Counseling to Promote a Healthy Diet in Adults: A Summary of the Evidence for the U.S. Preventive Services Task Force

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Epidemiology

Diseases associated with unhealthy dietary behavior rank among the leading causes of illness and death in the United States.[1,2] Major diseases in which diet plays a role include coronary heart disease, some types of cancer, stroke, hypertension, obesity, osteoporosis, and non-insulin-dependent diabetes mellitus.[1] All of these diseases are major causes of morbidity and mortality in this country.[3] Although diet is associated with multiple health outcomes, the ability of counseling to change dietary patterns and improve health is unclear. In this report, counseling is defined as a cooperative mode of interaction between the patient and primary care physician or related healthcare staff to assist patients in adopting behaviors associated with improved health outcomes.[4]

To address the question of whether counseling can improve dietary patterns, we performed an extensive systematic evidence review on behalf of the U.S. Preventive Services Task Force (USPSTF).[1] This larger report comprehensively updated the chapter on dietary counseling from the second edition of the *Guide to Clinical Preventive Services,*[5] and it is available from the Agency for Healthcare Research and Quality (AHRQ) at www.preventiveservices.ahrq.gov.

In 1996, the USPSTF recommended counseling adults and children older than 2 years of age to limit intakes of saturated fat and cholesterol, to maintain caloric balance in diets, and to emphasize foods that are high in fiber.[5] An updated recommendation,[6] dealing specifically with the question of dietary counseling, accompanies this summary of the evidence and is also available at www.preventiveservices.ahrq.gov.

Methods

We searched the MEDLINE database for randomized controlled trials (RCTs) published between 1966 and December 2001 that examined the effectiveness of counseling in changing dietary

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The USPSTF recommendations based on this review can be found in Counseling for A Healthy Diet in Adults: Recommendations and Rationale, available on the AHRQ Web site and through the AHRQ Publications Clearinghouse.

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behavior. Search terms are provided in Appendix Table 1. We supplemented our searches by reviewing the bibliographies of included articles and querying experts in the field during an extensive peer review process.

We included only studies that had been conducted with patients similar to those found in primary care practices and that had measured dietary behavior change. We excluded studies that specifically recruited patients with previously diagnosed chronic illnesses (eg, heart disease, diabetes, renal failure) or that required special diets (eg, prenatal interventions); however, we did include studies that enrolled patients with known risk factors for chronic diseases (eg, elevated cholesterol, hypertension, obesity, family history of heart disease). Studies that enrolled only overweight or obese patients for the purpose of weight management were not included; a forthcoming USPSTF report on screening for obesity will examine these articles.[7]

All included articles used a randomized controlled study design. Because our main outcome of interest was dietary change, we excluded studies that reported only biochemical markers (eg, serum vitamin A level) or anthropomorphic measures (eg, weight, proportion of body fat) with no direct measure of dietary behavior. We also excluded studies in which the diet was externally controlled (ie, provided in a residential institution or distributed by researchers). Trials had to be of at least 3 months' duration and have a minimum retention rate of 50% for inclusion.

Senior investigators reviewed titles and abstracts to identify which full manuscripts to review and made the final decisions about inclusion or exclusion. Other team members then reviewed individual articles and abstracted selected information into evidence tables. When multiple articles described the same study, we used the most complete article as the main source of data and used the other articles for supplemental information. Team members discussed disagreements with reviewers and made final decisions by consensus.

We used net change in consumption, defined as change in the intervention group from baseline to follow-up minus the change in the control group from baseline to follow-up, as the main outcome. We reported unadjusted outcomes from the article when they were presented. In some cases when necessary data were not presented in the article, we were able to calculate them from other information that was presented.

To facilitate comparison of effectiveness of counseling on dietary change across studies that used a variety of different outcome measures, 2 investigators independently classified the magnitude of dietary change in each study as "small," "medium," or "large." The study team resolved disagreements by consensus. We developed a definition of small, medium, and large changes based on the distribution of findings from the studies and the limited information available about the relationship between dietary change and health outcomes.

For saturated fat, we defined small as an absolute net difference between intervention and control groups of 0 to 1.2 percentage points, medium as a difference of 1.3 to 3.0 percentage points, and large as a difference of greater than 3.0 percentage points. When studies reported only change in proportion of calories from total fat, we classified large as a difference of greater than 10 percentage points, medium as a difference of 5.1 to 9.9 percentage points and small as a difference of less than or equal to 5 percentage points. We classified effect sizes based on the difference in the number of servings of fruit and vegetables per day consumed by the intervention and control groups. We defined small as a difference of less than 0.3 servings per day, medium as a difference of 0.4 to 0.9 servings per day, and large as a difference of greater than or equal to 1.0 serving per day. For fiber we defined a small effect size as a net difference of less than 2.0 g per day of fiber, medium as 2.0 to 4.0 g per day, and large as greater than 4.0 g per day.

If studies did not provide data on our main outcomes of interest we used the relative change in the outcome reported (eg, grams of fat consumed, dietary risk scores) to guide our definition of magnitude of change. The relative change was defined as the net change divided by the baseline value in the control group. A relative change of 25% or greater was considered large, 10% to 24% medium, and less than 10% small.

Analysis of Factors Influencing Effect Size

We examined the effect of different intervention characteristics, including intensity, the risk status of the patient populations studied, the study setting, and the use of well-proven counseling elements, on the magnitude of change in dietary behavior achieved. We considered trials that examined multiple nutrients as separate studies for these analyses. Because of concern about double-counting studies, we repeated the analyses with each study's effect counted only once (once using the largest effect and again using the smallest effect) and found similar results. Because of heterogeneity in the outcomes, we did not attempt meta-analysis.

Two senior reviewers independently rated the intensity of the dietary intervention as "low," "medium," or "high" based on the number and length of counseling contacts. Interventions with only one contact of 30 minutes or less were considered low intensity, those with 6 or more contacts of 30 minutes or more each were considered high intensity, and all others were considered medium intensity.

Each study's intervention "setting" was classified as (1) performed within the primary care clinic (by the usual primary care provider or referral to a dietitian or nutritionist); (2) conducted in a special research clinic; or (3) conducted using self-help materials and/or interactive health communications (eg, telephone messages or computer-generated mailings).

Finally, we examined the studies to determine whether they included as part of their intervention any of 7 counseling elements (using a dietary assessment, enlisting family involvement, providing social support, using group counseling, emphasizing food interaction, encouraging goal setting, and using advice appropriate to the patient group being studied) that have been effective in previous research on dietary behavior change.[8]

Quality Assessment

Using the techniques established by the USPSTF Methods group, we rated the quality of each article as good or fair, based on criteria affecting internal validity.[9] All studies that would be considered poor quality were excluded before the final review stage.

