INCREASING THE CONSUMPTION OF WHOLE GRAIN FOODS IN SCHOOL MEALS

A Dissertation

by

CYNTHIA ANN WARREN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2010

Major Subject: Food Science and Technology

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Approved by:

Chair of Committee,	Peter S. Murano
Committee Members,	Patricia Goodson
	Joanne Lupton
	Lloyd Rooney
	Susanne Talcott
Intercollegiate Faculty Chair,	Jimmy Keeton

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ABSTRACT

Increasing the Consumption of Whole Grain Foods

in School Meals. (May 2010)

Cynthia Ann Warren, B.S., Texas A&M University; B.S., Texas A&M University;

M.S., Texas A&M University

Chair of Advisory Committee: Dr. Peter S. Murano

Current national dietary policy recommends that half, or three, of the six daily servings of grain foods be consumed as whole grains. However, most American children prefer to consume enriched, refined over whole grains. One way of increasing the consumption of whole grain foods to children is through school meals. Why children and adolescents prefer enriched, refined grains over whole grain foods is thought to be due to product color and texture, but no literature exists that quantifies this, especially within the context of the National School Lunch Program. Information and research is therefore needed to examine and address this issue.

Since each school district's child nutrition department determines whether whole grain foods are offered in their schools, we conducted a roundtable discussion with Texas school dietitians to understand their experiences with providing whole grains. A phenomenological analysis of this discussion's transcript exposed how Texas school dietitians balance serving nutritious meals in their cafeterias, while maintaining customer acceptance of the foods. Whether or not students consume whole grains determines if

these foods are served again. Input from participants determined which whole grain were foods tested in this study: hamburger buns, sandwich bread, tortillas and spaghetti.

Focus groups were conducted with 137 elementary, middle and high school students in our targeted school district. Transcripts of these focus groups revealed the vocabulary students use to characterize their perceptions of whole grain foods tested. Using this vocabulary, consumer acceptance ballots were then developed and tested.

Consumer acceptance testing of whole grain foods was conducted during scheduled lunch periods in three different schools. The main objective of this study was to determine at what percent do whole grains contained in grain foods served in school meals become unacceptable to students. Our study determined that a 51% whole grain food product was acceptable to students and a 100% whole grain product was not. Color, taste and texture of a whole grain food can influence its acceptance by these students, but that acceptance is dependent on the percent whole grain content of the food and whether it is made with white or red whole wheat flour.

DEDICATION

To Angela, Cody and Alexander.

Thank you for the love, laughter and joy that you bring to my life.

To my father, Jasper Newton Warren, thank you for your love and support.

In memory of my mother, Dorothy Warren.

ACKNOWLEDGEMENTS

I would especially like to thank the members of my committee, chair, Dr. Peter Murano, and members, Dr. Pat Goodson, Dr. Lloyd Rooney, Dr. Joanne Lupton, and Dr. Susanne Talcott, for willingly sharing their valuable time and expertise with me for this research effort. My chair, Dr. Peter Murano, provided me with the unique opportunity to travel to USDA-FNS Headquarters in Alexandria, VA and acquire funding for this dissertation study. A mere thank you just doesn't seem to be enough for your kindness and generosity in doing so. Learning the intricate details of conducting applied research, I spent countless hours with Dr. Patricia Goodson. Pat, thank you, I could not have done this study without your guidance, knowledge, and patience.

Sandra, Heather M., Heather H., Yolanda, Christine S, and the women of POWER (Promoting Outstanding Writing for Excellence in Research), thank you for providing me with a community of researchers to share and learn from. Your mentoring and friendship has molded me into the person and researcher that I am today.

A huge thank you goes to the students, school food service personnel, parents, teachers, and child nutrition staff at Bryan ISD, especially Dr. Randi Boleman. I could have never done this project without your help and collaboration.

This dissertation is the culmination of 10 straight years of school. I have met some pretty amazing young people during my school years at Texas A&M University. It has been such a blessing to meet and get to know each of you.

GOD BLESS AND GIG EM'

-Cindy the Scientist-

NOMENCLATURE

FNS	Food and Nutrition Service
NSLP	National School Lunch Program
SFP	School food service professional
SNA	School Nutrition Association
TASN	Texas Association of School Nutrition
USDA	United States Department of Agriculture
USDHHS	United States Department of Health and Human Services

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CHAPTER I

INTRODUCTION

Current national dietary policy recommends that half, or three, of the six daily servings of grain foods be consumed as whole grains for adults. It is well documented that American children favor consuming refined grains over whole grains (Lin and Yen 2007) and most American children and adolescents consume less than one of the recommended three servings of whole grain foods per day (Cleveland and others, 2000, Harnack and others 2003). Therefore, it is important to understand what factors might influence children's consumption of whole grain foods, even in the context of school meals, since children's preference for refined or whole grain foods can determine whether these foods are consumed at home (Lin and Yen 2007). Why children and adolescents prefer refined grains over whole grain foods is thought to be due to product color and texture (Burgess-Champoux and others 2006), but no literature exists that quantifies this, especially within the context of the National School Lunch Program (NSLP).

The purpose of the Increasing the Consumption of Whole Grain Foods in School Meals study, reported in this dissertation, is to conduct research to try and address the issue of how to effectively menu whole grain food products in the National School Lunch Program. This will be accomplished utilizing a multi-site, mixed methods design.

This dissertation follows the style of the Journal of Food Science.

In the first phase of this study, I will examine the phenomenon of providing whole grain foods in schools through the experiences of dietitians from school districts across the state of Texas. For the second phase of this study, I will investigate what children participating in the National School Lunch Program (NSLP) like and dislike about whole grain foods (i.e. tortilla, hamburger bun) served within their school lunch environment, as compared to the same foods made from partial whole-grains (e.g. 51% whole grain) and from enriched, refined grains. Determining if there is a level at which the percentage of whole grains within food products are acceptable to students and to determine at what percentage level the whole grain product becomes unacceptable to students, will be investigated in the third phase of this study.

Mixed-methods research combines both qualitative and quantitative methods which can provide in-depth meaning to a complex situation, such as children's consumption behavior during school lunch. This type of methodology also gives credence to the presentation of facts as words (qualitative) and use of numbers (quantitative) in data collection and analysis, while combining both depth (qualitative) and breadth (quantitative) of understanding and corroboration, thereby strengthening the validity of results through triangulation of the data (Leech and Onwuegbuzie, 2007). Since objective reality can never be truly captured, data triangulation may provide the researcher with a more complete understanding of the phenomenon of interest and the meanings people bring to it (Denzin and Lincoln 2005).

This dissertation is organized into five chapters; chapters II-IV are formatted as journal articles. The first chapter (Chapter II) presents findings from a roundtable

discussion with Texas school food service professionals (SFP). The second manuscript, (Chapter III) reports findings from this study's second qualitative phase, focus groups conducted with school children in grades K-12. Finally the third manuscript (Chapter IV) focuses on results from consumer acceptance testing of whole grain foods, as compared to their enriched, refined and part whole grain (20-51% whole grain) counterparts, conducted during school children's lunch period.

The first chapter (Chapter I) introduces the study and the structuring of the overall dissertation. Chapter II provides findings from a roundtable discussion with dietitians from across the state of Texas. In this study, our participants were provided the opportunity to reflect on their experiences with whole grain foods in their schools. This discussion took place in June 2007 during the Dietitians Roundtable at the Texas Association of School Nutrition's Annual Nutrition Conference in Grapevine, TX. Twenty-six dietitians participated in the conversation and to the best of my knowledge, this was the first time such a dialogue took place in the state of Texas, which has the highest participation in the National School Lunch Program (USDA-FNS 2009). A secondary purpose of the roundtable was gather input from our participants on which whole grain foods they would most interested in being able to purchase to serve in their schools.

