

10-31-2017

Development of a Nutrition Education Program for the Mississippi Communities for Healthy Living Nutrition Intervention Using the Diffusion of Innovations Theory

Holly F. Huye

University of Southern Mississippi, Holly.Huye@usm.edu

Elaine Molaison

University of Southern Mississippi

Laura H. Downey

Mississippi State University

Alicia S. Landry

University of Central Arkansas

Lashaundra B. Crook

University of Southern Mississippi

See the page for additional authors <https://scholarsjunction.msstate.edu/jhse>



Part of the [Education Commons](#), [Medicine and Health Sciences Commons](#), and the [Social and Behavioral Sciences Commons](#)

Recommended Citation

Huye, H. F., Molaison, E., Downey, L. H., Landry, A. S., Crook, L. B., & Connell, C. L. (2017). Development of a Nutrition Education Program for the Mississippi Communities for Healthy Living Nutrition Intervention Using the Diffusion of Innovations Theory. *Journal of Human Sciences and Extension*, 5(3), 3. <https://scholarsjunction.msstate.edu/jhse/vol5/iss3/3>

This Original Research is brought to you for free and open access by Scholars Junction. It has been accepted for inclusion in *Journal of Human Sciences and Extension* by an authorized editor of Scholars Junction. For more information, please contact scholcomm@msstate.libanswers.com.

Development of a Nutrition Education Program for the Mississippi Communities for Healthy Living Nutrition Intervention Using the Diffusion of Innovations Theory

Acknowledgments

This research was funded by the USDA, Agricultural Research Service, Delta Obesity Research Prevention Unit under project number 58-6251-8-043

Authors

Holly F. Huye, Elaine Molaison, Laura H. Downey, Alicia S. Landry, Lashaundra B. Crook, and Carol L. Connell

Development of a Nutrition Education Program for the Mississippi Communities for Healthy Living Nutrition Intervention Using the Diffusion of Innovations Theory

Holly F. Huye

Elaine F. Molaison

The University of Southern Mississippi

Laura H. Downey

Mississippi State University

Alicia S. Landry

University of Central Arkansas

Lashaundra B. Crook

Carol L. Connell

The University of Southern Mississippi

This research identified themes when exploring the Dietary Guidelines for Americans' (DGA) attributes of relative advantage, compatibility, complexity, trialability, and observability to provide information for the design and structure of a nutrition education program for the Mississippi Communities of Healthy Living Nutrition Intervention. Diffusion of Innovations theory was used to develop education sessions to promote the adoption and consumption of a DGA-based healthy diet innovation in the Lower Mississippi Delta. Two focus groups were conducted with a purposive sample of 13 women in the community as well as one expert panel of six registered dietitians. Major themes identified for the DGA were Balanced Nutrition, All-inclusive, and Protective as the relative advantage; Adaptability when exploring compatibility; low complexity as Simple to Follow and Convenient and Portable; Gradual Change and Taste Tests when discussing trialability; and Modeling for observability. A Generational theme reflected participants' desire to impart healthy behaviors to future generations. Results were used to operationalize attributes and develop 12 lesson plans.

Keywords: Diffusion of Innovations theory, nutrition education, program planning, Lower Mississippi Delta

Direct correspondence to Holly Huye at Holly.Huye@usm.edu

Introduction

Behavioral theories are often used to guide the development and assessment of public health education interventions and to help establish a ‘big picture’ of the planned intervention (Fishbein & Cappella, 2006; Jeffery, 2004; Lemacks, Wells, Illich, & Ralston, 2013; Steckler, Goodman, McLeroy, Davis, & Koch, 1992). Brug, Oenema, and Ferreira (2005) suggest using theory to close the gap between intention to change and actual change. The Transtheoretical Model (Prochaska, 1979), the Social Learning Theory (Bandura, 1977), and the Health Belief Model (Rosenstock, 1974) are three widely used behavioral theories often used in nutrition interventions; however, there is no known research available about the use of the Diffusion of Innovations (DOI) theory (Rogers, 2003) to develop the structure of nutrition education sessions within a larger intervention.

Several key constructs within DOI theory enhance its applicability for use in bridging the gap between the intention to change behaviors and initiating or maintaining actual behavior change. Operational within the DOI theory is the concept of *diffusion*, which is defined as “the process in which an innovation is communicated through certain channels over time among the members of a social system,” where an ‘innovation’ is considered to be a new idea, practice or object (Rogers, 2003 p. 5). The innovation spreads from the initiator to adopter among particular segments of social system members starting with innovators (2.5% of members) and early adopters (13.5%) and spreading to influential early majority adopters (34%). The early majority adopters are observed using the innovation by the late adopters (34%) and laggards (16%), the last to adopt an innovation. A key construct of DOI theory related to health behaviors includes certain “attributes” that influence the adoption of a health behavior or *innovation*. In nutrition education, strategies targeting innovation attributes can be used to influence motivation, abilities, and opportunities that promote action to positively change behaviors. Although an innovation can have many attributes, according to Rogers (2003), there are five attributes in particular that contribute most to the rate of adoption of an innovation:

- 1) Relative advantage: The degree to which an innovation is better than a previous idea, practice, object;
- 2) Compatibility: The degree to which an innovation is perceived as being consistent with current values, experiences, needs;
- 3) Complexity: The degree to which an innovation is perceived as difficult to understand and use;
- 4) Trialability: The degree to which an innovation can be experimented with on a limited basis; and
- 5) Observability: The degree to which the results of an innovation are visible to others or can be easily communicated.

In the present study, a qualitative research method was used to provide information for the development of a nutrition education program designed to promote the adoption and consumption of a culturally compatible, healthy diet, based on regionally specific foods. The DOI theory was used as the theoretical foundation for the development of education components for the Mississippi Communities for Healthy Living (MCHL) nutrition intervention in the Lower Mississippi Delta (LMD).

