promoting long-term dietary change because it gives participants skills to select a personalized low-fat dietary plan. When working with minority populations, nutritionists should carefully evaluate whether the intervention materials are sufficiently flexible to accommodate a broad range of foods and food preparation patterns.

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Appendix 1: definitions of food groups, using food items from the WHT:FSMP food frequency questionnaire

Added fat
Salad dressings
Butter, margarine, sour cream or other fats added to vegetables, potatoes, rice, noodles
Butter, margarine on bread
Mayonnaise and mayonnaise-type spreads on sandwiches and in salads
Gravy
Fats used in cooking

Dairy foods
Milk, cream, coffee cream
Cheeses, cottage cheese
Yoghurt, frozen yoghurt
Ice cream, ice milk, other frozen desserts
Pudding, custard

Red meat
Beef, pork, lamb
Ground beef
Stew, pot pie, casserole
Chili
Liver and other organ meats
Pasta with meat sauce
Ham, turkey, bologna, salami, other lunch meats
Hot dogs, sausage
Bacon, breakfast sausage

Baked goods and sweets
Biscuits, muffins, bread, rolls, crackers, corn bread, tortillas
Pancakes, waffles
Doughnuts, cakes, pies, pastries, cookies
Chocolate, candy bars

Poultry
Chicken, turkey

Fish
Fish, shellfish
Tuna, tuna salad, tuna casserole

Mixed dishes
Macaroni and cheese, lasagna
Pasta with sauce, other than meat sauce
Pizza
Creamy and meat soups
Bean and other soups

Vegetables and salads
Avocado or guacamole
Coleslaw, potato and pasta salads
Fried vegetables, including summer squash, okra, plantains, sweet potatoes, yams
French fries, fried potatoes, fried rice

Other
Eggs
Snack chips, popcorn
Peanut butter, nuts, seeds
Cereals, dry and cooked

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Appendix 2: internal consistency, reliability and validity of the fat-related dietary habits questionnaire at baseline and 6 months post-intervention

	Cronbach's alpha			Correlation with % energy from fat‡		
		Six months			Six months	
Subscale*	Baseline	Intervention	Control	Baseline	Intervention	Control
Avoid fat as flavouring (5 items) Use meatless tomato sauce on spaghetti/noodles Eat bread/rolls without butter or margarine Eat vegetables with butter, margarine or salt pork† Eat potatoes without butter, margarine or sour cream Eat salads with no dressing	0.46	0.49	0.54	0.31	0.49	0.41
Avoid frying (4 items) Eat fried fish† Eat fried chicken† Eat fried vegetables† Eat fried potatoes, e.g. French fries/hash browns†	0.62	0.58	0.58	0.32	0.39	0.32
Modify meats (4 items) Take skin off chicken Trim visible fat from red meat Eat extra lean ground meat Trim fat from meat before cooking	0.68	0.61	0.68	0.28	0.23	0.28
Substitute lower-fat products (7 items) Drink 1% or skim milk Eat low-fat cheese Eat non-fat ice cream, frozen yogurt or sherbet Use low-calorie (diet) salad dressings Use non-stick spray to sauté or fry foods Use low-fat/non-fat mayonnaise Use less fat in baked items	0.72	0.77	0.72	0.33	0.49	0.50
Replace with fruits and vegetables (3 items) Eat fruit for dessert Eat fruit for snacks Eat vegetables for snacks	0.61	0.67	0.67	0.15	0.19	0.33
Summary score (mean of subscales)	0.55	0.60	0.57	0.46	0.60	0.58

* Questionnaire with exact format and wording available from authors.
† Score reversed before analysis.
‡ Mean of percent energy from fat from food frequency questionnaire and 4-day food record.

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