Chapter III presents findings from focus groups conducted with school children within their school learning environment to determine their sensory perceptions and descriptors of the various grain foods selected to be tested in this study. These descriptors were then used in development of a ballot for the consumer acceptance

portion of this study. Focus groups were conducted at elementary, middle, and high school campuses within the target school district using semi-structured questions developed for each grade or cognitive level. Prompts were utilized, as needed, to insure that students participating in the study understood that words (e.g. sticky) may be used to describe food (Oram 1998). The questions used at each grade level are presented in Appendix C.

Using descriptors that emerged from focus group data collected in Chapter III, ballots were developed for each grade level: elementary, middle and high school. The resulting ballots were then tested for understanding and efficiency of use with school children at each grade level or with experts, such as teachers. One-on-one cognitive interviews (Carbone and others 2002; Dillman 2007) were utilized with the students at the middle and high school level. The purpose of this portion of the study was to make sure that the students understood what the ballot was asking them to do at each of the respective grade levels since the consumer testing took place during each school's scheduled lunch period.

Chapter IV, therefore presents results from the quantitative phase of this dissertation study; the consumer acceptance testing of four grain foods: tortillas, hamburger buns, sandwich bread and spaghetti. These four grain foods were selected by dietitians participating in our roundtable discussion as the whole grain foods they would be most interested in having access to for serving in their schools (Chapter II). Each of these foods (tortillas, hamburger buns, sandwich bread and spaghetti) was tested as a 100% whole grain, partial whole grain (20-51% whole grain) and refined food. The

study presented in this chapter sought to answer the following question: What percent whole grains in the grain food products tested is acceptable to school children and at what level does it become unacceptable? Results were analyzed using Proc Mixed in SAS.

Chapter V provides a summary and conclusion to this mixed-methods study. Following Chapter V are the appendices containing the various documents related to each of the manuscripts described in this dissertation. Appendices include Appendix A (interview guide for roundtable discussion at TASN), Appendix B (informed consent for roundtable discussion), Appendix C (interview guide for focus groups), Appendix D (parental consent and student assent forms used), Appendix E (ballots used in consumer acceptance testing), and Appendix F (foods tested in this study).

The overall flow of this study is shown in Figure 1. The first phase consisted of a roundtable discussion conducted with Texas school dietitians. Qualitative data collected from this phase of the study included field notes written on a flip chart, along with a transcript of the recorded discussion. Findings from the Dietitian's Roundtable were used to determine which whole grain foods were evaluated and tested with K-12 grade school children in the second and third phases of the study.

In the second phase, focus groups using the whole grain foods tested in the study were conducted with K-12 grade students in our target school district. These focus groups were recorded and transcribed verbatim. Vocabulary or descriptors used by these students were used to develop scorecards for the third phase of the study, consumer acceptance testing of whole grain, partial whole grain and enriched refined grain foods.

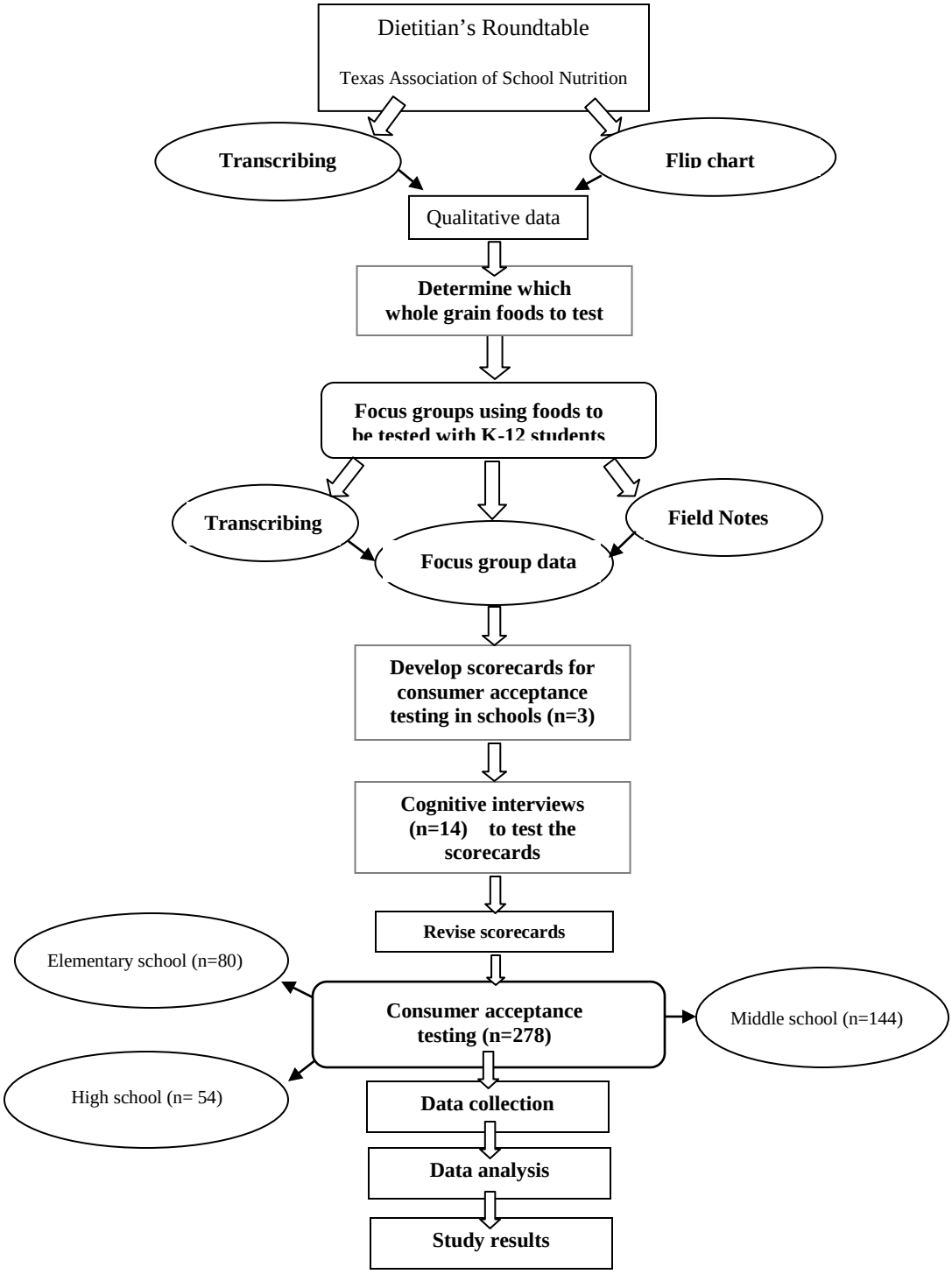

Figure 1.

Overall Flow of Dissertation Study

Scorecards developed from the focus group data were tested with students using cognitive interviews or an expert panel in each of the three school types (elementary, middle and high school). Scorecards were revised as needed. Consumer acceptance testing was conducted, using these scorecards, during the scheduled lunch period with elementary, middle and high school students. Data from the consumer acceptance testing was analyzed to determine at what percent do whole grains contained in grain foods tested in this study become unacceptable to students.

