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The Perceptions, Attitudes and Practices of Registered Dietitians Regarding Functional Foods

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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

THE PERCEPTIONS, ATTITUDES AND PRACTICES OF REGISTERED
DIETITIANS REGARDING FUNCTIONAL FOODS

A thesis submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

in

DIETETICS AND NUTRITION

by

Amanda Berhaupt

2010

To: Dean Fernando M. Treviño
R.Stempel College of Public Health and Social Work

This thesis, written by Amanda Berhaupt, and entitled The Perceptions, Attitudes and Practices of Registered Dietitians Regarding Functional Foods, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this thesis and recommend that it be approved.

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Date of Defense: March 22, 2010

The thesis of Amanda Berhaupt is approved.

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Florida International University, 2010

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DEDICATION

I dedicate this thesis to my husband, Jesse Glickstein, my parents Suzanne Gold and John Berhaupt, and Joanie and Gary Glickstein. Their love and unwavering support, gave me the strength to complete this thesis.

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ABSTRACT OF THE THESIS

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by

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Florida International University, 2010

Miami, Florida

Professor Evelyn B. Enrione, Major Professor

The term “functional food” (FF) has a variety of definitions resulting in term ambiguity. It is unclear Registered Dietitians’ (RDs) understanding and practices about FF. A descriptive, cross-sectional study investigated RDs’ perceptions, attitudes and practices regarding FF. A national random sample (n=1800) of RDs was mailed a FF questionnaire, 385 (22%) responded. Given five definitions from food-nutrition authorities, the majority of RDs did not agree on a definition, although three-fourths (n=292, 75.8%) perceived fortified foods as FF. Registered Dietitians agreed FF could improve health (n=266, 69.1%), prevent disease (n=282, 73.2%) and treat clientele (n=246, 63.9%), however were neutral (41.6%) or disagreed (37.7%) FF were herbs, or equivalent to medicine (32.7%, 49.2% respectively). Most RDs (n=290, 75.9%) ate FF; fewer (n=231, 61.4%) professionally recommended them. Nearly all (n=353) indicated interest in learning about FF. Registered Dietitians revealed inconsistencies between their perceptions, attitudes and practices regarding FF. Professional education is needed to resolve discrepancies regarding FF.

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I. INTRODUCTION

In the early 1990s, the Japanese government conceptualized ‘foods for specified health use,’ otherwise termed functional foods, to prevent disease and keep healthcare costs low (1,2,3). The term “functional food” has since expanded to the United States (US) and other parts of the world. A well-documented aspect of functional foods is a lack of a cohesive definition (4,5,6,7,8). Food and nutrition authorities in the US have not reached a consensus regarding definitions or types of food, resulting in an ambiguity about functional foods (5,6,7,8,9). This ambiguity makes it difficult for Registered Dietitians (RDs) to acquire a comprehensive understanding of functional foods and as a result, are unable to impart correct knowledge to their clientele.

In the US, the American Dietetic Association (ADA), the International Life Sciences Institute of North America (ILSINA), and the Food and Nutrition Board (FNB) of the Institute of Medicine all have different working definitions of functional food, while the Food and Drug Administration (FDA) does not provide any definition. The ADA “...classifies all foods as functional at some physiologic level...” citing that “...whole foods, fortified foods, enriched or enhanced foods, have a potentially beneficial effect on health when consumed as part of a varied diet” (4,5). The FNB describes functional foods as “...any modified food or food ingredient that may provide a health benefit beyond that of the traditional nutrients it contains” (4). The ILSINA states that functional foods are “those that by virtue of physiologically active food components provide health benefits beyond basic nutrition” (10). The FDA does not provide a definition, nor does it recognize functional foods as a regulatory category. It does maintain they are regulated under the Federal Food Drug and Cosmetic Act (5,9,11).

International authorities have different definitions as well. The European branch of the International Life Sciences Institute (ILSI) funded the European Union project, Functional Food Science in Europe (FUFOSE). The FUFOSE classifies functional foods as those that have “satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease” (12). Japan identifies them as those foods “composed of functional ingredients that affect the structure and/or function of the body and are used to maintain or regulate specific health conditions” (13). Currently, Japan is the only government that regulates functional foods (5).

While all definitions, both nationally and internationally, exhibit similarity in providing an “advantage to consumers in some functional way,” they are not synonymous (6,14,15). The verbiage, intent, meaning and professional interpretation of the definitions are different as to which foods and/or food components are functional. However, all definitions stress that functional foods contain added health benefits.

Registered Dietitians, as the nutrition experts, are responsible for interpreting nutrition research, being knowledgeable of emerging food products and concepts, and providing correct information to the public. The widespread lack of clarity and agreement among authorities regarding functional foods, presents a challenge to RDs to fulfill these obligations. Research is deficient regarding RDs’ perceived knowledge of functional foods as well as what RDs communicate to their clientele. The purpose of this study is to investigate RDs’ perceptions, attitudes and practices concerning functional foods.

Research Questions:

Which functional food definition does the majority of RDs believe is correct?

What foods do RDs categorize and define as functional foods?

Does educational level of RDs influence their functional food perceptions, attitudes and practices?

Does the geographic region where RDs practice influence their functional food perceptions, attitudes and practices?

II. LITERATURE REVIEW

Functional foods are applicable in both the health care and food industries. As such, a variety of databases were searched including, CINAHL, Medline, PubMed, Agricola, Ageline and the Health and Wellness Resource Database. The search terms were: functional foods and Registered Dietitians; functional food, knowledge and Registered Dietitians; functional food, attitudes and Registered Dietitians; functional food, perceptions and Registered Dietitians; dietitian and functional food; nutritionist and functional food; complementary alternative medicine and dietitian. It appears a paucity of literature is available regarding functional foods. The search yielded a total of four research articles.

Two of the four peer-reviewed studies surveyed perceived knowledge, attitudes and practices of dietitians regarding functional foods, the third study explored perceived knowledge and opinions, and the fourth study focused exclusively on attitudes. All four were descriptive, cross-sectional studies. Two studies were conducted in the US (Pennsylvania and Oregon), one in Holland and one in Canada.

Oregon Study

In March 1998, Lee et al. determined the perceived knowledge, attitudes, and practices of licensed dietitians (LDs) regarding functional foods, nutrient supplements, and herbs as complementary medicine (16). A focus group of five dietitians, whose credentials were not specified, developed the survey and devised a definition for functional foods. A geographically stratified, random sample of 202 Oregon LDs was obtained. The source of the sample was not detailed. To qualify as an Oregon LD, an individual must already be a Registered Dietitian. Therefore, the subjects in this study

were also RDs. The Oregon LD sample was mailed the 21-question survey that included a functional food definition. Eighty percent (n=162) of the sample responded. The majority of LDs were White and 31 – 50 years old. Gender was not reported. Sixty-seven percent (n=109) had bachelor degrees and 32% (n=52) reported having a master's or doctoral degree. Nearly two-thirds of respondents perceived they had a high level of knowledge about functional foods used to maintain good health and prevent chronic disease. Lee et al. reported 80% (n=130) of Oregon LDs believed functional foods were safe and effective in maintenance of good health, the prevention of illness and treatment of chronic disease. Eighty-six percent (n=139) reported to personally use functional foods and 94% (n=92) of LDs employed by a healthcare facility recommended them in the past year.

Although an excellent response rate, the sample was small (n=162) and only representative of RDs in Oregon. Results could not be generalized to a larger population of RDs. Additionally in Oregon, in order to become an LD, one must be an RD but not all RDs become LDs. Therefore the sample did not represent the views of RDs, only those who became LDs. Also, LDs with master's and doctoral degrees were combined and therefore it was difficult to determine if education influenced the results. Further, gender demographics were not reported. Therefore, it was unclear if the demographics of this sample represented the ADA population.

There were methodological concerns of the content development of the questionnaire. The questionnaire covered three topics that included functional foods, nutrient supplements and herbs. As a result, few questions asked about functional foods and only basic summaries could be made about the knowledge, attitudes and practices of

RDs regarding functional foods. It would have been more effective to survey RDs on one topic to obtain comprehensive data. In addition, the development of the survey was unclear. Lee et al. stated the five dietitians in the focus group “held professional positions in which they likely had been exposed to questions about complementary dietary therapies” (16). A further explanation of the focus group’s background would have given face validity to instrumentation. The functional food definition included in the questionnaire was based on a consensus of the focus group, however no information regarding the definition origin was identified. As this study took place in 1998, and the survey definition did not correspond with the 1995 published ADA definition from the position paper regarding phytochemicals and functional foods, the definition source is unclear. More information on origin of the definition would have given more credibility to the research. As the definition was supplied to LDs on the survey, it is difficult to determine the actual knowledge the LDs had of functional foods. Additionally, the LDs were asked to rate their functional food knowledge on a 1-5 Likert scale with 5 being “very high” and 1 being “none” (16). This was problematic because it did not determine inaccurate or accurate knowledge, only the perception of knowledge LDs thought they had. Further, Lee et al. reported LDs’ perceived knowledge however results can only be applied to LDs’ perception of the functional food definition supplied, rather than LDs’ general perceived knowledge of functional foods.

Although functional food was gaining popularity as an important food topic, it was not until four years later that another American study was conducted. Once again it was conducted in one state, Pennsylvania.

Pennsylvania Study

A survey consisting of 64 questions identified the perceived knowledge, attitudes, and self-reported practices of RDs concerning functional foods and herbal medicine (17). The authors reported that a sample of 100 RDs was selected randomly from the Pennsylvania Dietetic Association professional directory. The methodology for selecting the random sample was not discussed. The survey was content-and-face validated by four expert RDs in the areas of functional food and herbal medicine. The experts' qualifications were not reported. The mailed survey included a definition of functional foods and a total of 57 (57%) surveys were returned. No male RDs completed the survey. The reported ages of RDs ranged from younger than 35 to older than 55 years old, with the majority in the 35 – 55 age range. Forty-two percent (n=24) of RDs completed a bachelor's degree, 46% (n=26) earned a master's degree and 12% had doctoral degrees. Couch et al. found 98% (n=51) of RDs thought they should be the authority on functional foods, however 52% (n=30) did not feel confident in their knowledge of functional food or their qualifications to educate the public (n=31, 54%). The majority of respondents (n=48, 84%) trusted that functional foods could prevent disease and promote health. However only 30% (n=17) trusted functional food label claims. While 58% (n=33) claimed to personally use functional foods, only 38% (n=22) recommended them to clients.

Couch et al. reported the sample was similar to ADA demographics although comparison data with ADA demographics was not provided, but rather the demographic data of respondents to the ADA compensation and benefits survey. In addition, the sample size was small (n=57) so it is difficult to justify how results could represent the

larger RD population. While the compensation and benefits demographics revealed 4% (n=408) of the population were male RDs, no males participated in the study. Demographics also revealed an underrepresentation of RDs with bachelor's degrees and an overrepresentation of RDs with masters and doctoral degrees. Therefore, the sample results could not be generalized to the national body of RDs.

The questionnaire development, functional food definition, as well as the perceptions and knowledge results, were debatable. Even though four experts in the functional food and herbal medicine fields validated the survey, Couch et al. did not describe their credentials or the method to validate the instrument. Consequently it is unknown if the experts were qualified or instrument validation methods were appropriate. The source of the definition supplied to participants was not cited. It may have been created for the survey or based on opinion rather than an authentic source. Further, the definition did not coincide with the available ADA definition published in 1999. Having provided a definition to respondents, Couch et al. did not measure perceived knowledge but rather how the participants applied and perceived the definition given. In addition, the survey focused primarily on whole fruits and vegetables, or those foods containing phytochemicals, all of which were considered one subcategory of functional food as outlined by the 1999 ADA position (18).

During the time of the two US studies being conducted, studies were also being developed internationally. The dietitians were being surveyed in Canada and Holland.

Canadian Study

In 1999, 238 dietitians were contacted from the Dietitians of Canada (DC) membership to determine their attitudes towards functional foods and nutraceuticals

(19). A panel of 12 randomly chosen dietitians developed and pretested the telephone survey. Potential respondents were mailed a description of the study, possible dates they might be contacted, and the Health Canada (HC) definition of functional foods. Two trained assistants telephoned participants and asked each person to complete a survey consisting of 32 qualitative questions. Sixty-three percent (n=151) completed the survey. Demographic data reported 53% (n=80) of respondents worked in a healthcare setting. Age, sex, race/ethnicity or education level of participants was not reported. Sixty percent (n=91) of dietitians agreed health claims should be permitted on food products, while 32% (n=47) disagreed, citing they were difficult for consumers to understand. Sixty-five percent (n=98) of participants agreed the public could benefit from functional foods.

Sheeshka et al. suggested the sample of dietitians represented the DC however a comparison was not made between official demographic data of Canadian dietitians and the sample. Further, demographic data was limited as age, ethnicity and education level results were not reported. Therefore, it is unclear if the study sample reflected the larger DC body.

While a random panel of 12 DC members developed and pretested the survey, it would have been more reliable for an independent group to pretest the survey, as panelists were already familiar with the content and questions. Other dietitians' feedback would have contributed to reliable pretesting. The 32-item questionnaire included the topics of both functional foods and nutraceuticals. Incorporating more than one topic and fewer questions yielded minimal results regarding dietitians' attitudes towards functional foods. Results would have been more valuable had the questionnaire focused on one topic. The survey encompassed qualitative questions, which provided in depth

subjective data from participants however the quality of data relied on researcher's interpretation of answers. Participants' responses were subject to interpretation at two points during this study; the first time when the trained assistants recorded participant's answers and the second time, when data was coded for analysis. While the results were indicative of Canadian dietitians' attitudes, they could not be quantified or generalized to the larger DC population.

The most recent international study was from Holland. Once again it was a national study, which researched dietitians and functional foods.

Holland Study

In March 2002, a random sample of 500 dietitians from the Dutch Register of Qualified Paramedics was contacted to determine dietitians' opinions about functional foods (20). It is unclear how the random sample was selected. Five nutrition professionals pretested a 62-question survey, which included a definition of functional foods. The mailed survey yielded 238 completed questionnaires for a response rate of 48%. The respondents' ages ranged from under 30 to 65 years old, and ethnicity and education were not reported. Seventy-seven percent (n=183) of participants worked in the healthcare industry. However this sample was not compared to the national dietetics population. De Jong et al. found that half of the sample (n=136, 57%) reported limited functional food knowledge while the other half (n=126, 53%) believed they were adequately knowledgeable to counsel clients about functional foods. The majority of dietitians (n=164, 69%) ate few or no functional foods however 63% (n=149) advised about functional food usage. Dietitians thought functional foods were "useful in specific circumstances," however "specific circumstances" were not described. They also

indicated that functional foods did not serve any general community interest and again, that was not detailed.

De Jong et al. pretested the survey using five nutrition professionals with credentials ranging from “nutrition scientists to practice dietitians” (20). No other details about the nutrition professionals’ expertise or knowledge of functional foods were provided. Additional information would have given credence to the instrument. The questionnaire supplied a working definition however the source of the definition and method for obtaining it were not described. Without knowledge of the definition’s origin the interpretation of the results is questionable. De Jong et al. reported results of Dutch dietitians’ perceived knowledge of functional foods however in actuality they measured perceived knowledge of the given functional food definition.

Summary of Literature Review

Four studies exposed a lack of information about dietitians’ knowledge and perceptions of functional foods. Holland and Canada have completed national studies with dietitians regarding functional foods however in the US, a national study has not been conducted, the only studies were limited to a particular state (Pennsylvania and Oregon). The US studies did not represent the larger population of RDs of the ADA. Three of the four studies investigated functional foods in addition to herbs or herbal medicine, nutraceuticals and nutrient supplements, and generated broad results. This may have confused participants, as the questionnaires were not focused in the general area of functional foods. A survey that focuses exclusively on functional foods would provide more comprehensive conclusions about RDs perceptions and attitudes of functional foods. Survey development included a panel or focus group to design, pilot or

validate the questionnaire in each study. However, researchers neglected to specify the credentials of the focus group participants. Such detailed information would make the instrumentation process more reliable. All studies provided a functional food definition to participants however only Sheeshka et al. (Canada) identified the source of their definition. It was difficult to know if the other definitions came from credible sources. Three of the four studies reported dietitians' perceived knowledge however did not indicate perceived knowledge results were limited to the definition provided in the survey. All four studies were completed in 2002 or earlier. While all four studies provided meaningful results, it is still unclear how RDs' define and perceive functional foods.