Role of the Funding Agency

This evidence report was funded through a contract to the RTI—University of North Carolina Evidence-based Practice Center from the Agency for Healthcare Research and Quality (AHRQ). Staff of the funding agency contributed to the study design, reviewed draft and final manuscripts, and made editing suggestions.

Results

We identified a total of 129 abstracts for review from our literature searches. After review of the 129 abstracts, we identified 74 articles examining the effect of counseling on dietary behavior. After full article review, we excluded an additional 49 articles from our analysis because they did not meet our eligibility criteria. Reasons for exclusion are provided in Appendix Table 2.

We retained 21 studies reported in 25 articles that met our eligibility criteria.[10-34] Across this body of literature, 17 studies addressed changes in consumption of dietary fat, 10 studies addressed changes in consumption of fruits and vegetables, and 7 studies addressed changes in consumption of dietary fiber, for a total of 34 intervention "arms." Eleven studies addressed changes in one dietary element and 10 addressed changes in 2 or 3 elements. Four studies included interventions for other behavioral risk factors for chronic disease, such as offering smoking cessation or encouraging increased physical activity.[21,23,25,30] All included studies were considered to be of good quality, based on randomized design, high retention rates, and use of appropriate outcome measures.

Intervention Characteristics

Eight studies were performed in primary care settings. In 7 of the 8 studies, primary care providers performed the dietary counseling,[10,11,20,27,28,30,34] and in the remaining study, nutrition counseling was performed through referral within the clinic.[23] Five studies used self-help materials and/or interactive

health communications (eg, telephone messages, computer-generated mailings) to deliver counseling.[12,14,15,22,31] Eight studies were performed in special research clinics,[13,16,21,24,25,29,32,33] with counseling performed in most cases by a nutritionist or other specially trained counselor.

Nearly all the studies provided information on the dietary assessment tool used to assess outcomes and, in some cases, to guide counseling. Of the 21 studies, 12 used some version of a validated food frequency questionnaire, 2 used single- or multi-day diet recall, 2 used food diaries, and 4 used other specific instruments. One study did not report how assessment was performed.[24] The full systematic evidence review,[1] available on the AHRQ web site (www.preventiveservices.ahrq.gov), gives more information about the specific assessment instruments and their accuracy and reliability.

Effect of Counseling on Intake of Saturated Fat

Table 1 (p. 20) describes the 17 studies that examined the effect of counseling on intake of dietary fat. Nine studies reported specifically on change in the percentage of calories from saturated fat.[13-16,24-26,28,29] The remaining 8 studies used other measures of fat intake, including grams of saturated or total fat consumed or study-specific outcome scales.[10-12,20-23,30] Studies that measured only total fat intake focused much of their interventions on reducing saturated fat intake and hence are retained in this analysis.

Six studies focusing on the effect of counseling on reducing patients' consumption of saturated fat achieved a large effect (>3 percentage point reduction),[12,13,16,24,25,29] 5 achieved a medium effect (1.3 to 3.0 percentage point absolute reduction),[14,20,21,23,30] and 6 had only a small effect (less than 1.3 percentage points).[10,11,15,22,27,28] For the 9 studies reporting change in percentage of calories from saturated fat, net reductions ranged from 0.9 to 5.3 percentage points.

Effect of Counseling on Fruit and Vegetable Intake

We identified 10 studies that examined the effect of counseling on fruit and vegetable intake (Table 2, p. 30).[12-15,21,22,28,31-33] Most of the studies (6 of 10) did not define which foods (eg, potatoes or legumes) were considered fruits or vegetables or what constituted a serving.[11,12,14,15,21,33] Among these 10 studies, 3 demonstrated that dietary counseling produced small to no increases (< 0.3 servings per day) in fruit and vegetable consumption,[12,21,28] 5 demonstrated medium increases ranging from 0.3 to 0.8 servings per day,[13,15,22,31,33] and 2 demonstrated large effects, increasing fruit and vegetable consumption by 1.4 and 3.2 servings per day.[14,32]

Effect of Counseling on Fiber Intake

Seven studies examined the effect of counseling on fiber intake (Table 3, p. 36).[10,11,14,15,23,28,34] Five studies showed small increases in the amount of additional fiber consumed (range, 0.3 g to 1.6 g per day).[10,11,15,23,28] One study reported differences in daily fiber intake between intervention and control groups of 2.7 g for men and 6.0 g for women at 1-year follow-up,[34] and another found a net change of 3 g.[14]

Factors Affecting Response to Dietary Counseling

Next, we examined the characteristics of the available trials that could possibly explain the differences in effectiveness that we found. Explanatory factors included the intensity of the intervention, the risk status of the patient, the setting for delivery of the intervention, and the use of specific counseling elements that had previously been shown to be effective in producing behavior change. The findings presented combine interventions for the intake of all nutrients (fat, fruit and vegetable, fiber) together, as there were too few studies of counseling about fruit and vegetable or fiber intake alone to make comparisons among intervention characteristics.

Intensity of the Intervention

As depicted in Table 4 (p. 42), studies using higher intensity interventions produced larger effect sizes than studies using lower intensity interventions. Among 9 study arms classified as high intensity, 5 (55%) produced large changes in dietary behavior,

3 (33%) produced medium changes, and 1 (11%) produced only a small change. Of the 18 medium-intensity study arms, 1 (6%) produced a large effect, 10 (55%) produced medium effects, and 7 (39%) produced small effects. Of the 7 low-intensity study arms, 1 (14%) produced a large effect, 1 (14%) produced a medium effect, and 5 (71%) produced small effects. Higher intensity studies enrolled either patients at risk for chronic disease or selected motivated patients at average risk who may not be representative of the usual patients in primary care practices. They also used well-trained counselors (most often dietitians or nutritionists) to provide counseling.

Risk Status of Patients

Twenty-one study arms were conducted using unselected patients, and 13 were conducted using patients with identified risk factors for chronic disease. After stratifying by intervention intensity, we could find no clear relationship between the risk status of the patients and the effect size achieved.

Setting

Studies conducted in special research clinics were more likely to produce larger effects than studies performed in other settings, in large part because the interventions in these clinics were of higher intensity. In addition, most involved counseling by trained personnel (usually dietitians or nutritionists) who were focused mainly on counseling about diet. Primary-care-based interventions produced small or medium effects; more intensive studies produced larger effects. Studies using interactive health communications had effects that were larger than those with direct primary care counseling but smaller than those found in research-clinic based studies.

Counseling Components

Several components of counseling are thought to be associated with improved behavioral outcomes: using a dietary assessment, enlisting family involvement, providing social support, using group counseling, emphasizing food interaction (such as taste testing, cooking), encouraging goal setting, and using advice appropriate to the patient group being studied.[1] We examined each study to determine how many of these elements were included in their interventions. Many interventions were not described in sufficient detail to determine with certainty the absence or presence of these study components. The total number of identified components ranged from 0 to 7, with a median of 2.