CHAPTER II

WHOLE GRAINS IN SCHOOL MEALS: A ROUNDTABLE DISCUSSION WITH TEXAS SCHOOL DIETITIANS

Introduction

In spite of current attempts, American children and adolescents are not consuming the recommended three daily servings of whole grain foods (Story 2009). One way of increasing the offering and consumption of whole grain foods to children is through school meals. The National School Lunch Program (NSLP) is the second largest food and nutrition assistance program in the United States (Ralston and others, 2008). Every school day school, school food service professional professionals serve 31 million school lunches through the NSLP, of which approximately 15.4 million of these lunches are provided for free to children who qualify (USDA 2009). Understanding school food service professionals' experiences in serving whole grain foods in their schools may help identify factors that influence the selection, purchase, preparation and serving of these foods.

With the release of the 2005 Dietary Guidelines for Americans (USDHH and USDA, 2005), came the first ever recommendations for the consumption of three servings of whole grains as half of the six recommended grain servings per day. The remaining three servings may be consumed as refined, enriched grains. The scientific literature supporting the health claims of whole grain foods in the DGA 2005 is primarily from large epidemiological studies on adults, showing an inverse relationship

between whole grain consumption and the incidence of Type 2 diabetes and insulin resistance (Fung and others 2002, Liu and others 2000b, McKeown and others 2004), and all-cause mortality (Steffen and others 2003), cardiovascular disease (Anderson and others 2000, Jacobs and others 1998, Jensen and others 2004, Liu and others 1999, 2000a), along with the possibility of helping with weight maintenance (Liu and others 2000b). Despite the known health benefits of whole grain foods, only seven percent of all Americans consume the recommended three servings of whole grain foods each day (Lin and Yen 2007).

Since children determine whether whole grain or refined grain foods are eaten at home (Lin and Len 2007), it is important to understand how to increase the consumption of whole grain foods by children through multiple avenues, such as school lunches. In order to increase the consumption of whole grain foods in schools, we must first understand the issues and successes school food service professionals have had with these serving foods in their schools. A roundtable discussion with school food service professionals is one method to gather insight on how to increase the consumption of whole grain foods within the school lunch environment.

Research into school food service professional's knowledge and practice concerning whole grains has been reported by three studies using focus group methodology all three conducted in Minnesota (Chan and others 2009, Hesse and others 2009, Ujszaszy and others, 2004). Results of these studies indicate that Minnesota school food service personnel have issues with: increased cost, limited communication with vendors and industry of what products are needed in schools, small packaging, limited

distribution and availability, inconsistent quality, and increasing awareness of whole grain foods within these schools along with children's acceptance of whole grain foods. A clear definition of what constitutes a whole grain was seen as a major hurdle for school food service professionals in identifying and purchasing whole grains for use in their school meals (Hesse and others 2009). Whether this information is generalizable to other states, whose student demographics are different than Minnesota's schools, is not known.

Currently, the state of Texas has the largest participation in the NSLP (USDA 2009). During the Texas 2008 fiscal year, school food service professionals served over 514 million school lunches with almost half of those lunches being provided for free (Texas Department of Agriculture 2009). Hispanic children compose 47.2% of the student population in the state of Texas (Texas Education Agency 2009). Consumption behavior is of interest among this student population because whole grain consumption in America is considered to be the highest in Hispanics, who consume 41% of the recommended daily amount of whole grains (Lin and Yen 2007).

The aim of this study was to learn from a convenience sample of Texas school dietitians about their experiences (Creswell 2003) with providing whole grain foods in their schools utilizing a roundtable discussion. This roundtable focused on what barriers had been encountered, and what techniques had been acquired by these dietitians, for selecting, purchasing, menuing, preparing, serving and promoting whole grain foods in their schools. Additionally, the purpose of this roundtable was to identify four whole

grain foods these dietitians would like to have access to, and this became part of the purpose for subsequent research.

Researcher perspective and bias

Qualitative methodology positions the researcher as an observer and the instrument through which representations of the world are fitted to the specifics of a complex situation. As the instrument through which the world is interpreted, the researcher brings biases, previous experience and knowledge to the research process. Therefore, it is customary for the researcher to introduce themselves and what perspectives and biases they have.

The researcher is a doctoral student in Food Science and Technology at a university in the Southwestern United States. Her interest in child nutrition began with the birth of her first child. Following her formative experience as a Master's student in Nutrition and her work with understanding the protective effect of phytochemicals from plant-based foods on the promotional stage of colon cancer, she chose to give her science a voice through the venue of school nutrition.

During her doctoral studies, the researcher took classes in qualitative methodology in order to complement her basic science background with the understanding of human phenomena. She was able to experience firsthand how to conduct, collect and analyze data from interviews and focus groups. A class in narrative analysis furthered this understanding of qualitative methodology. Designing and implementing her mixed methods study provided the opportunity for her to fully immerse herself in the experience of understanding the "human as the instrument" of

data collection using naturalistic inquiry as an inductive method of theory generation (Lincoln & Guba 1985).

Method

Design

Qualitative research focuses on gaining "a more naturalistic, contextual, and holistic understanding of human beings in society" (Todd and others 2004, p. 4). Researchers utilize qualitative methodology in order "to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Denzin and Lincoln p. 3, 2005). A variety of empirical materials may be studied in qualitative research: interviews, focus groups, personal experience, historical documents, observational data, and roundtables (Denzin and Lincoln p. 3, 2005). All of these materials can be utilized to illuminate the "lived experience" (Creswell 2003) and to understand customary practice and their meanings to individuals' lives. When the purpose of research is to improve practice, qualitative methodology can be particularly useful in helping researchers describe the various manifestations of particular outcomes. One such outcome could be determining the factors that influence a school district dietitian's decision to serve whole grain foods in his/her school meals, which may not be reflected in standardized instruments, such as surveys (Leech and Onwuegbuzie 2007).

Roundtables consist of open discussions focused on a central topic that allows all participants to express their opinions and share tactics for solving problems in a non-threatening environment. These discussions can be used to enrich participants' thinking and produce new insights about pertinent issues through free-flowing and informal

exchanges. Open discussions can shed light on the multiple perspectives and experiences that people have, at the same time providing an opportunity for sharing among peers.

Phenomenology, according to Miles and Huberman (1994) is an approach to the "practical understanding of meanings and action" that occur within a particular context. As a psychological discipline, phenomenology tries "to discover and account for the presence of meanings in the stream of consciousness" (Giorgi 1985, p. 6). A phenomenological analytical method can be employed to approach and closely study the perceptions and experiences of individuals related to the phenomenon of interest. Therefore, the purpose of this study was to describe the perceived barriers and techniques acquired by Texas school dietitians for selecting, purchasing, menuing, preparing, serving and promoting whole grain foods in their schools, by employing a phenomenological lens to analyze the information these dietitians provided.

Sample

This study was approved by the Institutional Review Board at Texas A&M University prior to the collection of the data. Participants in this study consisted of a convenience sample of twenty-six registered dietitians, each representing a different school district from across Texas, who were in charge of menu planning for their school district. These participants were attending the Dietitian's Roundtable during the Texas Association of School Nutrition's (TASN) Annual Conference in June 2007. No participant recruitment occurred for this study and the participants in attendance were expecting the focus of the discussion to be menu planning. The researcher was given

permission by the current president of TASN to conduct the roundtable discussion focusing on the dietitians' experience with providing whole grain foods in their schools.

Interview guide

To provide an opportunity for the free-flowing exchange of ideas and experiences during the roundtable discussion, fourteen open-ended questions were developed from a review of the current literature (see Appendix C). The overall focus of the roundtable was to learn from the participants' experiences concerning specific ways to increase school children's consumption of whole grain foods without decreasing their participation in school lunch and breakfast. Input from two school food service dietitians who were not part of the dialogue at TASN, was used to determine the final set of questions. Based on positive feedback, no changes were made to the instrument prior to use for this study.