Conclusion

To accurately measure dietitians' perceptions of functional food, research would need to encompass all food products and provide multiple definitions from which dietitians could choose. Therefore, the purpose of this study is to investigate US RDs' perceptions, attitudes and practices regarding functional foods. Specifically, what functional food definition RDs' believe is correct, which foods they categorize as functional foods and if education level or geographic region influences their responses.

III. METHODOLOGY

Sample

A descriptive, cross-sectional study was conducted during the summer of 2009 to investigate RDs' perceptions, attitudes and practices regarding functional foods. Inclusion criteria were RDs who were not retired and resided in the US. Exclusion criteria were Dietetic Technicians Registered, RDs living outside of the US, and those that were retired. The Commission on Dietetic Registration (CDR), the credentialing agency for the American Dietetic Association, provided a random, national sample of 1,800 RDs based on the inclusion criteria. Prospective participants' names, addresses and email addresses were obtained through electronic mail (email). The Institutional Review Board of Florida International University along with CDR approved the study.

Instrument

The initial instrument was titled, "The Knowledge, Attitudes and Practices of Registered Dietitians' Regarding Functional Foods." Through the feedback of the pilot study and expert panelists, it was determined the variable was perceptions, and not knowledge. Therefore the title of the survey was modified to reflect perceptions, however the content and questions remained the same. The "Perceptions, Attitudes and Practices of Registered Dietitians Regarding Functional Foods" survey was a self-administered questionnaire consisting of 28 questions divided into five sections. Part one focused on perceptions and included three questions; part two examined attitudes about functional foods with seven questions; part three included two questions with an additional three contingency questions related to personal and professional practices; part four asked two

questions about nutrition information source with one contingency question; and part five collected demographics information through 10 questions (Appendix I).

The instrument was a modification of the two previous US questionnaires. The original survey from Holland was received however as it was written in Dutch, it could not be translated in sufficient time to incorporate into the survey (20). The original Canadian questionnaire was not obtained because access to the article did not occur until after study's survey was developed (19).

The Couch et al. survey was tested for face validity, and the survey developed by Lee et al. was tested for face and content validity (16,17) (Appendices II and III). Therefore, the current survey was based on previously validated questionnaires. The design, aesthetics and introductory directions were a modification of Couch et al., as well as the question format of the attitudes section, four attitudes questions, five demographics questions, and four self-reported practices questions. One demographic question and one question regarding past behaviors were modified from Lee et al. The remaining 13 questions were developed based on the literature review.

Perceptions Section

Part one of the questionnaire focused on perceptions and included three questions. Question one asked respondents to choose the best definition for functional foods from a list of six answers. The definitions were chosen to represent the national and international organizations and industries that have varied interests in functional foods. The sources for functional food definitions include ILSINA, FUFOSE, the ADA, the FNB, and the Japanese government. In addition to these five definitions, respondents had a sixth option, "I don't know" for RDs who did not know how to define a functional food.

The second question determined which food categories RDs thought would be functional foods. Respondents were able to select multiple food categories. The food categories based on the ADA definition included: “fortified products”, “enriched products,” and “unprocessed or natural products.” The other two categories, “herbal supplements” and “dietary supplements,” were added from an interpretation of “food components” from the ILSINA definition and “ingredients” from the FNB definition. The “I don’t know” option allowed participants to respond if they were unfamiliar with the functional foods. “None of the above” response was included in case participants did not agree with any of the food categories.

In question three, respondents identified foods they thought were functional from a list of 52 items. The foods were divided into eight categories. Six categories were based on the food groups of MyPyramid, grains, meat and beans, fruits, vegetables, milk, oils and fats (21). The other two categories, supplements, and vitamins and minerals, were interpreted from the ILSINA and FNB definitions. “I don’t know” was included for RDs who did not know about functional foods. A choice of “other” was also included. If participants chose “other,” they had the opportunity to write three foods they thought were functional and were not listed.

Attitudes Section

The second part initially included eight attitude statements about functional foods. The section was based on a review of literature, the Couch et al. questionnaire, the ADA definition and the ILSINA definition. Each RD rated each attitudinal statement quantitatively based on a five-point Likert scale, 1=strongly agree, 2=agree, 3=neutral,

4=disagree, and 5=strongly disagree. This scale specified the extent to which RDs agreed with each statement. The Likert scale was replicated from Couch et al.

Three of the eight attitudinal statements were reviewed and adapted from Couch et al. The first statement, “ Functional foods can be used to prevent disease and promote health” was changed to, “Functional foods are effective in preventing disease and promoting health.” The Couch et al. statement was interpreted to mean functional foods could generally prevent disease and promote health. The wording in the statement was changed to assert that functional foods produced a result of preventing disease and promoting health. “The use of functional foods improves health” was adapted to read, “Functional foods improve health.” The wording of “Functional foods should be integrated into the practice of medicine” was adjusted to “Functional foods should be included as part of a treatment plan for my patients/clients.” This statement was reworded to apply to the dietetics practice.

The five remaining attitude statements were based on the ADA and ILSINA definitions, and a literature review of Couch et al. and Lee et al. One attitudinal statement read, “All foods are functional,” and was adapted and abbreviated from the ADA definition. “All foods are functional at some physiological level...functional foods that include whole foods and fortified, enriched or enhanced foods have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels.” The fourth statement, “Functional foods provide benefit beyond basic nutrients,” was adapted and abbreviated from the ILSINA definition. Functional foods are “those that by virtue of physiologically active food components provide health benefits beyond basic nutrition.” The last three statements based on the literature review

were, “Functional foods are equal to medication,” “Herbs should be used as functional foods” and “Whole fruits and vegetables are the only functional foods.” The latter statement was removed due to a low reliability score.

Practices Section

The third part of the survey addressed RDs’ personal use of functional foods and professional recommendation to clientele in the past year. Two modified questions were included from Couch et al. and each question had additional contingency questions. The question, “Do you actively include functional foods into your diet in order to maintain or improve health?” was adjusted to, “Do you personally use functional foods?” The question was reworded for simplicity and to determine if RDs in general, personally used functional foods. If RDs responded yes, a contingency question then asked participants to list three functional foods they personally used. The second question from Couch et al. read, “Do you routinely recommend specific functional foods to your clients/patients in order to maintain or improve their health?” It was adapted to read, “Have you recommended functional food(s) to a client/patient in the past year?” This question was also reworded to simplify it and determine if RDs in general, recommended functional foods to clientele in the past year. If respondents answered yes, two contingency questions followed. The first contingency question asked why RDs had recommended functional foods: “Please indicate for what purpose(s) you have recommended functional food(s).” The answer options for the contingency question were adapted from Lee et al. and read: “maintenance of health”; “prevention of chronic disease”; “treatment of chronic disease”; and “treatment of acute disease.” The final contingency question of the attitudes

section asked RDs to identify three functional foods they had professionally recommended in the previous year.

Nutrition Information Source Section

Part four was about nutrition information sources and included two adjusted questions from Couch et al. and one contingency question. “Have you had any training to learn more about functional foods?” changed to “Please indicate where you have received your functional food information.” Answer options for this question included various sources as well as the option, “I have not received training on functional foods.” A question asked if respondents were interested in learning about functional foods. A contingency question from Couch et al. followed: “What is your preferred training or education format for complementary medicine?” The wording was modified to maintain the focus of the study on functional foods and read, “What is your preferred training or education format for learning about functional foods?”

Demographics Section

The fifth and final part of the survey regarded demographics and asked 10 questions. Four questions were replicated from the Couch et al. survey: “What is your age?”; “What is your gender?”; “What is your current employment status as a Registered Dietitian?”; “Which one of the following describes your work environment?” However, the answer options for the latter question were altered to include “food industry,” and “healthcare” changed to “clinical”. Two other questions were obtained and adapted from the same survey. The wording of “Which is the highest level of education you have completed?” had slight changes to read, “What is the highest level of education you have

completed?” One final demographics question was adapted from Lee et al.: “Is your ethnic identity: (followed by 5 options)” to “What is your ethnicity?”

Pilot Study

The questionnaire was designed to test the knowledge, attitudes and practices of Registered Dietitians regarding functional foods. A pilot test of the questionnaire was conducted at the April 21, 2009 meeting of the Broward Dietetic Association, Fort Lauderdale, FL. Fourteen RDs volunteered to participate in the pilot study to determine face and content validity of the questionnaire. They received the questionnaire plus an additional eight evaluation questions which dealt with the survey’s aesthetic appeal; the ease and readability of the survey; suggestions for changing, adding, or deleting any question; content or instructions; and the amount of time it took to complete the survey. Of the 14 who completed the survey, 12 answered the evaluation questions (Appendix IV); 11 indicated the survey read well; nine would not change or add anything; nine reported the wording to be easy to understand; and 11 thought it was aesthetically appealing. The 12 respondents spent an average of 10 minutes completing the survey. Five participants responded that question one was wordy. In evaluating that feedback, it was determined that abbreviating or summarizing the definitions would alter their meaning since the purpose of the question was to choose a definition. Therefore, no change was made to that question. One participant reported the instructions for question three were unclear. In the instructions for question three, an additional statement was added in bold and capitalized, “you may choose more than one answer in each category.”

The challenge to creating an answer key of the knowledge section of the survey was the absence of an official correct response for a definition of functional food,

functional food categories and functional food products. A panel of experts received the questionnaire via email in order to produce an answer key based on consensus from them of answers to each of the three knowledge questions.

Expert Panel

The nine expert panelists included an author from each US study, an author from the Holland study (Human Nutritionist for the Centre for Nutrition and Health, National Institute of Public Health and the Environment, the Netherlands), four academics from the Department of Dietetics and Nutrition at Florida International University (FIU) whose courses included the topic of functional foods; an RD employed at the International Food Information Council (IFIC) with previous experience in the development of a national consumer survey regarding functional foods; and an entrepreneurial RD and owner of a functional food company in Miami Dade County, Florida.

The survey, which the expert panelists received, included the original 28 questions, the same eight questions given to pilot study participants and two questions specific for the expert panelists (Appendix V). The panelists were asked to match each definition with associated functional food categories and functional foods to determine a correct answer for assessing knowledge when RDs returned the survey. Of the nine experts contacted, six completed the questionnaire: three FIU professors (two MS, one PhD), the RD from IFIC and two US authors from the Pennsylvania and Oregon studies.

Based on the feedback from the expert panel, the ADA definition in question one was changed to reflect the most current definition, which was updated and published in the April 2009 Position of the American Dietetic Association: Functional Foods (5). Another expert panelist suggested changing the instructions of a question that asked RDs

their preferred training or education format to learn about functional foods. Initially RDs were instructed to select one answer and the question was altered to allow multiple responses.

Three of the expert panelists did not understand the purpose and instructions of the two expert questions and did not complete them. One panelist reported the FNB definition was “too vague” to select associated food categories and foods. The same panelist also asserted that supplements were not foods and did not associate them with any of the definitions. Another panelist did not complete the expert questions, and still another indicated she could not answer the questions at all. Each panelist answered the two expert questions differently and so the results could not be aggregated to form knowledge answers. It was determined that perceptions were being assessed because the accuracy of RDs’ responses could not be evaluated. Therefore, the title of the survey was changed to “The Perceptions, Attitudes and Practices of Registered Dietitians Regarding Functional Foods” and replaced the original title, “The Knowledge, Attitudes and Practices of Registered Dietitians Regarding Functional Foods”.

Based on pilot test respondents and expert panelists, the reliability and consistency were assessed using the Statistical Package for the Social Sciences for Windows (version 15.0, 2006, SPSS, Inc. Chicago, IL). Cronbach’s alphas were calculated for questions two and three (.94), and questions four through 11 (.69) of the pilot study. When questions four through 11 were analyzed, question seven “Whole fruits and vegetables are the only functional foods,” did not fit with the remaining questions. It was removed, thereby raising the Cronbach’s alpha score (.79). No reliability measures were calculated for questions 11 through 28 since they had incompatible scales or were

demographic questions. The interrater reliability of the six experts of the entire questionnaire was .88. At the end of the instrumentation process, the final questionnaire included five sections with 28 questions.

Data Collection

Data collection occurred from mid-Summer thru mid-Fall 2009. A packet was mailed on July 17, 2009 through the bulk rate mail of the United States Postal Service to each of the 1,800 RDs. The mail packets included a consent form (Appendix VI) describing the study, the questionnaire (Appendix I), and a self-addressed, stamped return envelope. Potential respondents received the typed consent form that indicated an August 3, 2009 deadline to return the survey. However it was realized after materials were printed, bulk mail could take up to two weeks to reach participants. It was thought recipients would discard the questionnaire with a deadline of August 3, 2009. The decided solution was to use a red stamp indicating an extended deadline of August 18, 2009 to give respondents time to return the survey. On July 31, 2009, two weeks after the initial mailing, a postcard was mailed to subjects as a reminder to complete and return the questionnaire.

In response to a large number of invalid mailing addresses, an email was sent to those potential respondents on September 14, 2009 (Appendix VII). The email contained two electronic attachments: an interactive PDF version of the questionnaire and a PDF of the consent form. These participants were asked to complete the questionnaire by September 25, 2009 and were given the option to return the questionnaire through email or US Postal Service at their own expense. Once the survey was returned via email, the document was downloaded and saved with an identifying number to maintain anonymity.

On September 25, 2009, a reminder email was sent to everyone, with the exception of those who had received the previous email (Appendix VIII). The email excluded those 93 individuals who had previously been contacted on September 14, 2009. If an individual requested another copy of the survey (due to loss or misplacement), the electronic version of the questionnaire and consent form was sent in a follow-up email. It was requested that materials be returned as soon as possible as data collection efforts ceased October 31, 2009.

Statistical Analyses

The power for the study was determined by G-Power software (Version 3.0.10, 2007, Germany) (22). To obtain 95% power for the chi-square tests for a medium effect size ($\omega=.3$) a sample size of 342 was sufficient. The sample size was increased by 10% (376) to allow for non-responses or incomplete questionnaires.

The data were analyzed with SPSS for Windows (version 15.0, 2006, SPSS, Inc. Chicago, IL). Frequencies and percentages were calculated for all responses to the survey. Chi-square tests were used to compare the responses of participants by education level and by US census practice region. Chi-square goodness-of-fit tests were performed to compare this sample to the national breakdown of gender, education and ethnicity. One-way ANOVAs determined the differences of attitudes in questions 4 – 10 by reported education level and by US census region of practice. Tests were statistically significant if $p < .05$.

IV. RESULTS

Of the 1,800 mailed surveys, 390 were returned via USPS (n=353, 91.7%) and email (n=32, 8%). Five of the returned surveys were not completed. Therefore 385 surveys were usable resulting in a 22% response rate.

Demographic Characteristics

Respondents were from 46 states, which represented all four census regions of the US (Table 1) (23). The majority of respondents were White (n=347, 90.1%), women (n=368, 95.6%), 46 years or older (n=206, 53.5%), who had earned a master's degree (n=204, 53.1%) (Table 1). The RDs with PhDs were older (46 – 65 years old) than those with a bachelor's or master's degree (36 – 55 years old). Ninety-five percent of RDs were working. The highest percentage (41%) of RDs worked in clinical practice. Many of the RDs who responded lived in either the midwestern (n=119, 32.5%) or southern (n=103, 28.1%) regions of the US.

When compared to the national RD population, the sample did not differ significantly for gender ($p=.844$), ethnicity ($p=.174$) or US census practice region ($p=.938$). The education level of the respondents was significantly different than the national sample ($p<.001$). The percentage of RDs with a bachelor's degree in this study was 40%, whereas the national population was 96.4%. More RDs had master's degrees (53.1%) or doctoral degrees (6.0%) than the national population (2.8% and 0.7%, respectively).

Perceptions

Of the five proposed definitions, the ILSINA definition was the most selected (n=129, 33.5%) regardless of education level or region where RDs practiced (Tables

2,3,4). The least selected was the Japanese definition (n=7, 1.8%) (Table 2). For RDs with a bachelor's or master's degree, the second choice for a functional food definition was the FNB (Table 3). The same was true for RDs from the midwestern, southern and western regions of the US (Table 4). Registered Dietitians with doctoral degrees equally selected the FUFOSE and ADA definitions as their second choice.

The majority of RDs chose fortified food products (n=292, 75.8%), enriched food products (n=248, 64.4%) and unprocessed, or natural foods (n=230, 59.7%) as food categories they perceived to be functional (Figure 1). The least chosen food category was herbal supplements (n=72, 18.7%). The RDs' perceptions regarding food categories did not differ significantly with education level or region of practice.