Intervention Target Region and Development

The LMD is a rural, agricultural region rich in cultural heritage, faith, and family relations, but it is one of the most financially impoverished areas in the United States (National Park Services, n.d.). The LMD includes counties in Arkansas, Louisiana, and Mississippi with predominantly Black populations, characterized by high levels of poverty, low levels of educational attainment, and lack of access to healthy foods, as well as high rates of obesity and chronic disease (The Lower Mississippi Delta Nutrition Intervention Research Consortium, 2004). Mississippi has consistently been classified as one of the highest in the nation for the prevalence of obesity, with 35.6% of adults classified as obese in 2015 (Centers for Disease Control and Prevention, 2017). Poor dietary quality may be a contributing factor to the chronic health conditions among this population. Prior research has indicated a need for improving the overall dietary quality in the LMD and the five key attributes of the DOI theory present an avenue for diffusing healthy dietary practices (McCabe-Sellers et al., 2007; Thomson et al., 2011).

The MCHL nutrition intervention was conducted to fulfill the need for a methodologically sound, theory-based nutrition education intervention to address the identified nutrition and health concerns in the LMD (McCabe-Sellers et al., 2007; The Lower Mississippi Delta Nutrition Intervention Research Consortium, 2004; Thomson et al., 2011). Development of the intervention is described by Connell et al. (2015). In brief, the MCHL nutrition intervention targeted women who were members of social and civic organizations because of their influential nature as community leaders, representing early and/or early majority adopters (McGee et al., 2008). Furthermore, participant recruitment efforts targeted women, since McGee and colleagues (2008) found women in the Delta perceive themselves as primary food providers for their families and communities. According to Rogers (2003), earlier adopters typically have higher educational attainment levels, more social clout, and are more connected through interpersonal networks in their social system than later adopters. The targeted intervention population possessed these early adopter characteristics with the potential to diffuse the intervention to the late adopters.

The intervention consisted of six monthly nutrition education sessions and corresponding newsletters followed by a six-month maintenance period for a multi-site ($N = 16$), two-treatment arm intervention. The focus of the nutrition education sessions was the Dietary Guidelines for

Americans (DGA); each nutrition education session addressed a specific recommendation (U.S. Department of Agriculture [USDA] & U.S. Department of Health and Human Services [USDHHS] 2010). The MCHL intervention was constructed using the RE-AIM model for intervention development and evaluation (Glasgow, Vogt, & Boles, 1999; Huye, Connell, Crook, Yadrick, & Zoellner, 2014) and the DOI theory for nutrition education program development (Rogers, 2003). The objectives of this research project were to (1) identify and define attributes that would promote the adoption and consumption of a healthy diet and (2) incorporate these attributes into a structure for nutrition education sessions. This manuscript describes the resulting themes of the formative research that were used to provide information for the design of nutrition education sessions for the MCHL intervention. Research procedures were approved by the University of Southern Mississippi Institutional Review Board, and accordingly, all participants were provided written informed consent before proceeding with study methods.

Methods

Research Design and Procedures

Utilizing methodology recommended by Rogers (2003), potential early and early majority adopters of a healthy diet were invited to focus groups to identify healthy diet attributes. Purposive and snowball sampling methods (Patton, 2002) were used to recruit community members to participate in focus group sessions based on their relationships with the LMD communities and the earlier adopter characteristics (Rogers, 2003). An expert panel of registered dietitians was selected based on their expertise in nutrition, health, wellness, research and educational experience in working with populations with characteristics similar to those in the LMD. The expert panel was recruited from the local South Mississippi dietetics association member list. The aim of the focus groups and expert panel was to identify characteristics of the DGA that could potentially influence the adoption and implementation of the DGA recommendations as part of a healthy eating pattern among individuals participating in a nutrition education program. Semi-structured discussions were moderated by two researchers trained in qualitative interviewing methods. Participants received a handout listing the current DGA, with notation that the DGA reflected a healthy diet, and a handout listing Rogers' five key attributes and the corresponding definitions. Participants were asked to review the DGA handout and consider characteristics of the DGA recommendations that would encourage incorporation of one or more of the recommendations into their diets. For each of Rogers' five key attributes, the facilitator asked how these attributes could apply to a healthy diet. For example, for the relative advantage attribute, interviewers asked participants, "*How is the adoption of the DGA better than someone's current eating patterns*" (Table 1). Focus group and expert panel discussions lasted no longer than one hour and were audio-recorded and transcribed verbatim.

Table 1. Relative Advantage, Compatibility, Complexity, Trialability, and Observability Attributes, Original Definitions, and Corresponding Nutrition Education Session Planning Questions and Concepts for Focus Groups and Expert Panel Discussions

Attribute	Original Definition ^a	Example Questions and Concepts Addressed
Relative Advantage	Degree to which innovation is better than previous idea, practice, object	What are the benefits of the DGA? Do the benefits outweigh the cons? How is the adoption of the DGA better than someone's current eating patterns? What are some advantages of this diet [the DGA] versus other diets (e.g., high protein, low carbohydrate)
Compatibility	Degree to which innovation is perceived as being consistent with current values, experiences, needs	What are some characteristics that make the DGA compatible with various cultures? How can the DGA fit in with your lifestyle? Are the DGA consistent with your values, experiences, needs?
(Low) Complexity	Degree to which innovation is perceived as difficult to understand and use	What are some characteristics that make this diet easy to incorporate into someone's daily eating patterns? Would you need to incorporate all aspects of the DGA to reap the benefits?
Trialability	Degree to which an innovation can be experimented with on a limited basis	What are some ideas that would encourage someone to try incorporating the DGA into their daily eating patterns?
Observability	Degree to which the results of an innovation are visible to others or can be easily communicated	How might someone communicate to others the advantages and/or positive consequences of incorporating the DGA into one's daily eating patterns? What might be some consequences of incorporating the DGA into one's daily eating patterns? What might be some consequences of <i>not</i> incorporating the DGA into one's daily eating patterns? Can the results of using the DGA be seen?

