Effectiveness of Nutrition Education Intervention in Schenectady County Meal Site Participants

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Abstract

Background: The rapid growth of the aging population presents challenges for the healthcare industry. Increased longevity is often accompanied by higher risk of chronic disease, functional impairment, and food insecurity. Programs offered by Offices of the Aging seek to combat these issues through the provision of meals, nutrition education, physical activities, social activities, and health screenings. A needs assessment conducted at Schenectady County congregate meal sites revealed a high prevalence of cardiovascular disease and, despite educational offerings, significant nutrition knowledge deficits.
Objective: To evaluate the effectiveness of multiple sessions of heart-healthy nutrition education on congregate meal site participants' nutrition knowledge, dietary habits, and blood pressures.
Methods: 16 participants were recruited at the Glenville meal site. Changes in dietary habits and nutrition knowledge were evaluated by comparing FFQ and nutrition knowledge assessment data collected during the needs assessment to post-intervention results. Changes in blood pressure were evaluated by comparing pre- to post-intervention measurements.
Results: There were non-significant increases in overall nutrition knowledge assessment scores, as well as the scores for questions pertaining to the salt and fat content of foods. There were no significant changes in dietary habits or blood pressure measurements as compared to baseline.
Conclusions: Further research is needed to evaluate whether more educational sessions over a longer duration of time might be more effective at impacting changes in nutrition knowledge, dietary behaviors, and health outcomes.

Introduction

As people are living longer, the older adult population within the United States is rapidly growing, and it is expected that 88.5 million Americans will be aged 65 and older by the year 2050. [1] Increased longevity may bring many benefits, but an aging population also presents challenges for programs, such as Social Security and Medicare. [2] Older adults have a higher risk of experiencing chronic disease and associated functional impairment that interferes with the ability to carry out day-to-day household activities and engage in activities outside of the home. [3] This has implications for the projected demand on health care workers. As older adults begin to consume a disproportionate share of health care services, there becomes a need for geriatric training and more data about how health professionals can better serve older adults. [4]

The Older Americans Act (OAA), passed in 1965, has served as the foundation for home and community-based programs, run by state and territorial Area Agencies on Aging that provide services and supports such as home-delivered meals and congregate meal sites for older adults and their caregivers. The OAA administers the National Survey of Older American Act Participants (NSOAAP) annually in order to assess the health-related needs and characteristics of the older adult population. [5,6] The surveys are administered by phone and reveal findings that indicate that OAA participants have significant rates of chronic disease, food insecurity, difficulty with activities of daily living, diets that do not meet nutritional guidelines, and that older adults do not follow physical activity recommendations. [7] OAA nutrition programs aim to reduce hunger and food insecurity, promote health and wellness, provide a place where older adults can socialize, and help older adults remain independent through nutrition and exercise. [6]

In New York, Offices of the Aging provide these services for adults, aged 60 and older and it is New York State policy that nutrition education presentations be provided at each congregate meal site at least six times annually. [8] A needs assessment was conducted at all four Schenectady County meal sites using select questions from the NSOAAP to assess for prevalence of malnutrition, food insecurity, and health conditions, select questions from the General Nutrition Knowledge Questionnaire-Revised (GNKQ-R) to assess nutrition knowledge, and select questions from the NHANES Food Frequency Questionnaire (FFQ) to assess for average diet over the past year. [9,10] This needs assessment revealed that a significant proportion of participants are affected by cardiovascular disease and that participants' diets are high in sodium and low in fiber. High rates of high cholesterol and hypertension were reported within this population as compared to the NSOAAP national sample findings. Additionally, despite nutrition education requirements at the meal sites, the needs assessment revealed a significant nutrition knowledge deficit, particularly for their ability to identify the sodium and fat content of foods.

Drawing upon the health belief model that suggests that positive changes to health behavior can be implemented when barriers to these changes are addressed, this study will investigate the impact of additional nutrition education on meal site participants. The purpose of this study is to find out whether multiple sessions of education about cardiovascular disease can improve nutrition knowledge, diet, and blood pressure for participants.