In terms of individual foods of the 52-food list, the five most selected food items were yogurt with probiotics, eggs with omega-3 fatty acids, olive oil with omega-3 fatty acids, margarine with plant stanols and sterols and orange juice with calcium (Table 5). Eggs with omega-3 fatty acids were the most chosen by RDs with doctoral degrees whereas participants with a bachelor's or master's degree chose yogurt with probiotics. However RDs from all four regions identified yogurt with probiotics the most.

In the grains group, the majority of participants selected old fashioned oatmeal (n=258, 67.0%) (Table 5). Approximately 10 times more RDs chose a chocolate chip cookie with fiber (n=218, 56.6%) than the regular chocolate cookie (n=21, 5.7%) or low-fat chocolate chip cookie (n=28, 7.3%). Fewer RDs chose low-calorie bread (n=38, 9.9%) than multigrain bread (n=207, 53.8%).

Salmon (n=239, 62.1%) was identified as a functional food by more RDs than any other animal protein (Table 5). Less than 20% of RDs selected chicken (n=75, 19.5%) or

ground beef (n=64, 16.6%) and the least chosen item of the meat and beans group was ground beef.

In the fruit group, fortified juices were chosen more than non-fortified juices (Table 5). However respondents chose cranberry juice (n=193, 50.1%) and cranberry juice with pomegranate (n=225, 58.4%) equally. Of the tomato food products, RDs preferred ketchup (n=78, 20.3%) less than tomatoes (n=215, 55.8%).

Registered Dietitians viewed soybean products and soybeans similarly and were chosen the most out of all the vegetables. Half of the respondents thought avocados (n=194, 50.4%) were a functional food however only 30% perceived guacamole (n=119, 30.9%) as a functional food.

Of the six available options in the fat and oil, and milk groups, the fortified food products were selected by the most RDs. Approximately 35% more dietitians identified olive oil with omega-3 fatty acids (n=315, 81.8%) as a functional food than regular olive oil (n=184, 47.8%). Margarine with plant stanols and sterols was selected 10 times more than regular margarine. Yogurt with probiotics was also chosen as a functional food by 50% more RDs than regular yogurt.

In the supplements category flaxseed oil and fish oil were identified by nearly half of participants as functional foods (Table 6). All five vitamins and minerals were selected by less than 35% of RDs.

Of the 52-food list, RDs with a bachelor's (n=140, 89.2%) or a master's (n=179, 87.7%) degree identified yogurt with probiotics the most as a functional food while RDs with doctoral degrees (n=20, 87.0%) selected eggs with omega 3 fatty acids. Yogurt with

probiotics was also identified the most by RDs in the northeast (n=69, 85.2%), midwest (n=102, 85.7%), south (n=93, 90.3%) and western (n=56, 88.9%) regions of the US.

Attitudes

When agreed and strongly agreed were aggregated, nearly 75% (n=282, 73.2%) of RDs regarded functional foods as effective in disease prevention and health promotion (Figure 2). Registered Dietitians did not accept all foods as functional foods, with nearly 25% who were neutral and over 40% who disagreed or strongly disagreed with the statement (Figure 3). The majority of RDs (n=311, 80.8%) concurred that functional foods improve health with only 3.1% (n=12) who disagreed and none that strongly disagreed (Figure 4). Less than 5% (n=12, 3.1%) of dietitians did not agree that functional food provided benefit beyond basic nutrients, and less than 15% were neutral (Figure 5). Over 60% of RDs concurred that functional foods should be a part of patient/client's treatment plans (Figure 6). Nearly half of RDs disagreed (n=140, 36.4%) or strongly disagreed (n=51, 13.2%) that functional foods were equal to medication (Figure 7). Registered Dietitians were either neutral (n=160, 41.6%) or disagreed (n=145, 37.7%) that herbs were functional foods (Figure 8).

A significantly lower percent of RDs with doctoral degrees agreed that, functional foods should be a part of treatment plans for patients ($p<.004$) (Table 7). A significantly less percent of RDs from the northeast agreed that functional foods improve health ($p=.002$) (Table 8). The percent of RDs from the northeast (n=51, 64.5%) who agreed that functional foods improve health, was significantly less than those RDs from the midwest (n=87, 74.4%), south (n=73, 72.3%) and western (n=45, 75.0%) regions ($p<.001$).

Practices

Three-quarters of RDs personally used functional foods and over half professionally recommended them to clients in the past year (Table 9). Registered Dietitians who earned a master's degree (n=161, 79.7%) personally used functional foods more than RDs with bachelor's degrees (n=114, 73.1%) or PhD RDs (n=14, 60.9%). Fewer PhD RDs (n=8, 36.4%) had professionally recommended functional foods in the past year than those with a master's (n=127, 63.8%) or bachelor's degree (n=96, 62.3%). With regards to the region of practice, personal use and professional recommendation were similar among dietitians.

When asked which functional food they specifically consumed, fruit (n=138, 48.4%) was identified the most (Table 10). Yogurt products (n=77, 20.0%) were the most professionally recommended to clientele in the past year. The written responses for each question regarding functional foods personally used and professionally recommended were categorized into similar food products. For example, blueberries, apples and oranges were recognized as fruit. Kefir, regular yogurt and yogurt with probiotics were identified as yogurt products.

Of the four reasons for recommending a functional food to clientele, maintenance of good health (n=175, 45.5%) was predominant (Table 11). The PhD RDs (n=2, 8.7%) recommended functional foods to treat chronic disease significantly less than those with a master's degree (n=72, 35.3%) or bachelor's degree (n=49, 31.2%), ($p=.033$) (Table 12). Region of practice did not influence dietitians' purpose for recommending functional foods to clientele (Table 13).

Nutrition Information Source

Registered Dietitians mainly received their information from attending a professional conference (n=115, 29.9%) (Table 14). Over 25% did not receive training about functional foods (n=104, 27.0%). One hundred and eight (28%) respondents learned of functional foods from a peer-reviewed journal and 78 (72%) of those identified another source. Sixty-six (85%) of the 78 indicated the Journal of the American Dietetic Association as their journal source. Of those 78, only 14 (21.2%) chose the ADA definition as the best definition of functional food.

The majority of RDs (n=353, 92.9%) indicated an interest in learning about functional foods. Registered Dietitians did not prefer a specific format to learn about functional foods (Figure 9).

V. DISCUSSION

Functional foods are an emerging industry and controversial topic however it is clear definition what constitutes a functional food (4,5,6,7,8,9). Food and nutrition authorities have different perspectives and missions that have guided the development of their definition for functional foods. Few studies have explored RDs' understanding of functional foods (16,17,18,19). This study investigated RDs' perceptions, attitudes and practices regarding functional foods and currently it seems there are inconsistencies among RDs about functional foods.

Demographics

The sample represented the national population. The majority of respondents were White women, 46 years or older and had earned a bachelor's or master's degree. Over 40% of dietitians were employed in a clinical setting and 60% practiced in the midwest and southern regions. A smaller percentage practiced in the northeast and western regions, however when demographics were compared to self-reported data from CDR, the sample represented the national population regarding US census region of practice, gender and ethnicity. However there were differences among educational levels. Registered Dietitians with bachelor's degrees (40.9%) were under-represented in this sample compared to 96.4% in the CDR population. Registered Dietitians with master's (53.1%) and doctoral degrees (6.0%) were over-represented compared to the national population, 2.8% and 0.7%, respectively. Couch et al. found similar results (17). It is possible a larger number of RDs with graduate degrees responded because the survey indicated it was for the thesis research of a master's student. Additionally, most of the PhD RDs worked in an educational institution and likely oversaw research for master's

students. Respondents may have empathized and understood the importance of a high response rate. Regardless of educational level, nearly 75% of RDs had not previously learned about functional foods. Therefore, those RDs who responded may have been interested in learning about functional foods. This finding is reasonable since functional foods were conceptualized in the early 1990s, and the majority of participants were over 45 years of age (1,2,3).

Perceptions

Previous research studied dietitians' understanding of functional foods, however provided one definition at the beginning of the questionnaire (16,17,19,20). The definitions were based on the perceptions of the focus groups, not food and nutrition authorities. Therefore, this limited the results because the definition was not officially sanctioned. The current study differentiated itself by providing a variety of definitions from food and nutrition authorities to respondents, and then asked them to choose the definition that best defined a functional food.

Results revealed there was no consensus among RDs about a functional food definition. While RDs preferred the ILSINA definition, there were minimal differences between definitions (Table 2). Therefore it is not possible to make conclusions about how RDs define functional foods although it does demonstrate the variety of perceptions held by RDs. The inherent "wordiness" of the definition question may have contributed to the first definition (ILSINA) being selected the most as Fowler pointed out, a wordy question is difficult for respondents to complete (24). The Japanese definition was perceived as the least plausible functional food definition. When responses were analyzed according to education degree or region of practice, there was no difference within each definition.

Therefore, the degree and region of practice did not appear to influence the choice of definition.

The majority of RDs considered fortified food products, enriched food products and unprocessed or natural food products to be functional foods. Fewer dietitians chose both dietary and herbal supplements. Thus RDs considered foods, and not supplements, as functional foods. This notion coincides with dietitians' underlying principle that the "best nutrition-based strategy" to maintain health, results from getting nutrients from food rather than supplements (25,26). Although RDs chose the three food categories reflected in the ADA definition, fewer RDs chose the actual ADA definition. Rather, RDs selected the ILSINA definition, which used non-specific language and did not specify food categories but mentioned "food components."

When RDs were asked to choose which foods were functional from a list of 52 different foods, they selected fortified foods more than other foods. This finding supports RDs' choice of fortified food products as a functional food category. Registered Dietitians consistently chose fortified foods. Of the ten most selected functional foods, six of them were fortified and the remaining four were whole or unprocessed foods. Unfortunately enriched foods were not included in the survey and so it cannot be determined if dietitians would have chosen them.

The three most identified functional foods in the grains group were old-fashioned oatmeal, multigrain bread and the chocolate chip cookie with fiber. Dietitians also selected the chocolate chip cookie with fiber more than the other types of chocolate chip cookies. The low-fat chocolate chip cookie and regular chocolate chip cookie were chosen equally, by less than a tenth of RDs. Multigrain bread was chosen five times more

by dietitians than the low-calorie bread. Of the hot cereals, old-fashioned oatmeal was selected by twice as many RDs than were instant oatmeal and three times more than cream of wheat. The chocolate chip cookie with fiber, old-fashioned oatmeal and multigrain bread all provide fiber, which has been associated with improving bowel function and lowering the risk for cardiovascular disease risk, cancer and diabetes (27). Therefore, it seems dietitians perceived foods with added components, specifically fiber, as functional foods although they did not view a food with lower fat or kilocalorie content as a functional food.

Close to two-thirds of RDs considered salmon as a functional food. Salmon was also the most selected food of the flesh protein options. Eggs with omega-3 fatty acids were chosen by RDs three times more than regular eggs and were the most identified functional food in the meat and beans group. Both foods are naturally or fortified with omega-3 fatty acids and it could be the majority of RDs considered them functional foods because research which has indicated omega-3 fatty acids may lower heart disease and stroke risk (28,29). Also, the selection of salmon and eggs with omega-3 fatty acids correspond with dietitians' perception of fortified and whole or unprocessed foods as functional foods. Ground beef was perceived as the least functional food and this might be credited to the numerous public health alerts and reports foodborne illness in the past few years (30).

In the fruit group, less than a quarter of RDs considered ketchup as a functional food while over half of participants perceived a tomato as a functional food. Registered Dietitians also chose fortified fruit juices more than non-fortified juices. Further, orange juice with calcium was selected slightly more than blueberries, and identified by the most

dietitians as a functional food in the fruit group. These findings were previously indicated when RDs' selected fortified food products more than whole or unprocessed food products. Therefore, it is reasonable that blueberries were selected less than orange juice with calcium, and that tomatoes were selected more than ketchup, as it is a processed food product. It was thought RDs would select ketchup and tomatoes similarly as both contain lycopene, the bioactive compound associated with lowering risk of cancer and cardiovascular disease (31,32). Ketchup bottles even advertise lycopene, however other studies have indicated dietitians do not trust or believe functional food claims (17,19).

When avocados were compared with guacamole, avocados were identified by more RDs as a functional food. Soybeans were selected by more RDs than soybean products and were the most selected functional food in the vegetable group. These findings coincide with RDs' perceptions of whole or unprocessed foods as more functional than processed items. Interestingly, PhD RDs selected soybeans and soybean products 10% more than RDs with bachelors and master's degrees. Soybeans and soybean products are commonly used to treat peri and post-menopausal symptoms (33,34). Since PhDs were in an age bracket closer to menopausal age, the difference in perceptions is reasonable.

In the oils and fats group, a large difference in perception was found between regular margarine and margarine with plant stanols and sterols. The same was true for regular olive oil and olive oil with omega-3 fatty acids. More dietitians selected the food products with added components, plant stanols and sterols, and omega-3 fatty acids, than the non-fortified food products. Registered Dietitians again affirmed their perception that fortified food products are functional foods. The products appeal increased with the

addition of the components, which likely relates to their associated health benefits. Research has shown the addition of plant stanols and sterols into the diet can lower low-density lipoprotein cholesterol levels, and omega-3 fatty acids have been linked to lower risk of cardiovascular disease and stroke (27,28,35,36).

Of the two food products in the milk group, twice as many dietitians selected yogurt with probiotics than regular yogurt. Yogurt with probiotics was also the single most selected functional food from the 52-item food list. The addition of probiotics increased the perceived value of yogurt, which may relate to the claims to improve “intestinal integrity” (37,38). This finding maintains RDs identified fortified food products as functional foods.

Fewer RDs selected fish oil than salmon, a fatty fish with naturally occurring fish oil. Both items contain omega-3 fatty acids. A glucosamine supplement was chosen by just over 20%, whereas orange juice with added glucosamine was selected three times more by RDs as a functional food. Almost half of the dietitians chose dietary fiber as a functional food whereas old-fashioned oatmeal, which has a high fiber content, was selected by over 65% of RDs. Foods were selected more than supplements, which probably results from RDs’ belief that it is more healthful to receive nutrients from foods than through supplementation (25,26). Therefore, RDs perceived foods as more functional than supplements.

Few differences were found among dietitians’ selection of vitamins and minerals. Calcium and vitamin D was chosen most however the other vitamin and mineral options were selected similarly by RDs. Therefore, dietitians perceived the five vitamins and

minerals equally as functional foods, and reiterates RDs' preference for food over supplements.

While RDs did not reach a consensus regarding a functional food definition, results repeatedly support RDs' perception of fortified foods as functional foods. Respondents identified fortified food products more than other food categories, and RDs' responses to the 52-food list confirmed fortified foods were perceived as functional foods. Furthermore, fortified foods were perceived to be more functional than non-fortified foods, and foods were selected more as functional foods than supplements, including vitamins or minerals.

Attitudes

Nearly three-quarters of respondents strongly agreed or agreed that "Functional foods are effective in preventing disease and promoting health" and no respondents strongly disagreed. A similar statement read, "Functional foods improve health" and as thought, RDs responded similarly with close to 70% who strongly agreed or agreed. Other research has shown dietitians agree with similar attitudinal statements (16,17). The ADA describes RDs as "the professionals who are trained to help people achieve health by 'eating right'" (38). It could be that RDs agreed with both statements because each identified the fundamental relationship between food and health. The majority of RDs strongly agreed or agreed that functional foods should be included as part of a treatment plan for clientele, and this is reasonable since RDs agreed functional foods improved and promoted health, and prevented disease. However this conclusion cannot be entirely true because it assumes RDs would agree all foods to be functional. On the contrary, nearly half of dietitians strongly disagreed or disagreed that all foods were functional. There is

an inconsistency in RDs' responses because this last statement had similar phrasing to the ADA definition, which was chosen by less than 20% of RDs. Although when RDs identified functional food categories, they selected the three food categories listed within the ADA definition. This finding may again result from the wordy nature of the definition question. Just over 80% of dietitians strongly agreed or agreed, "Functional foods provide benefit beyond basic nutrients." This response was expected as the attitudinal statement exhibited similar language to the ILSINA definition, which was the most selected functional food definition by dietitians. Registered Dietitians agreed less with the statement, "Functional foods are equal to medication." While food is viewed as the body's medicine in some cultures, there is a strong line of delineation between food and medicine in the US (8). Registered Dietitians support the use of food to maintain a healthy lifestyle and medication, by the US standards, is outside the scope of dietetics (25,26,39). "Herbs should be used as functional foods" yielded a similar response, which corresponds with fewer RDs selection of herbal supplements in the 52-food list.