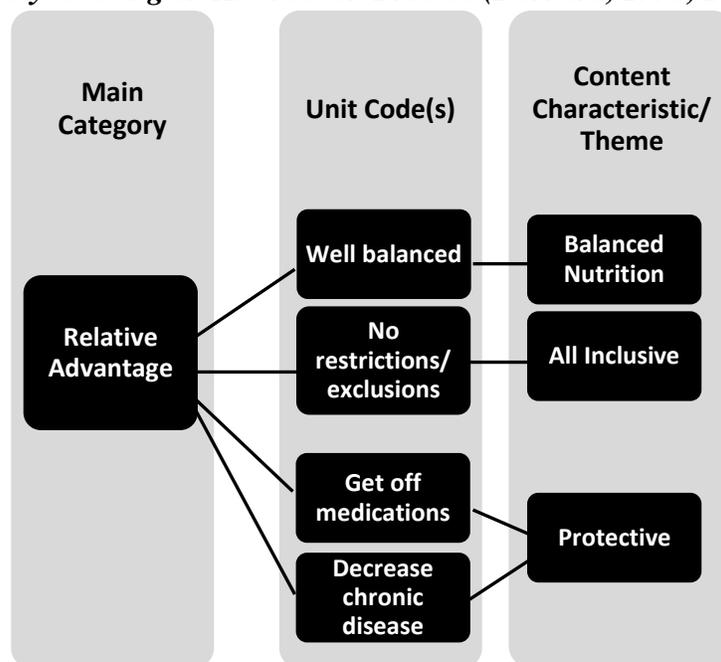
^aRogers (2003)

Data Analysis

After the focus group and expert panel discussions were transcribed, a deductive content analysis strategy (Catanzaro, 1988) was used to code the data using a categorization framework

representing relative advantage, compatibility, complexity, trialability, and observability of the DGA. Attributes were emphasized during focus groups and with the expert panel to determine if their original definition could be applied to a healthy diet. An inductive approach was used to generate themes that emerged from the data (Elo & Kyngäs, 2008; Patton, 2002). Two researchers individually coded the raw data from each focus group and expert panel discussion using a question-by-question, open coding technique. The data were segmented, labeled with a unit code, and assigned to the appropriate attribute category. An abstraction process (Figure 1) was used to name the unit codes using words that described the content or theme according to the patterns in the data (Burnard, 1996; Polit & Beck, 2004). Themes were cross-checked and confirmed collaboratively by the researchers, and a peer debriefing strategy was implemented with a research staff member from the LMD (Lincoln & Guba, 1985). Using the themes that emerged from the focus group and expert panel discussions, definitions were established for the five key attributes relative to a healthy diet. A *member checking* strategy was employed to verify interpretation of the attribute definitions and to reach consensus (Johnson, 1997). Member checking ensured the researchers accurately understood and represented what the participants said about study subject matter. The member checking procedure began by randomly selecting approximately 25% of the participants from each focus group ($n = 4$) and the expert panel ($n = 2$); these participants were provided with a form and asked to indicate their agreement (yes or no) with the created attribute definitions. Member checking participants were also asked to make recommendations for definition revision if they perceived the current statement was not accurate.

Figure 1. Data Analysis Using an Abstraction Process (Burnard, 1996; Polit & Beck, 2004)



Results

The two community focus groups ($n = 13$) included professional women belonging to social and civic organizations (e.g., sorority chapter or church group). The expert panel was composed of six dietitians representing areas of practice such as clinical, outpatient, bariatric, and education. Most participants in the focus groups and expert panel ($n = 11$) were between the ages of 26 and 40 years, with a college or graduate/professional degree ($n = 17$) (Table 2). Findings were similar between expert and community participants, with the exception of language differences. Members of the expert panel used more technical terms than the focus group participants. Therefore, results were combined for both focus groups and the expert panel, and themes are reported according to the categorization framework representing Rogers' key attributes.

Table 2. Characteristics of Community Focus Group and Expert Panel Participants ($N = 19$)

Characteristic	Number of Participants	
	Community	Expert
<i>Gender</i>		
Female	13	6
<i>Age range</i>		
21-25	1	1
26-30	5	3
31-40	1	2
41-50	4	
51-60	2	
<i>Ethnicity</i>		
Black or African American	7	
White	6	6
<i>Education attainment</i>		
Some College	1	
College Degree	8	
Some graduate or professional school	1	
Graduate or professional degree	3	6
<i>Member of social or civic club participating in community outreach (check all that apply)</i>		
Church group	3	2
Sorority	6	1
Group or club associated with job	2	2
Other not specified	2	

Relative Advantage

Participants perceived the relative advantage of the DGA as well-balanced nutrition in which no food groups are excluded. According to participants, the DGA provide “balanced nutrition,” and is “all-inclusive” and “protective.” Many participants expressed that, if adopted, the DGA would increase energy levels and improve mood and overall well-being. One woman said, “*It [the DGA] includes a full scope of what the human body needs to function the way it is designed, whereas other diets take away without adding something. It [the DGA] is just the perfect balance of what the body needs.*” Pertaining to all-inclusive, another participant stated, “*It [the DGA] doesn’t prohibit anything, I mean it just speaks to re-shifting your portion sizes around.*”

Participants remarked about the protective effects of a healthy diet and the prevention or management of chronic disease as being relative advantages. Several women stated that individuals could also stop taking medications. One woman said, “*If you have diabetes, controlling blood sugar and getting off medication is an advantage.*” When asked what the consequences of not incorporating DGA recommendations were, participants overtly said, “*death,*” “*obesity,*” and “*increased risk of disease.*” Comments related to the advantages of the DGA when compared to other diets indicated that the participants recognized that the DGA recommendations do not require the purchase of pre-packaged or mail-order foods and that no foods are prohibited.

