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Nutrition-Related Knowledge and Behaviors of Healthcare Professionals: A Pilot Study

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Nutrition-related knowledge and behaviors of healthcare professionals:

A pilot study

by

Sarah Dale Zeola

Thesis

Submitted to the School of Health Sciences

Eastern Michigan University

in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE

in

Human Nutrition Coordinated Program in Dietetics

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Ypsilanti, Michigan

DEDICATION

To my amazing husband, Mike, for putting up with me during my degree program and always being there for me when I needed a laugh or a hug, and to my loyal companions, Rocco and Barley, for lying by my feet every day that I worked on my laptop and giving me a sideways glance if they thought I might be procrastinating.

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ABSTRACT

Background: Healthcare consumers have a plethora of resources of nutrition guidance available, yet many sources provide unreliable information.

Healthcare professionals are expected to be the expert source of nutrition information and dietary guidance for their clients and patients.

Purpose: To determine the nutrition knowledge, behaviors, and beliefs of healthcare professionals to identify which, if any, professional group are experts in nutrition and which professionals are the best resource for nutrition information and guidance for healthcare consumers.

Research Design: A self-reported online survey gathered information on participants' (n=201) BMI, knowledge of the Dietary Guidelines for Americans, dietary intake, and beliefs about healthcare professionals' knowledge of nutrition and providing dietary guidance.

Conclusions: All groups demonstrated knowledge of the Dietary Guidelines for Americans, though RDs displayed the greatest knowledge of the guidelines and most congruence between guideline recommendations and reported dietary intake, and were identified as experts in nutrition by all professional groups surveyed.

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CHAPTER ONE

Overview of Study

Preventive healthcare and medicine are at the forefront of people's minds and current legislation. Americans are receiving information on improving their health and lifestyle from a variety of sources, both reliable and unreliable. With so much information available it is difficult for consumers to discern credible sources of nutrition information and the effect of nutrition on their life, the prevention of disease and maintenance of optimal health. This study surveyed hundreds of healthcare professionals in an attempt to determine who truly are the experts in nutrition.

Background

Nutrition information is available from a vast array of sources, making it difficult for consumers to identify whom they should look to as experts in nutrition. Consumers can find nutrition information on the internet, in books and magazines, and from medical professionals. The Dietary Guidelines for Americans (DGA), 2005, provide information on foods that are encouraged, such as fruits, vegetables, whole grains, calcium-rich foods, and lean protein sources, and foods that should be limited, including sodium and alcohol (1).

Previous studies, such as the Nurse's Health Study, have examined the dietary intake of groups of healthcare professionals, but no study has examined the nutrition-related behaviors, beliefs and intake of healthcare professionals to identify which, if any, professionals are experts in nutrition.

Registered dietitians (RDs) are the healthcare professionals with the most intensive and rigorous education in nutrition and should be looked to, by consumers and other healthcare professionals, as the experts in nutrition. No studies, to date, have been able to identify who are nutrition experts. The goal of this study was to identify the experts in nutrition.

This pilot study provides relevant information on the nutrition-related knowledge, behaviors and beliefs of healthcare professionals. An online survey gathered self-reported dietary intake and information on nutrition knowledge and beliefs. As a pilot study, this study was intended to be a foundation for future research on nutrition-related knowledge and behaviors of physicians, nursing professionals, and RDs. By surveying these professionals, it is possible to determine if they are meeting current dietary intake guidelines provided by the USDA. This survey also allows for determining which professionals feel most comfortable providing nutrition education to clients and which professionals provide nutrition education to clients most frequently.

Medical professionals surveyed include registered dietitians, registered nurses, nurse practitioners, medical doctors, and doctors of osteopathy. The survey included questions of self-reported anthropometric measurements, gender, age, and length of time in current profession. The body-mass index (BMI) for each individual was calculated using their reported height and weight. The mean BMI and mean length of employment in current profession has been calculated for each professional group.

The survey asked for self-reported food intakes based on the United States Department of Agriculture's (USDA's) Dietary Guidelines for Americans, 2005 (1). Survey participants were asked to report how frequently they consume foods in several different groups including fruits, vegetables, meat, dairy, and fats. The survey participants were also asked questions about the 2005 USDA Dietary Guidelines. The mean responses for each group have been compared.

Survey participants also answered several questions about their nutrition behaviors and beliefs. Participants were asked how often they provide nutrition education to clients and how comfortable they feel providing that guidance. Participants were asked if they believe their BMI to be underweight, within normal range, overweight, or obese, as the categories are defined by the National Heart, Lung and Blood Institute (NHLBI) (2).

It was postulated that the results of the study would show that registered dietitians (RDs) have superior nutrition knowledge when compared to other healthcare professionals. It was also expected that RDs would show the greatest congruence in their reported intake and the USDA guidance.

Purpose of Research

The purpose of this research was to identify experts in nutrition among a group of healthcare professionals. Experts in nutrition are those individuals or groups who have knowledge of the DGA. Experts in nutrition

will further be those individuals or groups who follow the guidance put forth by the U.S. Department of Health and Human Services (HHS) most closely when compared with other healthcare professionals.

Nutrition-related knowledge includes knowledge of BMI and BMI classification, knowledge of nutrition as evidenced by knowledge of the recommendations of the Dietary Guidelines for Americans, 2005. Nutrition-related behaviors of healthcare professionals were identified by a survey. The online survey gathered information on the food intake and beliefs of physicians, nursing professionals, and dietitians. Nutrition-related behavior in this research has been limited to food intake. Nutrition-related beliefs focus on comfort with their nutrition knowledge when providing nutrition education to clients or patients, sources patients or clients are referred to for nutrition advice or guidance, and beliefs about which, if any, healthcare professionals are experts in nutrition.

Hypothesis

RDs are considered experts in nutrition by healthcare professionals.

Objectives of Research

The objectives of this research were to gather information about specific aims focusing on the nutrition-related knowledge, behavior, and beliefs of healthcare professionals.

Will the mean BMI for professional groups be lowest for RDs? Many healthcare professionals have knowledge of how diet affects health and weight maintenance, and it was postulated that dietitians would maintain

the healthiest weight as demonstrated by self-reported weight and height and calculated BMI.

Will RDs have the most congruence in their belief about their weight (underweight, normal weight, overweight or obese) and their self-reported weight? Dietitians, when compared with other healthcare professionals, likely have the best understanding of what a healthy weight is, and it was expected that they could identify most closely in which category their current weight falls. It was anticipated that dietitians would understand what constitutes an underweight, normal weight, overweight and obese BMI (2) and would be able to identify better than other healthcare professionals the appropriate category for their current weight.

Do RDs have superior nutrition knowledge? It was anticipated that RDs would have superior knowledge of nutrition and the DGA to that of other healthcare professionals. With the level of training in nutrition and knowledge in nutrition that RDs are required to have, it was anticipated that RDs would demonstrate superior knowledge of the DGA. While other health professionals may have a basic knowledge of nutrition concepts, it was estimated that their knowledge of the DGA would be on a level significantly lower than that of RDs.

Will RDs demonstrate dietary intake behavior most congruent with the DGA? RDs were anticipated to not only have the greatest knowledge of nutrition as demonstrated by their knowledge of the DGA, but also to be most closely meeting the recommended dietary intakes when compared to

other healthcare professionals. Many health professionals are knowledgeable about what constitutes a healthful diet, but it is unclear if health professionals follow a healthful diet.

Do healthcare professionals feel comfortable with their level of nutrition knowledge when providing nutrition education to clients or patients? Though many health professionals may be expected to provide nutrition education, it was anticipated that RDs feel more comfortable than physicians and nursing professionals with their knowledge-base in nutrition and in providing nutrition education and guidance to clients or patients.

Definition of Terms

A list of terms and abbreviations used in this document, and their meanings, are included below.

“AHEI” will be used in place of “Alternate Healthy Eating Index.”

“BMI” will be used in place of “body mass index.”

“DGA” will be used in place of “Dietary Guidelines for Americans, 2005.”

“DO” will be used in place of “doctor of osteopathy.”

“DTR” will be used in place of “Dietetic Technician, Registered.”

“DQI” will be used in place of “Diet Quality Index.”

“DQI-R” will be used in place of “Diet Quality Index Revised.”

“HEI” will be used in place of “Healthy Eating Index.”

“HHS” will be used in place of “United States Department of Health and Human Services.”

“HPFS” will be used in place of “Health Professionals Follow-up Study.”

“MD” will be used in place of “medical doctor.”

“NHANES” will be used in place of “National Health and Nutrition Examination Survey.”

“NHLBI” will be used in place of “National Heart, Lung and Blood Institute.”

“NHS” will be used in place of “Nurses Health Study.”

“NIH” will be used in place of “National Institutes of Health.”

“NP” will be used in place of “nurse practitioner.”

“OEI” will be used in place of “Obesity Education Initiative.”

“Participants” will be used in place of “subjects” or “survey participants.”

“RD” will be used in place of “registered dietitian.”

“RFS” will be used in place of “Recommended Food Score.”

“RN” will be used in place of “registered nurse.”

“SCT” will be used in place of “social cognitive theory.”

“US” will be used in place of “United States of America.”

“USDA” will be used in place of “United States Department of Agriculture.”

CHAPTER TWO

Review of Literature

Many studies have evaluated nutrition-behavior, but no previous research has been able to identify which health professionals have superior nutrition knowledge. There have been several studies researching the nutrition behaviors of healthcare professionals, such as the Nurse's Health Study and the Health Professionals Follow-Up Study. Nutrition-related knowledge and behavior of healthcare professionals is not known.

Some studies have recommended and evaluated increased nutrition education in medical school, as the primary care physician may be the only source of health and nutrition information for many people (3-6). Campbell and colleagues evaluated the effectiveness of specific nutrition messages delivered in primary care settings and found that providing specific, rather than generic, messages in a primary care setting improves clients' dietary intake (3). Integration of nutrition science into medical school curricula was studied by Tobin et al. The authors aimed to integrate nutrition science in all four years of medical school curricula while also providing training in allied health disciplines so that physicians will be prepared as primary care providers to provide nutrition information to patients, especially in underserved areas (4). Van Dillen and colleagues studied nutrition communication between healthcare professionals and consumers and noted that consumers identified their family doctor as their primary source of nutrition information (5). Improvements in medical student training in

basic and applied nutrition science were recommended by Wong and colleagues as gaps in knowledge and utilization of expert nutrition recommendations for disease prevention were identified in a cohort of medical school preceptors and students (6).

Large health-related behavior studies, such as the Nurses Health Study (NHS) and the Health Professionals Follow-up Study (HPFS), have been conducted on health professionals (7-9). However, these studies have not compared the professionals' own dietary intake to current guidelines of the United States Department of Agriculture (USDA) or compared the study results by profession.

Quality of diet of healthcare professionals has been evaluated using the Healthy Eating Index and the Diet Quality Index Revised, as well as food frequency questionnaires (10-13). In an article published in the *Annals of Epidemiology*, Feskanich and colleagues found that a brief 45-item food frequency questionnaire was successful in assessing relative dietary intake of health professionals for fat, carbohydrates, dietary fiber, and some vitamins and minerals (10). Feskanich et al. evaluated the ability of the HEI and the Youth Healthy Eating Index (YHEI) to assess total energy intake and found that the HEI was strongly associated with quantity of food consumption, while the YHEI was not (11). The AHEI was studied by McCullough and Willett, who found that the AHEI was twice as strong at predicting chronic disease and cardiovascular disease risk compared with the HEI (12). Newby and colleagues evaluated the DQI-R and found that

DQI-R scores displayed reproducibility and validity when compared with food frequency questionnaires (13).

Nutrition education for consumers is offered through community-based nutrition programs, but consumers are expecting to learn more and more about nutrition from physicians and other health professionals (5, 6). Previous studies have evaluated the success of community nutrition education programs and nutrition education provided by healthcare providers (5, 14, 15). Van Dillen and colleagues noted that though consumers are exposed to nutrition information from a variety of sources, most listed the family doctor as the best source for nutrition information (5). A study by Brehm and colleagues evaluated the approach of a multi-disciplinary health team, including a nurse, dietitians, a psychologist, and an exercise physiologist, to providing nutrition information to consumers and found that it was successful in promoting acquisition of new skills and knowledge (14). Sanders and colleagues evaluated a training program for healthcare providers designed to improve their ability to deliver information to clients on nutrition interventions for chronic disease prevention and management and found that the course was successful in improving the skills of public health practitioners not previously trained in nutrition (15).

Regarding This Study

Body Mass Index. A person's BMI provides a measure of a person's weight in kilograms divided by the square of the person's height in meters. BMI is not a predictor of lean body mass; however, it is a useful tool in

identifying a person's relative risk for disease based on the classification of their BMI as underweight, normal weight, overweight, or obese. A study by Wang, Colditz, and Kuntz published in *Obesity* in 2007 discussed obesity prevalence in the United States (US) population (9). These researchers studied how the obesity epidemic will compound health problems faced by the US population as a large number of Americans are carrying their excess weight into their elder years. The authors anticipate that as the mean age among obese men and women rises, the rates of obesity-related comorbidities will continue to rise (9).

Nutrition Education for Healthcare Professionals. Wong and colleagues published an article on nutrition education for medical students in *Preventive Medicine* in 2004. They found that although medical nutrition science had made significant advancements, formal training in medical nutrition science in medical schools was lacking (6). In this study conducted at the medical school at Boston University, the authors surveyed preceptors of medical students to determine the extent that expert nutrition guidelines were taught to students. The authors also assessed if the preceptors thought it was necessary for the medical students to discuss nutrition guidelines with patients and if the medical students were evaluated on this area of their patient interaction. Wong and colleagues found that of those who responded to their survey, 83% of preceptors had considered only one or no sources in instructing medical students on medical nutrition science (6). Of preceptors responding to the survey, 84%

expected medical students to “routinely discuss nutritional practices with patients and/or their families; however, less than half of preceptors routinely provided feedback to students on patient nutritional education or counseling strategies” (6). Wong and colleagues found that there are “gaps in faculty awareness and utilization of expert nutrition recommendations and practice guidelines” (6) in medical school curriculum.