Educational level and region of practice did not yield significant differences in responses. Although PhD RDs agreed less that functional foods should be included as part of a treatment plan for patients/clients. This may relate to the majority of PhD RDs working in an education institution and not working in a counseling capacity to recommend functional foods.

Registered Dietitians were more likely to agree with statements that dealt with functional foods and their relationship to health, as opposed to statements regarding functional foods and medication or herbs. This may again result from dietitians supporting food to maintain a healthy lifestyle (38).

Practices

Over three-quarters of the respondents personally used functional foods in their diet, while closer to 60% professionally recommended them to clientele in the past year. Couch et al. reported similar findings with 58% who personally used functional foods and less than 30% of the RDs who recommended them (17). While the difference between personal use and professional recommendation by RDs was not explored in this study, it could have been RDs were not confident in their knowledge of functional food as Couch et al. found, or that there was inadequate proof of functional foods' efficacy as de Jong et al. found (17,20).

It was thought RDs from the western region would personally use and professionally recommend functional foods more than other regions, however all regions responded in the same way; more RDs personally used functional foods than professionally recommended them. Lee et al. found the majority of dietitians in Oregon used functional foods and a higher percentage professionally recommended them (16). It was suggested dietitians accepted functional foods more in Oregon because naturopathic doctors were legal in state and dietitians were more accustomed to alternative therapies. Educational level revealed fewer PhD RDs personally ate or professionally recommended functional foods in the past year, than RDs with a master's degree or bachelor's degree. This may result from PhD RDs being older than other RDs in the sample, the least likely to have learned about functional foods in university and the most likely to work in an education institution where counseling may not be a part of their occupation.

Yogurt products were the most professionally recommended food in the past year was yogurt products. The most selected functional food of the 52-food list was also a

yogurt product, yogurt with probiotics. These findings are consistent with other studies that found yogurt as the most accepted functional food (1,12,40,41). Registered Dietitians identified whole fruit as the most personally used functional food. Yet in the perceptions section, RDs selected fortified juices more than whole fruit. It could be that RDs understand functional foods to be fortified food products but not necessarily trust that those fortified products are healthier than whole fruits. Nearly half of RDs indicated “maintenance of good health” as their purpose for professionally recommending functional foods to clientele in the past year. This likely relates again to RDs’ description as the health professionals who help others achieve optimal health by “eating right” (38).

Results of RDs’ practices demonstrate that the majority of dietitians personally used functional foods. Fewer RDs had professionally recommended them in the past year and if they did, it was mainly for “maintenance of good health.” This finding probably indicates RDs lack of confidence in functional foods or possibly a lack of confidence in their personal knowledge of functional foods as Couch et al. found (17).

Nutrition Information Source

A professional conference was identified as the predominant functional food information source, followed by a peer-reviewed journal. Seventeen percent (n=66) of respondents learned about functional foods from the Journal of the American Dietetic Association (JADA). Interestingly, less than a quarter of those 66 selected the ADA definition. Further, among those who identified learning about functional foods from a journal, no significant differences were found between those who cited JADA, another journal, or did not provide a journal title. Therefore there was no difference if a respondent had learned about functional foods from JADA or another peer-reviewed

journal in selecting a functional food definition. Although less than 30% did not have previous training on functional foods, more than 90% of RDs responded they would like to learn more. Other studies have yielded similar results (16,17,20).

Research Questions

Which functional food definition does the majority of RDs believe is correct? A majority of RDs did not select any one functional food definition. The ILSINA definition was selected by a third of dietitians.

What foods do RDs categorize and define as functional foods? Over three-quarters of RDs identified fortified foods as functional foods among the five food categories. This finding was confirmed again with results of the 52-food list. The five most selected functional foods were all fortified foods and were chosen by nearly 75% of RDs.

Does educational level of RDs influence their functional food perceptions, attitudes and practices? Education level did not yield major differences in the way the sample of RDs responded to questions. Registered Dietitians' perceptions of functional foods were similar regardless of education level. Two statically significant differences were found among attitudes, practices and education level. Registered Dietitians with doctoral degrees agreed less that functional foods should be a part of treatment for patients/clients ($p<.004$), and PhD RDs also recommended them less to clientele ($p=.003$).

Does the geographic region where RDs practice influence their functional food perceptions, attitudes and practices? Region of practice influenced RDs' perceptions, attitudes and practices less than education level. No statistically significant differences

were identified among region of practice and RDs' perceptions or practices regarding functional foods. Only one significant difference was found among attitudes and region of practice. The northeastern region agreed less that functional foods improve health ($p<.05$).

Limitations

The current study obtained a 22% ($n=385$) response rate and determined RDs' perceptions, attitudes and practices of functional foods. Other comparable studies achieved 48% ($n=238$), 57% ($n=57$), 63% ($n=151$), and 86% ($n=162$) response rates (16,17,19,20). A few possibilities might have altered the number of responses. The initial mailing was sent out during the summer, when many professionals are on vacation. Registered Dietitians may have opened the survey after the return deadline and discarded it. Several factors affected email communication: subjects were not notified prior to the email; they may have regarded it as junk mail and ignored it; the email may have been distributed to the recipient's spam box; or the intended recipient received it after the proposed deadline and disregarded it. A greater response rate might have been acquired if the instrument was mailed during another time of year, a notice of a future email correspondence was communicated to prospective participants, or an incentive offered for the completion of the survey.

The 52-item food list in the survey instrument was limited as a few of the food groups contained an inadequate number of items. This was true for the milk group, which included only two products, as well as oils and fats, which had four items. However the reason for the limited number of items within the 52-food list was to limit the length of the questionnaire as well as the number of foods within the food list. In the fruit group,

two out of the eight options were whole fruits. It would have been more effective to offer more of a variety of foods within each category. In addition, food categories between questions two and three were inconsistent. The 52-item list did not include enriched products. Results would have been strengthened had enriched food products been included as it was a potential functional food category in question two. Dietary supplements and herbal supplements were also listed as potential functional food categories, however in the 52-item list of question three, supplements, and vitamins and minerals, were the only available groups. It would have been more valuable to differentiate between dietary supplements and herbal supplements in question three.

Recommendations

Recommendations to advance RDs' understanding of functional foods are many. It would be beneficial to offer web course for continuing professional education credits (CPE) to enable learning about functional foods from home. The ADA could offer a session about functional foods at the annual Food and Nutrition Conference and Expo. The Commission on Accreditation for Dietetics Education could require an education component for foundation knowledge within the didactic curriculum content. Being that the ADA is the "world's largest organization of food and nutrition professionals," it would be ideal to lead the collaboration with other food and nutrition authorities to gain a consensus of a functional food definition (39).

Future Research

Future research opportunities might involve a web-based survey with close-ended and open-ended questions. Further, one might test the knowledge of RDs and focus on

the lack of a universal definition, FDA regulations, functional food labeling and/or the food industry's intentions with marketing and nutrigenomics.

Conclusion

Registered Dietitians revealed inconsistencies between their perceptions, attitudes and practices regarding functional foods. This indicates a need for professional education and training. While dietitians lacked agreement on a functional food definition, they consistently identified fortified foods as functional foods. Registered Dietitians agreed functional foods should be a part of a treatment plan for clientele, yet more RDs personally used functional foods than professionally recommended them. These findings probably indicate that RDs are uncertain of functional foods, which can be attributed to the lack of a universal functional food definition among food and nutrition authorities. This presents a significant challenge for RDs to gain knowledge and provide accurate information to the public. Even though functional foods are an ill-defined term, RDs are the nutrition experts and must be knowledgeable and cognizant of the issues surrounding them as their popularity continues to rise, parallel to healthcare costs (4).

Table 1. Demographic characteristics of respondents who completed a national survey: perceptions, attitudes and practices of Registered Dietitians regarding functional foods (n=385)

Demographics		n	%
Age	25 and younger	14	3.6%
	26 – 35 years old	85	22.1%
	36 – 45 years old	77	20.0%
	46 – 55 years old	127	33.0%
	56 – 65 years old	69	17.9%
	66 + years old	10	2.6%
	No Answer	3	0.8%
Gender	Women	368	95.6%
	Men	14	3.7%
	No Answer	3	0.8%
Education Level	Bachelor's Degree	157	40.9%
	Master's Degree	204	53.1%
	Doctoral Degree	23	6.0%
	No Answer	1	0.3%
Race/Ethnicity	Asian/Pacific Islander	13	3.4%
	Black/African American	8	2.1%
	Hispanic/Latino	9	2.3%
	White/Caucasian	347	90.1%
	Other	3	0.8%
	No Answer	5	1.3%
Employment Status	Full Time (40 hrs \leq per wk)	210	54.5%
	Part Time (< 40 hrs per wk)	117	30.4%
	Unemployed	11	2.9%
	Not Currently Working as an RD	39	10.1%
	No Answer	8	2.1%
Work Environment	Community-Based Organization	46	11.9%
	Education Institution	35	9.1%
	Clinical	160	41.6%
	Private Practice	31	8.1%
	Government	30	7.8%
	Food Industry	8	2.1%
	Other	56	14.5%
	No Answer	19	4.9%
Practice Region ^a	Northeast	81	22.1%
	Midwest	119	32.5%
	South	103	28.1%
	West	63	17.2%
	No Answer	19	4.9%

^a Based on Census Region and Divisions of the United States

Table 2. Registered Dietitians who either selected one of five functional food definitions or “I don’t know”

Organization	Definition	n	%
International Life Sciences of North America (ILSINA)	Functional foods are “those that by virtue of physiologically active food components provide health benefits beyond basic nutrition.”	129	33.5%
Food and Nutrition Board - Institute of Medicine (FNB)	Functional foods are “those foods that encompass potentially healthful products including any modified food or ingredient that may provide a health benefit beyond the traditional nutrients it contains.”	86	22.3%
Functional Food Science in Europe (FUFOSE)	Functional foods are those that have “satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease.”	69	17.9%
American Dietetic Association (ADA)	“All foods are functional at some physiological level...functional foods that include whole foods and fortified, enriched or enhanced foods have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels.”	68	17.7%
I don’t know		26	6.8%
Government of Japan	Foods that are “composed of functional ingredients that affect the structure and/or function of the body and are used to maintain or regulate specific health conditions.”	7	1.8%

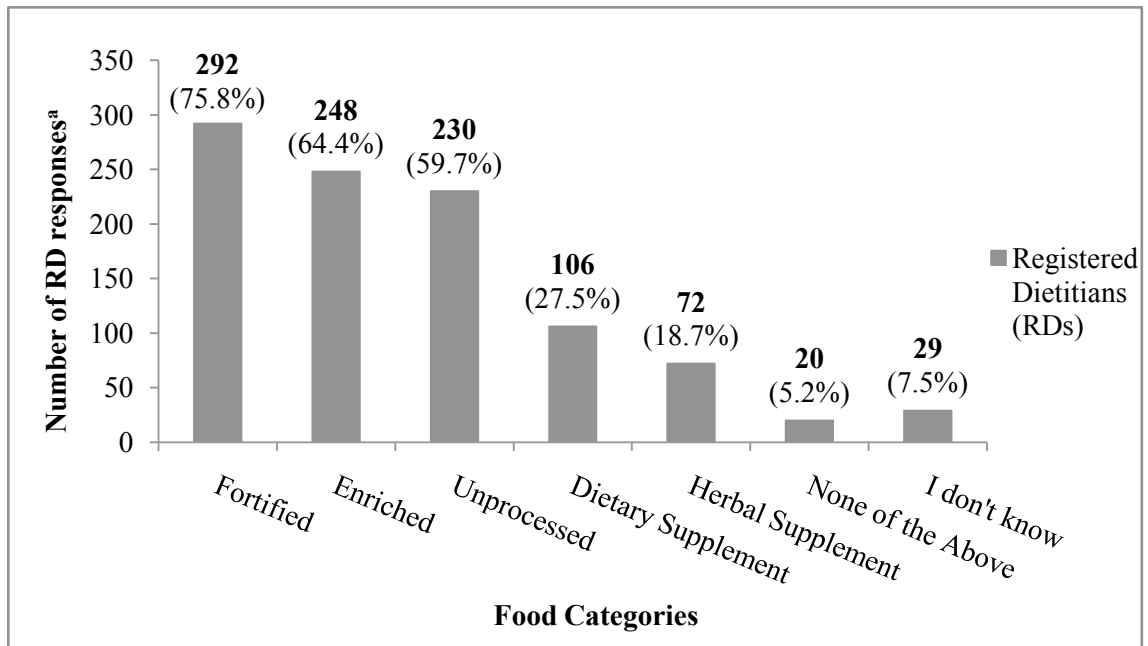
Table 3. Definition choices of Registered Dietitians according to their education

Organization	Bachelors		Masters		Doctoral	
	n	%	n	%	n	%
International Life Sciences of North America (ILSINA)	58	36.9%	65	31.9%	6	26.1%
Functional Food Science in Europe (FUFOSE)	27	17.2%	37	18.1%	5	21.7%
Food and Nutrition Board - Institute of Medicine (FNB)	32	20.4%	49	24.0%	4	17.4%
American Dietetic Association (ADA)	26	16.6%	37	18.1%	5	21.7%
Government of Japan	4	2.5%	3	1.5%	0	0%
I don't know	10	6.4%	13	6.4%	3	13.0%

Table 4. Definition choices of Registered Dietitians based on the region where they practiced ^a

Organization	Northeast		Midwest		South		West	
	n	%	n	%	n	%	n	%
International Life Sciences of North America (ILSINA)	23	28.4%	43	36.1%	33	32.0%	22	34.9%
Functional Food Science in Europe (FUFOSE)	19	23.5%	20	16.8%	20	19.4%	9	14.3%
Food and Nutrition Board - Institute of Medicine (FNB)	16	19.8%	24	20.2%	25	24.3%	15	23.8%
American Dietetic Association (ADA)	18	22.2%	22	18.5%	14	13.6%	12	19.0%
Government of Japan	0	0%	3	2.5%	3	2.9%	1	1.6%
I don't know	5	6.2%	7	5.9%	8	7.8%	4	6.3%

^a Census Regions and Divisions of the United States



^a multiple responses

Figure 1. Food categories Registered Dietitians considered functional foods

Table 5. Foods Registered Dietitians selected as functional foods MyPyramid food groups ^a

Food Group	Food	n	%
Grains	Old Fashioned Oatmeal	258	67.0%
	Chocolate Chip Cookie with Fiber	218	56.6%
	Multi-Grain Bread	207	53.8%
	Instant Oatmeal	126	32.7%
	Cream of Wheat	88	22.9%
	Low-Calorie Bread	38	9.9%
	Low-Fat Chocolate Chip Cookie	28	7.3%
	Chocolate Chip Cookie	21	5.7%
Meat and Beans	Eggs with Omega 3 Fatty Acids	328	85.2%
	Salmon	239	62.1%
	Black Beans	207	53.8%
	Lentils	194	50.4%
	Tuna	175	45.5%
	Tilapia	107	27.8%
	Eggs	104	27.0%
	Chicken	75	19.5%
	Ground Beef	64	16.6%
Fruits	Orange Juice with Calcium	286	74.3%
	Blueberries	256	66.5%
	Orange Juice with Glucosamine	249	64.7%
	Cranberry Juice with Pomegranate	225	58.4%
	Whole Tomato	215	55.8%
	Cranberry Juice	193	50.1%
	Orange Juice	148	38.4%
	Ketchup	78	20.3%
Vegetables	Soybeans	226	58.7%
	Garlic	220	57.1%
	Soybean Products	212	55.1%
	Avocado	194	50.4%
	Carrots	180	46.8%
	Guacamole	119	30.9%
Oils and Fats	Olive Oil with Omega 3 Fatty Acids	315	81.8%
	Margarine with Plant Stanols and Sterols	294	76.4%
	Olive Oil	184	47.8%
	Margarine	29	7.5%
Milk	Yogurt with Probiotics	338	87.8%
	Yogurt	166	43.1%

^a multiple responses

Table 6. Vitamins, minerals and dietary supplements Registered Dietitians considered functional foods ^a

Food Category	Food	n	%
Supplements	Flaxseed Oil	200	51.9%
	Fish Oil	197	51.2%
	Dietary Fiber	189	49.1%
	Prebiotics	187	48.6%
	Ginger	94	24.4%
	Ginger Root	92	23.9%
	Glucosamine	84	21.8%
	Ginkgo Biloba	55	14.3%
	Echinacea	52	13.5%
	St. John's Wort	48	12.5%
Vitamins and Minerals	Calcium and Vitamin D	131	34.0%
	Folate	117	30.4%
	Vitamin C	109	28.3%
	Vitamin E	106	27.5%
	Multivitamin	95	24.7%