Compatibility

When participants were asked what characteristics of the DGA were compatible with different lifestyles, cultures, and food preferences, participants considered the “adaptability” of the DGA. Participants discussed how the DGA could be adapted to any culture, including vegetarian, Latino, and southern cultures. For example, one woman commented, “*There are a lot of catfish farms in the Delta,*” acknowledging the southern culture in the LMD and that the consumption of catfish would make the DGA recommendation of lean protein compatible in this population. Another stated, “*It [the DGA] seems more multicultural as a plan than what I think of the American diet . . . it doesn’t focus on processed foods, it focuses on whole foods.*”

(Low) Complexity

Regarding the complexity of incorporating the DGA into one’s diet, participants believed the guidelines were straightforward and thus “simple to follow.” The women remarked on knowing how to identify serving sizes and ranges of servings (e.g., 2 to 3 cups). One participant stated, “*Measurements are recognizable by individuals; they know what a cup is.*” Others noted the popularity and availability of pre-portioned or single-serving items that enhance the ease of consuming a healthy diet. Participants agreed that the key to healthy eating was to make it easy.

One participant stated, *“If the diet is easy, people will be more likely to do it.”* However, the need for education regarding the various forms of food packaging (i.e., fresh, frozen, canned in water or syrup) was also expressed, as one stated, *“The key is knowledge. If you don’t know they [manufacturers] make fruit packed in water, they [consumers] are going to pick up what they normally buy,”* while another affirmed, *“They need to have programs to teach them [potential adopters] what is available.”*

Participants also considered the DGA as “convenient and portable.” As the women in these groups were working professionals with active social networks, the number of convenience items available today was an important factor in being able to eat healthy for today’s “on-the-go” lifestyle. Comments included, *“There are so many on-the-go products, like 100-calorie snack packs that are accessible to modern living, acceptable for on-the-go women,”* and *“There are more healthy convenience foods available for those that are too busy . . . like juice, fruit cups, instant rice and oatmeal.”* There were also numerous comments about the portability of fruits and vegetables, as one participant stated, *“People think it is too hard if they are busy. They need to realize it is just as easy to grab a bag of grapes versus a bag of chips.”* However, some of the women expressed the need for education related to fresh fruits and vegetables when discussing convenience items. Although whole fruits and vegetables were considered portable, participants discussed the limited shelf-life of fresh fruits and vegetables and resulting waste. To overcome this potential barrier to low complexity of healthy eating, participants suggested education related to using frozen fruits and vegetables, as well as the variety of healthy convenience foods on the market. Another recommendation was teaching meal planning skills, as one participant stated, *“All of this [eating healthy] will take meal planning skills to accomplish . . . teach them [potential adopters] how to prep on weekends.”*

Trialability

Participants believed DGA recommendations could be implemented one at a time to facilitate “gradual change.” As one participant said, *“Take the idea of gradual changes create drastic, positive results. Gradual, is one month at a time...a month of trying a new food. This month, do better with fruits.”* When asked about ideas to promote trialability of the DGA, “taste tests” and food sampling were most frequently suggested. *“Taste testing, like they do on the ‘Today’ show or ‘Morning Show’.* You can do that at the church on a Saturday morning and get things they really enjoy,” one participant said. Other ideas to promote trialability of the DGA included food demonstrations, recipe swaps, and grocery store tours. With regard to the population in the LMD, participants mentioned social events in which trialability might be appropriate. For example, the women believed food demonstrations and taste-tests could be conducted at revivals, health fairs or any program with a social activity across the LMD, reflecting the social nature of this population.

Observability

Outward manifestations of healthy eating patterns (e.g., feeling better, reducing medications, decreasing risk of chronic disease, etc.) may not be immediately apparent. Therefore, the facilitator asked participants how positive outcomes of a healthy diet might be communicated. Participants expressed the need to be a personal example or role model in how to eat at work, what and how to order in restaurants, and what to buy at the grocery store, thus “modeling” that the DGA could demonstrate observability. One woman conveyed modeling in this way, “*You give somebody something to look at and then you are embodying it yourself; so, you are living, walking, breathing benefits of a healthy diet.*” One recommendation to promote observability of healthy eating was to promote healthy eating events at churches such as a “*healthy potluck dinner*” and provide participants with the recipes used. Participants also expressed that if results could not be seen immediately, verbal communication would be necessary, as one suggested, “*The people who are leading the [education] session need to be role models and talking about what they did to achieve their goals . . . testimonials . . . seeing is believing.*”

Additional Findings

Although not specific to one particular attribute, participants thought of the DGA as “generational.” The women expressed a desire for lifestyle changes to start in the family so that healthy dietary behaviors become culturally ingrained and passed on to future generations. As one participant said, “*The dietary guidelines become incorporated into the family and become a behavior; [the DGA] become generational.*” Other examples of the generational finding included comments like, “*It [the DGA] becomes a trend of healthier eating, like generational.*” When asked about why it was important to incorporate DGA recommendations into daily eating patterns, one participant said, “*We have to change the generational trends; we’ve got to start somewhere.*” Another expressed concern for the future generation of children, “*If all you cook is chicken nuggets and French fries, that’s all they [the children] are going to eat.*” It was evident from participant responses that the passing on of healthy eating behaviors to future generations was a motivational factor in adopting a healthy diet in the present to prevent onset of illness in the future.