Nutrition Education of Consumers. Van Dillen and colleagues used focus groups to research nutrition communication between consumers and health professionals. The authors found that consumers identified their family doctor as the source of nutrition information most often (5). Outside of healthcare professionals, consumers are able to find nutrition information on websites and in other media (5). Van Dillen and colleagues cite a barrier to nutrition communication between healthcare professionals and consumers as the consumers believe that they eat healthy when they actually don’t (5). When discussing sources of nutrition information, the study participants listed the following sources in decreasing order, “family doctor, social environment, magazines, Internet, dietitian, television, the Nutrition Center, food labels, the media, and food manufacturers” (5). The consumers considered family doctors as the number one source of nutrition information, dietitians as the fifth source, and food labels as the eighth best source of nutrition information.

In 1994, Campbell and colleagues published an article in the *American Journal of Public Health* on approaches to improving dietary

behavior. The authors found that study participants responded more to messages tailored to their specific needs than to generic messages (3). Medical nutrition therapy appointments provided by dietitians allow for one-on-one nutrition counseling tailored to the patient's unique needs. Nutrition information provided by other healthcare professionals may not be able to obtain the same results as nutrition information provided by dietitians, as standard practice is to provide generic written materials to patients (3).

Consumers report that the family doctor is their source of nutrition information (5), yet nutrition education in medical schools is currently lacking (6). This study aimed to show that RDs have nutrition knowledge that is superior to nutrition knowledge of MDs and DOs and should be the source consumers look to for nutrition information.

Nutrition Behavior. The Annals of Behavioral Medicine published a study by Anderson, Winett, and Wojcik discussing nutrition behavior (7). Anderson and colleagues noted that access to healthier foods and understanding the importance of eating healthy foods has not had a significant impact on the diets of the US population (7). The authors propose that other factors such as self-regulation and self-efficacy may be more important to improving nutrition behaviors than awareness of and access to healthy foods. Anderson and colleagues utilized the social cognitive theory (SCT) to identify and understand influences on nutrition behavior. The SCT was developed by Bandura and describes mediators of

behaviors and behavior change and explains that when behavior change requires regular performance of familiar behaviors, self-regulation becomes a priority over self-efficacy (7). The authors found that interventions aimed at improving self-regulatory nutrition behaviors were the most successful in improving food choices. Interventions focusing on “garnering family support, increasing nutrition-related self-efficacy, and overcoming negative outcome expectations” (7) are most likely to improve consumers’ self-regulatory behaviors and impact buying and eating healthier foods (7). RDs are the health professionals that not only have the most training in nutrition but are able to take time to counsel clients on ways to improve nutrition behavior and improve self-regulation of nutrition behavior.

Dietary Intakes. McCullough and colleagues studied dietary intakes among men and women to identify the best tool for determining the relationship between dietary intake and a person’s risk for chronic disease (8). The authors developed an Alternate Healthy Eating Index focused on intake of macro and micronutrients thought to have the greatest inverse relationship with chronic disease risk. McCullough and colleagues determined that the Alternate Healthy Eating Index (AHEI) provided a better indication of chronic disease risk than did the Healthy Eating Index (HEI) or the Recommended Food Score (RFS). The HEI was developed by the USDA as a 10-component index providing a 100-point score measuring how dietary consumption conforms to DGA recommendations for foods from five groups in addition to fat, cholesterol, and sodium intake and dietary variety

(12). The RFS provides a sum of recommended foods consumed weekly and is an efficient way to assess diet quality (8). The RFS is a simple summary of healthy foods listed on a dietary questionnaire (8). The AHEI was developed by McCullough and colleagues to better predict chronic disease risk than the HEI by focusing on dietary patterns and eating behaviors associated with lower chronic disease risk. The AHEI includes nine components with higher scores in each area representing dietary intakes associated with decreased risk for developing chronic disease (12). The AHEI was able to better identify the individuals at risk for developing chronic diseases including cardiovascular disease, cancer, or non-traumatic death during the eight- to twelve-year follow-up period, though the AHEI, HEI, and RFS were all able to identify which individuals adhered most closely to Dietary Guidelines (8).

CHAPTER THREE

Research Methodology

The objective of this study was to perform a pilot study on health professionals' nutrition knowledge and behavior using a self-reported survey.

The study was conducted using an online survey form that asked questions about the participant's demographics (gender), anthropometrics (height, weight and estimated BMI), and profession. Professions surveyed include RDs, RNs, NPs, MDs, and DOs. Each participant answered questions on the USDA's Dietary Guidelines for Americans, 2005 (1) followed by questions on their food consumption. Additional questions about the healthcare practitioner's beliefs and attitudes toward providing nutrition education to clients or patients were included.

Research Problem

Nutrition-related knowledge, behavior, and beliefs were evaluated using a self-reported survey.

Sub-problems

The BMIs of healthcare professionals were calculated based on self-reported height and weight. The BMIs were compared across groups of healthcare professionals. The survey asked participants to identify if they believe their BMI is underweight, normal weight, overweight, or obese based on the guidelines of the National Institutes of Health (2). It was anticipated that healthcare professionals would have varying degrees of comfort with their knowledge of nutrition when providing nutrition education to clients or

patients.

Methodology Description

Over the course of four months, a survey was administered to healthcare professionals to determine their current nutrition-related behaviors and beliefs. Healthcare professionals included in the study were RDs, RNs, NPs, MDs, and DOs. Data obtained were analyzed to determine which healthcare professionals have intake behaviors most closely aligned with the recommendations of the United States Department of Agriculture. Additional analysis identified healthcare professionals' level of comfort with their knowledge of nutrition when providing nutrition advice or guidance to their clients or patients.

Research Design

Survey respondents were recruited from professional organizations and were invited to participate in an online survey. The invitation to participate in the survey included informed consent language stating that by going to the survey website the participant understands and agrees to participate in the study. The survey was available for a period of four months. A sample of the informed consent email and request to participate in the survey may be found in Appendix A, the survey is available in Appendix B, and a copy of the research approval letter is in Appendix C.

Data from the survey were compiled by the SurveyMonkey™ software program and were analyzed using SPSS software version 17.0 (16) to

determine correlations and relationships between healthcare professional groups.

Study Population

The study population included RDs, RNs, NPs, MDs, and DOs. Participants were recruited from professional organizations in the state of Ohio including the Dayton Dietetic Association, Ohio Dietetic Association, Ohio State Medical Association, Montgomery County Medical Society, American College of Physicians Ohio Chapter, Ohio Osteopathic Association, Ohio Osteopathic Association Dayton District, Dayton Area Graduate Medical Education Consortium, Ohio Nurses Association, Ohio Nurses Association District Ten, Dayton Black Nurses' Association, Ohio Association of Advanced Practice Nurses, Northeast Ohio Nurse Practitioners, Cincinnati Region of Ohio Association of Advanced Practice Nurses, and the Ohio Chapter of the National Association of Pediatric Nurse Practitioners. Participants were also recruited from universities in Ohio, Michigan, and New York.

An email was sent to members of the organizations and universities to request participation in the survey. The email included information about the study, the link to the survey, and information on informed consent.

Data Collection Procedures and Tools

Data was collected using the SurveyMonkey™ software program. A multiple choice survey questionnaire was administered that included

questions related to demographics (age, gender, height, weight and profession), food frequency, and food behavior/belief.

The food frequency questions asked about different food categories and the frequency of consumption with answer options of “as little as possible,” “1 serving per day,” “2 to 3 servings per day,” “3 to 5 servings per day,” “6 to 11 servings per day,” and “greater than 11 servings per day.”

Food behavior and belief questions were focused around how comfortable the study participant felt with their knowledge of nutrition as well as their beliefs about their weight and current intake.

Timeline

The total time required for the study was eight months. The first phase was the preparation phase, the second phase was the data collection phase and the third phase was the data analysis phase.

The preparation phase took place during the first two months and involved obtaining permission to recruit participants from professional organizations as well as development of the online survey using the SurveyMonkey™ software program. Prior to this phase, permission to do a graduate study with human subjects was obtained from the Eastern Michigan University College of Health and Human Services Human Subjects Review Committee (CHHS 10-008). The permission letter may be found in Appendix C.

After the first two months, the data collection phase began. The survey was available and emails were sent to the professional organizations

and universities to recruit survey participants for the data collection phase. The data collection phase lasted for four months, from April 2010 through July 2010. Data organization began during the data collection phase and lasted through the data analysis phase.

The last phase was the data analysis phase. During the data analysis phase, the results from the SurveyMonkey™ program were compiled and the food frequency portion of the surveys was compared with the 2005 United States Department of Agriculture guidelines.

Statistical Analysis

SPSS software version 17.0 (16) was utilized to perform statistical analysis. Data from the SurveyMonkey™ program were imported into a Microsoft® Office Excel 2003 spreadsheet prior to analysis (17). The data from the surveys were analyzed utilizing Pearson Correlation and z-tests.

The sample size from each professional group was at least thirty participants as “samples of sufficient size (usually $n > 30$)...the sample means would determine a normal distribution” (18). A sample size of at least thirty individuals would allow for statistical significance at the $p < .05$ level (18). The survey was sent to 1248 individuals with a response rate of 20.75% ($n=259$). The sample size includes complete surveys from respondents within each professional group with at least thirty participants for each professional group.

CHAPTER FOUR

Presentation and Analysis of Data

Data Collection

Two hundred fifty-nine (259) participants responded to the online SurveyMonkey™ software program self-reported survey. Incomplete surveys and surveys from professionals not meeting study criteria were excluded from data collection, resulting in analysis of 201 surveys. Surveys excluded due to incompleteness included surveys that did not have a response to one or more questions. Analysis was not completed on surveys from professionals not meeting study criteria, including those surveys with the primary profession selected by the survey participant as “other profession not listed above.” One hundred and twelve RDs were contacted to participate in the survey and 48 responded for a response rate of 43%. Two hundred and eight RNs were contacted, and 51 responded for a response rate of 25%. The response rate for NPs was 19%, with 222 NPs contacted and 42 NPs responding to the survey. Response rate was lowest for MDs at 12%, with 398 MDs contacted and 47 MDs participating in the survey. DO response rate was 15%, with 46 out of 308 DOs contacted participating in the survey. Some respondents from each professional group were excluded from data analysis due to one or more survey questions having no response. Of the 201 respondents included in data analysis, 41 participants were RDs, 41 RNs, 37 NPs, 42 MDs, and 40 DOs.

Table 1. Survey participants by profession.

PROFESSION		
	n	Percent
Registered Dietitian (RD)	41	20.4
Registered Nurse (RN)	41	20.4
Nurse Practitioner (NP)	37	18.4
Medical Doctor (MD)	42	20.9
Doctor of Osteopathy (DO)	40	19.9
Total	201	100.0

Anthropometric and Demographic Data

Self-reported height. Each participant responded to the survey with their height in feet and inches. Heights were converted to total inches and meters and were utilized to calculate each participant's body mass index. RDs' heights were between 60 inches (1.524 meters) and 72 inches (1.8288 meters). Nurses' heights ranged from 55 inches (1.397 meters) to 72 inches (1.8288 meters). NPs' heights ranged from 60 inches (1.524 meters) to 78 inches (1.9812 meters). The height range for both MDs and for DOs was between 60 inches (1.524 meters) and 76 inches (1.9304 meters).

Self-reported weight. Participants were asked to report their current weight, in pounds. Weights were converted to kilograms for calculation of each participant's body mass index. RDs reported weights between 107 lbs (48.64 kg) and 200 lbs (90.91 kg). Reported weight ranged from 61 pounds (lbs) (27.73 Kilograms (kg)) to 275 lbs (125 kg) for RNs and from 97 lbs (44.09 kg) to 335 lbs (152.27 kg) for NPs. Weights for MDs and DOs ranged from 106 lbs (48.18 kg) to 285 lbs (129.55 kg) and 118 lbs (53.64 kg) to 325 lbs (147.73 kg), respectively.

Body Mass Index. Participants were asked to respond to the questions “What do you think your current Body Mass Index (BMI) is” and “What do you think the classification of your current Body Mass Index (BMI) would be according to the standards of the National Institutes of Health’s National Heart Lung and Blood Institute (NHLBI).” Participants’ actual body mass index and BMI classification were determined using the respondents’ self-reported height and weight data.

For RDs, reported BMIs were between eighteen and thirty-four, with actual BMIs ranging from nineteen to thirty-four. RDs have a large amount of congruence between their reported BMI and actual BMI and have the BMI range most close to the normal range. RN participants reported BMIs ranging from one to forty-five though actual BMIs based on reported height and weight were between twelve and forty-six. It is expected that there was an error in self-reported weight for the individual with an actual BMI of 12. For NPs, reported BMIs were between five and forty-four, with actual BMIs ranging from eighteen to forty-four. This suggests that some nurses and NPs are unfamiliar with their true BMI. MDs reported their BMIs in the range of eighteen to forty, with actual BMIs ranging from nineteen to forty. DO participants reported BMIs between twenty and fifty, with actual BMIs ranging from eighteen to fifty-three.

Table 2. Height, weight, and BMI by gender.