Context of the study

One roundtable discussion took place at 8 am in the morning in June 2007, during the Dietitian's Roundtable at the Texas Association of School Nutrition's Annual Conference. The environment of the discussion was in a conference room containing ten tables, each surrounded by eight chairs, grouped in the center of the room. Three different audio recorders were set on three different tables around the room with boundary microphones attached to them. Participants were asked not to touch the microphones or recorders during the discussion.

None of the dietitians were aware that the topic of the roundtable would focus on their experience with providing whole grain foods in their schools. As the participants

entered the room and sat at one of the tables, the moderator approached each individual, one-on-one. The moderator explained to each participant the change in the topic of the roundtable, provided each participant with an information sheet to read, and answered any questions. The participants gave assent to participate in the discussion by staying in the room.

Data collection

Data were collected during one roundtable, which lasted for 50 minutes. A flip chart, placed on an easel in front of the room, was used to write down main ideas. After the last question had been thoroughly discussed, the moderator went over the notes written on the flip chart with the participants, asking for any additional input or clarification. The resulting audiotaped session was transcribed verbatim.

Data analysis

A phenomenological method of analysis developed by Giorgi (1985) and Moustakas (1994) was employed for analyzing study participants' experiences in providing whole grain foods in their school meals. Using a roundtable discussion, the participants had an opportunity to provide a comprehensive description of their experiences. Utilizing the transcript that emerged from this discussion, two researchers segmented the transcript and analyzed the data following the analytical steps described below.

The transcript was organized into double-spaced paragraph format with line numbers added on the left margin to allow for ease of text-based data analysis (Giorgi 1985, Moustakas 1994). The *first analytical step* involved reading through the transcript

several times in order to derive a global impression of the whole. This step included immersing in participants' descriptions of the phenomenon and "dwelling" on description details (Wertz 1985). Every statement relevant to the topic of interest was approached as having equal significance. Additionally, care was taken to avoid the imposition of theoretical notions about meaningful elements of the experience as they emerged.

For the *second step*, participants' statements were separated into chunks of "raw data" or "meaning units" (Giorgi 1985). Meaning units can be one word or paragraph having one self-contained idea or notion. This process is also referred to as "unitizing" the data (Lincoln and Guba 1985). This gives rise to a series of meaning units expressed in the participants' own words.

In the *third step* of the analysis, these units were clustered, by similarity, into common categories or themes. All overlapping and repetitive statements and text (unrelated to the phenomenon) were removed from the analysis. In this step, rather than focusing on what each meaning unit represented to each individual participant's experience, we sought to identify and label a core concept that was descriptive and related to aspects of the experience being investigated (Giorgi 1985, Moustakas 1994). Relationships among various meaning units were also examined. Table 1 below provides an example of the themes:

Table 1.
Examples of Meaning Units and Common Themes

Line number	Meaning units	Common Themes
34	Industry has increased in their availability and even at food shows there are a lot of products available.	availability
35	They are higher cost, so that's sometimes a consideration.	cost
38	And student acceptability	acceptability
44	We've had success with some items, but um, for example we've tested some whole grain burritos that were not well accepted.	Acceptability (product specific)
45	You've got to run it by them before you select it as your main item.	acceptability
47	But whole grain pizza, we have had good success with.	acceptability (product specific)
48	And a lot of the products that I would say, we were having better success with are the white wheat type products,	acceptability sensory

For the *fourth* and *final step* of the analysis, the common theme and all meaning units were analyzed as a narrative account that would explain the participants' experience and perceptions about providing whole grain foods in their schools. In this step, the researcher synthesized and integrated the perceptions contained in the common themes into a consistent description of the structure of the experience. This synthesis and integration yielded a "psychological insight" (Giorgi 1985) into the participants' experience of the phenomenon.

Findings

In this section, our findings are organized around the six interrelated common themes that emerged from our roundtable discussion: 1) acceptability of whole grain foods by students; 2) the cost of providing whole grain foods as compared to their refined counterparts; 3) education for parents, students, and staff about whole grains served in school meals; 4) availability of whole grain foods; 5) whole grain education materials and 6) fiber content of whole grain foods. These themes are presented in descending order, from the most to the least mentioned theme, based on their frequency counts. All themes presented were mentioned more than seven times during the roundtable discussion. For the structural description of each experience in this phenomenological analysis, as well as for illustration purposes, direct quotes from participants are being used, so their own language is allowed to represent and illustrate the findings. The findings are then situated and discussed in terms of the current literature based on school food service professionals' experience with providing whole grain foods in their schools.

***Theme 1* = "If it is ending up in the trash can, I don't care how healthy it is for you, I'm not going to keep serving that."**

The quote above emphasizes what emerged as the most prominent factor in providing whole grain foods within the schools served by the dietitians in our sample: student acceptability. Student acceptability of whole grain foods has been mentioned by other studies as a barrier to higher consumption in school meals (Chan and others, 2009,

Hesse and others, 2009). However, this focus on student acceptability highlights an apparent contradiction between a school dietitian's job of feeding her/his students so students do not return to class hungry, and promoting the consumption of whole grain foods according to national dietary policy. They believe it is their job to make sure each student in their schools is provided with a meal they will eat, not throw away.

All of our study participants were dietitians, implying that each one had a college degree and high levels of certification and that only the most nutritious foods would be served in their schools. This was a very enlightening response to the situation of providing whole grain foods in school meals because the original goal of the NSLP was to provide the best nutrition available to students in order to prevent malnutrition and chronic disease. To the best of our knowledge, this is the first study to uncover this point of view from a school food service dietitian's perspective

If dietitians offer a whole grain food item and the students will not eat it, participants indicated they would not continue to purchase that item to put on their menus. These dietitians agreed they are willing to test various whole grain food products with their students, but student acceptability is the *driving force* for the purchases they make:

"You've got to run it by them before you select it as your main item."

In terms of student acceptability, familiarity with a given food and whether the new grain food product is similar to (or radically different from) a given grain food that students are accustomed to eating, was absolutely essential. Whole grain foods which looked like their refined counterpart were more accepted by students in these dietitians' schools. Our study's participants indicated that differences in a whole grain food's sensory attributes, such as darker in color or a denser, chewier texture, could also lead to a decrease in student acceptance. Focus groups conducted with children by Burgess-Champoux and others (2006) also found that the familiarity, taste and appearance of whole grain foods influenced acceptability with these children.

> *"And a lot of the products that I would say, we were having better success with are the white wheat type products, and looking like the refined type…"*

The term "customer acceptance", used in the quotation below, ties together two major factors influencing our study participants' decision to serve whole grains in their schools: student acceptability and cost:

> *"I think all of us are willing to experiment and play with it. It's just you are going to try different products, but of course the bottom line is your customer acceptance."*

<u>Theme 2</u> =“It’s a balancing act between informing parents…but then you don’t tell the kids… It’s also an educational process with your staff.”

This quote describes how some of the dietitians in our study perceive their role in disseminating information about the foods they serve in their school cafeterias. The desire to *balance* implies that our participants want parents in their districts to understand how school food service tries to provide nutritious foods, such as whole grains in their school’s meals, but students perceive healthy foods as tasting bad.

“…even if they've been eating it and you tell them, 'Oh this is whole grain,' they'll suddenly go 'Oh, yuck.'…”

Despite their understanding of the importance of nutritious meals in their schools, these dietitians also realize the importance of “customer acceptance”. School food service must maintain participation in their district’s school meals. To our study’s participants, they are running a business and cannot lose money, even if that means sacrificing the opportunity to promote the consumption of nutritious foods in their schools’ cafeterias.

“We have a customer basis to raise a certain amount a week.”