Use of Attributes and Findings to Develop Nutrition Education Sessions

Findings from the focus groups and expert panel discussions were used to operationalize the five attributes relative to a healthy diet (i.e., the DGA) for the MCHL nutrition intervention. Member-check participants ($N = 6$) agreed that the definitions were reflective of the discussion with minor revisions suggested. Themes arising from the data for each attribute were then used to develop components of the MCHL nutrition education sessions. Education components and corresponding DOI attribute definitions and pertinent themes are shown in Table 3.

Table 3. Key Attributes, Data Themes, New Attribute Definitions, and Application to Education Session Components

Attribute	Major Data Themes	New Attribute Definition	Education Session Component
Relative Advantage	Balanced Nutrition All-inclusive Protective	The degree to which implementing components of a healthy diet is better than previous eating patterns, increasing one's overall well-being.	Relationship between diet and chronic diseases and consequences of a healthy diet were emphasized during the <i>Introduction, Lesson, and Summary of Main Points</i> segments. Focus on how a healthy diet is better than previous eating behaviors was also highlighted during the <i>Lesson and Share Your Story</i> segments.
Compatibility	Adaptability	The degree to which components of a healthy diet are adaptable to one's dietary needs and/or cultural food preferences.	Culturally-appropriate foods were incorporated into the <i>Interactive Food Demo</i> . At the end of the program, participants modified family recipes for a potluck celebration. A <i>Home Challenge</i> was given at the end of every session to encourage modeling healthy behaviors for family and friends.
(Low) Complexity	Simple to Follow Convenient and Portable	The degree to which components of a healthy diet are easy to incorporate into one's diet and are convenient and readily available for today's "on-the-go" lifestyle.	The <i>Interactive Food Demos</i> exhibited minimal preparation and ingredients. Ease of meeting DGA recommendations using various snack and meal planning methods was emphasized during the <i>Lesson and Summary of Main Points</i> segments.
Observability	Modeling	The degree to which components of a healthy diet and positive outcomes can be modeled or shared.	A <i>Share Your Story</i> segment gave participants an opportunity to discuss changes made in their diet as well as positive outcomes.
Additional Findings	Generational		Discussion of important reasons to change dietary patterns occurred in the <i>Lesson</i> segment. Participants were encouraged to share recipes with family and friends during the <i>Home Challenge</i> given at the end of the session during the <i>Summary of Main Points</i> segment.

A total of 12 education sessions (six sessions per treatment arm) were developed that included seven segments each. An example of a session lesson plan with corresponding DOI attributes and activities are shown in the Figure 2.

Figure 2. Lesson Plan of One Education Session Including Lesson Segments, Talking Points, and Activities

Topic: Lean Protein		
Lesson title: <i>Lean Protein for a Lean Me</i>		
Goal: Introduce ways to incorporate more lean protein sources into the everyday diet.		
Objectives: After session, participant will be able to: <ol style="list-style-type: none"> 1) List at least one benefit of eating lean protein. 2) Identify at least one lean protein food. 3) Identify recommended number of lean proteins servings/day. 4) Prepare a recipe featuring a lean protein. 		
Time allotted: 1- 1.5 hours		
Content and sequence:	Talking Points/Description of Activity	Target Attributes
<ul style="list-style-type: none"> • Welcome to session and topic intro (5-10 minutes) 	<ul style="list-style-type: none"> • Welcome participants to the session, introduce topic, and review objectives (listed above). 	
<ul style="list-style-type: none"> • Share Your Story (5-10 minutes) 	<ul style="list-style-type: none"> • What are some of your favorite bean dishes? • Describe a time when you prepared a lean meat, fish or bean dish for yourself and/or family. • What do you find challenging about eating lean meats or beans? 	<ul style="list-style-type: none"> • Observability
<ul style="list-style-type: none"> • Lesson. Benefits of eating lean meats; recommended servings; discuss substituting lean protein in place of high fat protein foods. (10 minutes) 	<ul style="list-style-type: none"> • Ask participant to name reasons for eating lean meats. • Discuss the different types of lean protein sources. • Indicate the recommended number of ounces of lean protein for each person's gender and age. • Discuss ways to reduce the fat in protein sources and prepared dishes (i.e., skim the top of stews). 	<ul style="list-style-type: none"> • Relative Advantage • Low Complexity • Compatibility
<ul style="list-style-type: none"> • Interactive Food Demo and Tasting "Oven Baked Catfish" (10-20 minutes) 	<ul style="list-style-type: none"> • Ask for a volunteer to help instructor prepare Oven Baked Catfish recipe. During demonstration, discuss types of protein sources and preparation methods. • Allow participants to taste the catfish. 	<ul style="list-style-type: none"> • Trialability • Compatibility • Low Complexity
<ul style="list-style-type: none"> • Tasting Discussion. Identify protein sources and recipe modifications (5 minutes) 	<ul style="list-style-type: none"> • Ask participants to identify ways they could prepare their favorite catfish recipe and how they can incorporate other lean proteins into their diet. 	<ul style="list-style-type: none"> • Low Complexity • Compatibility
<ul style="list-style-type: none"> • Q&A (5 minutes) 		

<ul style="list-style-type: none"> • Summary of Main Points. Home Challenge, Meal Planning Tip, & Monthly Goal (5-10 minutes) 	<ul style="list-style-type: none"> • Summarize the importance of eating lean proteins, sources of lean proteins, and preparation methods. • Encourage participants to try the recipes provided in the session and in the upcoming newsletter and share with friends and family • Provide a tip for meal planning • Encourage participants to set a goal for the month 	<ul style="list-style-type: none"> • Relative Advantage • Low Complexity • Compatibility • Trialability • Generational
<ul style="list-style-type: none"> • Giveaways and Evaluation (5-10 minutes) 	<ul style="list-style-type: none"> • MCHL logo spatula and door prizes 	
<p>Notes: Promote lean proteins in place of high fat proteins; trimming away and reducing the fat in meats and recipes; preparing meals with beans; and ordering lean protein items at restaurants.</p>		