^a multiple responses

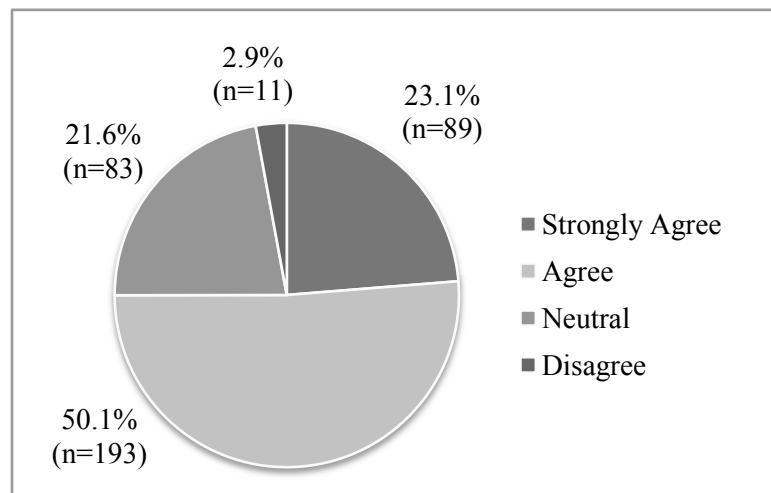


Figure 2. Responses of Registered Dietitians to the statement, "Functional Foods Are Effective In Preventing Disease and Promoting Health" (n=376)

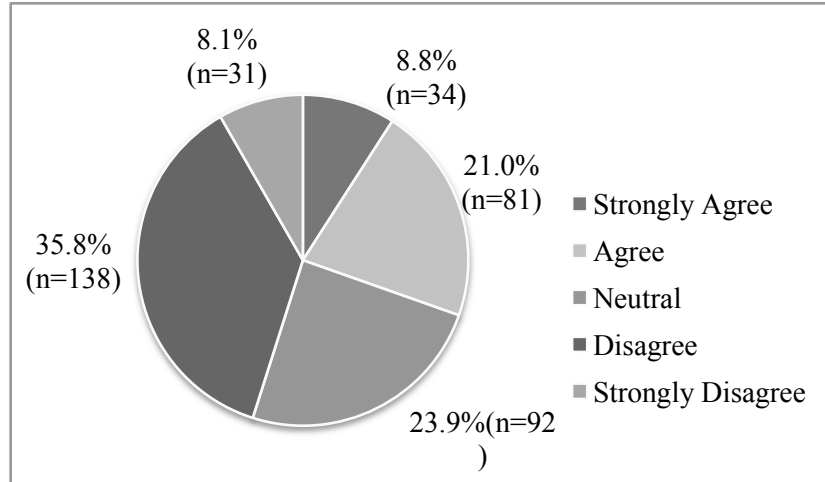


Figure 3. Responses of Registered Dietitians to the statement, "All Foods are Functional" (n=376)

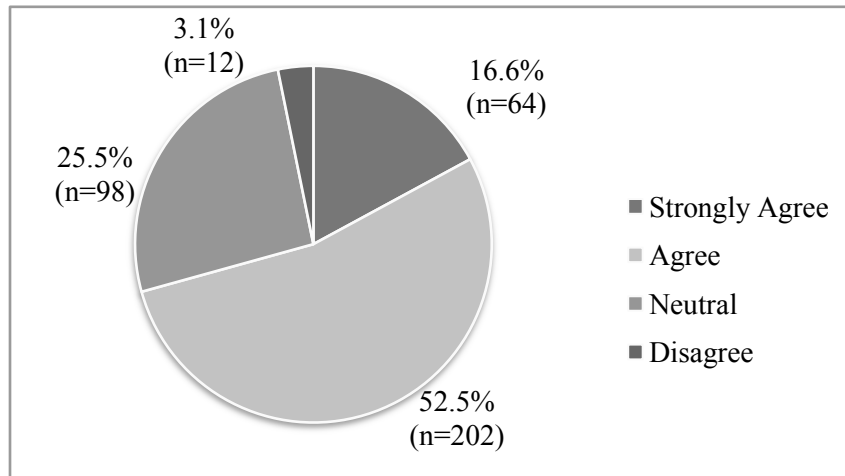


Figure 4. Responses of Registered Dietitians to the statement, "Functional Foods Improve Health" (n=376)

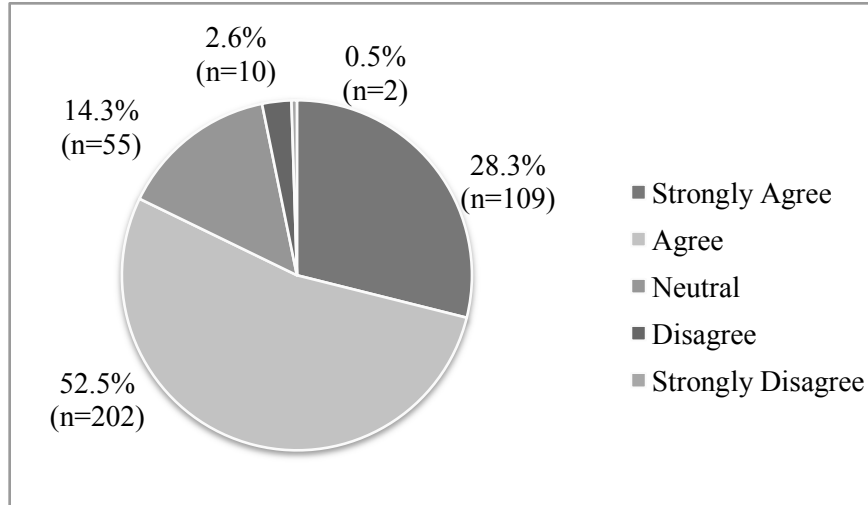


Figure 5. Responses of Registered Dietitians to the statement, "Functional Foods Provide Benefit Beyond Basic Nutrients" (n=378)

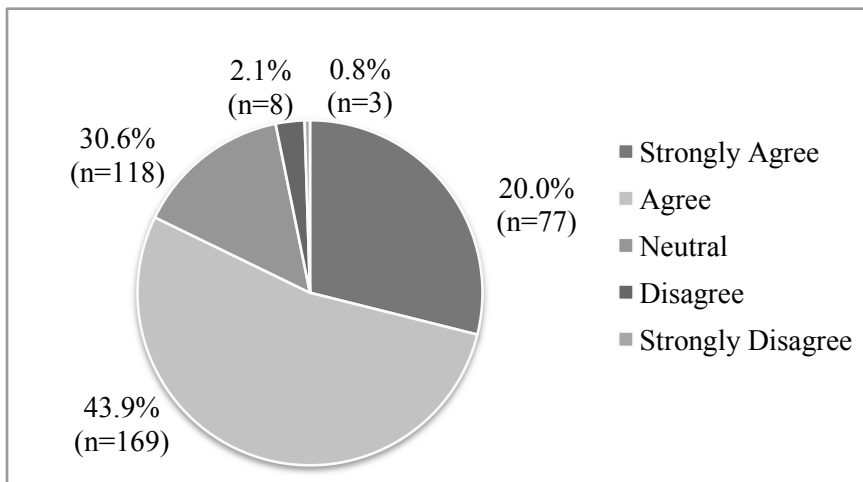


Figure 6. Responses of Registered Dietitians to the statement, "Functional Foods Should be Included as Part of a Treatment Plan for my Clients/Patients" (n=375)

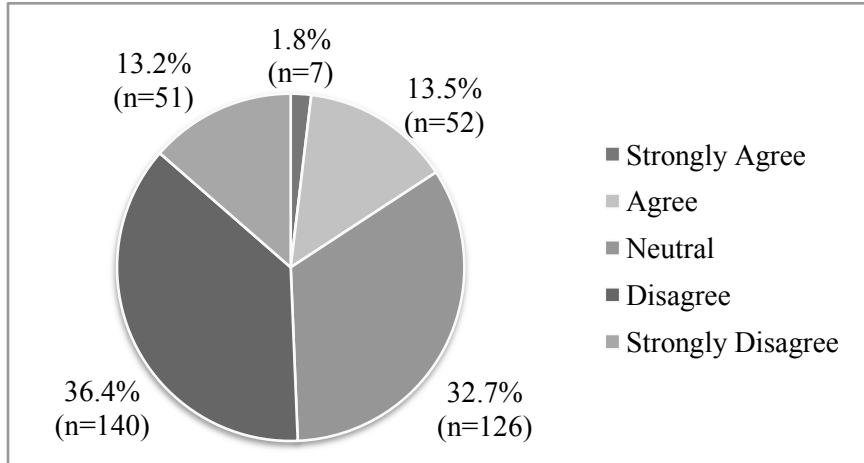


Figure 7. Responses of Registered Dietitians to the statement, "Functional Foods Are Equal To Medication" (n=376)

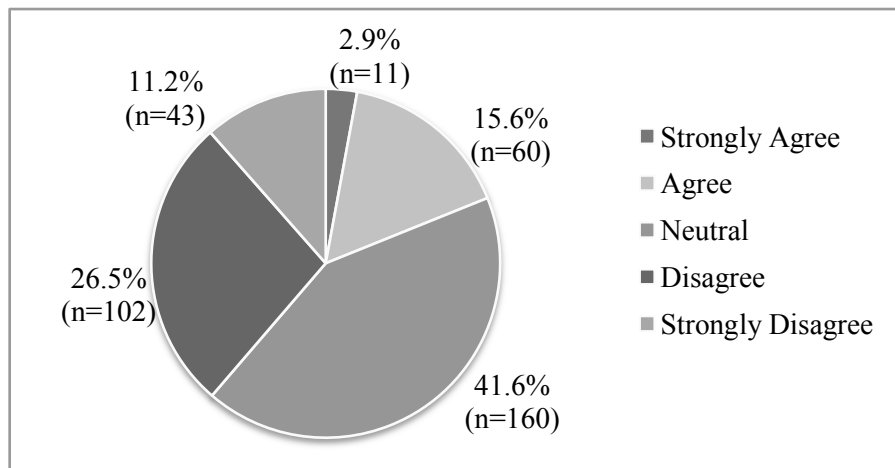


Figure 8. Responses of Registered Dietitians to the statement, "Herbs Should Be Used As Functional Foods"(n=376)

Table 7. Agreement of Registered Dietitians with functional food statements based on their education ^a

Statement	Bachelors		Masters		Doctoral	
	n	%	n	%	n	%
1) Functional foods are effective in preventing disease and promoting health.	113	73.4%	151	76.3%	17	73.9%
2) All foods are functional.	45	29.4%	62	31.3%	7	30.4%
3) Functional foods improve health.	106	68.8%	144	72.8%	15	65.2%
4) Functional foods provide benefit beyond basic nutrients.	122	79.2%	168	84.0%	20	87.0%
5) Functional foods should be included as part of a treatment plan for my patients/clients.	107	69.5%	131	66.1%	8	36.4%**
6) Functional foods are equal to medication.	26	16.9%	30	15.1%	3	13.0%
7) Herbs should be used as functional foods.	24	15.5%	43	21.7%	4	17.4%

^a Strongly agreed and agreed data were aggregated and considered agreement

** p<.001

Table 8. Agreement of Registered Dietitians with functional food statements according to their region of practice ^a

Statement	Northeast		Midwest		South		West	
	n	%	n	%	n	%	n	%
1) Functional foods are effective in preventing disease and promoting health.	59	75.7%	90	76.9%	80	79.2%	41	67.2%
2) All foods are functional.	26	32.9%	38	32.5%	29	29%	17	27.9%
3) Functional foods improve health.	51	64.5%**	87	74.4%	73	72.3%	45	75.0%
4) Functional foods provide benefit beyond basic nutrients.	66	83.6%	100	85.5%	83	82.2%	45	72.6%
5) Functional foods should be included as part of a treatment plan for my patients/clients.	52	65.8%	82	70.7%	62	61.4%	40	66.7%
6) Functional foods are equal to medication.	15	19.0%	17	14.6%	18	17.8%	8	13.3%
7) Herbs should be used as functional foods.	16	20.5%	16	13.7%	23	22.8%	13	21.4%

^a Strongly agreed and agreed data were aggregated and considered agreement

** p < .001

Table 9. Registered Dietitians' personal consumption, and professional recommendation of functional foods

Use of functional foods	Yes		No		I don't know	
	n	%	n	%	n	%
Do you personally use functional foods?	290	75.9%	67	17.5%	25	6.5%
Have you recommended a functional food(s) to a client/patient in the past year?	231	61.4%	124	33.0%	21	5.6%

Table 10. Three identified functional foods Registered Dietitians personally consumed or professionally recommended in the past year, based on written response

Functional Food	n	%
Personally Used		
Fruit	138	48.4%
Yogurt Products ^a	123	31.9%
Vegetables	78	20.3%
Professionally Recommended		
Yogurt Products ^a	77	20.0%
Vegetables	50	12.9%
Fruit	42	10.9%

^a Yogurt products included: regular yogurt, yogurt with probiotics and kefir

Table 11. Registered Dietitians' purposes for professionally recommending functional foods to patients and/or clients in the past year ^a

Purposes	n	%
Maintenance of good health	175	45.5%
Prevention of chronic disease	151	39.2%
Treatment of chronic disease	123	31.9%
Treatment of acute disease	60	15.6%

^a multiple responses

Table 12. Registered Dietitians' purposes for professionally recommending functional foods to patients and/or clients in the past year, according to education ^a

Purposes	Bachelors		Masters		Doctoral	
	n	%	n	%	n	%
Maintenance of good health	71	45.2%	97	47.5%	7	30.4%
Prevention of chronic disease	62	39.5%	84	41.2%	5	21.7%
Treatment of chronic disease	49	31.2%	72	35.3%	2	8.7%*
Treatment of acute disease	26	16.6%	34	16.7%	0	0%

^a multiple responses

* p < .05

Table 13. Registered Dietitians' purposes for professionally recommending functional foods to patients and/or clients in the past year, according to Census Regions and Divisions of the United States ^{ab}

Purposes	Northeast		Midwest		South		West	
	n	%	n	%	n	%	n	%
Maintenance of good health	38	50.0%	43	49.4%	50	47.2%	32	44.4%
Prevention of chronic disease	28	36.8%	35	40.2%	44	41.5%	28	38.9%
Treatment of chronic disease	28	36.8%	36	41.4%	36	34.0%	16	22.2%
Treatment of acute disease	7	9.2%	16	18.4%	23	21.7%	12	16.7%

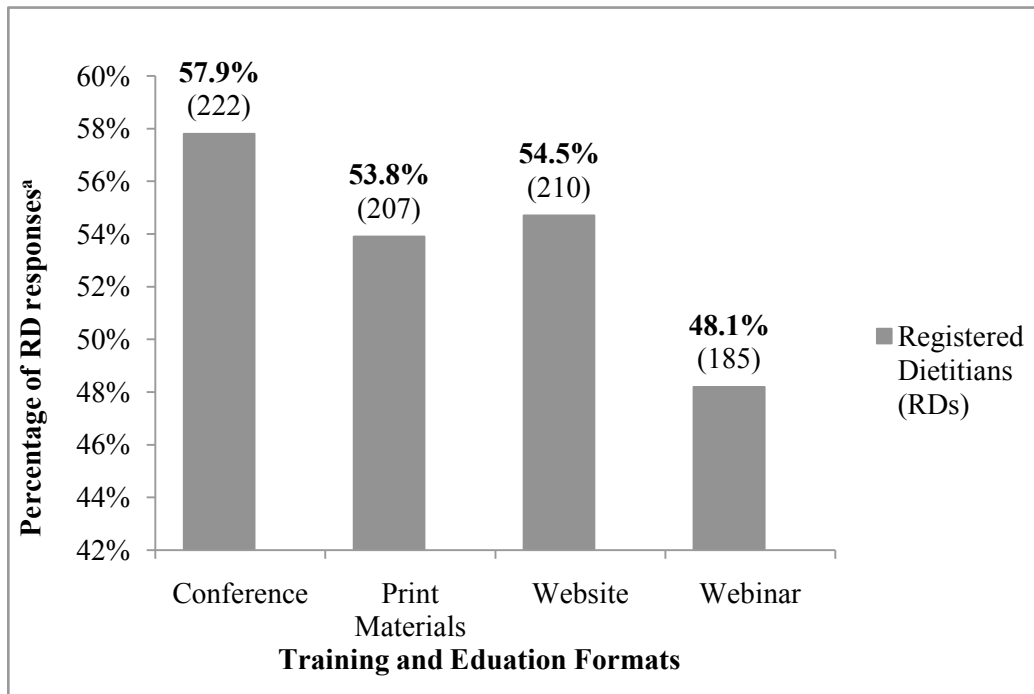
^a multiple responses

^b Census Regions and Divisions of the United States

Table 14. Source where Registered Dietitians' learned about functional foods ^a

Source	n	%
Professional Conference	115	29.9%
Peer Reviewed Journal	108	28.1%
No Training	104	27.0%
University	79	20.5%
Internet Website	78	20.3%
Other	63	16.4%

^a multiple responses



^a multiple responses

Figure 9. Training and education formats chosen by Registered Dietitians to learn about functional foods, based on multiple responses

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APPENDICES

APPENDIX ONE

Survey of the Perceptions, Attitudes and Practices of Registered Dietitians regarding Functional Foods

The purpose of this survey is to gain a better understanding of Registered Dietitians' perceptions, attitudes and practices regarding functional foods. The Commission on Accreditation for Dietetics Education provided a sample population and you were chosen to participate based on a set of criteria; Registered Dietitian, not retired and a current resident of the U.S. Please find the letter enclosed outlining the purpose of the study, confidentiality and contact information for results and/or future questions.