	RDs												RNs						NPs						MDs						DOs												
	Male			Female			Male			Female			Male			Female			Male			Female			Male			Female			Male			Female									
	Low	High	1.83	1.52	1.80	1.83	1.52	1.83	1.40	1.78	1.75	1.52	1.98	1.68	1.70	1.93	1.52	1.80	1.80	1.52	1.80	1.70	1.93	1.52	1.80	1.80	1.52	1.80	1.70	1.93	1.52	1.80	1.80	1.52	1.80								
Height (in meters)	1.75	1.83	90.00	48.64	90.91	60.91	104.55	27.73	125.00	63.64	152.27	44.09	116.36	68.18	129.55	48.18	80.91	64.55	118.18	53.64	147.73	25	29	19	34	26	31	12	46	23	39	18	44	22	40	19	27	23	35	18	53		
Weight (in kg)	82.73	90.00	90.00	48.64	90.91	60.91	104.55	27.73	125.00	63.64	152.27	44.09	116.36	68.18	129.55	48.18	80.91	64.55	118.18	53.64	147.73																						
BMI (calculated)	25	29	19	34	26	31	12	46	23	39	18	44	22	40	19	27	23	35	18	53																							

BMI correlation. Pearson correlation was used to analyze and report data to measure how closely reported mean BMIs were to actual mean BMIs, by group. Pearson correlation between reported BMIs and actual BMIs was greatest for RDs with a correlation coefficient of 0.96 and was lowest for RNs with a correlation coefficient of 0.65. Correlation coefficients for NPs, MDs, and DOs were 0.86, 0.88, and 0.95, respectively. Though the ranges for actual and reported BMI were more similar for MDs than for DOs, DOs predicted their BMIs more accurately than MDs, resulting in a greater correlation coefficient for DOs than MDs.

The mean difference between reported BMI and actual BMI was lowest for RDs at 0.63 and highest for RNs at 4.10. MDs and DOs had less difference in their actual and reported BMI, with a mean difference of 1.29 and 1.15, respectively, than NPs with a mean difference of 2.22.

Table 3. Pearson Correlation Coefficient between actual and reported BMI by profession.

Correlation Coefficient BMI actual * BMI reported		
<i>Pearson Correlation</i>		
	Total	0.79
	Registered Dietitian (RD)	0.96
	Registered Nurse (RN)	0.65
	Nurse Practitioner (NP)	0.86
	Medical Doctor (MD)	0.88
	Doctor of Osteopathy (DO)	0.95

Table 4. Mean difference between actual and reported BMI by profession.

Difference between actual and reported BMI	
<i>Mean difference BMI (abs)</i>	
Registered Dietitian (RD)	0.63
Registered Nurse (RN)	4.10
Nurse Practitioner (NP)	2.22
Medical Doctor (MD)	1.29
Doctor of Osteopathy (DO)	1.15

BMI classification. Of the 201 survey participants, 156 (77.6%) participants correctly identified their BMI classification. Of the 85 participants reporting their weight as a normal weight, 94.1% (n=80) truly had a BMI within the normal range. Sixty-nine participants reported their weight as “overweight” with 78.3% (n=54) correctly identifying their BMI class. Twenty-two participants reported their BMI classification as obesity class I with 54.5% (n=12) correctly identifying this as their BMI class; those incorrectly reporting their BMI classification as obesity class I had actual classifications of underweight (n=1), normal weight (n=1), overweight (n=5) and obesity class II (n=8). Of the sixteen people identifying their BMI class as obesity class II, 6 participants (37.5%) were correct, two participants had actual BMIs classified as obesity class I and three had BMIs in the extreme obesity range.

Table 5. Actual BMI classification compared with self-reported BMI classification.

BMI class actual by BMI class reported								
		BMI class actual						Total
		Underweight	Normal Weight	Overweight	Obesity Class I	Obesity Class II	Extreme Obesity	
BMI class reported	Underweight	1	1	1	0	0	0	3
	Normal Weight	1	80	9	1	0	0	91
	Overweight	0	3	54	7	0	0	64
	Obesity Class I	1	1	5	12	8	0	27
	Obesity Class II	0	0	0	2	6	3	11
	Extreme Obesity	0	0	0	0	2	3	5
		3	85	69	22	16	6	201

Spearman’s rank correlation coefficient was conducted to determine the accuracy of reported BMI classes compared with calculated BMI classes, by professional group. RDs had the second highest correlation, with a correlation coefficient of 0.88. RNs had the lowest correlation between actual and reported BMI, with a correlation coefficient of 0.78. NPs had the greatest correlation between their reported BMI classification and their actual BMI classification, with a correlation coefficient of 0.94. MDs and DOs had correlation coefficients of 0.85 and 0.80, respectively, for the correlation value between their actual and reported BMI classification.

Thirty-five of forty-one (85.4%) RDs correctly classified their BMI. Twenty-eight dietitians had BMIs within the normal range, 10 in the overweight range, and three in the obesity class I category. Twenty-five of 41 (61.0%) RNs correctly identified the class for their BMI. One RN was underweight, 10 were normal weight, 14 were overweight, seven were

obesity class I, six were obesity class II, and three had BMIs in the extreme obesity range. Eighty-six point five percent (n=32) of NPs correctly identified their BMI classification. Actual BMI classifications for NPs were as follows: one underweight, fifteen normal weight, eleven overweight, four obesity class I, five obesity class II, and one extreme obesity. Seventy-eight point six percent (n=33) of MDs correctly identified their BMI classification with 20 MDs being normal weight, 15 being overweight, three being obesity class I, three being obesity class II and one being in the extreme obesity range. Thirty-one DOs (77.5%) correctly identified their BMI classification. Actual BMI distribution for DOs included one underweight, 12 normal weight, 19 overweight, five obesity class I, two obesity class II, and one extreme obesity. RDs were slightly less accurate than NPs in identifying their actual BMI class, though RDs had weights within the narrowest range and most close to a healthy, normal weight.

Table 6. Actual BMI classification compared to reported BMI classification.

BMI class reported	BMI class actual						Total
	Underweight	Normal Weight	Overweight	Obesity Class I	Obesity Class II	Extreme Obesity	
Underweight	1	1	1	0	0	0	3
Normal weight	1	80	9	1	0	0	91
Overweight	0	3	54	7	0	0	64
Obesity Class I	1	1	5	12	8	0	27
Obesity Class II	0	0	0	2	6	3	11
Extreme Obesity	0	0	0	0	2	3	5
Total	3	85	69	22	16	6	201

Table 7. Spearman’s rank correlation coefficient for actual versus reported BMI classification by profession.

Correlation Coefficient BMI actual class * BMI reported class		
<i>Spearman's rank correlation coefficient</i>		
	Total	0.85
	Registered Dietitian (RD)	0.88
	Registered Nurse (RN)	0.78
	Nurse Practitioner (NP)	0.94
	Medical Doctor (MD)	0.85
	Doctor of Osteopathy (DO)	0.80

Table 8. Actual versus reported BMI classification by profession.

BMI class actual by BMI class reported		BMI class actual				
BMI class reported	BMI class reported	Underweight	Normal Weight	Overweight	Obesity Class I	Obesity Class II
Registered Dietitian (RD)	Underweight	0	1	0	0	0
	Normal Weight	0	26	1	0	0
	Overweight	0	1	8	1	1
	Obesity Class I	0	0	1	1	1
	Obesity Class II	0	0	0	0	1
	Extreme Obesity	0	0	0	0	0
Total		0	28	10	3	3
Registered Nurse (RN)	Underweight	0	0	1	0	0
	Normal Weight	0	10	1	1	1
	Overweight	0	0	9	1	1
	Obesity Class I	1	0	3	4	4
	Obesity Class II	0	0	0	1	1
	Extreme Obesity	0	0	0	0	0
Total		1	10	14	7	7
Nurse Practitioner (NP)	Underweight	1	0	0	0	0
	Normal Weight	0	14	1	0	0
	Overweight	0	1	10	2	2
	Obesity Class I	0	0	0	2	2
	Obesity Class II	0	0	0	0	0
	Extreme Obesity	0	0	0	0	0
Total		1	15	11	4	4
Medical Doctor (MD)	Underweight	0	0	0	0	0
	Normal Weight	0	19	4	0	0
	Overweight	0	1	10	0	0
	Obesity Class I	0	0	1	3	3
	Obesity Class II	0	0	0	0	0
	Extreme Obesity	0	0	0	0	0
Total		0	20	15	3	3
Doctor of Osteopathy (DO)	Underweight	0	0	0	0	0
	Normal Weight	1	11	2	0	0
	Overweight	0	0	17	3	3
	Obesity Class I	0	1	0	2	2
	Obesity Class II	0	0	0	0	0
	Extreme Obesity	0	0	0	0	0
Total		1	12	19	5	5

Table 8. Actual versus reported BMI classification by profession.

BMI class actual by BMI class reported				Total	correct estimation	% correct estimation
BMI class reported	BMI class actual		Obesity Class II			
Registered Dietitian (RD)	Underweight	0	0	1	35	85.4%
	Normal Weight	0	0	27		
	Overweight	0	0	10		
	Obesity Class I	0	0	2		
	Obesity Class II	0	0	1		
	Extreme Obesity	0	0	0		
Total	0	0	41	25	61.0%	
Registered Nurse (RN)	Underweight	0	0	1	32	86.5%
	Normal Weight	0	0	12		
	Overweight	0	0	10		
	Obesity Class I	3	0	11		
	Obesity Class II	1	2	4		
	Extreme Obesity	2	1	3		
Total	6	3	41	33	78.6%	
Medical Doctor (MD)	Underweight	0	0	0	33	78.6%
	Normal Weight	0	0	23		
	Overweight	0	0	11		
	Obesity Class I	2	0	6		
	Obesity Class II	1	1	2		
	Extreme Obesity	0	0	0		
Total	3	1	42	31	77.5%	
Doctor of Osteopathy (DO)	Underweight	0	0	0	31	77.5%
	Normal Weight	0	0	14		
	Overweight	0	0	20		
	Obesity Class I	2	0	5		
	Obesity Class II	0	0	0		
	Extreme Obesity	0	1	1		
Total	2	1	40			

Only 38.3% (n=77) of all participants correctly identified both their BMI and their BMI classification. Seventy-nine individuals (39.3%) correctly identified only their BMI class, while six (3.0%) correctly identified only their BMI and 39 (19.4%) did not correctly identify their BMI or their BMI classification.

RDs had the second highest percentage of correct response for both BMI and BMI class, with 18 (43.9%) responding accurately to both categories. Seventeen RDs (41.5%) correctly identified only their BMI class, and one (2.4%) correctly identified only BMI. RDs had the lowest percentage of responding with both inaccurate BMI and BMI class, with only five RDs (12.2%) providing inaccurate responses in both categories.

RNs were the least successful in identifying their BMI and BMI classification. Fifteen (36.6%) RNs did not correctly identify either their BMI or BMI classification, a significant difference from all other professional groups surveyed ($p=0.010$). Twelve (29.3%) nurses correctly identified their BMI and BMI class, with 13 (31.7%) correctly identifying only their BMI class and one (2.4%) nurse responding with only the correct BMI.

Of the thirty-seven NPs responding to the survey, 29.7% (n=11) responded accurately with their BMI and BMI classification. As a group, NPs had a significantly higher percentage of respondents correctly identify only their BMI classification ($p=0.016$), when compared with other professional groups, with 56.8% (n=21) correctly identifying only their BMI class. NPs had a significantly lower percentage of respondents accurately

responding with only the correct BMI ($p=0.014$) as no NPs (0.0%) only correctly identified their BMI. Five NPs (13.5%) responded with both incorrect BMI and BMI classification.

Eighteen (42.9%) MDs correctly identified both their BMI and BMI class, while 15 (35.7%) correctly identified only their BMI class, three (7.1%) responded with their accurate BMI and incorrect BMI class, and six (14.3%) responded with both incorrect BMI and BMI class.

DOs had the highest rate of responding with both a correct BMI and BMI class at 18 respondents (45%). Thirteen (32.5%) DOs accurately reported their BMI class and incorrect BMI, while one DO accurately reported his/her BMI and incorrect BMI class. Eight (20.0%) DOs responded with both incorrect BMI and BMI class.

Table 9. Accurate reporting of BMI and BMI classification.

BMI & BMI class estimation		
	Frequency	Percent
All correct	77	38.3
Correct BMI class	79	39.3
Correct BMI	6	3.0
All incorrect	39	19.4
Total	201	100

Table 10. Accurate BMI and BMI classification by professional group.

BMI & BMI class estimation by profession						
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	Total
Base	41	41	37	42	40	201
All correct	43.9	29.3	29.7	42.9	45.0	38.3
Correct class bmi	41.5	31.7	56.8	35.7	32.5	39.3
Correct bmi	2.4	2.4	0.0	7.1	2.5	3.0
All incorrect	12.2	36.6	13.5	14.3	20.0	19.4
Total	100.0	100.0	100.0	100.0	100.0	100

Nutrition-Related Knowledge: Knowledge of the Dietary Guidelines.

Overview. Survey participants responded to questions based on their knowledge of the Dietary Guidelines for Americans. Respondents were asked to report what they knew to be the recommended intake for healthy adults for categories including grains and breads, fruits, vegetables, dairy, meats, nuts, and legumes, and fats and sweets.

Eighty-one respondents (40.3%) accurately identified the recommended intake for grains and breads as six to eleven servings per day. Six to eleven servings was the category with the greatest percentage of responses for the grains and breads category, with the second highest response being two or three servings per day (n=59, 29.4%) and the third highest response being three to five servings per day (n=50, 24.9%).

Most participants responded with three to five servings per day as the recommended daily intake for fruits (n=128, 63.5%). Fifty-eight survey participants (29%) accurately selected two to three servings per day as the recommended daily intake for fruits. The vegetables category was the category with the highest percentage of correct responses, with 164 respondents (81.6%) selecting three to five servings per day as the recommended daily intake.