Methods

Study Design

A quasi-experimental design with a multi-session nutrition education intervention was used. Pre- to post-intervention changes in blood pressure, dietary habits, and nutrition knowledge were assessed among consenting Schenectady County congregate meal site participants. Pre-intervention survey materials were administered during the needs assessment conducted in the fall of 2023. Blood pressures were measured prior to administration of the first nutrition education presentation and measured again following the second nutrition education presentation. Approval for the study was granted by SUNY Oneonta Institutional Review Board.

Intervention

The intervention was designed based upon the health belief model that suggests that positive changes to health behavior can be implemented when barriers to these changes are addressed. Nutrition knowledge deficits were identified as a key barrier to making positive nutritional changes during the needs assessment. A multi-session group nutrition education was designed to cover heart healthy diet information, broken into sessions about low sodium and heart healthy fats. The intervention materials were presented at Glenville Senior Center meal site during two consecutive Thursday lunch services, with the presentations lasting 15-20 minutes long. Meal site attendees were asked to participate in the study and given a consent form to look over. The researcher offered and was available to read the consent form with the participants and answer any questions prior to consent forms being signed.

If a participant signed the consent form, the participant had their blood pressure read and recorded. Following blood pressure measurements, the first of the two nutrition presentations was conducted, with time for questions following the presentation. The following week, post-intervention blood pressure measurements were collected, followed by the second nutrition education presentation and the post-intervention survey.

Instruments

Blood pressure was measured using an electronic sphygmomanometer. The survey materials consisted of 74 questions about blood pressure medications, a Food Frequency Questionnaire (FFQ), and select questions from the General Nutrition Knowledge Questionnaire-Revised (GNKQ-R). Questions about blood pressure medications were developed by the researcher, to assess whether participants were on blood pressure medications and whether they began taking blood pressure medications during the course of the intervention. The FFQ questions were derived from the validated NHANES FFQ and asked the participants to recall their dietary behaviors over a shorter timeline to assess recent dietary changes since the intervention was implemented. The questions derived from the validated GNKQ-R primarily pertained to cardiovascular disease nutrition knowledge and were used to assess changes in diet and nutrition-related knowledge compared to the baseline data collected. These questions specifically highlighted knowledge of the salt and fat content of various foods. The survey took participants approximately 15 minutes to complete. For more information, see **Supplemental Figure 1**.

Participants

Meal site participants, aged 60 and older, were recruited at Glenville Senior Center during congregate meal site hours, prior to meal service. Sixteen participants were recruited. No information was gathered from participants about gender, race/ethnicity, or educational background. Some of the participants may have been intellectually disabled, or economically or educationally disadvantaged, but individuals of those populations were not specifically targeted.

Data Analysis

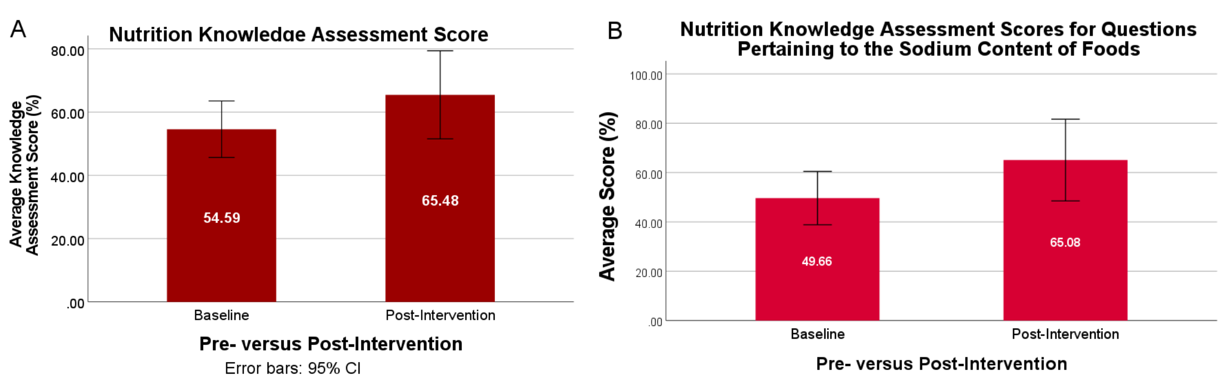
The focus of the data analysis was to determine if there was any significant improvement in dietary patterns, blood pressure measurements, and nutrition knowledge following a multi-session nutrition education. All data besides the blood pressure measurements were compared to baseline data obtained during the previously conducted needs assessment. Non-parametric two-sample t-tests were used to compare nutritional analysis of dietary patterns, blood pressure measurements, and nutrition knowledge scores between pre- and post-intervention. The level for determining statistical significance was $p < 0.05$ for all analyses. Data was analyzed using IBM SPSS Statistics.