This questionnaire is double-sided. Please answer all of the questions accurately and honestly.

Your participation is greatly appreciated!

Please return the survey in the enclosed envelope by August 3, 2009.

Section 1: Perceptions of Functional Foods

This section will gather information on Registered Dietitians' perceptions of functional foods.

Please consider each question carefully before responding.

1) Choose ONE answer; Please choose the ONE definition that best defines functional foods.

- ☐ A) Functional foods are "those that by virtue of physiologically active food components provide health benefits beyond basic nutrition."
- ☐ B) Functional foods are those that have "satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease."
- ☐ C) Functional foods are "those foods that encompass potentially healthful products including any modified food or ingredient that may provide a health benefit beyond the traditional nutrients it contains."
- ☐ D) "All foods are functional at some physiological level...functional foods that include whole foods and fortified, enriched or enhanced foods have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels."
- ☐ E) Foods that are "composed of functional ingredients that affect the structure and/or function of the body and are used to maintain or regulate specific health conditions."
- ☐ F) I don't know

2) Choose ALL That Apply: Functional foods include the following:

- ☐ A) Fortified food products
- ☐ B) Enriched food products
- ☐ C) Unprocessed or natural foods
- ☐ D) Dietary Supplements
- ☐ E) Herbal Supplements
- ☐ F) None of the above
- ☐ G) I don't know

3) Choose ALL That Apply: Please choose the functional foods from the list below:

YOU MAY CHOOSE MORE THAN ONE ANSWER IN EACH CATEGORY

GRAINS:

- ☐ Chocolate Chip Cookie
- ☐ Chocolate Chip Cookie with Fiber
- ☐ Cream of Wheat
- ☐ Instant Oatmeal
- ☐ Low-calorie Bread
- ☐ Low-fat Chocolate Chip Cookie
- ☐ Multi-grain Bread
- ☐ Old Fashioned Oatmeal

MEAT & BEANS:

- ☐ Black beans
- ☐ Chicken
- ☐ Eggs
- ☐ Eggs with Omega-3 Fatty Acids
- ☐ Ground Beef
- ☐ Lentils
- ☐ Salmon
- ☐ Tuna
- ☐ Tilapia

SUPPLEMENTS:

- ☐ Dietary Fiber
- ☐ Echinacea
- ☐ Fish Oil
- ☐ Flaxseed Oil
- ☐ Ginger
- ☐ Ginger Root
- ☐ Ginkgo Biloba
- ☐ Glucosamine
- ☐ Probiotics
- ☐ St. John's Wort

VITAMINS & MINERALS

- ☐ Calcium and Vitamin D
- ☐ Folate
- ☐ Multivitamin
- ☐ Vitamin C
- ☐ Vitamin E

FRUITS:

- ☐ Blueberries
- ☐ Cranberry Juice
- ☐ Cranberry Juice with Pomegranate
- ☐ Ketchup
- ☐ Orange Juice
- ☐ Orange Juice with Calcium
- ☐ Orange Juice with Glucosamine
- ☐ Whole Tomato

VEGETABLES:

- ☐ Avocado
- ☐ Carrots
- ☐ Garlic
- ☐ Guacamole
- ☐ Soybean Products
- ☐ Soybeans

OILS & FATS:

- ☐ Margarine
- ☐ Margarine with Plant Stanols and Sterols
- ☐ Olive Oil
- ☐ Olive Oil with Omega-3 Fatty Acids

MILK:

- ☐ Yogurt
- ☐ Yogurt with Probiotics

☐ I don't know

OTHER: _____

Section 2: Attitudes about Functional Foods

This section will gather information pertaining to Registered Dietitian's attitudes with regard to the usage, effectiveness and safety of functional foods. Please consider each question carefully before responding.

☒ INDICATE YOUR OPINION OF EACH STATEMENT BY CHECKING THE ONE APPROPRIATE BOX.

Statements	Please Check <i>ONE</i> per statement				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4) Functional foods are effective in preventing disease and promoting health.					
5) All foods are functional.					
6) Functional foods improve health.					
7) Functional foods provide benefit beyond basic nutrients.					
8) Functional foods should be included as part of a treatment plan for my patients/clients.					
9) Functional foods are equal to medication.					
10) Herbs should be used as functional foods.					

Section 3: Practices of Functional Foods

This section will gather information pertaining to Registered Dietitian's personal and professional practices with regard to functional foods. Please consider each question carefully before responding.

Personal Use

11) Choose ONE answer: Do you personally use functional foods?

- ☐ A) Yes
- ☐ B) No → SKIP TO QUESTION 12
- ☐ C) I don't know → SKIP TO QUESTION 12

a) Please list three (3) functional foods on the lines provided below.

PLEASE GO TO QUESTION 12

Professional Use

12) Choose ONE answer: Have you recommended a functional food(s) to a client/patient in the past year?

- ☐ A) Yes
- ☐ B) No → SKIP TO QUESTION 13
- ☐ C) I don't know → SKIP TO QUESTION 13

a) Please report which functional foods you recommend:

b) Choose ALL That Apply: Please indicate for what purpose(s) you have recommended functional food(s)?

- ☐ A) Maintenance of good health
- ☐ B) Prevention of chronic disease
- ☐ C) Treatment of chronic disease
- ☐ D) Treatment of acute disease
- ☐ E) Other _____

PLEASE GO TO QUESTION 13

Section 4: Nutrition Information Source

This section will gather data pertaining to Registered Dietitians' professional needs, including sources of information and training preferences with regards to functional foods. Please consider each question carefully before responding.

13) **Choose ONE answer:** Please indicate where you have received your functional food information:

- ☐ A) University
- ☐ B) Professional Conference
- ☐ C) Peer-reviewed journal (please specify) _____
- ☐ D) Internet Website (please specify) _____
- ☐ E) Other _____
- ☐ F) I have not received training on functional foods

14) **Choose ONE answer:** Would you like to learn about functional foods?

- ☐ A) Yes _____
- ☐ B) No → SKIP TO QUESTION 15

a) **Choose ALL That Apply:** What is your preferred training or education format for learning about functional foods?

- ☐ A) Conferences or workshops
- ☐ B) Books, journals and other written materials
- ☐ C) Web site
- ☐ D) Webinar (Internet – Interactive Conference)
- ☐ E) Other (please specify) _____

PLEASE GO TO QUESTION 15

Section 5: Demographics

This section will gather background information of respondents. Please answer all of the questions.

15) **Choose ONE answer:** What is your age?

- ☐ A) 25 or younger
- ☐ B) 26-35 years old
- ☐ C) 36-45 years old
- ☐ D) 46-55 years old
- ☐ E) 56-65 years old
- ☐ F) 66 + years old

16) **Choose ONE answer:** What is your gender?

- ☐ A) Male
- ☐ B) Female

17) **Choose ONE answer:** What is the highest level of education you have completed?

- ☐ A) Bachelor's degree
- ☐ B) Master's degree
- ☐ C) Doctoral degree

18) **Choose ONE answer:** What is your ethnicity?

- ☐ A) American Indian or Alaskan native
- ☐ B) Asian or Pacific Islander
- ☐ C) Black/African American
- ☐ D) Hispanic/Latino
- ☐ E) White/Caucasian
- ☐ F) Other (Please specify) _____

19) **Choose ONE answer:** Was an education component on functional foods included in your dietetics program at the university?

- ☐ A) Yes
- ☐ B) No, functional foods did not exist while I was in school
- ☐ C) No, I was not taught about functional foods in school
- ☐ D) Other (Please specify) _____

20) Please provide the state where you received your terminal dietetics/nutrition degree: _____

21) Please provide the state where you completed your internship/practice program: _____

22) **Choose ONE answer:** What is your current employment status as a Registered Dietitian?

- ☐ A) Full - time - 40 hrs / week or more
- ☐ B) Part - time - less than 40 hrs / week
- ☐ C) Unemployed
- ☐ D) Not currently working as an RD
- ☐ E) Retired

23) Please provide the state in which you practice _____

24) **Choose ONE answer:** Which one of the following describes your work environment?

- ☐ A) Community-Based Organizations
- ☐ B) Education Institution
- ☐ C) Clinical
- ☐ D) Private Practice
- ☐ E) Government
- ☐ F) Food Industry
- ☐ G) Other (Please specify): _____

**THIS IS THE END OF THE SURVEY ON FUNCTIONAL FOODS.
THANK YOU FOR YOUR TIME AND COOPERATION IN COMPLETING THIS SURVEY!**

APPENDIX TWO

***Survey of the Knowledge, Attitudes and Self-Reported Behaviors of
Pennsylvania Registered Dietitians regarding Functional Foods and Herbal
Medicine as Complementary Medicines***

Dear Colleague:

For the purpose of this study, terms are defined as follows:

Complementary Medicine: an approach to medical diagnosis and treatment that uses alternative therapies as an adjunct to, and not simply a replacement for, conventional medicine. Functional foods and herbal medicine are examples of complementary medicine.

Phytochemicals: nonnutrient compounds found in plant-derived foods that have biological activity in the body.

Functional Foods: a food that contains phytochemicals which provide a physiologic benefit in addition to its nutrient content that may prevent disease and/or promote health. For example, yellow/orange fruits and vegetables contain carotenoid color pigments such as lycopene, lutein and beta-carotene act as antioxidants to protect against certain cancers.

Herb or Herbal: a plant with leaves, roots, stems, or flowers used to treat disease and enhance health. Also known as Botanical medicine. For example, ginseng root may improve glucose control in those with Type II diabetes as well as helping to fight stress-induced fatigue by slowing the release of stress hormones.

Demographics

The purpose of this survey is to gain a better understanding of Pennsylvania Registered Dietitians' views regarding functional foods and herbal medicine. The survey is confidential. Please answer the following questions as accurately and honestly as possible.

☒ **PLEASE CHECK THE ONE APPROPRIATE ANSWER BELOW.**

1. What is your age?

- ☐ 19-25 years old
☐ 26-35 years old
☐ 36-45 years old
☐ 46-55 years old
☐ 56-65 years old
☐ 66 + years old
☐ Other (Please specify) _____

2. Which best describes your ethnic background? (Optional)

- ☐ Aleut, Eskimo, or American Indian
☐ Asian or Pacific Islander
☐ Black
☐ Hispanic
☐ White
☐ Other (Please specify): _____

3. How many years have you been a Registered Dietitian?

- ☐ 1-5 years
☐ 6-15 years
☐ 16-25 years
☐ over 25 years

4. Which is the highest level of education you have completed?

- ☐ Bachelor's degree
☐ Master's degree
☐ Doctoral degree

5. What is your gender?

- ☐ Male
☐ Female

6. What is your current employment status as a Registered Dietitian?

- ☐ Full – time – 40 hrs / week or more
- ☐ Part – time – less than 40 hrs/week
- ☐ Unemployed
- ☐ Retired
- ☐ Not currently working as an RD

7. Which one of the following describes your work environment?

- ☐ Community-based organizations
- ☐ Education institution
- ☐ Healthcare facility
- ☐ Private Practice
- ☐ Government office
- ☐ Other (Please specify):

10. How would you describe the majority of your clientele?

- ☐ Primarily older/ geriatric (greater than 60 years old)
- ☐ Primarily pediatric/ young adults (birth to 30 years old)
- ☐ Primarily adult (31–59 years old)
- ☐ All ages
- ☐ Other (Please specify)

11. What is the most prevalent ethnic group you serve?

- ☐ Aleut, Eskimo, or American Indian
- ☐ Asian or Pacific Islander
- ☐ Black
- ☐ Hispanic
- ☐ White
- ☐ Equal mixture of all backgrounds
- ☐ Other (please specify) -----

8. What is your religious affiliation or preference? (Optional)

- ☐ Buddhist
- ☐ Catholic
- ☐ Hindu
- ☐ Jewish
- ☐ Muslim
- ☐ Protestant
- ☐ Other -----

9. What is the type of population you primarily serve?

- ☐ Rural
- ☐ Greater Metropolitan Area
- ☐ Institutionalized Population (prison, rehabilitation, schools, etc.)
- ☐ Suburban/ Residential Area
- ☐ Other (please specify) -----

12. What percent of your clientele inquire about functional foods and/or herbal medicine?

- ☐ 0–15%
- ☐ 16–30%
- ☐ 31–45%
- ☐ 46–60%
- ☐ 61–75%
- ☐ 76–90%
- ☐ Greater than 90%

13. What percent of your clientele use functional foods and /or herbal remedies ?

- ☐ 0–15%
- ☐ 16–30%
- ☐ 31–45%
- ☐ 46–60%
- ☐ 61–75%
- ☐ 76–90%
- ☐ Greater than 90%

Self Reported Practices

This section will help determine the trends regarding the use of Functional foods and Herbal medicine among Pennsylvania Registered Dietitians.

☒ **PLEASE CHECK THE ONE APPROPRIATE ANSWER BELOW.**

1. Have you ever personally used herbal supplements or remedies?

☐ No

☐ Yes (Please specify)_____

2. Do you actively include functional foods into your diet in order to maintain or improve health?

☐ No

☐ Yes (Please specify the most common functional food(s) you use)

3. Do you currently use herbal supplements/remedies of any kind?

☐ No

☐ Yes (Please specify the most common herb you use) _____

4. Do you routinely recommend specific functional foods to your clients / patients in order to maintain or improve their health?

☐ No

☐ Yes (Please specify most common) _____

5. Do you routinely recommend herbal supplements / remedies to your clients / patients in order to maintain or improve their health?

☐ No

☐ Yes (Please specify most common) _____

6. Have you ever, or would you refer a patient / client to an herbal specialist?

☐ No

☐ Yes

7. Have you had any training to learn more about functional foods?

☐ No

☐ Yes

8. Have you had any training to learn more about herbal medicine?

☐ No

☐ Yes

Attitudes about Safety and Effectiveness

This section will gather information pertaining to Registered Dietitian's attitudes and beliefs with regard to the usage, effectiveness and safety of functional foods and herbal medicine. Please consider each question carefully before responding.

☒ **INDICATE YOUR OPINION OF EACH STATEMENT BY CHECKING THE ONE APPROPRIATE BOX.**

<i>Statements</i>	<i>Please Check One</i>				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The use of herbal medicine has increased significantly in recent years.					
2. Changes in the practice and coverage of medical care have increased patients' interest in herbal medicine.					
3. Functional foods can be used to prevent disease and promote health.					
4. Many herbs have valid medical uses.					
5. The use of functional foods improves health.					
6. I am interested in learning about current herbal therapies available on the market.					
7. I am interested in learning about functional foods and their effect on health.					
8. Herbal supplements should not be promoted unless they are given FDA approval.					
9. Registered Dietitians should be the primary educators concerning the possible positive or negative effects of herbal supplements.					

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10. Registered Dietitians should be the primary educators concerning the possible positive or negative effects of functional foods.					
11. I would discourage an interested client from trying herbal medicine as an alternative to traditional medicine.					
12. Some herbal remedies are just as effective as traditionally used medical remedies.					
13. Lack of FDA approval inhibits many potentially beneficial herbal therapies from gaining acceptance.					
14. The use of herbal supplements can be dangerous to one's health.					
15. Registered Dietitians should be knowledgeable about major herbal therapies on the market.					
16. Functional foods should be integrated into the practice of medicine.					
17. Herbal medicine education should be incorporated into the nutrition education curriculum.					
18. Learning more about herbal medicine and functional foods would be beneficial to my practice.					
19. I feel qualified to educate my patients / clients about herbal remedies and preparations.					
20. I feel qualified to recommend specific functional foods as part of a treatment plan to my patients/ clients.					