Describing the need to balance what information is disseminated to parents about school meals, and whether or not they should promote whole grain foods in their schools, shows another *balancing act* that our participants encounter while maintaining customer acceptance. Parents want their children to eat nutritious meals at school, but experience has taught these dietitians to just serve the whole grain foods and not say anything.

> *"…is that sometimes the perception from parents is that, 'Oh, you don't have any whole grains'…but we actually do.'"*
> *"… when you tell the kids, its like, 'Oh, well then this is horrible, we can't eat it."*

Another perceived *balancing act* was with students interested in consuming healthier meal options because many of the products that are currently made with whole grain have a "fast food" image; pizza, hamburgers, chicken nuggets with whole grain breading:

> "*It's not knowing what the student perception is, because we have had focus groups with students that don't participate. And their comment is, 'Oh, well we haven't participated because we perceive that school lunches are very high fat and not healthy. So, there is a balance there because you do want to promote it so those students that are health conscious want to go."*

Participants voiced their frustration with also having to educate and train their staff on the preparation of whole grains. Challenges are many. Starting with a high turnover in personnel and many with limited English who cannot read directions:

> *"There are areas where they might be able to understand a little bit of English. It is one thing when you're cooking four servings at a time, then it's another when it becomes hundreds."*

Staff may have limited cooking skills:

> *"People don't know what a measuring spoon is, and they've never used one in their lives when they come in to cook."*
> *"The cooking of the whole grain pasta is also a bit different as far as how they absorb water and testing their texture for doneness."*

Not all schools have the same equipment to cook with:

> *"People have different cooking tools…when you cook it in a steamer, that's different than an oven or a braiser or a crock pot."*

Proper preparation of whole grain foods may influence student's acceptance of these foods. This topic was one of the most interesting discussions provided by our

participants as they actively provided input on solutions to this problem. Development of on-line training, in both English and Spanish, or DVDs supplied by industry for preparation of their products, were two of the ideas shared by our participants for training staff on preparing whole grain foods. One participant mentioned how a vendor from whom her district purchased fish furnished a DVD containing recipes and preparation tips for use with different cooking tools (conventional ovens, braisers, stoves, steamers, convection ovens, crock pots). Standardized recipes, how to bake using commodity flour or preparing other commodity whole grain products furnished on USDA's website, was another suggestion. Staff training, better equipped kitchens and greater managerial skills have been shown to decrease labor costs in producing more nutritious school meals (Wagner and others, 2007).

Theme 3* = *"And we do all of this on a budget."

The above quote describes another perceived barrier to providing whole grain foods in our participants' schools: cost. Cost of whole grain foods to schools is often mentioned in the literature as a perceived barrier to school food service personnel in other states (Chan and others, 2009, Hesse and others, 2009). When cost is combined with student's lower acceptance of foods made with red whole wheat, providing whole foods in schools can be perceived as very difficult. This perception is compounded even further when foods are made with white whole wheat because these whole grain foods tend to be more expensive than those made with red wheat.

"Some things are identical and then some things that are anywhere from ten to fifty percent higher. No, most everything is usually higher."

A dietitian from one of the larger urban school districts in Texas explained to the rest of the group how her school district was able to collaborate with industry in developing a whole grain hamburger bun made of white whole wheat flour the students would consume. However, each hamburger bun costs the district's school food service approximately two cents more per bun and approximately five million hamburger buns are served each year in this school district. This dietitian admitted that her district was able to negotiate the development of the this whole grain product since they purchase such a high volume of hamburger buns and now they purchase all their hot dog buns and sandwich bread from this same company.

"I guess it was two years ago they started making that (white whole wheat) in a hamburger bun. I consulted them, because we sell five million hamburger buns a year. And we tested that out a year ago with all of our hamburger buns and it was very successful. And then this year, we've gone to hamburger buns, sliced bread, and hot dog buns for the white wheat. And we've had no problems with acceptability, but it is white wheat."

Most school districts in Texas do not use or serve this amount of product in their schools each year. Purchasing whole grain food products through co-ops is one way smaller districts have been able to afford providing whole grains in their schools without sacrificing the purchase of other nutritious food items such as fruits and vegetables. Having access to affordable whole grain hamburger buns and sandwich bread was considered important to our participants for providing these foods in the schools.

> "*…we see some things either way because we co-op our bid."*

<u>Theme 4</u> = "Initial frustration was availability, but that has become easier."

Participants in our study do not perceive availability as an issue with providing whole grain foods in their schools. Focus group data from other studies have indicated that availability is an issue with whole grains in schools, particularly with smaller school districts and those further away from distribution hubs (Hesse and others, 2009). However, these dietitians were seeing more whole grain foods available at the convention, as well as through their vendors.

> *"Industry has increased their availability and here at the food show there are a lot of products available."*

Availability may not be an issue with our participants due to the fact that they are all dietitians and work in school districts that can afford to pay dietitians to work in their child nutrition departments. Our study was conducted in the context of the Texas

Association of School Nutrition Annual Conference which is suppose to have the largest, if not one of the largest vendor shows in the nations. This factor could be influencing these dietitians' views of availability of whole grain foods for schools.

Tortilla, hamburger bun, sandwich bread and pasta that were affordable, were the types of whole grain foods that these school districts would like to have available to serve to their students. Whole grain pancakes, or a mix that could be used to make them, was another item mentioned. Having a whole grain tortilla that students would accept was particularly important due to the fact that a large percentage of students are Latino and that Mexican food (soft tacos, fajitas, breakfast tacos) are popular food items served. The only tortilla currently available, according to these dietitians, is one made from 100% red whole wheat, which students would not eat.

> *I think the only thing I, maybe I haven't seen or I'm aware of, is a tortilla. Because there's the whole wheat tortillas, and the kids just don't like it. I haven't seen a white wheat product."*

<u>Theme 5</u> = "Our wellness policies are also pushing nutrition education back into the classroom, so we've got to find something we can use…But it has to meet the TEKS (Texas Essential Knowledge and Skills) for us to be able to get it in the classroom."

Another balancing act was between school nutritionists, classroom teachers and principals. Dietitians participating in our study understand the reality of standardized

testing and the accountability of their schools' principals for the performance of students on these tests, but need a venue to teach nutrition without pointing fingers at teachers. Starting in elementary school and following students through high school, content mastery of science, math and reading determines what is taught in the classroom, according to our participants:

> *"…because teachers are so into the TEKS. They are so programmed to what their year is going to be."*

However, participants felt they had authority over what goes on the menus and what kind of nutrition education is provided on the cafeteria line. Having access to clip art, nutritional "sound bites" or anything about whole grains that could be put on flyers, menus or their website was considered useful and needed. Hesse and others, (2009) mentioned the need for promotional materials for whole grains in cafeterias and Chan and others (2009) discussed marketing whole grains to the community, as well as within the school. Interactive fun websites where students could play video games based on nutrition, was something these dietitians thought would be popular and useful with students.

<u>Theme 6</u> = "I don't like some of these cereals saying they are in high fiber and only have one gram a serving."

When describing whole grain foods they had success with in their schools, dietitians consistently mentioned the number of grams of fiber contained in each of these foods. This was very intriguing because high fiber isn't necessarily the same as whole grain due to the number of sources of dietary fiber added to foods. This could be a misconception, but this dietitian's statement summed it up for the rest of the groups:

> *"But you know, I think one thing that's going on right now that, now everybody is onto the whole grain thing. And we still have to be careful that, when we're looking at the whole day and the whole menu, that we're not going to then be going overboard on the whole grains. So, I think sometimes everybody is into the whole grain, but I think that what's important to me as a dietitian is still looking at not what whole grain is in there, but the total fiber content of the meal."*

At the time of the reporting of this study, and to the best of our knowledge, we don't know of another published account describing the importance of fiber content in whole grain foods from the perspective of a school food service dietitian.