As shown in Table 5 (p. 43), studies employing a greater number of components had larger effect sizes. Of 6 study arms employing 3 or more components, 4 (67%) produced large effects and 2 (33%) produced medium effects; among 24 study arms employing 1 to 2 components, 4 (17%) produced large effects, 11 (46%) produced medium effects, and 9 (37%) produced small effects. Among 4 study arms reporting no components, all produced small effects.[10,11] We did not identify a sufficient number of studies to determine whether any single component was associated with an independent effect on the magnitude of change in dietary behavior.

Discussion

Researchers have used a wide range of interventions to examine the effect of behavioral counseling on dietary patterns among predominantly healthy adult patients. Among the studies we identified, low-intensity interventions in unselected primary care adult patients produced small or medium changes in self-reported dietary outcomes. Medium- to high-intensity interventions generally produced medium or large changes in dietary behavior, but these studies were generally conducted either in adult patients with known risk factors for chronic disease or performed in special research clinics with highly motivated or selected patients. These interventions also generally used highly trained providers who focused on dietary behavioral change. The specific health effects of these dietary behavior changes are not clear, but epidemiological data suggest that the moderate or large differences in dietary behavior are likely to be associated with lower rates of cardiovascular disease and possibly some forms of cancer.[1]

Among the factors affecting the response to dietary counseling, the intensity of the intervention

was strongly associated with the magnitude of dietary change: medium- to high-intensity interventions produced larger changes than low-intensity interventions. Interventions conducted in special, study-specific research clinics were generally more effective than those performed within primary care clinics, but the effect of study setting was highly correlated with intensity. Interventions using self-help materials and interactive communications (computer-tailored mailings, telephone counseling) along with brief provider advice produced medium changes and appeared to be relatively feasible for use in primary care practices that have system support for their delivery. Interventions using greater numbers of well-proven counseling elements also were more likely to produce large or medium effect sizes than those reporting use of few or no components.

Our systematic review has several limitations. First, because we are extracting information from published studies, we are missing several pieces of important data that were not reported regularly. Second, identifying the appropriate measure of dietary change is difficult. Our main outcome measure, self-reported change in dietary behavior, relies on individual self-report, usually from validated food frequency questionnaires that have limited ability to measure small changes in dietary intake accurately and precisely. In addition, patients receiving dietary interventions may be more likely to report positive changes in dietary behavior than control patients, which could also lead to an overestimation of actual benefit. Although the use of biomarkers is often recommended as a more objective means of measurement, it is unclear whether available biochemical markers accurately reflect actual change in diet, may be influenced by medication use and smoking, and may not be any better correlated with health outcomes than patient self-report.

Because we also have little direct evidence about the effect of dietary changes on the risk for important health outcomes,[1] we cannot determine with certainty whether the small changes in dietary behavior seen in the lower-intensity trials will translate into changes in the incidence of chronic disease.

The lack of standard outcome measures for each nutrient makes synthesis of the available evidence, including meta-analysis, difficult to perform and interpret. To provide some means of comparison, we rated study outcomes as small, medium, and large, but these definitions were not developed *a priori* and only partially reflect the limited body of data that links dietary change with specific health outcomes. We did not formally assess for publication bias; smaller trials with negative results may not have been published, which could lead to an overly optimistic impression of the effect of counseling. Finally, we did not have sufficient information to determine the relationship between the cost of dietary interventions and the effect achieved.

Future research should address promising leads already highlighted in this paper and identify novel means to deliver dietary advice in effective and efficient ways. Broadly speaking, research can be pursued along several dimensions. First, research is warranted as to whether dietary assessment leads to more effective counseling and subsequent behavior change when compared with general dietary advice not preceded by an assessment. Better assessment tools for measuring dietary change, including better validated biochemical markers and novel means of documenting dietary consumption, such as hand-held computer diaries, will be useful to address concerns about measurement bias. The interaction between clinical interventions and broader public health, environmental, legislative, and economic interventions to change dietary behavior requires further study as well.

In addition, more in-depth examinations of the effectiveness of specific components and intensities of dietary counseling are needed. Studies with longer follow-up periods and linkages to actual health outcomes will also be important. The paucity of studies evaluating referral to health professionals outside the primary care setting for either one-on-one or group counseling is striking. Studies of dietary interventions delivered by special research clinics are common, but they are not representative of the resources typically available to primary care providers.

Better epidemiologic studies and randomized trials assessing the clinical as well as population-level benefits of small dietary changes would help clarify the effectiveness of brief counseling interventions. Studies examining the effectiveness of interventions to change consumption of other foods, food patterns, or nutrients, including fish, the Mediterranean diet, legumes, sodium, and calcium or dairy products are warranted, as they each appear to have important relationships to health outcomes.[1] Finally, cost-effectiveness studies comparing interventions through different health communication channels and at varying levels of intensity are needed to determine the most feasible approaches. This information, along with data concerning the health benefits of incremental dietary change, will help determine the relative value of dietary counseling compared with other clinical preventive interventions.

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Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Beresford et al, 1992[10]	Adult men and women in North Carolina, USA; 35% black	Unselected	Intv: 120 Cont: 122	79%	Primary care	Intv: RN on-site provided 5 min intro to self-help materials with phone F/U 10 d later Cont: no intervention	Low
Beresford et al, 1997[11]	Adult men and women in family practice clinics, USA	Unselected	Intv: 1,010 Cont:1,111	86%	Primary care	Intv: trained MD-delivered 3 min intro to self-help booklet; reminder letter from MD Cont: NR	Low
Campbell et al, 1994[12] Tailored msg vs. control	Adult men and women of family practices: 2 urban and 2 rural in North Carolina, USA	Unselected	Intv: NR Cont: NR	82%	Mailings and computer-generated messages	Intv: Self-administered surveys in office delivered by staff; tailored messages mailed home Cont: self-administered surveys only; no messages	Low

Note: Cont indicates control; F/U, follow-up; Intv, intervention; msg, message; NR, not reported.

Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes

Main outcome*	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change*† or difference at final follow-up	*P*-value	Relative change‡	Effect size§
Grams of total fat	Intv: 66 g Cont: 67 g	3 mo	NR	NR	*3.8 g*	NR	6%	Small
% calories as total fat	Intv: 37.6% Cont: 37.5%	12 mo	NR	Intv: –1.5% Cont: –0.3%	*1.2%*	*P* <0.01	3%	Small
Grams of total fat	Intv: 18.7 g Cont: 16.3 g	4 mo	Intv: 13.9 g Cont: 15.8 g	Intv: –4.8 g Cont: –0.5 g	*4.3 g*	*P* = 0.036	26%	Large
Grams of saturated fat	Intv: 45.6 g Cont: 41.1 g		Intv: 35.3 g Cont: 39.8 g	Intv: –10.3 g Cont: –1.3 g	*9 g*	*P* = 0.033	22%	

*Outcomes in this table are reported in the following order of preference depending on the data available from each study: (a) percentage of calories from saturated or total fat; (b) grams of saturated or total fat; and (c) other methods of measuring change in diet as presented by the authors of specific studies.

†Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

‡Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

§Effect size categories are assigned based on (in order of preference) net difference in change, difference at final follow-up, or relative change.

Note: Cont indicates control; Intv, intervention; msg, message; NR, not reported.

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Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Coates et al, 1999[13]	Post-menopausal women in research clinics of Women's Health Trial: 28% black, 16% Hispanic	At risk	Intv: 1,324 Cont: 883	75% to 85%	Research clinic	Intv: RD-delivered group sessions wkly for 6 wks, biweekly for 6 wks, monthly for 9 mo Cont: given Dietary Guidelines for Americans; no counseling	High
Delichatsios, Friedman et al, 2001[14]	Adult men and women in a large multisite, multispecialty group practice—Harvard Vanguard Medical Associates in Massachusetts, USA; 72% women, 45% white, 45% black	Unselected	NR	50%	Mailings and computer-generated messages	Intv: weekly diet-related educational feedback, advice, and behavioral counseling for 5-7 minutes by a totally automated, telephone-linked computer-based voice communication system Cont: weekly physical activity-related educational feedback, advice, and behavioral counseling for 5-7 minutes by a totally automated, telephone-linked computer-based voice communication system	Medium
Delichatsios, Hunt et al, 2001[15]	Adult men and women patients from 6 group HMO practices in the primary care research network of Harvard Pilgrim HealthCare, Massachusetts, USA	Unselected	Intv: 230 Cont: 274	Intv: 85% Cont: 92%	Mailings and computer-generated messages	Intv: mailed personalized dietary recommendations and 2 educational booklets; endorsement by trained (1 hour) MD or NP; 2 motivational phone counseling sessions by trained MPH student telephone counselors. RD consultation if needed. Cont: NR	Medium

Note: Cont indicates control; Intv, intervention; NR, not reported; RD, registered dietician.

Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Main outcome*	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change**† or difference at final follow-up	*P*-value	Relative change‡	Effect size§
% calories as saturated fat	Intv: 13.2% Cont: 12.9%	18 mo	NR	Intv: –4.4% Cont: –0.9%	*3.5%*	NR	27%	Large
% calories as total fat	Intv: 39.7% Cont: 39.1%			Intv: –14.1% Cont: –2.5%	*11.6 %*	NR	30%	
% calories as saturated fat	Intv: 10.1% Cont: 10.3%	6 mo	Intv: 8.8% Cont: 10.5%	Intv: –1.3% Cont: +0.2%	*1.5%*	*P* <0.05	15%	Medium
% calories as saturated fat	Intv: 10.6% Cont: 10.3%	3 mo	Intv: 9% Cont: 9.7%	Intv: –1.6% Cont: –0.6%	*1.0%*	NR	10%	Small

*Outcomes in this table are reported in the following order of preference depending on the data available from each study: (a) percentage of calories from saturated or total fat; (b) grams of saturated or total fat; and (c) other methods of measuring change in diet as presented by the authors of specific studies.

†Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

‡Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

§Effect size categories are assigned based on (in order of preference) net difference in change, difference at final follow-up, or relative change.

Note: Cont indicates control; Intv, intervention; NR, not reported.

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Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Henderson et al, 1990[16]; Insull et al, 1990[17]; Kristal et al, 1992[18]; White et al, 1992[19]	Adult women 45-69 yrs at increased risk for breast cancer participating in Women's Health Trial in Ohio, Texas, Washington, USA	At risk	Intv: 448 Cont: 457	86%	Research clinic	Intv: RD delivered 8 group counseling meetings, followed by 4 meetings, then 20 monthly meetings Cont: no intervention	High
Keyserling et al, 1997[20]	Adult men and women, low income with hypercholesterolemia in community and rural health centers North Carolina, USA	At risk	Intv: 184 Cont: 188	95%	Primary care	Intv: On-site MD (trained for intv in 1.5 hr) delivered diet assess and 3 sessions of 5-10 min counseling; followed up by referral to on-site (if available) or off-site RD if persistent hypercholesterolemia Cont: usual care	Medium
Knutsen and Knutsen, 1991[21]	Adult men at increased risk for CVD and their families Tromso, Norway	At risk	M: 1,373 F: 1,143 C: 2,838	M: 77% F: 82% C: 39%	Research clinic	Intv: MD and RD each made 1 home visit for CHD risk factor diet assessment and counseling Cont: NR	Medium

Note: C indicates males and females combined; Cont, control; F, females; Intv, intervention; M, males; NR, not reported; RD, registered dietician.

Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Main outcome*	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change**† or difference at final follow-up	*P*-value	Relative change‡	Effect size§
% calories as saturated fat	Intv: 13.8% Cont: 13.6%	24 mo	Intv: 7.2% Cont: 12.3%	Intv: –6.6% Cont: –1.3%	*5.3 %*	*P* <0.001	39%	Large
% calories as total fat	Intv: 39.1% Cont: 38.9%	24 mo	Intv: 22.6% Cont: 36.8%	Intv: –16.5% Cont: –2.1%	*14.4 %*	*P* <0.0001	37%	
Dietary risk assessment score (scale: 0 to 98)	Intv: 22.0 Cont: 22.0	12 mo	NR	Intv: –5.3 Cont: –2.0	*3.3*	*P* <0.001	15%	Medium
% of subjects using butter for cooking	NR	6 yrs	Intv: M: 20% F: 20% Cont: M: 36% F: 36%	NR	M: *16%* F: *16%* C: *10%*	NR	NA	Medium

*Outcomes in this table are reported in the following order of preference depending on the data available from each study: (a) percentage of calories from saturated or total fat; (b) grams of saturated or total fat; and (c) other methods of measuring change in diet as presented by the authors of specific studies.

†Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

‡Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

§Effect size categories are assigned based on (in order of preference) net difference in change, difference at final follow-up, or relative change.

Note: C indicates males and females combined; Cont, control; F, females; Intv, intervention; M, males; NA, not available; NR, not reported.