Results

A total of 16 Glenville meal site participants consented to the study, with 9 recruited during the first week of the intervention, and 7 recruited during the second week. Of those participants, blood pressure measurements were obtained from 12 participants (7 during the first week and 5 additional the second week), and 9 completed the survey containing the FFQ and GNKQ-R questions. While no demographic information was collected, all study participants were meal site attendees aged 60 and over. Participant's younger guests were not recruited. The pre-test sample used as the baseline for the nutrition knowledge and dietary assessment was recruited from all four Schenectady County meal sites during the previously conducted needs assessment (n=21).

Nutrition Knowledge

Results of the pre- versus post-nutrition knowledge assessment results can be found in **Figure 1**. While the average score was approximately 10% higher post-intervention, the results were not found to be clinically significant ($p = 0.083$). In addition, analysis assessing questions specifically related to the fat and salt content of foods revealed similar results. There was a higher average score post-intervention for both sets of questions, with the most significant improvement for questions pertaining to the salt content of foods, but again, these results were not statistically significant ($p = 0.247$ and $p = 0.053$ respectively).



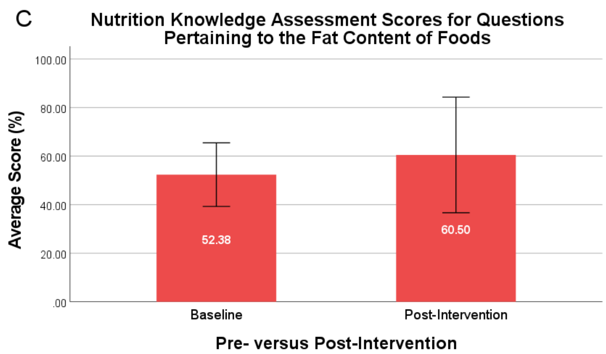
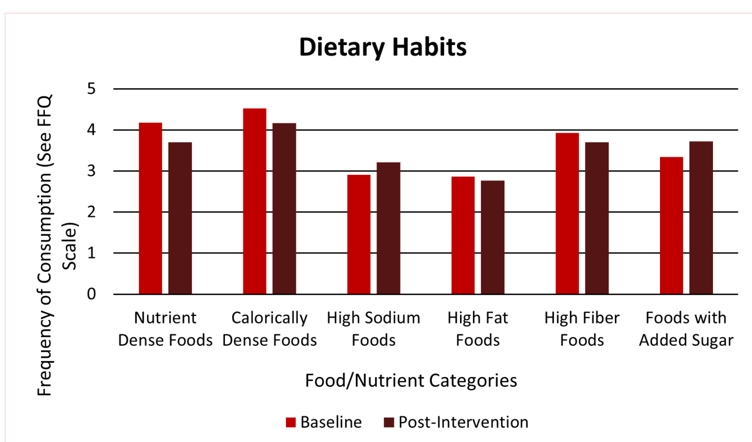


Figure 1. Nutrition Knowledge Assessment Scores at baseline (n=21) and following the intervention (n=9). A) Average nutrition knowledge assessment scores for the pre- and post-intervention groups, ($p = 0.083$). B) Average nutrition knowledge scores for questions pertaining to the sodium content of foods between the pre- and post-intervention groups, ($p = 0.053$). C) Average nutrition knowledge scores for questions pertaining to the fat content of foods, ($p = 0.247$).