Discussion

Participants spoke freely and candidly concerning their experiences with providing whole grains in their schools during our roundtable discussion. Dietitians in this study presented their struggles with offering nutritious meals in their schools, that would fit within a certain cost structure and that students would consume on a regular basis. Maintaining a customer base with their students, who regularly participated in the school meals program at their schools, was a major priority of the school dietitians in our study.

Putting whole grain foods on their menus, and promoting their consumption, was determined to be a balancing act between students, parents, and staff. Despite the apparent availability of whole grain foods to schools districts represented by participants in this study, the reality is whole grain foods cost more and are not always as accepted by their students as their refined counterparts. This is consistent with studies conducted with school food service personnel in Minnesota (Chan and others, 2009, Hesse and others, 2009). Despite the demographic differences between Texas and Minnesota, it is interesting to note these similarities when looking at policy implications and the development of methods to facilitate the menuing, preparing and serving of whole grain foods in school meals.

Despite the inability to give a precise definition of what constitutes a whole grain food, our study participants knew to read the ingredient label and that the first ingredient listed, should be a whole grain. Other studies using focus groups with school food service professionals conducted in Minnesota found defining and identifying whole

grain foods for use in schools to be an issue (Chan and others, 2009, Hesse and others, 2009). The difference may be that products available to schools are different in these two states or because of the difference in study participants.

What makes this study unique is the fact that all the participants were dietitians. These individuals have obtained college degrees and higher levels of training than other school food service personnel, yet they still face the same realities of student acceptance of foods in their cafeterias. One of our study's dietitians wrote a comment on her evaluation of the roundtable, "I do not focus on the nutritional benefits of whole grains with my students. I expose students to whole grains and focus on *good taste* of whole grain products, as taste is the most important thing to them". Focusing on taste and not the health benefits of whole grain foods may be the best route to promoting these foods to school children.

Taken together, the themes emerging from our study suggest a model of causal relationships in providing whole grain foods in schools, shown below (Figure 2). Students' acceptance and consumption of whole grains can be determined by what types of whole grain foods are offered in schools. If students consume whole grains at school, they can influence their parents to purchase these foods to eat at home. Since nutrition education in Texas schools is usually provided through a school district's child nutrition department, dietitians and other district employees determine what education about whole grains is disseminated to students and their parents through multiple media channels. Our model requires further external evaluation by others.

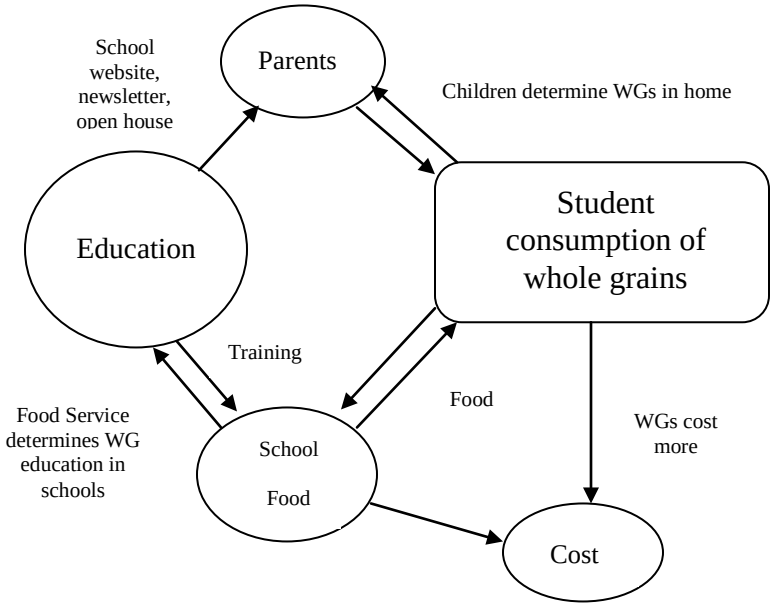

Figure 2.

Provisional Model of Whole Grain Consumption

Limitations of the study

The main limitation of our study is our sample. A small sample of dietitians is not a full representation of all voices or the widest viewpoints representing school food services experiences with providing whole grain foods in schools. Demographics or information describing our participants is also lacking.

Generalizability of findings is not a responsibility of qualitative research (Denzin and Lincoln 2005). This study's sample knowledge and skills set, along with its attitudes and intentions may not be reflective of all school food service professionals. Many school districts in Texas and throughout the nation do not have the financial resources to hire dietitians, for instance.

The findings of this study do, however, reflect the individuals who participated in the dialogue within the context and time it was conducted. The researcher attempted to preserve participants' voices as much as possible and establish the coherence and relationships of the data by presenting direct quotes from study participants. Whether the findings of this study are persuasive in describing effective strategies that most school food service professionals could use in the selecting, purchasing, menuing, preparing and serving of whole grain foods in their schools is the subject of future inquiry.

CHAPTER III

USE OF FOCUS GROUPS TO DETERMINE VOCABULARY USED BY SCHOOL CHILDREN TO DESCRIBE WHOLE GRAIN FOODS

Introduction

Many foods promoted as healthy, such as whole grains, are perceived by children as tasting unpleasant (Noble and others 2000; Wardle and Huan 2000; Ross 1995). Therefore, understanding school children's opinions and perspectives about whole grain foods while tasting them, may uncover factors that influence consumption behavior of these foods in schools. Conducting focus groups with school children within their learning environment can provide a unique insight into their perceptions of foods such as whole grains. This is due to the fact that the context of where a food is consumed may influence the foods acceptability (Meiselman and others 2000; King and others 2004).

Children and adolescent's food choices are influenced by a wide variety of lifestyle and environmental factors. One study conducted by Neumark-Szainer and others (1999), used focus groups to assess middle and high school students' perceptions about factors that influence their food choices and eating behaviors. Data collected from these focus groups were used in the development of more effective intervention programs aimed at adolescents' eating behaviors. Focus groups with children and adolescents have been used by health care providers to elicit children's views on a variety of health-related matters such as: program development, program evaluation,

questionnaire construction, and exploratory studies on children's health-related knowledge and behaviors (Heary and Hennessy 2002).

The recommendation for consuming whole grains, separate from all grain servings, was first mentioned in the 2005 Dietary Guidelines for Americans (USDA and USDHHS, 2005). Increasing the consumption of whole grains to three of the six daily grain servings has been linked to decreased risk of chronic disease (Jacobs and others 1998; Liu and others 1999, 2000a; Anderson and others 2000; Steffen and others 2003; McKeown and others 2004; Jensen and others 2004). Despite this recommendation, American children and adults consume one-third the recommended amount, or approximately one serving per day (Cleveland and others 2000). Preference for refined grains is cited as the reason for this low consumption of foods made from whole grains (Lin and Yen 2007).

Whole grain foods are thought to have a dense, drier texture, with a less than desirable color and taste, especially foods made from 100% whole grains (Bakke and Vickers, 2007). Sensory attributes, such as color, taste and texture, are thought to be barriers to consumption of whole grain foods by children (Delk and Vickers 2007). In a study with children, Burgess-Champoux and others (2006) found that familiarity, taste and appearance of new foods, such as whole grains, are important factors and may influence consumption of these foods. Children prefer refined over whole grains. This is important because a child's presence in a home can influence whether adults living with them consume whole grains as well (Lin and Yen 2007).