The dairy and meats, nuts, and legumes categories also had a high percentage of accurate responses, with 158 respondents (78.6%) accurately selecting two to three servings per day as the recommended intake for dairy and 154 participants (76.6%) reporting the recommended intake for meats,

nuts, and legumes as two to three servings per day. Most participants (n=131, 65.2%) accurately identified “as little as possible” as the recommended intake for fats and sweets, though a large portion (n=50, 24.9%) responded with one serving per day. It appears that when all survey responses were considered, most participants were able to accurately identify the recommended daily intakes based on the Dietary Guidelines for Americans.

Table 11. Knowledge of Dietary Guidelines by number of servings for food categories. Numbers in bold represent the percentage of correct responses based on the servings recommended in the Dietary Guidelines.

Total sample (N=201)	Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
	%	%	%	%	%	%
1 serving per day	4.5	0.5	1.0	6.0	14.4	24.9
2 to 3 servings per day	29.4	29.0	8.0	78.6	76.6	9.0
3 to 5 servings per day	24.9	63.5	81.6	14.4	7.5	1.0
6 to 11 servings per day	40.3	6.5	8.5	0.5	0.5	0.0
As little as possible	1.0	0.5	0.5	0.5	1.0	65.2
Greater than 11 servings per day	0.0	0.0	0.5	0.0	0.0	0.0

Table 12. Percentage of correct response for Dietary Guideline knowledge servings per day for food categories.

% of correct answers	Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Total	40.3	29.0	81.6	78.6	76.6	65.2
Registered Dietitian (RD)	97.6	58.5	87.8	95.1	90.2	78.0
Registered Nurse (RN)	34.1	26.8	78.0	75.6	82.9	65.9
Nurse Practitioner (NP)	21.6	10.8	89.2	86.5	73.0	51.4
Medical Doctor (MD)	21.4	21.4	69.0	61.9	61.9	66.7
Doctor of Osteopathy (DO)	25.0	25.6	85.0	75.0	75.0	62.5

Registered dietitians' knowledge of the Dietary Guidelines. RDs had the highest percentage of correct response in five of six categories: grains and breads, fruits, dairy, meats, nuts, and legumes, and fats and sweets. RDs had the second highest percentage of correct response in the remaining vegetable category, behind NPs. The percentage of correct response by RDs

in the grains and breads, fruits, dairy and meats, nuts, and legumes categories was significantly higher than all other professional groups.

All but one RD participating in the survey responded correctly with six to eleven servings per day as the recommended intake for grains and breads (97.6%, n=40), with the remaining RD selecting three to five servings per day (2.4%, n=1). RNs had the second highest percentage of correct response in the grains and breads category at a percentage of 34.1% responding correctly with six to eleven servings per day.

Most RDs responded correctly with two to three servings per day as the recommended intake for fruits (58.5%, n=24), though a large portion (39.0%, n=16) chose three to five servings per day. One dietitian (2.4%) responded with six to eleven servings per day in the fruits category.

RDs had the second highest percentage of correct responses in the vegetables category, with 87.8% (n=36) selecting three to five servings per day. All other dietitians selected two to three servings per day as their response in the vegetables category (12.2%, n=5).

Almost all RDs correctly responded with two to three servings per day as the recommended intake for dairy, with 95.1% (n=39) selecting the correct response. The remaining two RDs selected three to five servings per day (4.9%) as the recommended dairy intake.

Most dietitians (90.2%, n=37) correctly selected two to three servings per day as the recommended intake for meats, nuts, and legumes. Some

dietitians also responded with one serving per day (7.3%, n=3) and three to five servings per day (2.4%, n=1).

Over three quarters of the RDs participating in the survey correctly responded with “as little as possible” as the recommended intake for fats and sweets (78.0%, n=32). Some dietitians responded with two to three servings per day (17.1%, n=7) and three to five servings per day (4.9%, n=2).

Table 13. RD knowledge of Dietary Guidelines by number of servings per food category. Numbers in bold represent the percentage of correct responses based on the servings recommended in the Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Registered Dietitian (RD) <i>N=41</i>	1 serving per day	0.0	0.0	0.0	0.0	7.3	0.0
	2 to 3 servings per day	0.0	58.5	12.2	95.1	90.2	17.1
	3 to 5 servings per day	2.4	39.0	87.8	4.9	2.4	4.9
	6 to 11 servings per day	97.6	2.4	0.0	0.0	0.0	0.0
	As little as possible	0.0	0.0	0.0	0.0	0.0	78.0
	Greater than 11 servings	0.0	0.0	0.0	0.0	0.0	0.0

Registered nurses’ knowledge of the Dietary Guidelines. Most RNs were able to correctly identify the recommended intake for vegetables, dairy, meats, nuts, and legumes, and fats and sweets, but were not able to correctly identify the recommended intake for grains and breads or fruits. Thirty-four point one percent (n=14) of RNs correctly identified six to eleven servings as the recommended intake for grains and breads, with 31.7% (n=13) reporting the recommended intake as two to three servings and 29.3% (n=12) responding with three to five servings. One individual (2.4%)

responded with one serving per day, and one responded with “as little as possible.”

Most nurses responded with three to five servings per day as the recommended intake for fruits (63.4%, n=26), though some did respond correctly with two to three servings per day (26.8%, n=11). Few nurses responded with six to eleven servings per day (7.3%, n=3) and “as little as possible” (2.4%, n=1) as the recommended daily intake for fruit.

A majority of nurses correctly identified the recommended daily intake for vegetables with three to five servings per day (78.0%, n=32), though some did respond with two to three servings per day (9.8%, n=4) and six to eleven servings per day (7.3%, n=3). One individual (2.4%) responded with “as little as possible” and another individual (2.4%) responded with “greater than eleven servings per day” as the recommended daily intake for vegetables.

RNs were also relatively familiar with the recommended daily intake for dairy. Seventy-five point six percent (n=31) of nurses correctly identified the recommended daily intake as two to three servings per day. Seventeen point one percent (n=7) responded with three to five servings per day, and very few individuals responded with one serving per day and “as little as possible,” 4.9% (n=2) and 2.4% (n=1), respectively.

The meats, nuts, and legumes category was the area where RNs had the greatest percentage of correct response. Eighty-two point nine percent (n=34) of RNs correctly identified the recommended daily intake for meats,

nuts, and legumes as two to three servings per day. Some individuals responded with three to five servings per day (7.3%, n=3) and one serving per day (7.3%, n=3), with only one individual responding “as little as possible” (2.4%, n=1).

A large portion of RNs (65.9%, n=27) correctly identified “as little as possible” as the recommended daily intake for fats and sweets. Other RNs responded with one serving per day (29.3%, n=12) and two to three servings per day (4.9%, n=2).

Table 14. RN knowledge of Dietary Guidelines by number of servings per food category. Numbers in bold represent the percentage of correct responses based on the servings recommended in the Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Registered Nurse (RN) <i>N=47</i>	1 serving per day	2.4	0.0	0.0	4.9	7.3	29.3
	2 to 3 servings per day	31.7	26.8	9.8	75.6	82.9	4.9
	3 to 5 servings per day	29.3	63.4	78.0	17.1	7.3	0.0
	6 to 11 servings per day	34.1	7.3	7.3	0.0	0.0	0.0
	As little as possible	2.4	2.4	2.4	2.4	2.4	65.9
	Greater than 11 servings	0.0	0.0	2.4	0.0	0.0	0.0

Nurse practitioners’ knowledge of the Dietary Guidelines. NPs had a larger percentage of incorrect responses to questions about the knowledge of the Dietary Guidelines than RNs to all areas except vegetables and dairy. Only 21.6% (n=8) of NPs correctly responded with six to eleven servings as the recommended daily intake for grains and breads. Many NPs responded with three to five servings (40.5%, n=15) and two to three servings (32.4%,

n=12) as the recommended intake for grains and breads. Few responded with one serving per day as the recommended intake for grains and breads (5.4%, n=2).

The majority of NPs responded with three to five servings per day as the recommended intake for fruit (78.4%, n=29), with a small number (10.8%, n=4) responding correctly with two to three servings. Four NPs (10.8%) also responded with six to eleven servings per day as the recommended intake for fruits.

NPs had the highest percentage of correct response for the recommended daily intake of vegetables of all professional groups, with 89.2% of NPs (n=33) correctly identifying three to five servings as the recommended intake. Only four NPs (10.8%) provided an incorrect response for recommended vegetable intake, all responding with six to eleven servings per day as the recommended vegetable intake.

NPs had the second highest percentage of correct response for the dairy category, with 86.5% (n=32) responding with two to three servings per day. A small number of NPs responded with three to five servings per day and 1 serving per day, 10.8% (n=4) and 2.7% (n=1), respectively.

The majority of NPs responded correctly with two to three servings per day as the recommended intake for meats, nuts, and legumes (73.0%, n=27). Four NPs (10.8%) responded incorrectly with three to five servings per day and six (16.2%) responded incorrectly with one serving per day.

About half of the NPs participating in the survey (51.4%, n=19) correctly responded with “as little as possible” as the recommended daily intake for fats and sweets. A large portion responded incorrectly with one serving per day (40.5%, n=15) and only three NPs (8.1%) responded incorrectly with two to three servings per day as the recommended intake for fats and sweets.

Table 15. NP knowledge of Dietary Guidelines by number of servings per food category. Numbers in bold represent the percentage of correct responses based on the servings recommended in the Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Nurse Practitioner (NP)	1 serving per day	5.4	0.0	0.0	2.7	16.2	40.5
N=37	2 to 3 servings per day	32.4	10.8	0.0	86.5	73.0	8.1
	3 to 5 servings per day	40.5	78.4	89.2	10.8	10.8	0.0
	6 to 11 servings per day	21.6	10.8	10.8	0.0	0.0	0.0
	As little as possible	0.0	0.0	0.0	0.0	0.0	51.4
	Greater than 11 servings	0.0	0.0	0.0	0.0	0.0	0.0

Medical doctors’ knowledge of the Dietary Guidelines. MDs had the lowest percentage of correct response in four of six categories: grains and breads, vegetables, dairy, and meats, nuts, and legumes. MDs also had the second lowest percentage of correct response in the fruits category, though they had the second highest percentage of correct response in the fats and sweets category.

Nine MDs (21.4%) responded correctly with six to eleven servings per day as the recommended intake for grains and breads. A large number of

MDs incorrectly responded with two to three servings per day (38.1%, n=16) and three to five servings per day (31.0%, n=13). Some MDs also responded with one serving per day (7.1%, n=3) and “as little as possible” (2.4%, n=1) as the recommended intake for grains and breads.

Most MDs responded with three to five servings per day as the recommended intake for fruits (69.2%, n=29), though some correctly responded with two to three servings per day (21.4%, n=9). A small number of MDs responded with six to eleven servings per day as the recommended intake for fruits (9.5%, n=4).

The majority of MDs, 61.9% (n=26), correctly responded with two to three servings per day as the recommended intake for dairy. MDs also responded with three to five servings per day (23.8%, n=10), one serving per day (11.9%, n=5), and six to eleven servings per day (2.4%, n=1) as the recommended intake for dairy.

MDs had the second highest percentage of correct response for recommended intake of fats and sweets behind RDs. Sixty-six point seven percent (n=28) of MDs correctly responded with “as little as possible” with a large number (28.6%, n=12) responding with one serving per day. Only two MDs (4.8%) responded with two to three servings per day as the recommended intake of fats and sweets.

Table 16. MD knowledge of Dietary Guidelines by number of servings per food category. Numbers in bold represent the percentage of correct responses based on the servings recommended in the Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Medical Doctor (MD)	1 serving per day	7.1	0.0	0.0	11.9	26.2	28.6
<i>N=42</i>	2 to 3 servings per day	38.1	21.4	9.5	61.9	61.9	4.8
	3 to 5 servings per day	31.0	69.0	69.0	23.8	9.5	0.0
	6 to 11 servings per day	21.4	9.5	21.4	2.4	2.4	0.0
	As little as possible	2.4	0.0	0.0	0.0	0.0	66.7
	Greater than 11 servings	0.0	0.0	0.0	0.0	0.0	0.0

Doctors' of osteopathy knowledge of the Dietary Guidelines. DOs had neither the highest nor lowest percentage of correct response in any category for recommended intakes based on the Dietary Guidelines.

A large number of DOs (45.0%, n=18) incorrectly responded with two to three servings per day as the recommended intake for grains and breads, though 25% (n=10) correctly responded with six to eleven servings per day. DOs also responded with three to five servings per day (22.5%, n=9) and one serving per day (7.5%, n=3) as the recommended intake for grains and breads.

Approximately one quarter of the DOs participating in the survey correctly identified two to three servings as the recommended intake for fruits (25.6%, n=10). Most DOs responded with three to five servings per day (69.2%, n=28) as the recommended fruit intake, with one individual (2.4%) choosing one serving per day and one individual (2.4%) choosing six to eleven servings per day.

The vegetable category was the category in which DOs had the highest percentage of correct response, with 85.0% (n=34) choosing three to five servings per day. There were only a few responses with other choices, with three DOs (7.5%) selecting two to three servings per day, two (5.0%) selecting one serving per day and one (2.5%) selecting six to eleven servings per day as the recommended vegetable intake.

Most DOs correctly responded with two to three servings per day as the recommended intake of dairy (75.0%, n=30). Some DOs also responded with three to five servings per day (15.0%, n=6) and one serving per day (10.0%, n=4) as the recommended intake for dairy.

The majority of DOs selected two to three servings per day as the recommended intake for meats, nuts, and legumes, with 75% (n=30) responding correctly in this category. A small number of DOs selected one serving per day (15.0%, n=6), three to five servings per day (7.5%, n=3), and “as little as possible” (2.5%, n=1) as their response in the meats, nuts, and legumes category.

DOs had the second lowest percentage of correct response in the fats and sweets category, with 62.5% (n=25) selecting “as little as possible” compared with other professional groups. Approximately one quarter of DOs incorrectly responded with one serving per day (27.5%, n=11), and a few others selected two to three servings per day (10.0%, n=4) as the recommended intake for fats and sweets.