Dietary Changes

FFQ results were converted into numerical data so that they may be scored to find average consumption across various nutrient and food groups. No significant differences were found between the pre- and post-intervention dietary analyses. Dietary analysis revealed that the average participant reported scores for consuming each of the nutrient dense, calorically dense, high fiber, high fat, high sodium, and high added sugar foods anywhere from around once a month to 1-2 times per week. Consumption of high fat and high sodium foods appeared to be rated with lower frequencies than nutrient dense or calorically dense foods. There were little to no notable changes between the pre- and post- intervention groups. See **Figure 2** for more information.

A.



B.

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day
1	2	3	4	5	6	7	8

Figure 2. Assessment of dietary habits, broken down by nutrient and food categories of interest, at baseline (n=21) and following the intervention (n=9). A) Reported average frequency of consumption at baseline and post-intervention of nutrient dense foods, calorically dense foods, high sodium foods, high fat foods, high fiber foods, and foods with added sugars, ($p = 0.225$, $p = 0.379$, $p = 0.266$, $p = 0.415$, $p = 0.359$, and $p = 0.206$ respectively). Light red = pre-intervention, Dark red = post-intervention B) The FFQ scale used to assess frequency of consumption

Blood Pressure Measures

As shown in **Figure 3**, there were no significant changes in either systolic or diastolic blood pressures from pre- to post-intervention. The average blood pressure pre-intervention was 139/73, while the average blood pressure post-intervention was 137/75.

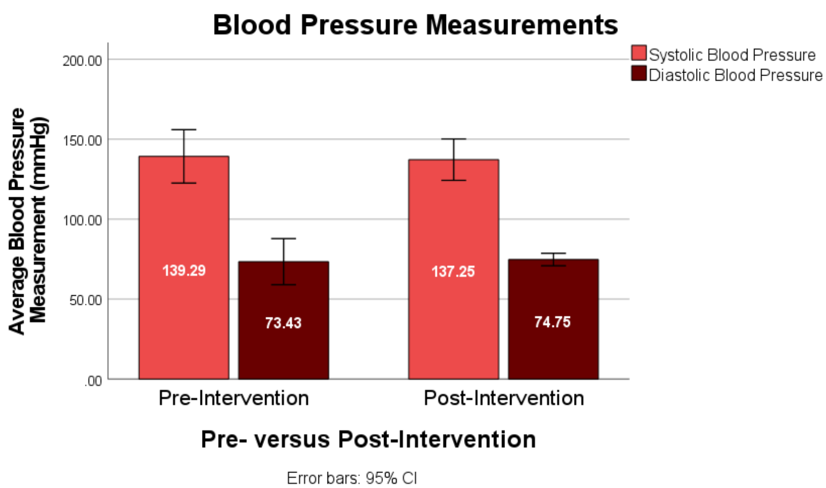


Figure 3. Average systolic and diastolic blood pressure measurements prior to (n=7) and following the intervention (n=12), ($p = 0.415$ and $p = 0.397$ respectively). Light red = systolic blood pressure, Dark red = diastolic blood pressure.

Discussion

Although not statistically significant, nutrition knowledge scores were improved overall, and seemed most improved on questions pertaining to the sodium content of foods, with approximately a 16% increase in scores on those questions. Similar studies have found success in improving nutrition knowledge, with programs that range anywhere from three 20-minute sessions to four hour-long sessions. [11,12] Similarly, in assessing the dietary intake of participants, most values averaged out to moderate to low consumption of various nutrient groups. Overall, participants reported diets only minimally changed from baseline, but this may be attributed to the small sample size and short duration of the study. Given more time, it may be beneficial to examine the results of a pre- and post-nutrition assessment with a static group of participants over a longer duration of time, so that effects of an ongoing intervention may be seen. At Schenectady County's meal sites, education and other activities are usually limited to 15-20 minutes, but some studies have found success recruiting meal site participants for activities outside meal site time constraints. An RDN for Leah's Pantry found success in conducting four hour-long Zoom workshops with meal site participants, while another intervention conducted sessions once a week for three months. [12,13] The longer format or longer duration seems to be something worth examining with this program going forward, as this would provide participants with more time to learn and implement behavior changes.