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
21. Stricter regulations of herbal remedies are needed.					
22. I believe that most claims about functional foods are true.					

23. Who should be the primary dispenser of information about herbal medicine?

- ☐ Registered dietitians/ Nutritionist
- ☐ Physicians
- ☐ Pharmacists
- ☐ Herbal specialist
- ☐ Other _____

24. Who should be the primary dispenser of information about functional foods?

- ☐ Registered dietitians/ Nutritionist
- ☐ Physicians
- ☐ Pharmacists
- ☐ Herbal specialist
- ☐ Other _____

Experience

This section will gather information on the current experience of Registered Dietitians with regard to Functional foods, and Herbal medicine.

PLEASE INDICATE YOUR RESPONSE BY CHECKING THE ONE APPROPRIATE ANSWER BELOW ☒.

1. How would you rate your knowledge of current information on herbal remedies?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

2. How would you rate your knowledge of current information on functional foods?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

3. Avocados are considered to be functional foods because they have which one of the following health benefits?
 - ☐ Improves energy levels.
 - ☐ Lowers blood cholesterol.
 - ☐ Helps in weight loss.
 - ☐ Improves cognitive functioning.

4. The serious adverse reactions of which herb has resulted in its removal from the herbal market?
 - ☐ St. John's Wort (*Hypericum Perforatum*)
 - ☐ Blue Cohosh (*Caulophyllum Thalictroides*)
 - ☐ Ephedra
 - ☐ Echinacea

5. Which functional food is commonly used in the treatment of menopausal symptoms for its weak estrogenic – like activity?
 - ☐ Broccoli and cauliflower.
 - ☐ Soybeans and soy products.
 - ☐ Green, red, yellow vegetables and fruits.
 - ☐ Garlic and onions.

6. Which herb is commonly used in the treatment of depression?
 - ☐ Melanex
 - ☐ Feverfew
 - ☐ St. John's Wort
 - ☐ Gingko Biloba

7. People who eat large amounts of fruits and vegetables are about half as likely to develop cancer.
 - ☐ True
 - ☐ False

8. Gingko Biloba increases which of the following physiological functions?
 - ☐ Metabolism
 - ☐ Nutrient absorption
 - ☐ Blood flow to the brain
 - ☐ Heart rate

9. This organization currently monitors and approves all items labeled as herbal supplements?
 - ☐ FDA (Food and Drug Administration)
 - ☐ NIH (National Institute of Health)
 - ☐ WHO (World Health Organization)
 - ☐ There is no regulation of herbal supplements.

10. Which herb is currently used internally to help curb colds and chronic infections of the respiratory tract and lower urinary tract?
 - ☐ Purple Cone Flower (*Echinacea*)
 - ☐ Pimento (*Pimenta Racemosa*)
 - ☐ Black Cohosh (*Cimicifuga Racemosa*)
 - ☐ St. John's Wort (*Hypericum Perforatum*)

11. Which phytochemical found in tomatoes has been shown to reduce the risk for prostate cancer?
- ☐ Allyl Sulfides.
 - ☐ Lycopene.
 - ☐ Isoflavones.
 - ☐ Flavonoids.
12. What has been your greatest source of information about complementary medicine?
- ☐ Continuing Education Programs and Seminars
 - ☐ Journal Articles
 - ☐ Colleagues
 - ☐ Patients / Clients
 - ☐ Media sources such as TV, radio and newspaper articles
13. Are you aware that a Physician's Desk Reference for herbs is available?
- ☐ No
 - ☐ Yes
14. As of 1994, the Dietary Supplement and Health Education Act (DSHEA) requires no proof of efficacy nor safety and sets no standards for quality control for products labeled as supplements.
- ☐ True
 - ☐ False
15. Are you confident in recommending functional foods to maintain health and prevent disease?
- ☐ No
 - ☐ Yes
 - ☐ Not Sure
16. Are you confident in recommending herbal preparations to maintain health and prevent disease?
- ☐ No
 - ☐ Yes
 - ☐ Not Sure
17. In which area of complementary medicine would you be most interested in receiving additional training or education?
- ☐ Functional foods
 - ☐ Herbal Medicine
18. What is your preferred training or education format for complementary medicine?
- ☐ Conferences or workshops
 - ☐ Books, journals and other written materials
 - ☐ ADA Web site
 - ☐ Other Web sites.
19. What is your dietetic specialty? _____

THIS IS THE END OF THE SURVEY ON COMPLEMENTARY MEDICINE. THANK YOU FOR YOUR COOPERATION AND TIME IN COMPLETING THIS SURVEY!

APPENDIX THREE

Diet as Complementary Medicine

Your contribution to this research is greatly appreciated. If you would like a summary of results, please print your name and address on the back of the return envelope (NOT on this questionnaire).

20



This survey is designed to explore what dietitians think about using diet - i.e. special diets, functional foods, nutrient supplements, and herbs - as complementary medicine. The questions are about your own ideas, so there are no right or wrong answers. When you answer the questions, please try to think about the general terms provided; not one specific example. Try to answer each question as accurately as you can as it applies to you. Don't spend too much time on any part of the questionnaire, and don't worry if you are not exactly sure of your answers.

Your contribution to this study is greatly appreciated. Participation is voluntary and by completing the survey, you indicate your consent to have your responses included in the study. If you wish to answer any questions in more detail or qualify your answers, please feel free to comment in the margins or attach a separate sheet. Your responses will be completely confidential.

Thank you for your assistance with this research project.

Please return your completed survey questionnaire to:

Survey of Dietitians
Department of Nutrition and Food Management
Oregon State University
Milam 108
Corvallis, OR 97331-5103

Department of Nutrition and Food Management
Oregon State University

Definitions of terms:
 For this survey, please use the following working definitions of terms:

- **Special diet** : A specific pattern of food consumption designed to lead to a desired physiological result (e.g. vegetarian diet, fat-controlled diet, Ornish diet, macrobiotic diet, Mediterranean diet, etc.).
- **Functional food** : A food that provides a physiological benefit in addition to its nutrient content and which may prevent disease and/or promote health (e.g. soybeans, garlic, oats, fish oil, broccoli, cranberry juice, etc.).
- **Nutrient supplement** : A nutrient taken to supplement the diet for purposes of enhancing health (e.g. calcium, Vitamin C, Vitamin E, Folic acid, Selenium, etc.).
- **Herb** : A plant with leaves, seeds, flowers, or roots used for enhancing health rather than as seasoning (e.g. echinacea, St. John's wort, ginseng, ginkgo, etc.).

Past Behaviors

To answer the following questions, think back over the past year (1997) and circle the number (1-5) which most accurately reflects how often you took each of the following actions:

1. During the past year (1997), how often did you personally use each of the following?

(Circle one for each type)	VERY OFTEN	SOME OF THE TIME			NOT AT ALL
		OFTEN	OFTEN	NOT	
A. Special diets for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1
B. Functional foods for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1

2. During the past year (1997), how often did you recommend the use of each of the following?

(Circle one for each type)	VERY OFTEN	SOME OF THE TIME			*NA Not Applicable	
		OFTEN	OFTEN	NOT	AT ALL	NA
A. Special diets for:						
a. Maintenance of good health.....	5	4	3	2	1	0
b. Prevention of chronic illness.....	5	4	3	2	1	0
c. Treatment of chronic illness.....	5	4	3	2	1	0
d. Treatment of acute illness.....	5	4	3	2	1	0
B. Functional foods for:						
a. Maintenance of good health.....	5	4	3	2	1	0
b. Prevention of chronic illness.....	5	4	3	2	1	0
c. Treatment of chronic illness.....	5	4	3	2	1	0
d. Treatment of acute illness.....	5	4	3	2	1	0

(Circle one for each type)

C. **Nutrient supplements** for:

- a. Maintenance of good health.....
- b. Prevention of chronic illness.....
- c. Treatment of chronic illness.....
- d. Treatment of acute illness.....

D. **Herbs** for:

- a. Maintenance of good health.....
- b. Prevention of chronic illness.....
- c. Treatment of chronic illness.....
- d. Treatment of acute illness.....

VERY OFTEN	OFTEN	SOME OF THE TIME	NOT OFTEN	NOT AT ALL	NA
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0
5	4	3	2	1	0

Future Intentions

In answering the following questions, think about the year ahead (1998) and circle the number which most accurately reflects how often you intend to take each of the following actions.

3. In the current year (1998), how often do you intend to recommend the use of each of the following?

(Circle one for each type)	VERY OFTEN	SOME OF THE TIME			NOT OFTEN	NOT AT ALL	NA
		OFTEN	OFTEN	NOT			
A. Special diets for:							
a. Maintenance of good health.....	5	4	3	2	1	0	
b. Prevention of chronic illness.....	5	4	3	2	1	0	
c. Treatment of chronic illness.....	5	4	3	2	1	0	
d. Treatment of acute illness.....	5	4	3	2	1	0	
B. Functional foods for:							
a. Maintenance of good health.....	5	4	3	2	1	0	
b. Prevention of chronic illness.....	5	4	3	2	1	0	
c. Treatment of chronic illness.....	5	4	3	2	1	0	
d. Treatment of acute illness.....	5	4	3	2	1	0	
C. Nutrient supplements for:							
a. Maintenance of good health.....	5	4	3	2	1	0	
b. Prevention of chronic illness.....	5	4	3	2	1	0	
c. Treatment of chronic illness.....	5	4	3	2	1	0	
d. Treatment of acute illness.....	5	4	3	2	1	0	
D. Herbs for:							
a. Maintenance of good health.....	5	4	3	2	1	0	
b. Prevention of chronic illness.....	5	4	3	2	1	0	
c. Treatment of chronic illness.....	5	4	3	2	1	0	
d. Treatment of acute illness.....	5	4	3	2	1	0	

The following are questions about your opinions on use of special diets, functional foods, nutrient supplements, and herbs. Please circle the number corresponding to your opinion about each statement below.

(Circle one for each type)

c. **Nutrient supplements** can be ___ for
a. Maintenance of good health.

- Maintenance of good health.....
- Prevention of chronic illness.....
- Treatment of chronic illness.....
- Treatment of acute illness.....

(Circle one for each type)

B. **Functional foods** can be _____ for:

- a. Maintenance of good health.....
- b. Prevention of chronic illness.....
- c. Treatment of chronic illness.....
- d. Treatment of acute illness.....

(PLEASE TURN THE PAGE)

(Circle one for each type)

- Maintenance of good health.
- Prevention of chronic illness.
- Treatment of chronic illness.
- Treatment of acute illness.

Herbs can be _____ for:

6. I believe that recommending the use of:

Special diets can be _____ for:

Functional foods can be _____ for:

- Maintenance of good health.....
- Prevention of chronic illness.....
- Treatment of chronic illness.....
- Treatment of acute illness.....

- Maintenance of good health.....
- Prevention of chronic illness.....
- Treatment of chronic illness.....
- Treatment of acute illness.....

Maintenance of good health
Prevention of chronic illness
Treatment of chronic illness
Treatment of acute illness

Social / Peer Opinions

The following questions are about your impressions of what other people think about special diets, functional foods, nutrient supplements, and herbs. Please circle the number corresponding to your degree of agreement with each statement below.

7. People whose opinions I value think I ought to recommend the use of:

(Circle one for each type)	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE	*NA-Not Applicable
A. Special diets for:						
a. Maintenance of good health.....	5	4	3	2	1	0
b. Prevention of chronic illness.....	5	4	3	2	1	0
c. Treatment of chronic illness.....	5	4	3	2	1	0
d. Treatment of acute illness.....	5	4	3	2	1	0
B. Functional foods for:						
a. Maintenance of good health.....	5	4	3	2	1	0
b. Prevention of chronic illness.....	5	4	3	2	1	0
c. Treatment of chronic illness.....	5	4	3	2	1	0
d. Treatment of acute illness.....	5	4	3	2	1	0
C. Nutrient supplements for:						
a. Maintenance of good health.....	5	4	3	2	1	0
b. Prevention of chronic illness.....	5	4	3	2	1	0
c. Treatment of chronic illness.....	5	4	3	2	1	0
d. Treatment of acute illness.....	5	4	3	2	1	0
D. Herbs for:						
a. Maintenance of good health.....	5	4	3	2	1	0
b. Prevention of chronic illness.....	5	4	3	2	1	0
c. Treatment of chronic illness.....	5	4	3	2	1	0
d. Treatment of acute illness.....	5	4	3	2	1	0

8. Who do you believe would support your recommending the use of:

(Circle all that apply)	1. DIETITIANS	2. ADA	3. PHYSICIANS	4. NURSES	5. NATUROPATHS	6. CHIROPRACTORS	7. MY PATIENTS/CLIENTS	8. MY FAMILY	9. MY CLOSE FRIENDS	10. OTHER(Specify)
A. Special diets										
a. Maintenance of good health.....	5	4	3	2	1	0				
b. Prevention of chronic illness.....	5	4	3	2	1	0				
c. Treatment of chronic illness.....	5	4	3	2	1	0				
d. Treatment of acute illness.....	5	4	3	2	1	0				
B. Functional foods										
a. Maintenance of good health.....	5	4	3	2	1	0				
b. Prevention of chronic illness.....	5	4	3	2	1	0				
c. Treatment of chronic illness.....	5	4	3	2	1	0				
d. Treatment of acute illness.....	5	4	3	2	1	0				
C. Nutrient supplements										
a. Maintenance of good health.....	5	4	3	2	1	0				
b. Prevention of chronic illness.....	5	4	3	2	1	0				
c. Treatment of chronic illness.....	5	4	3	2	1	0				
d. Treatment of acute illness.....	5	4	3	2	1	0				
D. Herbs										
a. Maintenance of good health.....	5	4	3	2	1	0				
b. Prevention of chronic illness.....	5	4	3	2	1	0				
c. Treatment of chronic illness.....	5	4	3	2	1	0				
d. Treatment of acute illness.....	5	4	3	2	1	0				

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C. Nutrient supplements.....

(Circle all that apply)

1. DIETITIANS
2. ADA
3. PHYSICIANS
4. NURSES
5. NATUROPATHS

6. CHIROPRACTORS
7. MY PATIENTS/CLIENTS
8. MY FAMILY
9. MY CLOSE FRIENDS
10. OTHER(Specify)

D. Herbs.....

(Circle all that apply)

1. DIETITIANS
2. ADA
3. PHYSICIANS
4. NURSES
5. NATUROPATHS

6. CHIROPRACTORS
7. MY PATIENTS/CLIENTS
8. MY FAMILY
9. MY CLOSE FRIENDS
10. OTHER(Specify)

Knowledge

The following questions are about your understanding of special diets, functional foods, nutrient supplements, and herbs. Please circle the number corresponding to your level of knowledge about each subject below.

9. How would you describe your level of knowledge about the role of:

(Circle one for each type)	VERY HIGH	HIGH	MODERATE	FAIRLY LOW	NONE
A. Special diets for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1
B. Functional foods for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1
C. Nutrient supplements for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1
D. Herbs for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1

(PLEASE TURN THE PAGE)

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Training Interests

Another important purpose of this study is to learn more about your training interests. Please circle the number which most accurately reflects your training interests.