Table 17. DO knowledge of Dietary Guidelines by number of servings per food category. Numbers in bold represent the percentage of correct responses based on the servings recommended in the Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Doctor of Osteopathy (DO)	1 serving per day	7.5	2.6	5.0	10.0	15.0	27.5
N=40	2 to 3 servings per day	45.0	25.6	7.5	75.0	75.0	10.0
	3 to 5 servings per day	22.5	69.2	85.0	15.0	7.5	0.0
	6 to 11 servings per day	25.0	2.6	2.5	0.0	0.0	0.0
	As little as possible	0.0	0.0	0.0	0.0	2.5	62.5
	Greater than 11 servings	0.0	0.0	0.0	0.0	0.0	0.0

Nutrition-Related Behavior: Dietary Intake

Overview. Survey participants were asked to report their usual daily intake using the same categories and response options as were available for the questions about the Dietary Guidelines. This allows for evaluating if reported intakes are consistent with recommended intakes from the Dietary Guidelines and comparing the professional groups' knowledge of the guidelines with reported intake. There was no significant difference between professional groups for intake congruence with the DGA recommendations. Though many of the healthcare professionals had a good knowledge of the Dietary Guidelines, most do not consume food in a manner consistent with recommended daily intakes.

Only 18.4% (n=37) of survey participants consume the recommended six to eleven servings per day of grains and breads. A large percentage of survey respondents (57.7%, n=116) reported consuming two to three servings per day of vegetables rather than the recommended three to five

servings. Approximately half of respondents reported consuming the recommended intake of two to three servings per day for fruits (53.7%, n=108), dairy (46.3%, n=91), and meats, nuts, and legumes (55.2%, n=111). Twenty-seven point four percent of survey participants (n=55) reported a vegetable intake consistent with dietary guideline recommendations with three to five servings per day. Many professionals reported consuming greater than the recommended intake of fats and sweets, with 35.3% (n=71) consuming one serving per day and 35.8% (n=72) consuming two to three servings per day.

When reported intake was compared with BMI classification, it was found that a significantly lower number of individuals with obesity reported an intake of grains and breads and fats and sweets consistent with dietary guideline recommendations, with only 6.8% (n=3 of 44) meeting the recommended intake in both categories. Normal weight individuals had the highest percentage of respondents meeting the recommended intake for grains and breads (28.4%, 25 of 88), fruits (55.7%, n=49), vegetables (31.8%, n=28), and dairy (58.0%, n=51) and the lowest percentage of respondents meeting the recommended intake for meats, nuts, and legumes (48.9%, n=43).

Table 18. Reported daily intake in servings. Numbers in bold represent the percentage meeting recommended daily intake in servings based on the 2005 Dietary Guidelines.

Total sample (N=201)	Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
	%	%	%	%	%	%
1 serving per day	7.0	18.9	10.9	33.3	29.9	35.3
2 to 3 servings per day	38.8	53.7	57.7	46.3	55.2	35.8
3 to 5 servings per day	31.3	24.4	27.4	12.9	10.9	10.0
6 to 11 servings per day	18.4	1.5	3.5	0.0	1.0	0.0
As little as possible	3.0	1.5	0.5	7.5	3.0	18.4
Greater than 11 servings per day	1.5	0.0	0.0	0.0	0.0	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 19. Percentage of responses congruent with Dietary Guideline recommendations by professional group.

% of answers congruent with DGA	Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Total	18.4	53.7	27.4	46.3	55.2	18.4
Registered Dietitian (RD)	53.7	56.1	31.7	56.1	78.0	22.0
Registered Nurse (RN)	7.3	53.7	26.8	36.6	53.7	12.2
Nurse Practitioner (NP)	5.4	59.5	29.7	59.5	45.9	13.5
Medical Doctor (MD)	9.5	61.9	21.4	42.9	52.4	21.4
Doctor of Osteopathy (DO)	15.0	37.5	27.5	37.5	45.0	22.5

Registered dietitians' dietary intake. RDs had the highest percentage of responses consistent with the Dietary Guideline recommendations in three of six categories: grains and breads, vegetables, and meats, nuts, and legumes. RDs had the second highest percentage of intake responses consistent with dietary guideline recommendations for both dairy and fats and sweets and the third highest percentage for fruits.

Over half of dietitians surveyed (53.7%, n=22) reported consuming six to eleven servings of grains and breads per day, meeting the recommendations of the Dietary Guidelines. One dietitian (2.4%) reported consuming greater than eleven servings per day, though many reported consuming fewer than the recommended servings with 34.1% (n=14) selecting three to five servings per day and 9.8% (n=4) consuming two to three servings per day.

Most RDs consume the recommended two to three daily servings of fruits (56.1%, n=23), though some consume greater than the recommendation with three to five servings per day (31.7%, n=13). A small number of RDs consume less than the recommendation, with 12.2% (n=5) reporting an intake of one serving of fruit per day.

A large number of RDs consume two to three servings of vegetables daily (58.5%, n=24), with 31.7% (n=13) meeting the recommended intake of three to five daily vegetable servings. One RD reported consuming greater than the recommendation, with six to eleven servings per day (2.4%), while others consume only one serving of vegetables per day (7.3%, n=3).

Many dietitians reported consuming two to three servings of dairy daily (56.1%, n=23), meeting the Dietary Guideline recommendations. An equal number of RDs reported consuming one serving of dairy and three to five servings of dairy per day (19.5%, n=8), with two dietitians (4.9%) consuming as little dairy as possible.

Over two-thirds of dietitians surveyed reported a consumption of meats, nuts, and legumes consistent with the Dietary Guideline recommendations, with 78% (n=32) consuming two to three servings per day. Other dietitians reported a meat, nut, and legume intake of one serving per day (19.5%, n=8) and “as little as possible” (2.4%, n=1).

Some dietitians meet the recommended intake for fats and sweets (22%, n=9), though many (31.7%, n=13) consume one serving per day or two to three servings per day (36.6%, n=15). A few dietitians reported consuming three to five servings of fats and sweets per day (9.8%, n=4).

Table 20. RD reported daily intake in number of servings by food category. Numbers in bold represent the percentage meeting recommended daily intake in servings based on the 2005 Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Registered Dietitian (RD) N=41	1 serving per day	0.0	12.2	7.3	19.5	19.5	31.7
	2 to 3 servings per day	9.8	56.1	58.5	56.1	78.0	36.6
	3 to 5 servings per day	34.1	31.7	31.7	19.5	0.0	9.8
	6 to 11 servings per day	53.7	0.0	2.4	0.0	0.0	0.0
	As little as possible	0.0	0.0	0.0	4.9	0.0	22.0
	Greater than 11 servings	2.4	0.0	0.0	0.0	0.0	0.0

Registered nurses' dietary intake. Approximately half of RNs participating in the survey reported intakes consistent with recommended intakes for fruits and meats, nuts, and legumes, with the majority of respondents having intakes inconsistent with recommended intake in all other categories.

A large number of RNs report consuming two to three servings of grains and breads per day (48.8%, n=20) with only 7.3% (n=3) meeting the recommended intake of six to eleven servings per day. Many nurses reported consuming three to five servings of grains and breads per day (29.3%, n=12), with only a few nurses reporting intakes of one serving per day (9.8%, n=4), “as little as possible” (2.4%, n=1) and “greater than eleven servings per day” (2.4%, n=1).

Approximately half of RNs reported consuming the recommended two to three servings per day of fruits (53.7%, n=22). A large number also reported consuming three to five servings per day (22.0%, n=9) and one serving per day (17.1%, n=7). Only one RN (2.4%) reported consuming six to eleven servings of fruits per day, and two (4.9%) reported consuming “as little as possible.”

Most RNs reported consuming two to three servings per day of vegetables (51.2%, n=21) rather than the recommended three to five servings per day. Eleven RNs (26.8%) reported consuming the recommended three to five servings of vegetables per day, with only two RNs (4.9%) reporting consumption greater than the recommended intake. Some nurses reported vegetable intake much below the recommended three to five servings per day, with 14.6% (n=6) reporting a consumption of one serving per day and one nurse (2.4%) reporting an intake of “as little as possible.”

About one third of RNs participating in the survey (36.6%, n=15) reported consuming the recommended two to three servings per day of dairy

foods. A small number (12.2%, n=5) reported consuming more than the recommended amount at three to five servings per day, though many reported consuming one serving per day (41.5%, n=17) or less (9.8%, n=4).

More than half of the RNs participating in the survey reported consuming the recommended two to three servings per day of meats, nuts, and legumes (53.7%, n=22). Thirty-four point one percent (n=14) reported an intake of one serving per day and 4.9% (n=2) reported an intake of “as little as possible.” Three RNs reported consuming greater than the recommended intake of meats, nuts, and legumes, with 7.3% selecting three to five servings per day.

RNs had the smallest percentage of respondents consuming the recommended intake for fats and sweets, compared with the other professional groups. A small number of nurses reported consuming the recommended intake for fats and sweets, with 12.2% (n=5) choosing “as little as possible.” Many consume one serving per day (46.3%, n=19) or two to three servings per day (34.1%, n=14), with a small number (7.3%, n=3) consuming three to five servings per day of fats and sweets.

Table 21. RN reported daily intake in number of servings by food category. Numbers in bold represent the percentage meeting recommended daily intake in servings based on the 2005 Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Registered Nurse (RN) N=41	1 serving per day	9.8	17.1	14.6	41.5	34.1	46.3
	2 to 3 servings per day	48.8	53.7	51.2	36.6	53.7	34.1
	3 to 5 servings per day	29.3	22.0	26.8	12.2	7.3	7.3
	6 to 11 servings per day	7.3	2.4	4.9	0.0	0.0	0.0
	As little as possible	2.4	4.9	2.4	9.8	4.9	12.2
	Greater than 11 servings	2.4	0.0	0.0	0.0	0.0	0.0

Nurse practitioners' dietary intake. NPs had the smallest percentage of participants consuming the recommended daily intake for grains and breads, with only 5.4% (n=2) consuming the recommended six to eleven servings per day. Most NPs reported consuming only two to three servings of grains and breads per day (51.4%, n=19), followed by 27.0% (n=10) reporting consumption of three to five servings per day. Some NPs selected one serving per day (10.8%, n=4), with only one NP (2.7%) reporting a consumption of “as little as possible” and one (2.7%) reporting a consumption greater than eleven servings per day.

NPs had the second highest percentage of respondents consuming the recommended intake of two to three servings of fruits per day (59.5%, n=22), behind MDs. Some NPs reported consuming more than the recommended intake, with 24.3% (n=9) selecting three to five servings per day and one NP (2.7%) reporting a consumption of six to eleven servings of fruits per day. A small number of NPs reported consuming less than the recommended daily

intake for fruits, with 10.8% (n=4) reporting an intake of one serving per day and 2.7% (n=1) reporting an intake of “as little as possible”.

Most NPs reported consuming two to three servings of vegetables per day (62.2%, n=23) with 29.7% (n=11) meeting the recommended intake of three to five daily servings. Two NPs (5.4%) reported consuming one serving of vegetables per day and one NP (2.7%) reported consuming six to eleven servings of vegetables daily.

NPs were the group of professionals with the highest percentage of respondents reporting intake consistent with Dietary Guidelines’ recommendations for dairy with 59.5% (n=22) reporting consumption of two to three servings per day. Thirty-seven point eight percent (n=14) of NPs reported consuming one dairy serving daily and 2.7 (n=1) reported consuming three to five servings of dairy daily.

A large number of NPs (45.9%, n=17) selected two to three servings per day as their daily intake of meats, nuts, and legumes, as recommended by the Dietary Guidelines. There was also a high response to one serving per day of meats, nuts, and legumes, by NPs at 40.5% (n=15) of NP participants. Some NPs reported consuming more than the recommended daily intake for meats, nuts, and legumes, with 10.8% (n=4) selecting three to five servings per day and 2.7% (n=1) selecting six to eleven servings per day.

A small percentage of NPs reported consuming the recommended intake for fats and sweets, with 13.5% (n=5) selecting “as little as possible.”

Most NPs consumed more than the recommended intake for fats and sweets, with 43.2% (n=16) selecting one serving per day, 32.4% (n=12) selecting two to three servings per day, and 10.8 (n=4) selecting three to five servings per day.

Table 22. NP reported daily intake in number of servings by food category. Numbers in bold represent the percentage meeting recommended daily intake in servings based on the 2005 Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Nurse Practitioner (NP) <i>N=37</i>	1 serving per day	10.8	10.8	5.4	37.8	40.5	43.2
	2 to 3 servings per day	51.4	59.5	62.2	59.5	45.9	32.4
	3 to 5 servings per day	27.0	24.3	29.7	2.7	10.8	10.8
	6 to 11 servings per day	5.4	2.7	2.7	0.0	2.7	0.0
	As little as possible	2.7	2.7	0.0	0.0	0.0	13.5
	Greater than 11 servings	2.7	0.0	0.0	0.0	0.0	0.0

Medical doctors' dietary intake. MDs had the highest percentage of respondents report a fruit intake consistent with the recommendations of the Dietary Guidelines and the lowest percentage report a vegetable intake consistent with recommendations, compared with other professional groups.

Few MDs reported their daily grains and breads intake as consistent with the Dietary Guidelines, with 9.5% (n=4) reporting an intake of six to eleven servings per day. Many MDs reported an intake of two to three servings per day (45.2%, n=19) or three to five servings per day (38.1%, n=16), with few reporting an intake of one serving per day (7.1%, n=3).

Most MDs consume fruits in an amount consistent with dietary guideline recommendations. Sixty-one point nine percent (n=26) reported consuming two to three servings of fruits daily. Some MDs selected one serving per day (23.8%, n=10) or three to five servings per day (14.3%, n=6) as their daily fruits intake.