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Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Kristal et al, 2000[22]	Adult men and women enrollees of Group Health Cooperative of Puget Sound HMO, Washington, USA	Unselected	Intv: 729 Cont: 730	86.5%	Mailings and computer-generated messages	Intv: self-help materials, dietary analysis with behavioral feedback, and semi-monthly newsletters mailed home; trained health educator delivered one motivational phone call Cont: usual care—no intervention	Medium
Lindholm et al, 1995[23]	Adult men and women at increased risk for CHD in 32 county health centers, Lund, Sweden	At risk	Intv: 339 Cont: 342	Intv: 92% Cont: 95%	Primary care	Intv: usual health care advice from MD (see Cont) plus trained MD or RN delivered 6 group health care advice sessions which discussed 6 separate videos about 6 risk factors for heart disease Cont: usual health care advice from MD to reduce dietary fat, reduce weight if necessary, to stop smoking; pamphlet to reinforce instructions	High
Mojonnier et al, 1980[24]	Adult men and women with hyperlipidemia in study centers, USA	At risk	Intv: NR Cont: NR	70%	Research clinic	Intv: RD and nutrition aids delivered 4 different multidimensional interventions including assessment, self-teaching or group-teaching or individual teaching, or multi-method Cont: follow-up at 6 or 9 mo for repeat measurements; no intervention	Medium
Neaton et al, 1981[25] (The MRFIT Study)	Adult men at increased risk for CHD: MRFIT Multicenter Study, USA	At risk	Intv: 5,825 Cont: 5,766	91%	Research clinic	Intv: 10 initial intensive sessions followed by counseling sessions approx. every 4 mo; provider NR Cont: 3 screenings plus annual risk factor measurement and medical exam	High

Note: Cont indicates control; Intv, intervention; NR, not reported; RD, registered dietician.

Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Main outcome*	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change**† or difference at final follow-up	*P*-value	Relative change‡	Effect size§
Fat score: 1 to 4 1 = low fat 4 = high fat	Intv: 2.29 Cont: 2.30	12 mo	Intv: 2.20 Cont: 2.30	Intv: –0.09 Cont: 0.00	*0.09*	*P* <0.001	4%	Small
Grams of total fat	NR	18 mo	NR	NR	*14.6 g*	*P* <0.001	NA	Medium
% calories as saturated fat	Intv: 13.9% Cont: 13.3%	6 and 9 mo F/U combined	Intv: 10.5% Cont: 12.8%	Intv: –3.9% Cont: –0.5%	*3.4%*	*P* <0.001	26%	Large
% calories as total fat	Intv: 37.8% Cont: 36.3%		Intv: 33.9% Cont: 36.6%	Intv: –3.9% Cont: +0.3%	*4.2%*	*P* <0.01	12%	
% calories as saturated fat	Intv: 14.0% Cont: 14.0%	3 yrs	Intv: 10.0% Cont: 13.5%	Intv: –3.9% Cont: –0.4%	*3.5%*	NR	25%	Large
% calories as total fat	Intv: 38.3% Cont: 38.2%		Intv: 33.8% Cont: 38.0%	Intv: –4.5% Cont: –0.2%	*4.3%*	NR	12%	

*Outcomes in this table are reported in the following order of preference depending on the data available from each study: (a) percentage of calories from saturated or total fat; (b) grams of saturated or total fat; and (c) other methods of measuring change in diet as presented by the authors of specific studies.

†Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

‡Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

§Effect size categories are assigned based on (in order of preference) net difference in change, difference at final follow-up, or relative change.

Note: Cont indicates control; F/U, follow-up; Intv, intervention; NA, not available; NR, not reported.

(Continued on p. 28)

Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Ockene et al, 1996[26] and Ockene et al, 1999[27]*	Adult men and women with hyperlipidemia in HMOs, USA	At risk	Intv: NR Cont: NR	80%	Primary care	Intv: MDs (trained for 3 hr) delivered nutrition counseling and staff provided office support Cont: usual care	Medium
Roderick et al, 1997[28]	Adult men and women with hypercholesterolemia in general practice from 4 regions, United Kingdom	Unselected	Intv: 473 Cont: 483	Intv: 86% Cont: 74%	Primary care	Intv: RNs on-site (trained for intv by RD) delivered dietary assessment, advice and F/U Cont: standard health education materials	Medium
Simkin-Silverman et al, 1995[29]	Premenopausal women at research centers Pennsylvania, USA	Unselected	Intv: 267 Cont: 253	97%	Research clinic	Intv: Trained RD and behavioral interventionists led wkly group meetings x 10 wks then biweekly x 10 wks Cont: no intervention	High
Steptoe et al, 1999[30]	Adult men and women at increased risk for CHD in 20 general practices in London, England	At risk	Intv: 316 Cont: 567	59%	Primary care	Intv: RN trained (4 days) in behavioral counseling delivered 2 to 3 individual counseling sessions-20 minutes each and 1 or 2 phone F/U Cont: NR	Medium

*Total baseline participants = 1,162, not divided by groups.

Note: C indicates control; F/U, follow-up; Intv, intervention; NR, not reported; RD, registered dietician.

Table 1. Studies of counseling to reduce dietary fat: study descriptions and outcomes (continued)

Main outcome*	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change**† or difference at final follow-up	*P*-value	Relative change‡	Effect size§
% calories as saturated fat	Intv: 10.7% Cont: 10.7%	12 mo	NR	Intv: –1.1% Cont: 0%	*1.1%*	*P* = 0.01	10%	Small
% calories as total fat	Intv: 30.7% Cont: 31.2%		NR	Intv: –2.3% Cont: –0.7%	*1.6%*	*P* = 0.11	5%	
% calories as saturated fat	Intv: 13.7% Cont: 14.0%	12 mo	NR	Intv: –1.5% Cont: –0.6%	*0.9%*	NR	6%	Small
% calories as total fat	Intv: 34.3% Cont: 34.2%			Intv: –2.4% Cont: –0.9%	*1.4%*		4%	
% calories as saturated fat	Intv: 12.3% Cont: 11.8%	6 mo	NR	Intv: –4.3% Cont: –0.4%	*3.9%*	*P* <0.001	33%	Large
% calories as total fat	Intv: 36.1% Cont: 35.5%			Intv: –11.1% Cont: –1.0%	*10.1%*		28%	
DINE Fat score	Intv: 30.5 Cont: 28.2	12 mo	Intv: 23.4 Cont: 23.9	Intv: –7.1 Cont: –4.3	*2.8*	*P* <0.05	10%	Medium

*Outcomes in this table are reported in the following order of preference depending on the data available from each study: (a) percentage of calories from saturated or total fat; (b) grams of saturated or total fat; and (c) other methods of measuring change in diet as presented by the authors of specific studies.

†Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

‡Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

§Effect size categories are assigned based on (in order of preference) net difference in change, difference at final follow-up, or relative change.

Note: Cont indicates control; Intv, intervention; NR, not reported.

Table 2. Studies of counseling to increase intake of fruit or vegetables: study descriptions and outcomes

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Campbell et al, 1994[12] Tailored msg vs. control	Adult men and women of family practices: 2 urban and 2 rural in North Carolina, USA	Unselected	Intv: NR Cont: NR	82%	Mailings and computer-generated messages	Intv: Self-administered surveys in office delivered by staff; messages mailed home Cont: self-administered surveys only; no messages	Low
Coates et al, 1999[13]	Post-menopausal in research clinics of Women's Health Trial 28% black, 16% Hispanic	At risk	Intv: 1,324 Cont: 883	75% to 85%	Research clinic	Intv: RD-delivered group sessions weekly x 6 weeks, biweekly x 6 weeks, monthly x 9 months Cont: given Dietary Guidelines for Americans; no counseling	High
Delichatsios, Friedman et al, 2001[14]	Adult men and women in a large multisite, multi-specialty group practice—Harvard Vanguard Medical Associates in Massachusetts, USA; 72% women, 45% white, 45% black	Unselected	NR	NR	Mailings and computer-generated messages: home	Intv: weekly diet-related educational feedback, advice, and behavioral counseling for 5-7 minutes by a totally automated, telephone-linked computer-based voice communication system Cont: weekly physical activity-related educational feedback, advice, and behavioral counseling for 5-7 minutes by a totally automated, telephone-linked computer-based voice communication system	Medium

Note: Cont indicates control; Intv, intervention; msg, message; NR, not reported.