While blood pressures remained stable across the intervention, the limited time frame of the study may be a contributing factor. Similar studies have found that use of self-measured blood pressure has been demonstrated to improve blood pressure control. These studies examined mean changes in blood pressure over the course of several months to years, with significant differences in blood pressure being seen at the year mark, so a time frame of two weeks may be too short to see any differences. [14,15] Over a longer period of time, however, the addition of blood pressure measurements into an intervention could prove a useful tool at generating engagement. Observationally, it appeared that the inclusion of blood pressure measures in this study was a key driving factor for participation. Many of the participants expressed excitement about having their blood pressure read, and some expressed a desire for their own device to do so at home. Unfortunately, due to time and resource constraints, not all participant blood pressures could be measured prior to lunch service at the site. The second week of intervention coincided with the St. Patrick's Day celebration at the meal site, which consisted of a high sodium meal, which may have also significantly impacted post-intervention results.

Overall, these results could have been impacted by several factors. Despite the additional recruitment during week two of the intervention, the small sample size is one factor that may have impacted the significance of the results. Both the samples from the needs assessment conducted in the fall, as well as the sample recruited during this study, were small enough to affect the statistical significance of t-test analyses. Additionally, using baseline measures from a previous study to compare pre- to post-intervention dietary behaviors and nutrition knowledge could have played a role. Another limitation to this study is the continued recruitment of individuals during week two of the intervention. Any individuals recruited during the second week were not present for the first week's education presentation, and though extra handouts from that education were available, participants missed out on the education as it was intended to be provided.

Conclusion

While this study yielded no statistically significant findings pertaining to changes in nutrition knowledge or dietary behavior, and no changes in blood pressure outcomes, this is likely the result of the study's short duration and small sample size. The findings of this study support the need for future research using larger sample sizes and an increased number of education sessions over a longer study duration to evaluate whether this would significantly increase participants nutrition knowledge and would provide adequate time to see significant changes in behavior and/or health outcomes.

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Appendix

Supplemental Figure 1: The following are the survey materials administered to participants.

Do you currently take medication to treat high blood pressure?

Yes	No

If yes, did you start taking this medication within the last two weeks?

Yes	No

Over the past month, how often did you drink the following:

100% Fruit juice or fruit juice mixtures?

Never	1 time per month or less	2-3 times per month	1-2 times per week	2-3 times per week	3-4 times per week	5-6 times per week	1 time per day	2-3 times per day	4-5 times per day	6 or more times per day

Fruit drinks (such as cranberry cocktail, Hi-C, lemonade, or Kool-Aid)?

Never	1 time per month or less	2-3 times per month	1-2 times per week	2-3 times per week	3-4 times per week	5-6 times per week	1 time per day	2-3 times per day	4-5 times per day	6 or more times per day

How often were your fruit drinks diet or sugar-free drinks?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Milk as a beverage (NOT in coffee or cereal)? (Please include chocolate milk and hot chocolate)

Never	1 time per month or less	2-3 times per month	1-2 times per week	2-3 times per week	3-4 times per week	5-6 times per week	1 time per day	2-3 times per day	4-5 times per day	6 or more times per day

What kind of milk do you usually drink?

Whole milk	2% milk	1% milk	Skim or nonfat milk	Soy milk	Rice milk	Raw, unpasteurized milk	Other

Meal replacement, energy, or high-protein beverages (such as Instant Breakfast, Ensure, Slimfast, or others)

Never	1 time per month or less	2-3 times per month	1-2 times per week	2-3 times per week	3-4 times per week	5-6 times per week	1 time per day	2-3 times per day	4-5 times per day	6 or more times per day

Soft drinks, soda, or pop

Never	1 time per month or less	2-3 times per month	1-2 times per week	2-3 times per week	3-4 times per week	5-6 times per week	1 time per day	2-3 times per day	4-5 times per day	6 or more times per day

How often were the soft drinks diet or sugar-free?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Alcohol, (such as beer, wine or wine coolers, liquor, or mixed drinks