Vegetable intake was low for all professional groups, with MDs having the lowest percentage of survey respondents meeting the recommended three to five servings per day (21.4%, n=9). Most MDs reported consuming two to three servings of vegetables daily (71.4%, n=30), with only two MDs (4.8%) consuming one serving per day and one MD (2.4%) consuming six to eleven servings per day.

Less than half of MDs reported a dairy intake consistent with dietary guideline recommendations, with 42.9% (n=18) consuming two to three servings per day. Nineteen percent (n=8) consume three to five servings per day, while 28.6% (n=12) consume one serving per day and 9.5% (n=4) take in as little dairy as possible.

Most MDs (52.4%, n=22) consume the recommended two to three servings of meats, nuts, and legumes per day. Some (16.7%, n=7) consume greater than the recommendation with three to five servings per day and others consume less than the recommendation, with 28.6% (n=12) consuming one serving per day and 2.4% (n=1) consuming as little as possible meats, nuts, and legumes.

Approximately one-fifth (21.4%, n=9) of MDs surveyed consume the recommended “as little as possible” fats and sweets, though most consume more than is recommended. Twenty-one point four percent (n=9) consume one serving per day, 42.9% (n=18) consume two to three servings per day and 14.3% (n=6) consume three to five servings per day of fats and sweets.

Table 23. MD reported daily intake in number of servings by food category. Numbers in bold represent the percentage meeting recommended daily intake in servings based on the 2005 Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Medical Doctor (MD) N=42	1 serving per day	7.1	23.8	4.8	28.6	28.6	21.4
	2 to 3 servings per day	45.2	61.9	71.4	42.9	52.4	42.9
	3 to 5 servings per day	38.1	14.3	21.4	19.0	16.7	14.3
	6 to 11 servings per day	9.5	0.0	2.4	0.0	0.0	0.0
	As little as possible	0.0	0.0	0.0	9.5	2.4	21.4
	Greater than 11 servings	0.0	0.0	0.0	0.0	0.0	0.0

Doctors’ of osteopathy dietary intake. DOs were the professional group with the second highest percentage consuming the recommended six to eleven servings of grains and breads daily, with only fifteen percent (n=6) meeting the recommendation. DOs had the lowest percentage of survey respondents consuming the recommended two to three servings of fruits and meats, nuts, and legumes daily and were the second lowest group for the recommended intake of dairy when compared with the other professional groups.

A small percentage of DOs meet the recommended intake for grains and breads daily, with 15% (n=6) reporting an intake of six to eleven servings. Many DOs consume three to five servings per day (27.5%, n=11) or two to three servings per day (40%, n=16), with a small number consuming one serving per day (7.5%, n=3) or “as little as possible” (10%, n=4) grains and breads daily.

Just over one third of the DOs surveyed reported consuming the recommended two to three daily servings of fruits (37.5%, n=15). An equal number of DOs reported consuming three to five servings daily and one serving per day of fruits (30%, n=12), with only one DO (2.5%) reporting a fruit consumption of six to eleven servings per day.

Approximately one quarter of the DO respondents (27.5%, n=11) consume the recommended intake for vegetables with three to five servings per day. A large number of DOs consume less than the recommended intake for fruits, with 45% (n=18) consuming two to three servings per day and 22.5% (n=9) consuming one serving per day. Some DOs also reported a vegetable intake of six to eleven servings per day (5.0%, n=2).

Forty percent of DOs surveyed reported consuming one serving of dairy daily (n=16) with 37.5% (n=15) meeting the recommended intake of two to three servings per day. Some reported consuming three to five servings of dairy daily (10.0%, n=4), while others reported consuming as little as possible (12.5%, n=5).

Many DOs reported consumption of fats and sweets that was greater than the recommendation of “as little as possible,” with 35% (n=14) reporting a consumption of one serving per day, 32.5% (n=13) consuming two to three servings per day, 7.5% (n=3) consuming three to five servings per day and 2.5% (n=1) consuming greater than eleven serving of fats and sweets per day. Nine DOs (22.5%) reported consuming “as little as possible” fats and sweets daily, a response consistent with the Dietary Guideline recommendations.

Table 24. DO reported daily intake in number of servings by food category. Numbers in bold represent the percentage meeting recommended daily intake in servings based on the 2005 Dietary Guidelines.

Profession		Grains and breads	Fruits	Vegetables	Dairy	Meats, nuts and legumes	Fats and sweets
Doctor of Osteopathy (DO) N=40	1 serving per day	7.5	30.0	22.5	40.0	27.5	35.0
	2 to 3 servings per day	40.0	37.5	45.0	37.5	45.0	32.5
	3 to 5 servings per day	27.5	30.0	27.5	10.0	20.0	7.5
	6 to 11 servings per day	15.0	2.5	5.0	0.0	2.5	0.0
	As little as possible	10.0	0.0	0.0	12.5	5.0	22.5
	Greater than 11 servings	0.0	0.0	0.0	0.0	0.0	2.5

Nutrition-Related Beliefs, Education and Practice

Providing dietary advice or guidance to clients or patients. Survey participants were asked to respond to the statement “I give dietary advice to my patients/clients” with the options “always,” “most of the time,” “sometimes,” “rarely,” and “never.” Nearly eighteen percent of all respondents (17.9%, n=36) and 46.3% of dietitians (n=19) selected “always.”

As expected, RDs had a significantly higher response of “always” compared to other professional groups, with RNs and MDs having a significantly lower response than other professional groups. DOs had the second highest response rate of “always,” with 17.5% (n=7) followed by NPs with 13.5% (n=5). MDs and RNs had the lowest response of “always” with 4.8% (n=2) and 7.3% (n=3), respectively.

Many survey participants selected “most of the time” as the frequency with which they provide dietary advice or guidance to their patients/clients (35.8%, n=72). MDs had the highest percentage of respondents select “most of the time” at 47.6% (n=20), followed by NPs at 37.8% (n=14). Approximately one third of RDs (31.7%, n=13) and DOs (37.5%, n=15) and about one quarter of RNs surveyed (24.4%, n=10) selected “most of the time” as their response.

RDs had the smallest percentage of respondents select “sometimes” as their frequency of providing dietary advice or guidance to clients or patients with 9.8% (n=4), a percentage significantly lower than other professional groups. RNs had the highest percentage of responding “sometimes” at 46.3% (n=19), followed by NPs with 37.8% (n=14), MDs with 35.7% (n=15), and DOs with 30.0% (n=12). “Sometimes” was the second most popular overall response (31.8%, n=64) after “most of the time” (35.8%, n=72).

Few respondents reported that they “rarely” provide dietary advice or guidance to their clients or patients (10.0%, n=20). “Rarely” as a response

was most common among RNs (14.6%, n=6), followed by RDs (12.2%, n=5), DOs (10.0%, n=4), NPs (8.1%, n=3), and MDs (4.8%, n=2).

“Never” was the least common response among all professionals, with only 4.5% (n=9) of survey participants selecting this as their answer choice. RDs were the only professional group to have no respondents select “never” as an answer. Small rates of “never” as a response were seen in all other professional groups, with the response being highest among RNs (7.3%, n=3), followed by MDs (7.1%, n=3), DOs (5.0%, n=2), and NPs (2.7%, n=1).

Table 25. Response to statement, “I give dietary advice to my patients/clients” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Always	46.3	7.3	13.5	4.8	17.5	17.9
Most of the time	31.7	24.4	37.8	47.6	37.5	35.8
Sometimes	9.8	46.3	37.8	35.7	30.0	31.8
Rarely	12.2	14.6	8.1	4.8	10.0	10.0
Never	0.0	7.3	2.7	7.1	5.0	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Comfort level with knowledge of nutrition. Survey participants were asked to select from the choices “strongly agree,” “agree,” “neutral,” “disagree,” and “strongly disagree” to respond to the statement, “I feel comfortable with my knowledge of nutrition when providing nutrition advice or guidance to patients/clients.”

Though 22.9% (n=46) of all survey participants reported they “strongly agree” with the above statement, RDs had a significantly higher response with “strongly agree” than other professional groups. Just over 80% (80.5%, n=33) of RDs reported that they strongly agree to feeling comfortable with their knowledge of nutrition when providing information to clients. A small number of other professionals selected “strongly agree” as their response, with RNs having the highest percentage after RDs (12.2%, n=5), followed by NPs (10.8%, n=4), MDs (7.1%, n=3), and DOs (2.5%, n=1).

A large number of healthcare professionals, other than RDs, reported that they “agree” that they feel comfortable with their knowledge of nutrition when providing guidance to clients. Forty-eight point three percent of all participants (n=97) selected “agree” as their response. DOs had the highest percentage of “agree” as a response with 67.5% (n=27), though high responses were also seen from RNs (61.0%, n=25), NPs (54.1%, n=20), and MDs (42.9%, n=18). RDs had a low rate of “agree” as a response (17.1%, n=7) due to the overwhelming RD response with “strongly agree.”

Percentage of “neutral,” “disagree,” and “strongly disagree” responses was low. Twenty-two point four percent (n=45) of all participants selected “neutral” in response to the above statement. Response of “neutral” was highest among MDs (35.7%, n=15) and lowest among RDs (2.4%, n=1). Approximately one quarter of RN, NP, and DO respondents selected “neutral” as their answer choice to the statement above (RN: 24.4%, n=10; NP: 24.3%, n=9; DO: 25.0%, n=10). Response of “disagree” was low, with no

RDs or RNs (0.0%) selecting “disagree” and only a small number of MDs, NPs, and DOs selecting “disagree,” 14.3% (n=6), 10.8% (n=4), and 5.0% (n=2), respectively. “Strongly disagree” was the answer choice with the lowest percentage of response with only one survey participant (0.5%, n=1) selecting “strongly disagree.” No RD, NP, MD, or DO respondents selected “strongly disagree,” and only one RN (2.4%, n=1) selected “strongly disagree” as a response.

Table 26. Response to statement, “I feel comfortable with my knowledge of nutrition when providing nutrition advice or guidance to patients/clients” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Strongly agree	80.5	12.2	10.8	7.1	2.5	22.9
Agree	17.1	61.0	54.1	42.9	67.5	48.3
Neutral	2.4	24.4	24.3	35.7	25.0	22.4
Disagree	0.0	0.0	10.8	14.3	5.0	6.0
Strongly Disagree	0.0	2.4	0.0	0.0	0.0	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Formal training in nutrition. Survey participants were asked to select either “yes,” “no,” or “not sure” in response to the statement, “I have received formal training in nutrition.” RDs were the only professional group with all respondents selecting “yes” (100.0%, n=41). RNs had the second highest percentage of “yes” response, with 75.6% (n=31) selecting “yes,”

22.0% (n=9) selecting “no,” and 2.4% (n=1) selecting “not sure.” NPs had the third highest “yes” response at 48.6% (n=18), with 40.5% (n=15) selecting “no” and 10.8% (n=4) selecting “not sure.” Both MDs and DOs had the majority of respondents select “no” as a response, 61.9% (n=26) and 55.0% (n=22), respectively. Less than half of MDs and DOs surveyed reported having formal training in nutrition, 35.7% (n=15) and 40.0% (n=16), respectively. A small number of MDs and DOs selected “not sure” as a response (MD: 2.4%, n=1; DO: 5.0%, n=2).

Table 27. Response to statement, “I have received formal training in nutrition” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Yes	100.0	75.6	48.6	35.7	40.0	60.2
No	0.0	22.0	40.5	61.9	55.0	35.8
Not sure	0.0	2.4	10.8	2.4	5.0	4.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Referral to nutrition professional. Response options for the statement, “When a patient/client requests information on nutrition or dietary guidance I refer him/her to a nutrition professional” included “always,” “most of the time,” “sometimes,” “rarely,” “never,” and “N/A because I am a nutrition professional.” Responses were varied among all professional groups, though all RD respondents selected either “N/A because I am a

nutrition professional” (78.0%, n=32) or “always” (22.0%, n=9). A small number of survey participants reported they “always” refer a client to a nutrition professional (15.4%, n=31), with the highest percentage of “always” as a response among RDs (22.0%, n=9) and RNs (22.0%, n=9), followed by NPs (16.2, n=6), MDs (11.9%, n=5), and DOs (5.0%, n=2).

Approximately one quarter of survey participants reported referring a client or patient to a nutrition professional “most of the time” (25.4%, n=51). RNs had the highest percentage of “most of the time” as a response (39.0%, n=16), with MDs having the lowest percentage of “most of the time” as a response (28.6%, n=12). Approximately 30% of NPs (29.7%, n=11) and DOs (30.0%, n=12) selected “most of the time” as the frequency with which they refer clients or patients to a nutrition professional.

“Sometimes” was the response selected by over half of NPs (51.4%, n=19). A large number of DOs selected “sometimes” as a response (45.0%, n=18), followed by RNs (34.1%, n=14) and MDs (31.0%, n=13). Just over one quarter of MDs selected “rarely” as a response (26.2%, n=11), and 17.5% of DOs (n=7) selected “rarely” as a response. A small number of RNs and NPs reported referring to a nutrition professional “rarely,” 2.4% (n=1) and 2.7% (n=1), respectively.

Few participants reported “never” referring a client or patient to a nutrition professional. No RDs, RNs or NPs selected “never” as a response and one MD (2.4%, n=1) and one DO (2.5%, n=1) selected “never” as a response. No NPs, MDs, or DOs selected “N/A because I am a nutrition

professional” as a response with one RN selecting this answer choice (2.4%, n=1) and the majority of RDs selecting this answer choice (78.0%, n=32).