Table 2. Studies of counseling to increase intake of fruit or vegetables: study descriptions and outcomes

Main outcome	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change** or difference at final follow-up	*P*-value	Relative change†	Effect size
Servings of fruit and vegetables per day	Intv: 3.6 Cont: 3.6	4 mo	Intv: 3.3 Cont: 3.3	Intv: –0.3 Cont: –0.3	*0 servings*	*P* = 0. 817	0%	Small
Servings of fruit per day	Intv: 1.53 Cont: 1.52	18 mo	NR	Intv: +0.54 Cont: +0.02	*0.53 servings*	NR	35%	Medium
Servings of vegetables per day	Intv: 1.62 Cont: 1.65			Intv: +0.35 Cont: +0.08	*0.27 servings*	NR	16%	
Combined fruits and vegetables	Intv: 6.6 Cont: 5.9	6 mo	Intv: 7.7 Cont: 5.6	Intv: +1.1 Cont: –0.3	*1.4 servings*	NR	24%	Large

*Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

†Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

Note: Cont indicates control; Intv, intervention; msg, message; NR, not reported.

(Continued on p. 32)

Table 2. Studies of counseling to increase intake of fruit or vegetables: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Delichatsios, Hunt et al, 2001[15]	Adult men and women patients from 6 group HMO practices in the primary care research network of Harvard Pilgrim HealthCare, Massachusetts, USA	Unselected	Intv: 230 Cont: 274	Intv: 85% Cont: 92%	Mailings and computer-generated messages	Intv: mailed personalized dietary recommendations and 2 educational booklets; endorsement by 1 hour-trained MD or NP; 2 motivational phone counseling sessions by trained MPH student telephone counselors. RD consultation if needed. Cont: NR	Medium
Knutsen and Knutsen, 1991[21]	Adult men at increased risk for CVD and their families Tromso, Norway	At risk	2,838	39%	Research clinic	Intv: MD or RD each made 1 home visit for CHD risk factor counseling and diet assessment and counseling Cont: NR	Medium
Kristal et al, 2000[22]	Adult men and women enrollees of Group Health Cooperative of Puget Sound HMO, Washington, USA	Unselected	Intv: 729 Cont: 730	86.5%	Mailings and computer-generated messages	Intv: self-help materials, dietary analysis with behavioral feedback, and semi-monthly newsletters mailed home; trained health educator delivered motivational phone call Cont: usual care—no intervention	Medium

Note: Cont indicates control; Intv, intervention; NR, not reported.

Table 2. Studies of counseling to increase intake of fruit or vegetables: study descriptions and outcomes (continued)

Main outcome	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change** or difference at final follow-up	*P*-value	Relative change†	Effect size
Servings of fruit and vegetables per day	Intv: 2.9 Cont: 3.3	3 mo	Intv: 4.0 Cont: 3.7	Intv: +1.1 Cont: +0.4	*0.7 servings*	NR	21%	Medium
% of subjects eating > 4 fruits per week	NR	6 yrs	Intv: 43% Cont: 39%	NR	4%	NR	NA	Small
% of subjects eating vegetables with dinner	NR	NR	Intv: 51% Cont: 53%	NR	2%	NR	NA	Small
Servings of fruit and vegetables per day	Intv: 3.62 Cont: 3.47	12 mo	Intv: 4.09 Cont: 3.61	Intv: +0.47 Cont: +0.14	*0.33 servings*	*P* <0.001	10%	Medium

*Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

†Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

Note: Cont indicates control; Intv, intervention; NA, not available; NR, not reported.

(Continued on p. 34)

Table 2. Studies of counseling to increase intake of fruit or vegetables: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Lutz et al, 1999[31] Tailored msg w/goal vs. control	Adult men and women	Unselected	Intv: 177 Cont: 180	81%	Mailings and computer-generated messages	Intv: self-administered assessment mailed home; tailored messages were mailed home Cont: no newsletter	Low
Maskarinec et al, 1999[32]	Healthy adult women over age 35 consuming less than 5 servings of fruit and vegetables daily in a study center Hawaii, USA	Unselected	Intv: 13 Cont: 16	88%	Research clinic	Intv: RD delivered monthly counseling sessions (1st 2 individual, next 3 group) with phone F/U as needed to increase fruits and vegetables Cont: RD delivered general healthy eating counseling based on the USDA Dietary Guidelines	High
Roderick et al, 1997[28]	Adult men and women with - hypercholesterolemia in general practice from 4 regions, United Kingdom	Unselected	Intv: 473 Cont: 483	Intv: 86% Cont: 74%	Primary care	Intv: RNs on-site (trained for intv by RD) delivered dietary assessment, advice and F/U Cont: standard health education materials	Small
Siero et al, 2000[33] Group education and tailored msg vs. control	Low income adult men and women at increased risk for CVD in primary care practices and at home, The Netherlands	At risk	Intv: NR Cont: NR	NR	Research clinic	Intv: messages were mailed home; group sessions 2 hr each led by group instructor, not otherwise specified Cont: received printed leaflet with the Dutch nutritional guidelines	High

Note: Cont indicates control; F/U, follow-up, Intv, intervention; NR, not reported.

Table 2. Studies of counseling to increase intake of fruit or vegetables: study descriptions and outcomes (continued)

Main outcome	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change*** or difference at final follow-up	*P*-value	Relative change†	Effect size
Mean servings of fruits and vegetables per day	Intv: 3.5 Cont: 3.5	6 mo	Intv: 4.4 Cont: 3.6	Intv: +0.9 Cont: +0.1	*0.8 servings*	*P* <0.002	23%	Medium
Servings of fruit and vegetables per day	Intv: 3.2 Cont: 3.3	6 mo	Intv: 7.4 Cont: 4.1	Intv: 4.2 Cont: 0.8	*3.4 servings*	*P* = 0.0001	100%	Large
Servings of fruit and vegetables per week	NR	12 mo	NR	Intv: 1.09 Cont: 0.03	*0.94 servings*	NR	NA	Medium
Fruits and vegetables grams/day	Intv: 426 g Cont: 416 g	16 wks	Intv: 494 g Cont: 395 g	Intv: +68g Cont: –21 g	*+99 g*	NR	24%	Medium

*Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

†Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

Note: Cont indicates control; Intv, intervention; NA, not available; NR, not reported.