Discussion

Qualitative methods informed development of theory-based nutrition education sessions. The community focus groups and expert panel were used to identify and define attributes of the DGA. This formative phase assisted researchers in understanding how the DGAs are perceived in terms of DOI attributes and how those attributes might be operationalized to promote dietary behavior change and ultimately diffused to the greater community. Knowing important factors that influence the adoption and consumption of a healthy diet can provide a useful framework for developing targeted nutrition education programs or consumer messages. According to Rogers (2003), positioning an innovation using relative advantage, compatibility, low complexity, trialability, and observability increases the rate of innovation adoption. While the DGAs are not new or innovative, promoting them as a *healthy diet innovation* (i.e., a dietary pattern better than the previous dietary pattern) may be a suitable approach to promote healthy eating patterns.

While there was no known literature available related to DOI attributes used for developing nutrition education session components at the time of this study, prior research in nutrition education and nutrition interventions often indicate factors that motivate, enhance or facilitate behavior change. Frequently, these factors mirror DOI attributes. For example, Eikenberry and Smith (2004) found *feeling good/better* and *maintaining health* were motivators to eating healthy, which correlate to the relative advantage DOI construct. Recent shifts in attitudes about nutrition have indicated diet and nutrition are of personal importance among consumers (Academy of Nutrition and Dietetics, 2013). In the present study, balanced nutrition and increased energy levels were cited as positive consequences of adopting a healthy diet and are consistent with relative advantages of the DGA compared with previous eating patterns. Furthermore, fruits and vegetables have been found to have a protective effect on some cancers (Riboli & Norat, 2003). Thus, it was not surprising that *protective* emerged as a theme within the relative advantage construct. Participant responses strongly reflected the consequences of *not* eating a healthy diet (i.e., as indicated in the DGA). Consistent with previous research in

the LMD, a perceived motivator of consuming a healthy diet was a desire to avoid adverse health conditions (McGee et al., 2008). Relative advantage of the DGA was incorporated into the MCHL nutrition education sessions by describing advantages of making the targeted dietary change at the introduction of each session. Likewise, relative advantage, in terms of positive consequences of the DGA, was conveyed during the Lesson and Share Your Story segments of the session when comparing a healthy diet to previous eating behaviors (Figure 2).

Cultural food practices can influence taste preference and shopping habits (Academy of Nutrition and Dietetics, 2013). Participants in the present study perceived that the DGA allowed for cultural and regional foods to be adapted to a healthy diet and thus, compatible with their culture. Consumers have reported wanting dietary guidelines that were consistent with their personal food preferences and lifestyles (King & Gibney, 1999; Welsh & Davis, 1992). Therefore, compatibility of the DGA was incorporated into the MCHL intervention. For example, adaptation of regional recipes (e.g., oven baked catfish) was used in the Interactive Food Demos and a Home Challenge at the end of every session to promote the use of modified regional recipes and healthier eating behaviors among family and friends (Figure 2).

Convenient and portable were related to the low complexity of the DGA in the present study. Participants frequently mentioned the availability of convenience food products that fit within the DGA and the ease of being able to portion foods to take on-the-go. Similarly, lack of time to prepare foods has been cited as a significant influence on food choices, as consumers reported purchasing items that require minimal preparation time (Food Marketing Institute, 2013). The low complexity construct was emphasized in the MCHL intervention by using easy and quick preparation methods during the Interactive Food Demos, including recipes that did not require cooking. Tips on meal planning and pre-portioning snacks to take when on-the-go were discussed during the Tasting Discussion and Summary of Main Points.

With regard to trialability of the DGA, dietary changes should be made in increments for gradual improvement, allowing for lifestyle changes that can be maintained over time (Sahyoun, Pratt, & Anderson, 2004; USDA & USDHHS, 2010). Participants in this formative research study considered implementing gradual changes easier and more conducive to permanent change. Participants stated the DGAs were simple enough to make gradual changes, reiterating the low complexity of a healthy diet innovation. Participants further commented that consuming a healthy diet should be a lifestyle change, as one participant remarked that the guidelines should be called "*lifestyle guidelines*." In order to utilize trialability findings during MCHL, one DGA recommendation was incorporated into the Interactive Food Demo at each session in addition to taste-testing of a featured recipe associated with that specific recommendation.

The major theme associated with observability of consuming a healthy diet was modeling. Orally communicating the positive effects of consuming a healthy diet was expressed by participants as the best way to observe results of a healthy eating pattern because results may not be immediately evident or tangible. In this context, a healthy diet innovation would be considered a *preventive* innovation, and as described by Rogers (2003), an innovation that an individual adopts to avoid possible undesired consequences in the future. Preventive innovations are the most difficult to observe. For example, maintaining a healthy weight to avoid chronic disease later in life is not a tangible outcome that others readily recognize as a benefit of a healthy diet. Observability could be demonstrated through modeling behavior changes made in dietary habits or testimonials related to feelings of overall well-being or actual clinical manifestations, such as decreases in blood pressure, blood sugar, or weight loss. Observability of the DGA was initiated in the MCHL intervention in the Share Your Story segments of the education sessions as shown in Figure 2. During these segments, participants were given the opportunity to talk about behavioral changes they were making based on key messages in the program as well as any physical changes they were experiencing (e.g., weight loss, lower blood pressure).