10. How would you rate your interests in receiving training in the role of:

(Circle one for each type)	VERY HIGH	HIGH	SOME	FAIRLY LOW	NOT AT ALL
A. Special diets for:					
a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1

B. Functional foods for:

a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1

C. Nutrient supplements for:

a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1

D. Herbs for:

a. Maintenance of good health.....	5	4	3	2	1
b. Prevention of chronic illness.....	5	4	3	2	1
c. Treatment of chronic illness.....	5	4	3	2	1
d. Treatment of acute illness.....	5	4	3	2	1

11. Please circle the three examples of special diets, functional foods, nutrient supplements, and herbs below that you would most like to learn about:

A. Special diets					
(Circle three numbers)	1. ASIAN DIET	11. LOW SODIUM DIET			
	2. CALORIE-CONTROLLED DIET	12. MACROBIOTIC DIET			
	3. FAT-CONTROLLED DIET	13. MEDITERRANEAN DIET			
	4. GERSON DIET	14. ORNISH DIET			
	5. HIGH-CHO DIET	15. PRITIKIN DIET			
	6. HIGH-FIBER DIET	16. SEVENTH-DAY ADVENTIST DIET			
	7. HIGH-PUFA DIET	17. NATIVE AMERICAN INDIAN DIET			
	8. KELLEY DIET	18. VEGETARIAN DIET			
	9. LIVINGSTON DIET	19. WIGMORE DIET			
	10. LOW-CAFFEINE DIET	20. OTHER (Specify _____)			

- B. Functional foods**
(Circle three numbers)
1. ALFALFA SPROUTS
 2. APPLES
 3. ASPARAGUS
 4. BARLEY/BUCKWHEAT
 5. BLUE GREEN ALGAE / KELP
 6. BROCCOLI
 7. BRUSSELS SPROUTS
 8. CELERY
 9. CRANBERRY JUICE
 10. FISH OIL
 11. FLAXSEED
 12. GARLIC
 13. GRAPEFRUIT JUICE
 14. HONEY / ROYAL JELLY
 15. MATAKE / REISHI / SHITAKE MUSHROOMS
 16. MISO/TEMPEH
 17. MUNG BEAN SPROUTS
 18. OATS
 19. OLIGOSACCHARIDES
 20. OLIVE OIL / RICE BRAN OIL
 21. ONIONS
 22. PRUNES
 23. SEA SALT
 24. SHARK CARTILAGE
 25. SOYBEANS / TOFU
 26. TOMATOES
 27. WILD YAMS
 28. YOGURT
 29. OTHER (Specify _____)

- C. Nutrient supplements**
(Circle three numbers)
1. AMINO ACIDS
 2. BETA-CAROTENE
 3. BIOTIN
 4. CALCIUM
 5. CHLORIDE
 6. CHROMIUM
 7. COLLOIDAL MINERALS
 8. COPPER
 9. CQ 10
 10. CREATINE
 11. ESSENTIAL FATTY ACIDS
 12. FIBER
 13. FOLIC ACID
 14. IODINE
 15. IRON
 16. MAGNESIUM
 17. PHOSPHORUS
 18. POTASSIUM
 19. SELENIUM
 20. VITAMIN A
 21. THIAMIN
 22. RIBOFLAVIN
 23. NIACIN
 24. PANTOTHENIC ACID
 25. VITAMIN B6
 26. VITAMIN B12
 27. VITAMIN C
 28. VITAMIN D
 29. VITAMIN E
 30. VITAMIN K
 31. ZINC
 32. OTHER (Specify _____)

- D. Herbs**
(Circle three numbers)
1. ALOE VERA
 2. BEE POLLEN
 3. BILBERRY EXTRACT
 4. BLUE COHOSH
 5. CATS CLAW
 6. CHAMOMILE TEA
 7. CHASTE TREE
 8. CHICORY
 9. COMFREY
 10. DANDELION
 11. DONG QUAI
 12. ECHINACEA
 13. FEVERFEW
 14. GENTIAN
 15. GINGER
 16. GINKGO
 17. GINSENG
 18. GREEN TEA
 19. HAWTHORN
 20. JEWELWEED
 21. KAVA KAVA
 22. LADY'S MANTLE
 23. LICORICE
 24. MA HUANG
 25. MILK THISTLE
 26. MISTLETOE
 27. NETTLE ROOT
 28. PEPPERMINT
 29. PRIMROSE OIL
 30. ROSEMARY
 31. ST. JOHN'S WORT
 32. SAW PALMETTO
 33. TANG KUEI
 34. OTHER (Specify _____)

(PLEASE TURN THE PAGE)

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12. If you are interested in receiving training in diet as complementary medicine, who would you want to provide it?
(Circle all that apply)

1. THE DIETETIC PROFESSION
2. THE MEDICAL PROFESSION
3. THE NURSING PROFESSION
4. THE COMPLEMENTARY HEALTH PROFESSIONS
5. THE PHARMACY PROFESSION
6. OTHER (Specify _____)

13. If you are interested in receiving training, what kinds of formats would be most helpful to you?
(Circle all that apply)

1. BOOKS
2. BROCHURES/FACT SHEETS
3. CONFERENCES / WORKSHOPS
4. INFORMATION ON "ADA" WEBSITE
5. OTHER INTERNET INFORMATION WEBSITES
6. ARTICLES IN PROFESSIONAL JOURNALS
7. OTHER (Specify _____)

Demographic

Finally, the following are questions about yourself. Please circle the applicable number.

14. Is your age
(Circle one number)
1. LESS THAN 30 YEARS
 2. BETWEEN 31 & 40 YEARS
 3. BETWEEN 41 & 50 YEARS
 4. BETWEEN 51 & 60 YEARS
 5. MORE THAN 60 YEARS

15. Are you a
1. FEMALE
 2. MALE

16. Is your ethnic identity
(Circle one number)

1. WHITE
2. BLACK
3. AMERICAN INDIAN, ESKIMO, ALEUT
4. ASIAN, PACIFIC ISLANDER
5. HISPANIC ORIGIN (ANY RACE)
6. OTHER (Specify _____)

17. Is the highest educational degree you have completed, a
(Circle one number)

1. BACHELOR'S DEGREE
2. MASTER'S DEGREE
3. Ph.D. DEGREE

18. What was your route to registration?

1. DIETETIC INTERNSHIP
2. AP4
3. COORDINATED PROGRAM
4. MS + 6 MONTHS EXPERIENCE
5. 3 YEAR PLANNED EXPERIENCE
6. OTHER (Specify _____)

19. How long have you worked as a registered dietitian?
(Circle one number)

1. 0-5 YEARS
2. 6-10 YEARS
3. 11-15 YEARS
4. 16-20 YEARS
5. 21-25 YEARS
6. Over 25 YEARS

20. Is your dietetic employment status:
(Circle one number)

1. EMPLOYED FULL TIME
2. EMPLOYED PART TIME
3. UNEMPLOYED (Do not answer # 21)

21. If employed, is your primary work with:

1. A COMMUNITY PROGRAM (WIC, NSLP, EFNEP, etc)
2. AN EDUCATIONAL INSTITUTION (K-12, HIGHER EDUCATION, etc)
3. A HEALTH CARE FACILITY (HOSPITAL, OUTPATIENT, LONG-TERM CARE, etc)
4. A LOCAL, STATE, OR FEDERAL GOVERNMENT OFFICE
5. A PRIVATE PRACTICE
6. OTHER (Specify _____)

(THANK YOU FOR YOUR COOPERATION)

APPENDIX FOUR

QUESTIONS FOR PILOT STUDY PARTICIPANTS

1) Did the survey read well?

- ☐ Yes
☐ No

1a) If NOT, please indicate the specific area and problem.

2) Would you change anything (question, content, directions)?

- ☐ Yes
☐ No

2a) If YES, please indicate the specific area and problem.

3) Would you add anything (question, content, directions)?

- ☐ Yes
☐ No

3a) If YES, please indicate the specific area and problem.

4) Would you delete anything (question, content, directions)?

- ☐ Yes
☐ No

4a) If YES, please indicate the specific area and problem.

5) How long did the survey take for you to complete? _____

6) Was the wording of the questions easy to understand?

- ☐ Yes

☐ No

6a) If NOT, please indicate the question number and problem.

7) Was the aesthetic look of the survey appealing?

☐ Yes

☐ No

7a) If NOT, please indicate what was unappealing and any suggestions for improvement.

8) Any overall suggestions regarding the survey?

APPENDIX FIVE

EXPERT PANELIST QUESTIONS

1) Did the survey read well?

☐ Yes

☐ No

1a) If NOT, please indicate the specific area and problem.

2) Would you change anything (question, content, directions)?

☐ Yes

☐ No

2a) If YES, please indicate the specific area and problem.

3) Would you add anything (question, content, directions)?

☐ Yes

☐ No

3a) If YES, please indicate the specific area and problem.

4) Would you delete anything (question, content, directions)?

☐ Yes

☐ No

4a) If YES, please indicate the specific area and problem.

5) How long did the survey take for you to complete? _____

6) Was the wording of the questions easy to understand?

☐ Yes

☐ No

6a) If NOT, please indicate the question number and problem.

7) Was the aesthetic look of the survey appealing?

☐ Yes

☐ No

7a) If NOT, please indicate what was unappealing and any suggestions for improvement.

8) Any overall suggestions regarding the survey?

It is well known that there are multiple definitions of functional foods and as a result, it is difficult to measure RDs' practical knowledge of this evolving term. Accordingly, each definition has a different set of foods and food types associated with it. So in this respect this is survey has posed a challenge because the interest of this study is to identify RDs knowledge of functional foods.

In order to measure knowledge, there needs to be a correct answer for each question. Therefore, I am asking expert panelists to identify the foods and food types associated with each definition from Question 1 of the Knowledge Section. The goal is to gain a consensus. The definitions are again listed below for reference:

A) Functional foods are “those that by virtue of physiologically active food components provide health benefits beyond basic nutrition.”

B) Functional foods are those that have “satisfactorily demonstrated to affect beneficially one or more target functions in the body beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease.”

C) Functional foods are "those foods that encompass potentially healthful products including any modified food or ingredient that may provide a health benefit beyond the traditional nutrients it contains."

D) All foods are functional on some physiologic level including “...whole foods, fortified foods, enriched or enhanced foods, have a potentially beneficial effect on health when consumed as part of a varied diet.”

E) Functional foods encompass those where “...one or more ingredients (nutrients or non-nutrients) have been added or modified to enhance their contribution to a healthful diet. These foods may have a beneficial effect on health beyond the effect of normal foods. They can improve certain body functions, state of health and/or lower the risk on developing certain diseases.”

9) Choose All That Apply: Letters A – E represent the definitions listed above. For each of the five food types listed, please check the boxes indicating which food types are associated with each definition.

FOOD TYPE	DEFINITION LETTER				
	A	B	C	D	E
1) Fortified food products					
2) Enriched food products					
3) Unprocessed or natural foods					
4) Herbal Supplements					
5) Dietary Supplements					

10) Choose All That Apply: Letters A – E represent the definitions listed above. For each of the foods listed, please check the boxes indicating which foods are associated with each definition.

FOOD ITEM	DEFINITION LETTER				
	A	B	C	D	E
1) Chocolate Chip Cookie					
2) Chocolate Chip Cookie with Fiber					
3) Cream of Wheat					
4) Instant Oatmeal					

5) Low-calorie Bread					
6) Low-fat Chocolate Chip Cookie					
7) Multi-grain Bread					
8) Old Fashioned Oatmeal					

FOOD ITEM	DEFINITION LETTER				
MEAT & BEANS	A	B	C	D	E
9) Black beans					
10) Chicken					
11) Eggs					
12) Eggs with Omega-3 Fatty Acids					
13) Ground Beef					
14) Lentils					
15) Salmon					
16) Tuna					
17) Tilapia					

FOOD ITEM	DEFINITION LETTER				
SUPPLEMENTS	A	B	C	D	E
18) Dietary Fiber					
19) Echinacea					
20) Fish Oil					
21) Flaxseed Oil					
22) Ginger					
23) Ginger Root					
24) Ginkgo Biloba					
25) Glucosamine					
26) Probiotics					
27) St. John's Wort					

FOOD ITEM	DEFINITION LETTER				
VITAMINS & MINERALS	A	B	C	D	E
28) Calcium and Vitamin D					
29) Folate					
30) Multivitamin					
31) Vitamin C					
32) Vitamin E					

FOOD ITEM	DEFINITION LETTER				
VEGETABLES	A	B	C	D	E
33) Avocado					
34) Carrots					
35) Garlic					
36) Guacamole					
37) Soybean Products					
38) Soybeans					

FOOD ITEM	DEFINITION LETTER				
FRUITS	A	B	C	D	E
39) Blueberries					
40) Cranberry Juice					
41) Cranberry Juice with Pomegranate					
42) Ketchup					
43) Orange Juice					
44) Orange Juice with Calcium					
45) Orange Juice with Glucosamine					
46) Whole Tomato					

FOOD ITEM	DEFINITION LETTER				
OILS & FATS	A	B	C	D	E
47) Margarine					
48) Margarine with Plant Stanols and Sterols					
49) Olive Oil					
50) Olive Oil with Omega-3 Fatty Acids					

FOOD ITEM	DEFINITION LETTER				
MILKS	A	B	C	D	E
51) Yogurt					
52) Yogurt with Probiotics					

FUNCTIONAL FOOD SUGGESTIONS: PLEASE TYPE IN SPACE PROVIDED AND INDICATE WHICH DEFINITIONS MATCH THE FOOD.

FOOD ITEM	DEFINITION LETTER				
OTHER	A	B	C	D	E
53)					

54)					
55)					

11) Any suggestions or thoughts regarding the survey?

APPENDIX SIX



CONSENT FORM

PERCEPTIONS, ATTITUDES AND PRACTICES OF REGISTERED DIETITIANS REGARDING FUNCTIONAL FOODS

My name is Amanda Berhaupt and I am a graduate student in the Department of Dietetics & Nutrition at Florida International University in Miami, Florida. I am conducting a research study to determine the perceptions, attitudes and practices of Registered Dietitians (RDs) regarding functional foods. In order to accomplish this, I am requesting your participation to complete the enclosed survey, which will take about 10 minutes. Surveys have been mailed to a sample population provided by the Commission on Dietetic Registration. You were chosen as a potential participant because your attributes match our selection criteria, which include RDs, who are not retired and currently reside within the United States.

By completing the survey, you will contribute to a pool of data that will be used to determine the perceptions, attitudes and practices of RDs and functional foods. Further, the data will identify training and education needs, and facilitate future training opportunities for dietetics professionals.

Please complete the enclosed survey and return it in the enclosed envelope provided by **August 3, 2009**. Your consent will be given when you complete the survey. You will not be asked for any private information. The data will be reported as a group and may be published however there is no information linking your survey to your person. There are no known risks or benefits to you for your participation in this survey. There is no cost or compensation for completing and returning the survey. Your participation in this study is completely voluntary. You have the right to decline or discontinue participation at any time without consequence. If you choose not to complete the survey no other action is needed.

If you have any questions about this study before or after you complete the survey please contact me at 305-397-9042 or email aberh001@fiu.edu. You may also contact my major professor, Evelyn B. Enrione, PhD, RD at 305-348-3236 or email enrionee@fiu.edu. If you have any questions regarding your rights as a participant in this research study you may call Dr. Patricia Price, the Chairperson of the Institutional Review Board at 305-348-2618 or 305-348-2494. Thank you for taking time to participate in this study.

Sincerely,
Amanda Berhaupt
Master's Graduate Student
Department of Dietetics & Nutrition

APPENDIX SEVEN

September 14, 2009 (Email)

“Hello, my name is Amanda Berhaupt and I am a graduate student at Florida International University in the department of Dietetics and Nutrition. This is an email regarding my thesis project. I have acquired a list of prospective participants from the Commission on Dietetic Registration to complete my survey on the “Perceptions, Attitudes and Practices of Registered Dietitians Regarding Functional Foods.” You are receiving this email because CDR included your contact information in a random sample. Surveys were initially mailed out via the U.S. Postal Service, however the address provided for you was no longer valid. Thus, I have created a computer version of the survey and emailed those individuals. Attached are two documents; a consent form outlining the purpose of the study, and the survey. I ask that you please fill out the attached survey and email it back to me by September 25, 2009.

INSTRUCTIONS: Please download and save the attached interactive document entitled “RD Functional Food Survey for Graduate Student” to your desktop. All questions are in check box, or type formats and may be completed directly on the PDF document using your computer. Once you have filled in the survey, you must save it again and attach it to your return email.

This document is an Adobe Acrobat interactive PDF form. If you do not have Adobe Acrobat Reader on your computer, you may download it for free here: <http://get.adobe.com/reader/>. If you prefer to return the survey through regular mail, please use the address and contact information at the bottom of this email.

Lastly, if you have any trouble or have any questions, please feel free to contact me at aberh001@fiu.edu or 305-397-9042. Thank you for your time. I really appreciate your participation.”

Amanda Berhaupt
Master’s Graduate Student
Florida International University

APPENDIX EIGHT

September 25, 2009 (Email)

Good morning, this is a friendly reminder regarding the survey entitled, "The Perceptions, Attitudes and Practices of Registered Dietitians Regarding Functional Foods" for my thesis project. The survey I'm referring to had initially been mailed to you at the beginning of August. The responses received so far have been wonderful and I just need 20 more surveys to meet my quota! If you have lost or thrown out the survey, I would be happy to e-mail you another copy, so you may return it by e-mail.

Thank you for your time and please let me know if I can be of any assistance. Your participation is greatly appreciated!

Amanda Berhaupt
Master's Graduate Student
Florida International University