Table 28. Response to statement, “When a patient/client requests information on nutrition or dietary guidance I refer him/her to a nutrition professional” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Always	22.0	22.0	16.2	11.9	5.0	15.4
Most of the time	0.0	39.0	29.7	28.6	30.0	25.4
Sometimes	0.0	34.1	51.4	31.0	45.0	31.8
Rarely	0.0	2.4	2.7	26.2	17.5	10.0
Never	0.0	0.0	0.0	2.4	2.5	1.0
N/A because I'm a nutrition professional	78.0	2.4	0.0	0.0	0.0	16.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Nutrition professionals. Survey participants were asked to select all answers that applied from the choices “Registered Dietitian (RD),” “Registered Nurse (RN),” “Nurse Practitioner (NP),” “Medical Doctor (MD),” “Doctor of Osteopathy (DO),” “Dietetic Technician, Registered (DTR),” “Clinical Nutritionist,” “Certified Personal Trainer,” or “other” in response to the statement, “If I were to refer a patient/client to a nutrition professional that person would be a:_____.” Respondents selecting “other” as an answer choice were asked to fill-in a response.

RD was selected significantly more than other answer choices as a nutrition professional that survey participants would refer their clients or patients to with 93.0% (n=187) participants selecting RD as an answer. RD

was selected as a response by 87.8% (n=36) of RNs, 100% of NPs (n=37), 92.9% (n=39) of MDs, 92.5% of DOs (n=37), and 92.7% (n=38) of RDs.

RN was selected as a response by few participants (4.5%, n=9; RN: 4.9%, n=2; NP: 2.7%, n=1; MD: 4.8%, n=2; DO: 5.0%, n=2; RD: 4.9%, n=2). NP was selected as a response by nine survey participants (4.5%; RN: 9.8%, n=4; NP: 2.7%, n=1; MD: 2.4%, n=1; DO: 2.5%, n=1; RD: 4.9%, n=2). MD as a response option was the least selected answer choice (2.5%, n=5) with no NPs, MDs or DOs (0.0%) selecting MD as a nutrition professional that they would refer a client or patient to for nutrition information. A few RDs and RNs selected MD as an answer (7.3%, n=3 and 4.9%, n=2, respectively). DO was also minimally selected as an answer choice (3.5%, n=7) with no NPs or MDs (0.0%) selecting DO as a response. Three RNs (7.3%), two DOs (5.0%) and two RDs (4.9%) selected DO as a professional to refer clients to for nutrition information and guidance.

Dietetic Technician, Registered (DTR), was selected as a nutrition professional to refer clients to for nutrition advice or guidance by 23.4% (n=47) of survey participants. RDs had the highest percentage of selecting DTR as a response with 39.0% (n=16), followed by MDs with 28.6% (n=12), DOs with 22.5% (n=9), RNs with 17.1% (n=1) and NPs with 8.1% (n=3).

Clinical nutritionist had the second highest selection rate, after RDs, as a nutrition professional that the survey respondents would refer a client or patient to for nutrition guidance (37.8%), though RDs had the lowest rate of selecting clinical nutritionist compared with other professional groups

(9.8%, n=4). Half of DOs surveyed selected clinical nutritionist as a response to the above statement (50.0%, n=20), followed by 47.6% of MDs (n=20), 41.5% of RNs (n=17), and 40.5% of NPs (n=15).

Few survey participants identified Certified Personal Trainers as nutrition professionals they would refer clients or patients to for nutrition guidance (3.5%, n=7). Two RNs (4.9%), NPs (5.4%), and MDs (4.8%) and one RD (2.4%) selected Certified Personal Trainers as a response.

Some respondents selected “other” as an answer (4.0%, n=8; RN: 2.4%, n=1; NP: 2.7%, n=1; DO: 7.5%, n=3; RD: 7.3%, n=3). The response filled-in by the RN selecting “other” as an answer included “I only give cholesterol info, anything else I refer to a dietitian.” The NP selecting “other” as an answer filled in “local herbalist” and “reiki master that does nutritional response testing” as nutrition professionals to refer clients to for nutrition guidance. Responses filled in by the three DOs selecting “other” as an answer included “we have no nutritionist in our area,” “whoever their insurance would pay for!!” and “Functional Medicine Specialist.” RDs selecting “other” as a response filled in “I would not refer as I am a nutrition professional/RD LD,” “Diabetes Educator,” and “I see patients in the Health Dept, my clients are at the lowest end of the economic scale.”

Table 29. Response to statement, “If I were to refer a patient/client to a nutrition professional that person would be a: _____ (please select all that apply)” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Registered Dietitian (RD)	92.7	87.8	100.0	92.9	92.5	93.0
Registered Nurse (RN)	4.9	4.9	2.7	4.8	5.0	4.5
Nurse Practitioner (NP)	4.9	9.8	2.7	2.4	2.5	4.5
Medical Doctor (MD)	7.3	4.9	0.0	0.0	0.0	2.5
Doctor of Osteopathy (DO)	4.9	7.3	0.0	0.0	5.0	3.5
Dietetic Technician, Registered (DTR)	39.0	17.1	8.1	28.6	22.5	23.4
Clinical Nutritionist	9.8	41.5	40.5	47.6	50.0	37.8
Certified Personal Trainer	2.4	4.9	5.4	4.8	0.0	3.5
Other (filled-in response)	7.3	2.4	2.7	0.0	7.5	4.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Nutrition experts. Survey participants were asked to respond to the statement “A person I think of as a nutrition expert includes: _____” by selecting all that apply from the options “Registered Dietitian (RD),” “Registered Nurse (RN),” “Nurse Practitioner (NP),” “Medical Doctor (MD),” “Doctor of Osteopathy (DO),” “Dietetic Technician, Registered (DTR),” “Clinical Nutritionist,” “Certified Personal Trainer,” or “other”. RDs selected only RDs (100%, n=41), DTRs (68.3%, n=28) and clinical nutritionists (19.5%, n=8) as nutrition experts, while other professional groups had more varying responses.

RD was selected by all professional groups at a rate significantly higher than other answer choices. One hundred percent of RDs (n=41) and MDs (n=42) surveyed selected RD as a nutrition expert. Ninety-seven point six percent (n=40) of RNs, 94.9% (n=38) of DOs and 94.6% (n=35) of NPs

selected RDs as nutrition experts. A small number of respondents (8.0%, n=16) reported RNs as a person they consider a nutrition expert (RNs: 14.6%, n=6; NPs: 13.5%, n=5; MDs: 4.8%, n=2; DOs: 7.7%, n=3; RDs: 0.0%). Eight point five percent (n=17) of survey participants selected NPs as nutrition experts (RNs: 12.2%, n=5; NPs: 18.9%, n=7; MDs: 7.1%, n=3; DOs: 12.8%, n=5; RDs: 0.0%). MDs were reported as nutrition experts by 8.0% (n=16) of survey participants (RNs: 7.3%, n=3; NPs: 18.9%, n=7; MDs: 4.8%, n=2; DOs: 10.3%, n=4; RDs: 0.0%). Seven percent (n=14) of participants surveyed selected DOs as experts in nutrition (RNs: 9.8%, n=4; NPs: 10.8%, n=4; MDs: 2.4%, n=1; DOs: 12.8%, n=5; RDs: 0.0%).

Almost half of survey participants (43.5%, n=87) reported that they think of DTRs as nutrition experts. RDs had the highest percentage of respondents reporting DTRs as nutrition experts with 68.3% (n=28), followed by MDs (47.6%, n=20), NPs (37.8%, n=14), DOs (35.9%, n=14), and RNs (26.8%, n=11). Though a small number of RDs selected clinical nutritionists as nutrition experts (19.5%, n=8), a large number of respondents in all other professional groups reported thinking of clinical nutritionists as nutrition experts (RNs: 75.6%, n=31; NPs: 83.8%, n=31; MDs: 83.3%, n=35; DOs: 79.5%, n=32). Few survey respondents reported Certified Personal Trainers as nutrition experts (7.0%, n=14; RNs: 7.3%, n=3; NPs: 18.9%, n=7; MDs: 7.1%, n=3; DOs: 2.6%, n=1).

Table 30. Response to statement, “A person I think of as a nutrition expert includes: _____ (please select all that apply)” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Registered Dietitian (RD)	100.0	97.6	94.6	100.0	94.9	97.5
Registered Nurse (RN)	0.0	14.6	13.5	4.8	7.7	8.0
Nurse Practitioner (NP)	0.0	12.2	18.9	7.1	5.1	8.5
Medical Doctor (MD)	0.0	7.3	18.9	4.8	10.3	8.0
Doctor of Osteopathy (DO)	0.0	9.8	10.8	2.4	12.8	7.0
Dietetic Technician, Registered (DTR)	68.3	26.8	37.8	47.6	35.9	43.5
Clinical Nutritionist	19.5	75.6	83.8	83.3	79.5	68.0
Certified Personal Trainer	0.0	7.3	18.9	7.1	2.6	7.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Profession seen as experts in nutrition by healthcare professionals.

Survey participants were asked to respond with “strongly agree,” “agree,” “neutral,” “disagree,” or “strongly disagree” to the statement, “I feel that my profession is looked to as experts in nutrition by healthcare professionals.” The response that had the highest percentage of respondent selection was “neutral” (34.3%, n=69).

RDs had the highest percentage of positive response with 34.1% of RDs selecting “strongly agree” (n=14) and 51.2% selecting “agree” (n=21). Nine point eight percent (n=4) of RDs selected “neutral” and 4.9% (n=2) selected “disagree,” but no RDs selected “strongly disagree.”

The answer choice with the greatest percentage of response among RNs was “disagree,” with 36.6% of RNs selecting this answer choice (n=15). The second most popular answer choice among RNs was “neutral” with 31.7% (n=13) followed by “agree” with 24.4% (n=10). Both the responses

“strongly agree” (4.9%, n=2) and “strongly disagree” (2.4%, n=1) had a small percentage of respondents.

A large number of NP respondents selected “neutral” in response to the above statement (48.6%, n=18). Approximately one quarter of NPs (24.3%, n=9) selected “disagree” followed by 21.6% (n=8) selecting “agree.” One NP respondent (2.7%) selected “strongly agree” and one NP respondent (2.7%) selected “strongly disagree.”

MD responses were nearly evenly split between “agree” (33.3%, n=14), “neutral” (33.3%, n=14), and “disagree” (28.6%, n=12) with only a few respondents selecting “strongly disagree” (4.8%, n=2). Half of DOs surveyed selected “neutral” (50.0%, n=20), with 40% (n=16) selecting disagree and 10% (n=4) selecting “agree.” No DO participants selected “strongly agree” or “strongly disagree” as their response.

Table 31. Response to statement, “I feel that my profession is looked to as experts in nutrition by healthcare professionals” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Strongly agree	34.1	4.9	2.7	0.0	0.0	8.5
Agree	51.2	24.4	21.6	33.3	10.0	28.4
Neutral	9.8	31.7	48.6	33.3	50.0	34.3
Disagree	4.9	36.6	24.3	28.6	40.0	26.9
Strongly Disagree	0.0	2.4	2.7	4.8	0.0	2.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Profession seen as experts in nutrition by healthcare consumers. In response to the statement, “I feel that my profession is looked to as experts in nutrition by healthcare consumers” the answer options included: “strongly agree,” “agree,” “neutral,” “disagree,” and “strongly disagree.” The most popular response among all survey participants was “agree” with 55.7% of participants (n=112).

RDs had the third highest response rate for “strongly” agree” (7.3%, n=3) after MDs and RNs and the third highest response rate for “agree” (56.1%, n=23) behind NPs and MDs. Some RDs also responded with “neutral” (22.0%, n=9) and “disagree” (14.6%, n=6).

The majority of RNs responded with “agree” (56.1%, n=23) followed by 19.5% responding with “neutral” (n=8) and 14.6% (n=6) responding with disagree.” A few RNs (9.8%, n=4) selected “strongly agree” as a response.

Most NPs selected “agree” as their response (62.2%, n=23), though some selected “neutral” (18.9%, n=7) or “disagree” (16.2%, n=6). A small number of NPs selected “strongly agree” as a response (2.7%, n=1).

MDs had the highest percentage of respondents select “strongly agree” (11.9%, n=5), compared with other professional groups. The majority of MDs selected “agree” (59.5%, n=25), though some MDs selected “neutral” (16.7%, n=7) or “disagree” (11.9%, n=5).

DOs were the only group of professionals to have no survey participants respond “strongly agree” and to have survey respondents select “strongly disagree” (2.5%, n=1) as a response. A large number of DOs

selected “agree” (45.0%, n=18), followed by 32.5% selecting “neutral” (n=13) and 20.0% selecting “disagree” (n=8).

Table 32. Response to statement, “I feel that my profession is looked to as experts in nutrition by healthcare consumers” by professional group.

	Profession					Total
	Registered Dietitian (RD)	Registered Nurse (RN)	Nurse Practitioner (NP)	Medical Doctor (MD)	Doctor of Osteopathy (DO)	
Strongly agree	7.3	9.8	2.7	11.9	0.0	6.5
Agree	56.1	56.1	62.2	59.5	45.0	55.7
Neutral	22.0	19.5	18.9	16.7	32.5	21.9
Disagree	14.6	14.6	16.2	11.9	20.0	15.4
Strongly Disagree	0.0	0.0	0.0	0.0	2.5	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

CHAPTER FIVE

Summary and Conclusions

Summary

This study provides insight into the nutrition knowledge and behaviors of healthcare professionals as well as information about their nutrition-related beliefs. Healthcare professionals are often the primary resource for nutrition information for patients and clients, making it imperative to understand the nutrition-related knowledge and behaviors of healthcare professionals in order to begin to understand the nutrition messages that are provided to the community via client interactions with healthcare providers. In this study, healthcare professionals surveyed included RDs, RNs, NPs, MDs, and DOs. Two hundred fifty-nine healthcare professionals completed the online self-reported survey providing insight into their nutrition-related knowledge, behaviors, and beliefs.