Limitations

While there are several strengths to this study, including conducting interviews with women similar to the target population and member checking attribute definitions, there were also limitations. First, this research took place in a specific geographic region and may not reflect perceptions of women living in other areas. Additionally, the qualitative methods used consisted of small sample sizes. However, with prior research and experience with the LMD population for the last 20 years (The Lower Mississippi Delta Nutrition Intervention Research Consortium, 2004; Yadrick et al., 2001; Zoellner et al., 2007), the research team found the data to accurately reflect LMD attitudes and opinions. Although information relayed could be subject to misinterpretation, interpretive strategies were employed to minimize this limitation. Lastly, the participants were all women. This decision was made because the intervention target population was women in social and civic organizations. In retrospect, it may have been advantageous to include a male community group discussion to capture masculine perspectives with regards to attributes of a healthy diet.

Conclusion

Utilization of theoretical frameworks is often thought to be an initial step in developing effective and sustainable behavior change interventions. One theoretical framework that has not been extensively researched within dietary behaviors is the DOI theory. Focus groups and an expert panel were used to identify and describe women's perceptions of attributes of a healthy diet innovation (i.e., the DGA). Generational trends and cultural food practices were noted as key

components and messages in nutrition interventions aimed at promoting healthy diets and reducing chronic disease prevalence. Participants considered healthy, culturally compatible convenience foods and gradual integration of healthy dietary behaviors delivered through taste tests and food demonstrations as important factors in promoting a healthy diet. Furthermore, participants relayed that sharing individuals' journeys to a healthy lifestyle promotes the adoption of a healthy diet innovation and adds a social support element to the program.

As obesity continues to be a national public health dilemma, there is a need for nutrition intervention, especially in the LMD where chronic health conditions related to obesity are serious concerns. Promoting the relative advantage, compatibility, low complexity, trialability and observability of a healthy diet in a population known for its unique food culture is essential to promote the adoption and maintenance of a healthy diet innovation. The DOI theory is useful in prompting behavior change by promoting the attributes of the behavior that are of interest to the population. Data themes generated from each theoretical construct provided rich information related to the study population and educational strategies used to develop education sessions and intervention components for this multisite nutrition intervention in the LMD. In addition, study findings helped MCHL researchers discern attributes of a healthy diet educational program that would motivate participants to move beyond an intention to adopt healthier dietary behaviors to a position where adoption and maintenance of a healthy diet are actively integrated into family culture, and ultimately, will result in improvements in health outcomes across generations.

References

- Academy of Nutrition and Dietetics. (2013). Position of the Academy of Nutrition and Dietetics: Total diet approach to healthy eating. *Journal of the Academy of Nutrition and Dietetics*, 113(2), 307–317. doi:10.1016/j.jand.2012.12.013
- Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.
- Brug, J., Oenema, A., & Ferreira, I. (2005). Theory, evidence and intervention mapping to improve behavior nutrition and physical activity interventions. *International Journal of Behavioral Nutrition and Physical Activity*, 2(2). doi:10.1186/1479-5868-2-2
- Burnard, P. (1996). Teaching the analysis of textual data: An experiential approach. *Nurse Education Today*, 16(4), 278–281. doi:10.1016/S0260-6917(96)80115-8
- Catanzaro, M. (1988). Using qualitative analytical techniques. In P. Woods & M. Catanzaro (Eds.), *Nursing: Research, theory and practice*. (pp. 437–456). New York, NY: C. V. Mosby Company.
- Centers for Disease Control and Prevention. (2017). *Nutrition, physical activity, and obesity: Data, trends and maps*. Retrieved from <https://www.cdc.gov/nccdphp/dnpao/data-trends-maps/index.html>

- Connell, C. L., Thomson, J. L., Huye, H. F., Landry, A. S., Crook, L. B., & Yadrick, K. (2015). Mississippi Communities for Healthy Living: Implementing a nutrition intervention effectiveness study in a rural health disparate region. *Contemporary Clinical Trials*, *42*, 196–203. doi:10.1016/j.cct.2015.04.00
- Eikenberry, N., & Smith, C. (2004). Healthful eating: Perceptions, motivations, barriers, and promoters in low-income Minnesota communities. *Journal of the American Dietetic Association*, *104*(7), 1158–1161. doi:10.1016/j.jada.2004.04.023
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115. doi:10.1111/j.1365-2648.2007.04569.x
- Fishbein, M., & Cappella, J. N. (2006). The role of developing effective health communications. *Journal of Communications*, *56*(1), S1–S17. doi:10.1111/j.1460-2466.2006.00280.x
- Food Marketing Institute. (2013). *Shopping for health 2013*. Emmaus, PA: Rodale Inc.
- Glasgow, R. E., Vogt, T. M., & Boles, S. M. (1999). Evaluating the public health impact of health promotions interventions: The RE-AIM framework. *Journal of Public Health*, *89*(9), 1322–1327. doi:10.2105/AJPH.89.9.1322
- Huye, H. F., Connell, C. L., Crook, L. B., Yadrick, K., & Zoellner, J. (2014). Using the RE-AIM framework in formative evaluation and program planning for a nutrition intervention in the Lower Mississippi Delta. *Journal of Nutrition Education and Behavior*, *46*(1), 34–42. doi:10.1016/j.jneb.2013.09.006
- Jeffery, R. (2004). How can health behavior theory be made more useful for intervention research? *International Journal of Behavioral Nutrition and Physical Activity*, *1*(10) doi:10.1016/1479-5868-1-10
- Johnson, R. B. (1997). Examining the validity structure of qualitative research. *Education*, *118*(2), 282–292.
- King, S., & Gibney, M. (1999). Reduce fat intake is more successful when it does not restrict habitual eating patterns. *Journal of the American Dietetic Association*, *99*(6), 685–689. doi:10.1016/S0002-8223(99)00166-2
- Lemacks, J., Wells, B., Illich, J., & Ralston, P. (2013). Interventions of improving nutrition and physical activity behaviors in adult African American populations: A systematic review. *Preventing Chronic Disease*, *10*, 120256. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/23786910>. doi:10.5888/pcd10.120256
- Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.
- Malnick, S., & Knobler, H. (2006). The medical complications of obesity. *QJM: An International Journal of Medicine*, *99*(9), 565–579. doi:10.1093/qjmed/hcl085
- McCabe-Sellers, B. J., Bowman, S., Stuff, J. E., Champagne, C. M., Simpson, P. M., & Bogle, M. L. (2007). Assessment of the diet quality of U.S. adults in the Lower Mississippi Delta. *American Journal of Clinical Nutrition*, *86*(3), 697–706.