Table 3. Studies of counseling to increase intake of fiber: study descriptions and outcomes

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Baron et al, 1990[34]	Adult men and women in a group general practice, Abingdon, UK	Unselected	Intv: 187 Cont: 181	91%	Primary care	Intv: RN delivered 30 min group or individual diet advice and 2 F/Us Cont: RN F/U visit at 1 and 3 months; no dietary advice	Medium
Beresford et al, 1992[10]	Adult men and women in primary care 35% black North Carolina, USA	Unselected	Intv: 120 Cont: 122	79%	Primary care	Intv: RN on site provides 5 min intro to self-help materials with phone F/U 10 d later Cont: baseline interview only	Low
Beresford et al, 1997[11]	Adult men and women in family practice clinics, USA	Unselected	Intv: 1,010 Cont: 1,111	86%	Primary care	Intv: MD-delivered 3-min intro to self-help booklet + reminder letter from MD Cont: NR	Low

Note: Cont indicates control; F/U, follow-up, Intv, intervention; NR, not reported.

Table 3. Interventions to increase intake of fiber: study descriptions and outcomes (continued)

Main outcome	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change*** or difference at final follow-up	*P*-value	Relative change†	Effect size
Grams of fiber per day	Intv: M: 20.4 g F: 18.9 g Cont: M: 19.3 g F: 16.4 g	12 mo	Intv: M: 22.8 g F: 21.4 g Cont: M: 20.1 g F: 15.4 g	NR	M: 2.7 g F: 6.0 g	NS	M: 14% F: 37%	Medium
Grams of fiber per day (adjusted)	Intv: 14 g Cont: 15 g	3 mo	NR	NR	*0.6 g*	NR	4%	Small
Grams of fiber per 1,000 kcal	Intv: 10 g per 1,000 kcal Cont: 10 g per 1,000 kcal	12 mo	NR	Intv: +0.5 g per 1,000 kcal Cont: +0.2 g per 1,000 kcal	*0.3 g*	NS	3%	Small

*Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

†Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

Note: Cont indicates control; Intv, intervention; NS, not significant; NR, not reported.

(Continued on p. 38)

Table 3. Studies of counseling to increase intake of fiber: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Delichatsios, Friedman et al, 2001[14]	Adult men and women in a large multisite, multi-specialty group practice—Harvard Vanguard Medical Associates in Massachusetts, USA; 72% women, 45% white, 45% black	Unselected	NR	NR	Mailings and computer-generated messages	Intv: weekly diet-related educational feedback, advice, and behavioral counseling for 5-7 minutes by a totally automated, telephone-linked computer-based voice communication system Cont: weekly physical activity-related educational feedback, advice, and behavioral counseling for 5-7 minutes by a totally automated, telephone-linked computer-based voice communication system	Medium
Delichatsios, Hunt et al, 2001[15]	Adult men and women patients from 6 group HMO practices in the primary care research network of Harvard Pilgrim HealthCare, Massachusetts, USA	Unselected	Intv: 230 Cont: 274	Intv: 85% Cont: 92%	Mailings and computer-generated messages	Intv: mailed personalized dietary recommendations and 2 educational booklets; endorsement by 1 hour-trained MD or NP; 2 motivational phone counseling sessions by trained MPH student telephone counselors. RD consultation if needed. Cont: NR	Medium

Note: Cont indicates control; Intv, intervention; NR, not reported; RD, registered dietician.

Table 3. Interventions to increase intake of fiber: study descriptions and outcomes (continued)

Main outcome	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change*** or difference at final follow-up	*P*-value	Relative change†	Effect size
Grams of fiber per day	Intv: 21 g Cont: 20 g	6 mo	Intv: 22 g Cont: 18 g	Intv: +1 g Cont: –2 g	3 g	*P* <0.05	15%	Medium
Grams of fiber per day	Intv: 7.3 g Cont: 8.2 g	3 mo	Intv: 9.3 g Cont: 9.0 g	Intv: +2 g Cont: +0.8 g	1.2 g	NR	15%	Small

*Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

†Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

Note: Cont indicates control; Intv, intervention; NR, not reported.

(Continued on p. 40)

Table 3. Studies of counseling to increase intake of fiber: study descriptions and outcomes (continued)

Author, year	Sample population	Level of risk	Baseline patient numbers	Retention rate	Setting	Intervention and control group counseling provider and resources	Intensity
Lindholm et al, 1995[23]	Adult men and women at increased risk for CHD in 32 county health centers Lund, Sweden	At risk	Intv: 339 Cont: 342	Intv: 92% Cont: 95%	Primary care	Intv: MD- or RD-delivered group health care advice sessions Cont: usual health care advice from MD to reduce dietary fat, reduce weight if necessary, to stop smoking; pamphlet to reinforce instructions	High
Roderick et al, 1997[28]	Adult men and women with hypercholesterolemia in general practice from 4 regions, United Kingdom	Unselected	Intv: 473 Cont: 483	Intv: 86% Cont: 74%	Primary care	Intv: RNs on-site (trained for intv by RD) delivered dietary assessment, advice and F/U Cont: standard health education materials	Medium

Note: Cont indicates control; Intv, intervention; NR, not reported; RD, registered dietician.

Table 3. Interventions to increase intake of fiber: study descriptions and outcomes (continued)

Main outcome	Baseline values	Duration of follow-up	Final follow-up values	Change from baseline to final follow-up	*Net difference in change*** or difference at final follow-up	*P*-value	Relative change†	Effect size
Grams of fiber per day	NR	18 mo	NR	NR	*0.9 g*	*P* <0.001	NA	Small
Grams of fiber per day	Intv: 23.3 g Cont: 23.2 g	12 mo	NR	Intv: +0.9 Cont: –0.2	*1.1 g*	CI (-0.2–2.23)‡	4%	Small

*Baseline minus follow-up value for the intervention group minus baseline minus follow-up value for the control group.

†Absolute change in the intervention group from baseline to follow-up divided by the baseline value of the control group.

‡P-value not reported, confidence interval given instead.

Note: Cont indicates control; Intv, intervention; NA, not available; NR, not reported.