One method that can be utilized to understand school children's' perceptions of whole grain foods is focus groups. According to Krueger and Casey (2009), a focus group study is "a carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, nonthreatening environment" (p. 2). Focus groups are commonly used in consumer and sensory science to determine the vocabulary that consumers use when investigating the sensory aspects of commercial products (McNeil and others, 2000, Civille and Lawless, 1986). Vocabulary or descriptive words (descriptors) emerging from focus group discussions can also determine which sensory attribute descriptors should be incorporated into ballots for consumer testing (Lotong and others 2000). Since consumer preferences for a product can be different from trained panelists preferences, focus group data can span the gap between studies conducted in the lab and those conducted with consumers in a naturalistic setting (Kraft 1981). Additionally, outcomes from focus groups can also be vital in capturing significant information concerning a target sample's reaction, description and behavior towards the product of interest in a study.

The purpose of this study was to gain insight into the language or descriptors used by K-12 grade school children to describe various grain foods, containing different levels of whole grains, currently served as enriched refined grain foods in their school lunch. Focus group methodology was utilized to permit school children participating in this study a means to discuss these foods openly in their own words. This type of methodology is suited for use with children of various ages because it does not disadvantage children with low literacy skills. The list of consumer-generated

descriptors gathered from our focus groups was then utilized for developing quantitative consumer ballots used to evaluate the foods tested in another study.

Materials and methods

Subjects

Students in kindergarten through 12th grade (137 students total; 68 high school students, 21 middle school and 48 elementary school students) from Bryan (TX) Independent School district participated. We recruited the students through a gourmet foods class (high school), Health Foundations class (middle school) and by flyer sent home in students' weekly folders (elementary school). Participants indicated they ate school lunch at least three times per week. Parental consent and child assent were obtained for all subjects (see Appendix D). This study was approved by the Texas A&M University Institutional Review Board. For their participation, students received a gift card.

Products

Grain food products used in this study were currently served as refined grains in participants' schools. Products tested were hamburger bun, sandwich bread, tortilla and spaghetti. These products were determined by Texas school dietitians during a roundtable discussion at the 2007 TASN Annual Conference. Foods were tested at three levels of whole grain: enriched refined as control, partial whole grain (30-51% whole grain) and 100% whole grain. All foods tested had to be available for purchase by Texas schools and provided by local grocery stores for this study. For a complete listing of foods used in this study, see Appendix F.

Food preparation

Foods tasted and discussed in our focus groups were prepared by the researcher in each school's cafeteria and served in the same manner as students would normally consume them during their lunch: hamburger with meat patty, spaghetti with meat sauce, tortilla as a deli wrap (turkey ham, low-fat American cheese, shredded lettuce, low-fat ranch dressing) and deli sandwich (turkey ham, low-fat American cheese). Condiments such as mayonnaise, mustard and ketchup were available with the hamburger and deli sandwich. Hamburgers and deli sandwiches were cut into quarters prior to tasting. The deli wrap was cut into thirds and one-quarter cups of spaghetti pasta were served with meat sauce. As soon as the food was prepared in the school's kitchen, it was covered and taken to the students and served by one of the research assistants.

Procedure

Focus groups of up to eleven students and some dyads (2 students and 1 moderator) were used to uncover and assess the subjective responses of students while evaluating the sensory properties of the grain foods tested in this study. A moderator conducted the focus group discussions, while another researcher presented the foods to the students, one food at a time. The location of the focus groups was determined by the principal of each participating school.

At the high school, focus groups were conducted during the Gourmet Foods class. Eight to ten students sat around a table during the discussion. One food was tested per class period for a total of four class periods, all in the same day. Middle school students participated in two focus groups sessions, with ten or eleven students in

each group. Two foods were tested in each focus group discussion, both conducted on the same day. Focus groups were conducted during middle school students' Health Horizons class, in the morning before their scheduled lunch periods.

Since students from PK-12 grade participate in the NSLP, this study was interested in collecting information from students of different ages and cognitive levels. Focus groups with elementary school students were conducted with four students at a time or one pair of students (one male and one female) per grade level in the school's cafeteria after lunch. Due to the large percentage of native Spanish speakers, half of the focus groups conducted with elementary school children were conducted in Spanish, with the remainder conducted in English. Elementary school students from each grade level (K-5) were involved in the focus group discussions and the focus groups were conducted in the school cafeteria in the afternoons on four different days.

Data collection

Focus group questions were developed by the researcher and were designed to target students' ability to describe the food products using their own vocabulary. Since our focus groups involved the tasting of food, the semi structured questions and protocol for conducting focus groups, were pretested for comprehension and clarity with three groups of students (n=27) during a summer camp. Children involved in this portion of the study were between five and twelve years of age and did not attend any schools involved in this study. The length of time for the focus groups varied according to the age of the students and the time allowed by the school's principal. The focus group interview guide can be found in Appendix C.

The moderator began each focus group session by telling the students that they would be trying foods and discussing them. Guidelines were also provided at this time. During these focus groups, participating students were asked to: 1) look at and taste samples from each food product to be tested; and 2) describe each sample of whole grain, partial whole grain, and refined grain foods based on the product's appearance, flavor, and textural attributes. All focus group interviews were recorded using audiotape and field notes were taken by a researcher other than the moderator. Focus group interviews were transcribed verbatim and analyzed for descriptors.

Data analysis

Two researchers read the transcripts through several times. Each transcript was coded for the specific vocabulary or descriptors used by students in our study to describe all grain foods tested. Frequency counts were used to keep track of the most commonly mentioned descriptive terms (soft, color) used by the students (Table 2). The most frequently used descriptors for each food type tested (hamburger bun, sliced bread, spaghetti and tortilla) were then utilized in ballot development.

Table 2
Vocabulary Generated by Students and Their Frequency of Use.

School	Vocabulary used	Frequency of use
Elementary (n=48)	Color (all foods)	83
	Taste (all foods)	44
	Soft (bread, hamburger bun)	52
	Chewy (tortilla, spaghetti)	16
	Hard (bread crust)	9
	Sticky(bread)	5
	Yummy (all foods)	5
	Squishy(bread)	3
	Sugary(hamburger bun)	2
	Thick (spaghetti)	2
Middle School (n=21)	Soft	12
	Color	10
	Taste	10
	Chewy (tortilla, spaghetti)	8
	Texture	3
	Thick (spaghetti)	3
	Sticky (hamburger bun)	3
	Sweet	2
	Floury (tortilla)	1
	Grainy (bread)	1
	Tough (spaghetti)	1
	Flexible (spaghetti)	1
	Yummy	1
	Wheaty	1
High School (n=68)	Taste	37
	Color	23
	Soft	16
	Nasty looking	13
	Chewy (tortilla, spaghetti)	9
	Sweet (bread, hamburger bun)	4
	Grainy (bread, tortilla)	4
	Rough (bread, tortilla)	4
	Sticky	4
	Juicy (hamburger bun)	3
	Dry (bread)	3
	Smell	3
	Fresh looking	2
	Smooth	1
	Thick (spaghetti)	1
	“Feels” like wheat (tortilla)	1
	“Feels” old (tortilla)	1

Ballot development

Findings from our focus groups indicated which consumer-generated vocabulary students from our target school district used to describe the whole grain foods tested in our study. Three ballots were then developed and tested. The following vocabulary or attribute terms were tested on all three ballots: color, taste, softness and chewiness. Stickiness and sweetness were two terms tested on the ballots for middle and high school students. An initial consumer acceptance ballot was developed using these descriptors, with an overall liking question placed first on the ballot.

Preliminary ballots were tested for understanding and scale usage, using two different methods. Cognitive interviews were conducted using a 'think aloud' approach with middle and high school students to determine the manner in which they processed the information on each ballot (Carbone and others 2002; Dillman 2007). High school students attending a separate Gourmet Foods class from those participating in the focus groups tested the high school ballot. Middle school students testing the ballot for their school level came from a health education class attending a different middle school from those involved in our focus groups. Once the final ballots were developed and tested, ballots were translated into Spanish for the schools that needed a translated version for their student population.