- McGee, B. B., Richardson, V., Johnson, G. S., Thornton, A., Johnson, C., Yadrick, K., . . . McCabe-Sellers, B. (2008). Perceptions of factors influencing healthful food consumption behavior in the Lower Mississippi Delta: Focus group findings. *Journal of Nutrition Education and Behavior, 40*(2), 102–109. doi:10.1016/j.jneb.2006.12.013
- National Park Services. (n.d.). Draft heritage study and environmental assessment. Retrieved from <https://www.nps.gov/nhl/learn/delta/dhsea.htm>
- Patton, M. Q. (2002). *Qualitative evaluation methods* (3rd ed.). Beverly Hills, CA: Sage.
- Polit, D. F., & Beck, C. T. (2004). *Nursing research. Principles and methods*. Philadelphia, PA: Lippincott, Williams & Wilkins.
- Prochaska, J. O. (1979). *Systems of psychotherapy: A transtheoretical analysis*. Pacific Grove, CA: Brooks-Cole.
- Riboli, E., & Norat, T. (2003). Epidemiologic evidence of the protective effect of fruit and vegetables on cancer risk. *American Journal of Clinical Nutrition, 78*(3), 559S–569S.
- Rogers, E. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Rosenstock, I. M. (1974). The health belief model and preventive health behavior. *Health Education Monographs, 2*(4), 354–386. doi:10.1177/109019817400200405
- Sahyoun, N. R., Pratt, C. A., & Anderson, A. (2004). Evaluation of nutrition interventions for older adults: A proposed framework. *Journal of the American Dietetic Association, 104*(1), 58–69. doi:10.1016/j.jada.2003.10.013
- Steckler, A., Goodman, R. M., McLeroy, K. R., Davis, S., & Koch, G. (1992). Measuring the diffusion of innovative health promotion programs. *American Journal of Health Promotion, 6*(3), 214–224. doi:10.4278/0890-1171-6.3.214
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.
- The Lower Mississippi Delta Nutrition Intervention Research Consortium. (2004). Self-reported health of residents of the Mississippi Delta. *Journal of Healthcare for the Poor and Underserved, 15*(4), 645–662.
- Thomson, J. L., Onufrak, S. J., Connell, C. L., Zoellner, J. M., Tussing-Humphreys, L. M., Bogle, M. L., & Yadrick, K. (2011). Food and beverage choices contributing to dietary guidelines adherence in the Lower Mississippi Delta. *Public Health Nutrition, 14*(12), 2099–2109. doi:10.1017/S1368980011001443
- U. S. Department of Agriculture & U. S. Department of Health and Human Services. (2010). *Dietary guidelines for Americans, 2010* (7th ed.). Washington, DC: U.S. Government Printing Office.
- Welsh, S., & Davis, C. (1992). Development of the food guide pyramid. *Nutrition Today, 27*(6), 12–23. doi:10.1097/00017285-199211000-00005
- Yadrick, K., Horton, J., Stuff, J., McGee, B., Bogle, M., Davis, L., . . . Zaghloul, S. (2001). Perceptions of community nutrition and health needs in the Lower Mississippi Delta: A key informant approach. *Journal of Nutrition Education, 33*(5), 266–277. doi:10.1016/S1499-4046(06)60291-1

Zoellner, J. Connell, C., Santell, R., Fungwe, T., Strickland, E., Avis-Williams, A., . . . Bogle, M. L. (2007). Fit for Life Steps: Results of a community walking intervention in rural Mississippi Delta. *Progress in Community Health Partnerships: Research, Education, and Action*, 1(1), 49–60. doi:10.1353/cpr.0.0009

Holly F. Huye is an Associate Professor in the Department of Nutrition and Food Systems at The University of Southern Mississippi and has worked in the Lower Mississippi Delta since 2009.

Elaine F. Molaison is a Professor and the Chair of the Department of Nutrition and Food Systems at The University of Southern Mississippi and is active in dietetics educational assessment and accreditation.

Laura H. Downey is an Associate Extension Professor and Extension Evaluation Specialist in the School of Human Sciences at Mississippi State University.

Alicia S. Landry is an Assistant Professor in the Department of Family and Consumer Sciences at the University of Central Arkansas and has 10 years of research experience with health disparate, rural populations in Louisiana and Mississippi.

LaShaundra B. Crook was a research dietitian in the Department of Nutrition and Food Systems at the University of Southern Mississippi at the time of this study. She has worked on various research projects serving communities in South Mississippi and the Lower Mississippi Delta over the last 10 years.

Carol L. Connell is a Professor in the Department of Nutrition and Food Systems at The University of Southern Mississippi and has 19 years of research experience with health disparate, rural populations in the Lower Mississippi Delta.

Acknowledgements

This research was funded by the USDA, Agricultural Research Service, Delta Obesity Research Prevention Unit under project number 58-6251-8-043.