Overall, many healthcare providers were able to accurately estimate their body mass index (BMI) based on their reported height and weight, though fewer were able to accurately identify the classification of their BMI using the system put forth by the National Heart, Lung, and Blood Institute (2). Less than half of all professionals surveyed were able to correctly identify both their BMI and BMI classification. This suggests that there may be some lack of knowledge on how to calculate a body mass index, BMI classification, and how a BMI value and classification can be utilized in providing tailored nutrition messages to clients and patients (2, 3, 8, 14).

RDs had the greatest correlation between their actual and reported BMI values based on self-reported height and weight, and had the second greatest correlation between actual and reported BMI classification behind NPs.

The Dietary Guidelines for Americans (DGA) are a tool provided to all Americans that illustrate how the science of nutrition can be assimilated into a healthy and well-balanced diet. The Guidelines represent the primary dietary advice given to Americans on avoiding major chronic disease and are updated every five years, incorporating new information and addressing how nutrition and dietary intake impact public health concerns, such as obesity and cancers (1, 12, 19). The Dietary Guidelines for Americans, 2010, are being finalized and include updated recommendations for translating the guidelines into a nutrient dense and calorie balanced lifestyle (20). The Dietary Guidelines for Americans, 2010, focus on increasing intake of plant-based foods, seafood, and low-fat dairy while decreasing overall kilocalorie intake, added sugars, and solid fats as well as maintaining a moderate intake of lean meats and meeting the 2008 Physical Activity Guidelines for Americans (20). Healthcare professionals provide nutrition advice and dietary guidance to clients and patients using the DGA as a platform, though knowledge of the DGA among healthcare professionals surveyed was less than 82% accurate in all categories and as low as 29% in one category. As anticipated, RDs had better knowledge of the Dietary Guidelines than other professional groups. RDs had significantly greater knowledge of the

DGA, compared with other professional groups, for grains and breads, fruits, dairy, meats, nuts, and legumes, and fats and sweets ($p=0.000$, $p=0.000$, $p=0.000$, $p=0.004$, $p=0.037$, respectively), though did not have significantly greater knowledge for recommended vegetable intake ($p=0.202$).

Dietary intake for all healthcare professionals surveyed was less than 56% congruent with DGA recommendations in all food categories and was lowest for grains and breads and fats and sweets. It was expected that RDs would have the greatest congruence between their reported daily intake and the DGA. Of the six food categories, RDs had the highest congruence in three groups, second highest congruence in two groups, and third highest congruence in the one remaining group, compared with other healthcare professionals. Vegetable intake was low among all professional groups, an outcome similar to reported intake for Americans as a whole (1, 3, 8, 11, 12, 21). Though dietary intake was not very congruent with the DGA recommendations, RDs displayed intake more consistent with DGA recommendations than other professionals surveyed.

MDs and DOs are often the primary healthcare provider and though most report not having had formal training in nutrition, most also report that they provide nutrition advice or guidance to clients or patients “always” or “most of the time.” In addition, most RNs, NPs, MDs, and DOs report referring clients or patients to a nutrition professional for advice or guidance when a client or patient requests nutrition information “sometimes,” “rarely,” or “never.”

Knowledge of the DGAs represents basic nutrition knowledge, and MDs had the lowest percentage of correct response to the knowledge of these guidelines in four of six categories, suggesting that physicians may not be well-equipped to provide nutrition education and guidance to clients or patients.

Self-selection or de-selection poses a potential bias for this study. Survey participants were those who opted to complete the online survey and thus may have a greater knowledge or more congruent dietary intake with the recommendations of the Dietary Guidelines than their counterparts who did not participate in the survey. Some individuals contacted to solicit participation in the survey responded that they were no longer in practice or did not have a good knowledge of nutrition, providing evidence that self-selection bias likely occurred.

As a self-reported survey it is possible that responses may have been skewed toward what the participants deemed as more favorable or desirable responses. This does pose a potential for bias, yet due to the anonymity of respondents, this was not seen as a significant concern.

Though most professionals reported they feel comfortable with their knowledge of nutrition, RDs feel most comfortable, have the greatest knowledge of the DGAs, consume diets more consistent with the DGAs, and have the most formal training in nutrition, compared with other healthcare professionals surveyed.

RDs were selected significantly by healthcare professionals as nutrition professionals that a client or patient should be referred to for nutrition information or guidance. A z-test was utilized to evaluate significance between responses and significance was seen at the $p=0.000$ level for all professional groups. In addition, RDs were selected significantly as experts in nutrition by RDs, RNs, MDs, and DOs ($p=0.000$, $p=0.004$, $p=0.006$, and $p=0.042$, respectively) based on analysis of responses using a z-test. NPs selected both RDs and Clinical Nutritionists in high number, thus RDs were not seen as experts in nutrition significantly more than Clinical Nutritionists by NPs ($p=0.134$). Because all professional groups surveyed significantly identified RDs as nutrition professionals that clients or patients should be referred to for nutrition information over other professionals and RDs, RNs, MDs and DOs identified RDs as experts in nutrition significantly more than other responses, the hypothesis that RDs are considered experts in nutrition by healthcare professionals can be accepted.

Recommendations for Further Research

Further research into the nutrition-related knowledge, behaviors, and beliefs of healthcare professionals will likely provide greater insight into mechanisms for improving dietary health among healthcare consumers. It is recommended that future research include a greater variety of healthcare professionals who may have nutrition-related client interactions in a healthcare setting such as physician assistants, physical therapists, dietetic

technicians, and clinical nurse specialists. It is further recommended that future research ask healthcare professionals to identify additional certifications or licensure they hold that may impact their nutrition knowledge, such as Certified Diabetes Educator (CDE), certification in nutrition support, or certification in sports nutrition.

In addition to determining knowledge of the DGAs, it is recommended that future research determine knowledge of serving sizes for different foods. Identifying whether healthcare providers have knowledge of serving sizes will allow for determining whether they are able to translate dietary guideline recommendations into tangible information. Survey participants responded to questions by selecting a number of serving sizes for their intake and knowledge of DGA recommendations, yet they were not provided information on serving sizes for different food groups, thus participant knowledge of food groups could not be established. It is anticipated that there was a lack of knowledge of serving sizes for some respondents, as knowledge of recommended intake for grains and breads was spread relatively evenly between two to three servings per day, three to five servings per day and six to eleven servings per day for most professional groups.

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Appendix A

Request to Participate and Informed Consent Document

My name is Sarah Dale Zeola and I am completing my Master's Degree in Human Nutrition at Eastern Michigan University. I am in the process of completing my thesis research and am looking for healthcare providers to participate in a brief online survey.

My thesis focuses on the nutrition-related knowledge, behaviors and beliefs of healthcare professionals including Registered Nurses, Nurse Practitioners, Registered Dietitians, Medical Doctors and Doctors of Osteopathy.

Would you be able to participate in my online thesis survey?

Information including a brief introduction to the thesis, informed consent information and a link to the survey are included below. Thank you for your time and consideration! I appreciate your help!

Warm regards,

Sarah Dale Zeola

Dietetic Student

Master of Science in Human Nutrition

Eastern Michigan University

smitch9@emich.edu

SURVEY LINK:

<https://www.surveymonkey.com/s/sarahdalezeola>

Consent Form: Nutrition-related knowledge and behaviors of healthcare professionals: A pilot study.

Hello, my name is Sarah Dale Zeola and I am a dietetic graduate student with the Eastern Michigan University Department of Dietetics and Human Nutrition. I am trying to gather information on the nutrition knowledge and behaviors of RDs, RNs, NPs, MDs, and DOs. I am also trying to gather self-reported anthropometric and demographic data including height, weight, and years in profession.

I would like to ask you for your help by answering a few questions for me about your nutrition knowledge, dietary intake, anthropometrics and demographics for a thesis research study. The purpose of this study is to identify the nutrition knowledge and behaviors of healthcare professionals.

If you choose to participate, you will be asked to complete an online survey that will take less than 20 minutes to complete. Your confidentiality will be protected to the greatest extent possible. You will be asked to answer questions regarding your height, weight, dietary intake, knowledge of the Dietary Guidelines for Americans and beliefs about providing nutrition education.

All of the data will be sent back to the researcher via a secure database using SurveyMonkey™. This information will categorize all participant responses in a manner that is not personally identifiable to the researcher. The only information the researcher will be able to determine is

the professional group the participant belongs to (MD, DO, NP, RN or RD). Survey responses will be identified by an alphanumeric identifier.

Participants will not see their survey results. Results of this research will be included in a graduate thesis and will be submitted for poster presentation at a professional meeting and for publication in professional journals. Because the researcher will not be able to identify survey participants based on survey responses the confidentiality of survey participants during the dissemination of research results is insured.

This study poses no foreseeable risks, discomforts or benefits for study participants. Your participation is completely voluntary, you may refuse to participate or withdraw from the study at any time without penalty or negative impact. You may end your participation by logging off the survey or by closing the Internet browser.

There will be no cost to you or compensation for participating in this study.

By completing this survey you acknowledge you have been informed of, and understand, the nature and purpose of this online survey, and that you freely consent to participation.

This research protocol and informed consent document has been reviewed and approved by the Eastern Michigan University CHHS Human Subjects Review Committee for use on 18 December 2009. If you have any questions about the approval process, please contact Dr. Judith Brooks (734-487-3221, Thesis Chair, judi.brooks@emich.edu) or Dr. George Liepa

(734-487-2499, Chair of CHHS Human Subjects Review Committee,
chhs_human_subjects@emich.edu).

After you have completed the survey, a closing paragraph will appear:
Thank you for your participation in this online survey. Your responses are
valued and appreciated!

SURVEY LINK:

<https://www.surveymonkey.com/s/sarahdalezeola>

Appendix B

Sample of Online Survey

Nutrition-related knowledge and behaviors of healthcare professionals

1. Please choose your gender from the choices below.

Female

Male

2. Please select the height that most closely represents your height from the drop-down menu below.

3. Please select the number that most closely represents your current body weight, in pounds, from the drop-down menu below.

4. What do you think your current Body Mass Index (BMI) is?

5. What do you think the classification of your current Body Mass Index (BMI) would be according to the standards of the National Institutes of Health's National Heart Lung and Blood Institute (NHLBI)?

Underweight

Normal Weight

Overweight

Obesity Class I

Obesity Class II

Extreme Obesity

6. What is your primary profession?

- Registered Nurse (RN)
- Nurse Practitioner (NP)
- Medical Doctor (MD)
- Doctor of Osteopathy (DO)
- Registered Dietitian (RD)
- Other profession not listed above

7. How long have you worked in your primary profession?

- Less than 1 year
- 1 to 5 years
- 6 to 10 years
- 11 to 15 years
- 16 to 20 years
- 21 to 25 years
- 26 to 30 years
- Greater than 30 years

Next

8. Please respond to this question based on your knowledge of the recommended intakes in the Dietary Guidelines for Americans, 2005, by the United States Department of Agriculture.

The recommended daily intake for healthy adults for foods in the following groups is:

	As little as possible	1 serving per day	2 to 3 servings per day	3 to 5 servings per day	6 to 11 servings per day	Greater than 11 servings per day
Grains and breads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dairy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meats, nuts and legumes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fats and sweets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Please respond to this question based on your average or usual intake.

My daily intake of foods in the following groups is usually:

	As little as possible	1 serving per day	2 to 3 servings per day	3 to 5 servings per day	6 to 11 servings per day	Greater than 11 servings per day
Grains and breads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dairy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meats, nuts and legumes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fats and sweets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Redacted]

10. I give dietary advice or guidance to my patients/clients.

- Always Most of the time Sometimes Rarely Never

11. I feel comfortable with my knowledge of nutrition when providing nutrition advice or guidance to patients/clients.

- Strongly agree Agree Neutral Disagree Strongly disagree

12. I have received formal training in nutrition.

- Yes
 No
 Not sure

13. When a patient/client requests information on nutrition or dietary guidance I refer him/her to a nutrition professional.

- Always
 Most of the time
 Sometimes
 Rarely
 Never
 Not applicable because I am a nutrition professional

14. If I were to refer a patient/client to a nutrition professional that person would be a: (please select all that apply)

- Registered Nurse (RN)
 Nurse Practitioner (NP)
 Medical Doctor (MD)
 Doctor of Osteopathy (DO)
 Registered Dietitian (RD)
 Dietetic Technician, Registered (DTR)
 Clinical Nutritionist
 Certified Personal Trainer
 Other (please specify)

[Redacted]

15. A person I think of as a nutrition expert includes: (please select all that apply)

- Registered Nurse (RN)
- Nurse Practitioner (NP)
- Medical Doctor (MD)
- Doctor of Osteopathy (DO)
- Registered Dietitian (RD)
- Dietetic Technician, Registered (DTR)
- Clinical Nutritionist
- Certified Personal Trainer
- Other (please specify)

16. I feel that my profession is looked to as experts in nutrition by healthcare professionals.

- Strongly agree Agree Neutral Disagree Strongly Disagree

17. I feel that my profession is looked to as experts in nutrition by healthcare consumers.

- Strongly agree Agree Neutral Disagree Strongly disagree

Prev

Done

Appendix C

Permission Letter



EASTERN MICHIGAN UNIVERSITY

December 18, 2009

Sarah Dale Zeola
c/o Judith Brooks
Eastern Michigan University
School of Health Science
Ypsilanti, Michigan 48197

Dear Sarah Dale Zeola,

The CHHS Human Subjects Review Committee has reviewed the revisions to your proposal entitled: "Nutrition-related Knowledge and Behaviors of Healthcare Professionals: A Pilot Study" (CHHS 10-008).

The committee reviewed your proposal and its revisions and concluded that the risk to participants is minimal. Your study is approved by the committee.

Good luck in your research endeavors.

Sincerely,

A handwritten signature in black ink, appearing to read "George Liepa".

George Liepa, Ph.D.
Chair, CHHS Human Subjects Review Committee