Table 4: The effect of patient risk status and intervention intensity on dietary change

	Unselected patients	"At risk" patients
Low intensity	Beresford et al, 1992[10] (fat) Beresford et al, 1992[10] (fiber) Beresford et al, 1997[11] (fat) Beresford et al, 1997[11] (fiber) Campbell et al, 1994[12] (F&V) Lutz et al, 1999[31] (F/V) **Campbell et al, 1994[12] (fat)**	
Medium intensity	Delichatsios Hunt et al, 2001[15] (fat) Kristal et al, 2000[22] (fat) Baron et al, 1990[34] (fiber) Delichatsios Friedman et al, 2001[14] (fat) Delichatsios Friedman et al, 2001[14] (F/V) Delichatsios Friedman et al, 2001[14] (fiber) Delichatsios Hunt et al, 2001[15] (F/V) Delichatsios Hunt et al, 2001[15] (fiber) Kristal et al, 2000[22] (F/V) Roderick et al, 1997[28] (fat) Roderick et al, 1997[28] (fiber) Roderick et al, 1997[28] (F/V)	Knutsen and Knutsen et al, 1991[21] (F/V) Ockene et al, 1999[27] (fat) Keyserling et al, 1997[20] (fat) Knutsen and Knutsen 1991[21] (fat) Steptoe et al, 1999[30] (fat) **Mojonnier et al, 1980[24] (fat)**
High intensity	**Maskarinec et al, 1999[32] (F/V)** **Simkin-Silverman et al, 1995[29] (fat)**	Lindholm et al, 1995[23] (fiber) Coates et al, 1999[13] (F/V) Lindholm et al, 1995[23] (fat) Siero et al, 2000[33] (F/V) **Coates et al, 1999[13] (fat)** **Henderson et al, 1990[16] (fat)** **Neaton et al, 1981[25] (fat)**

Note: Plain text indicates a small effect; underlined text, a medium effect; bold text, a large effect; F/V, fruits and vegetables.

Table 5. Relationship between the number of effective intervention elements and the change in dietary behavior

Amount of change in dietary behavior	0 Components	1–2 Components	3–7 Components
Small effect	Beresford et al, 1992[10] (fat) Beresford et al, 1992[10] (fiber) Beresford et al, 1997[11] (fat) Beresford et al, 1997[11] (fiber)	Campbell et al, 1994[12] (F/V) Delichatsios, Hunt et al, 2001[15] (fat) Knutsen and Knutsen, 1991[21] (F/V) Kristal et al, 2000[22] (fat) Lindholm et al, 1995[23] (fiber) Ockene et al, 1999[27] (fat) Roderick et al, 1997[28] (fat) Roderick et al, 1997[28] (fiber) Roderick et al, 1997[28] (F/V)	
Medium effect		Baron et al, 1990[34] (fiber) Delichatsios, Friedman et al, 2001[14] (fat) Delichatsios, Friedman et al, 2001[14] (fiber) Delichatsios, Hunt et al, 2001[15] (F/V) Delichatsios, Hunt et al, 2001[15] (fiber) Knutsen and Knutsen, 1991[21] (fat) Kristal et al, 2000[22] (F/V) Lindholm et al, 1995[23] (fat) Lutz et al, 1999[31] (F/V) Siero et al, 2000[33] (F/V) Steptoe et al, 1999[30] (fat)	Coates et al, 1999[13] (F/V) Keyserling et al, 1997[20] (fat)
Large effect		Campbell et al, 1994[12] (fat) Delichatsios, Friedman et al, 2001[14] (F/V) Mojonnier et al, 1980[24] (fat) Simkin-Silverman et al, 1995[29] (fat)	Coates et al, 1999[13] (fat) Henderson et al, 1990[16] (fat) Maskarinec et al, 1999[32] (F/V) Neaton et al, 1981[25] (fat)

Note: F/V indicates fruits and vegetables.

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Appendix

Literature Search Strategy and Search Results

Appendix Table 1. Search strategy

Step	Search history	Number of articles
1.	exp counseling	17,519
2.	exp diet or exp nutrition	149,189
3.	1 and 2	655
4.	(dietary counseling or diet counseling or nutrition counseling).mp	506
5.	3 or 4	1,043
6.	limit 5 to (human and English language)	923
7.	limit 6 to randomized controlled trial	115
8.	exp randomized controlled trial or exp single-blind method or exp double-blind method or exp random allocation	106,493
9.	6 and 8	30
10.	7 or 9	129

Appendix Table 2. Articles excluded for review in this report, by author and reason for exclusion

Author, Year	Reason for exclusion
Aubin et al., 1998[35]	No control group
Bakx et al., 1997[36]	17 year follow-up of a one-time intervention in 1977
Barratt et al., 1994[37]	Nonclinical intervention (worksite)
Brannon et al., 1997[38]	No control group
Burr et al., 1989[39]	Postmyocardial infarction subjects
Caggiula et al., 1996[40]	No diet outcomes
Calfas et al., 2000[41]	No true control group; comparable diet outcomes not presented
Campbell et al., 1998[42]	Patients with known cardiovascular disease
Cupples and McKnight 1994[43]	Patients with angina
Crouch et al., 1986[44]	No diet outcomes
DeBusk et al., 1994[45]	Postmyocardial infarction subjects
De Lorgeril et al., 1994[46]	Postmyocardial infarction subjects
Dyson et al., 1997[47]	No control group
Ershoff et al., 1983[48]	No diet outcomes
Family Heart Study Group, 1994[49]	No diet outcomes
Fletcher, 1987[50]	Postmyocardial infarction subjects
Ford and Sciamanna, 1997[19]	Not an intervention (editorial)
Foreyt et al., 1979[51]	No control group; no diet outcomes
George et al., 1993[52]	No diet outcomes
Gosselin et al., 1996[53]	No diet outcomes
Heller et al., 1989[54]	No diet outcomes
Heller et al., 1994[55]	Poor quality due to differential loss to follow-up
Henkin, et al., 2000[56]	No diet outcomes
Hjermann et al., 1981[57]	No diet outcomes for full study population
Howard-Pitney et al., 1997[58]	Nonclinical intervention
Hunt et al., 1976[59]	Prenatal care patients only
Kuehl et al., 1993[60]	No control group
Lee-Han et al., 1988[61]	Patients with breast dysplasia
Luepker et al., 1978[62]	No diet outcomes
Lytle et al., 1996[63]	Nonclinical intervention
Masley et al., 2001[64]	Patients with known cardiovascular disease
Miettinen et al., 1985[65]	No diet outcomes
MRFIT Investigators, 1982[66]	No diet outcomes
Naglak et al., 1998[67]	No control group
Neil et al., 1995[68]	No diet outcomes
Neyses et al., 1985[69]	No diet outcomes
Nikolaus et al., 1991[70]	Three week inpatient metabolic ward study
Ornish 1998[71]	Control group information not available
Ornish et al., 1990[72]	Patients with known cardiovascular disease
OXCHECK Study Group 1994[73]	
OXCHECK Study Group 1995[74]	No control group
Pritchard et al., 1999[75]	No diet outcomes
Ridgeway et al., 1999[76]	No diet outcomes
Shannon et al., 1994[77]	Non-comparable groups
Smith et al., 1976[78]	No diet outcomes
Tershakovec et al., 1998[79]	Non-comparable groups
Tomson et al., 1995[80]	No diet outcomes
Waber et al., 1981[81]	No diet outcomes
Winkleby et al., 1997[82]	Nonclinical intervention

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