Never	1 time per month or less	2-3 times per month	1-2 times per week	2-3 times per week	3-4 times per week	5-6 times per week	1 time per day	2-3 times per day	4-5 times per day	6 or more times per day

Over the past month, how often did you eat the following:

Fruit (such as bananas, pineapple, peaches, berries, melons, or other fruit)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Cooked greens (such as spinach, collard, mustard, chard, or kale)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Raw greens (such as spinach, collard, mustard, chard, or kale)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Other vegetables (such as carrots, corn, peas, onions, broccoli)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Starchy vegetables (such as sweet potatoes, yams, potatoes)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Beans (such as baked beans, pintos, kidney, black-eyed peas, lima, lentils, soybeans, or refried beans)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Oatmeal, grits, or other hot cereal

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Cold cereal

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Rice or other cooked grains (such as bulgur, cracked wheat, or millet)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

How often was the rice or other grains you ate brown rice, cracked wheat, or millet?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Pancakes, waffles, French toast

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Pasta, spaghetti, or other noodles

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

How often do you eat your pasta with tomato sauce **with** meat?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

How often do you eat your pasta with tomato sauce **without** meat?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

How often do you eat your pasta with margarine, butter, oil, or other cream sauce?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Bread or rolls

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

How often was the bread or roll white bread?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Cold cuts or luncheon meats

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Hot dogs

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Beef (including steak, ground beef, hamburger)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Chicken or turkey

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

How often was the chicken or turkey fried? (including nuggets)

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

How often was the chicken white meat?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

How often did you eat chicken with the skin on?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Pork

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Ham

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Bacon or sausage

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Fish or other seafood (including canned tuna and shellfish)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Eggs

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

How often were the eggs you ate egg whites or egg substitutes?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Tofu, soy burgers or soy-meat substitutes

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Cheese (including low-fat, on cheeseburgers, or in sandwiches)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

How often was the cheese you ate light or low-fat cheese?

Almost never or never	About 1/4 of the time	About 1/2 of the time	About 3/4 of the time	Almost always or always

Yogurt (not including frozen yogurt)

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

Cottage cheese

Never	1 time per month	2-3 times per month	1-2 times per week	3-4 times per week	5-6 times per week	1 time per day	2 or more times per day

This next section is not a test, but it is important that you complete it by yourself.

How many servings of fruit and vegetables per day do experts advise people to eat as a minimum? (One serving could be, for example, an apple or a handful of chopped carrots)

2	3	4	5 or more	Not Sure

Which of these types of fats do experts recommend that people should eat less of? (Check one box per food)

	Eat Less	Not Eat Less	Not Sure
Unsaturated Fats			
Trans Fats			
Saturated Fats			

Which type of dairy foods do experts say people should drink?

Full fat (e.g. full fat milk	Reduced fat (e.g. skim and semi-skim milk)	Mixture of full fat and reduced fat	Neither, dairy foods should be avoided	Not Sure

Do you think these foods and drinks are typically high or low in added sugar? (Check one box per food)

	High in Added Sugar	Low in Added Sugar	Not Sure
Diet Cola Drinks			
Natural Yogurt			
Ice Cream			
Tomato Ketchup			
Melon			

Do you think these foods are typically high or low in salt? (Check one box per food)

	High in Salt	Low in Salt	Not Sure
Breakfast Cereals			
Frozen Vegetables			
Bread			
Baked Beans			
Red Meat			
Canned Soup			

Do you think these foods are typically high or low in fiber? (Check one box per food)

	High in Fiber	Low in Fiber	Not Sure
Oats			
Bananas			
White Rice			
Eggs			
Potatoes with Skin			
Pasta			

Which is the main type of fat present in each of these foods? (Check one box per food)

	Unsaturated Fat	Saturated Fat	Not Sure
Olive Oil			
Butter			
Sunflower Oil			
Eggs			

Which of these foods has the most trans-fat?

Biscuits, cakes, and pastries	Fish	Rapeseed oil	Eggs	Not Sure

One healthy way to add flavor to food without adding extra fat or salt is to add:

Coconut Milk	Herbs	Soy Sauce	Not Sure