The ballot developed for elementary school children was tested using a panel of experts, consisting of elementary school teachers. One special education teacher and a former elementary science teacher provided input on the elementary school ballot. It was determined that due to the time constraints of the consumer acceptance testing

during school lunch, only fourth and fifth grades would participate in the consumer acceptance testing.

The final ballot developed for use with middle and high school students was a 9-point hedonic scale, with 1=strongly like and 9=dislike strongly. Neither like nor dislike was placed at the mid-point on the middle and high school students' ballot. Overall liking was placed as the first question on the ballot, with color, taste, softness, chewiness, and stickiness as the other attributes tested.

Fourth and fifth graders final ballot consisted of a 5-point facial hedonic scale (Guinard 2000), with 1=super good and 5= super bad. The mid-point on the elementary ballot was labeled "okay". Overall liking was used as the first question, with color, taste and texture (softness or chewiness) being used for the remaining attributes tested. Copies of the final ballots are provided in Appendix E.

Discussion

Children prefer refined grain foods over those made with whole grains (Lin and Yen, 2007). Yet, very little information is available on how school children view whole grain foods. Only one study, to the best of our knowledge, has utilized focus groups with children to gain insight into their perceptions of whole grain foods (Burgess-Champoux and others, 2006) and the study was conducted with children and their parents.

The language or vocabulary used to describe perceptions is of importance in product development and acceptance (Civille and Lawless 1986, Chamber 2005). In this study, focus group sessions were conducted at three schools, with a total 137 students, to

gather information on consumer vocabulary used by the students to describe various whole grain foods while tasting them. Color, taste and texture attributes were the most mentioned vocabulary used by these students. Vocabulary emerging from these focus groups was then used to develop consumer acceptance ballots for each school type. Resulting ballots were then tested and changes made as needed, using cognitive interviews. This method allowed the researcher to determine if students could process the information on the ballot and understand what they were being asked to do while testing the different grain foods within the time constraints and environment of the school cafeteria.

CHAPTER IV

CONSUMER PREFERENCE TESTING OF WHOLE GRAIN FOODS WITH STUDENTS DURING SCHOOL LUNCH

Introduction

Consumption of three servings of whole grains, separate from all grain servings, was first recommended in the 2005 Dietary Guidelines for Americans. Despite considerable amounts of epidemiologic evidence showing an inverse relationship between whole grain consumption and chronic disease, ninety-three percent of Americans fail to eat the recommended three daily servings (Lin and Yen, 2007). Even more than adults, American children prefer refined grain foods over those made with whole grains (Lin and Yen 2007). School meals may be a way to provide and increase the acceptance of whole grain foods by children through repeated exposure to these foods in the presence of children's peers (Salvy S–J, Kieffer E, Epstein LH, 2008).

Every school day in the United States, approximately 31 million children participate in the National School Lunch Program (NSLP) with half of these meals being free to students who qualify (United States Department of Agriculture Food and Nutrition Service, 2009). Created from the National School Lunch Act of 1946, the National School Lunch Program is currently the second largest federal nutrition assistance program in the United States. Therefore, the NSLP provides a conduit through which national dietary policy can be translated and promoted to school age children.

Offering whole grain foods during school meals is currently being advocated as a means to increase children's consumption of these foods. In October 2009, a report released by the Institute of Medicine (IOM) recommends that at least half of all grain/bread offerings should be as whole grain. According to the HealthierUS School Challenge, an award program administered by USDA-FNS to recognize schools that are promoting nutritious foods and physical activity, offering whole grain foods during school lunch is one of the criteria for receiving this award (United States Department of Agriculture Food and Nutrition Service, 2009). Results from the third School Nutrition Dietary Assessment (SNDA), a survey conducted in 2004-2005, indicates that only 5% of schools served whole grain breads and rolls for lunch and only 4% served whole grain breads at breakfast (Condon and others, 2009).

Studies looking at whole grain consumption in Minnesota schools have shown that elementary school students will consume pizza crust made from a 50:50 blend of refined and white whole wheat incorporated into a pizza crust (Chan and others, 2008). This study found no difference in consumption between refined wheat and the 50:50 blend pizza crust. Using a 10-point hedonic facial scale, this study also found no difference in liking between the two pizza crusts.

Having a child in the home can influence whether or not whole grains are consumed by adults living in the same household (Lin and Yen 2007). It is thought that children do not prefer whole grain foods due to their color, taste and texture. Why children and adolescents prefer refined grains over whole grain foods is thought to be due to product color and texture, but no literature exists that quantifies this, especially

within the context of the National School Lunch Program. Information and research is therefore needed to examine this issue.

The main objective of this study was to determine at what percent do whole grains contained in grain foods served in school meals become unacceptable to students through the use of consumer acceptance testing. A second objective of this study was to determine whether sensory attributes (color, taste, texture) of the whole grain foods evaluated in this study relates to students' overall liking and acceptance of that particular food. Since environment is thought to influence acceptance, choice and consumption (Meiselman and others 2000), this study was conducted during the students' regularly scheduled lunch period within the context of each participating school's cafeteria.

Method

Study design

For this study, consumer acceptance testing of grain foods was conducted in three different schools: one elementary, one middle, and one high school from a suburban/rural school district in Central Texas. The testing took place during the scheduled 30 minute lunch period for each school. All students from each school were invited to participate in the consumer testing. However, data were only collected from those students having parental consent and known food allergies (according to student's parent/guardian) for a total of 278 participants in the study.

Grain foods tested

The four whole grain food product types; hamburger bun, spaghetti pasta, sandwich bread and tortilla tested in this study were chosen by Texas school dietitians

during a roundtable discussion at the Texas Association of School Nutrition's annual conference (Warren 2010). For each food product type, three different percentages of whole grains were tested: refined or 0% whole grain, partial whole grain (30-51%) and 100% whole grain. All foods tested in this study were being served as an enriched refined product in the targeted school district and tested as these foods are normally served in the school cafeteria during lunch. In order to be a part of our consumer testing study, these foods had to be commercially available for purchase and serving in Texas school cafeterias. For a list of the foods used in this study, along with their whole grain content and list of ingredients, see Appendix F.

All grain foods were purchase through one of the local grocery stores and delivered to the participating schools by 8 am on the Monday morning of each school's testing week. Monday was selected as the delivery date because this was the normal delivery day for bread products to each of the participating schools. The foods tested in this study, were then stored on site until the testing day for that particular food.

The hamburger buns were tested as a traditional hamburger, with a meat patty and packages of mustard, mayonnaise and ketchup provided. Sandwich bread would be served as a deli sandwich: one slice each of turkey ham and low-fat American cheese between two slices of bread. Packages of mayonnaise and mustard were provided with the sandwich. The tortilla was served as a deli wrap: one slice each of turkey ham and low-fat American cheese with shredded lettuce on top of the meat and cheese and a drizzle of low-fat ranch dressing on top of the lettuce. The tortilla was then rolled up

around the meat, cheese and lettuce. The spaghetti pasta was served with the meat sauce normally prepared by the school food service personnel and frozen until use.

Randomization of samples

All food samples (n=12) tested in this study received three 3-digit randomized codes (e.g. 345). Sample codes were written in the upper right hand corner of each ballot and on the Styrofoam tray. For each testing day, one ballot per food group (refined, partial and 100% whole grain) was stapled together, for a total of three ballots used on each testing day per student. The consumer testing conducted in this study utilized a sequential nomadic design, where participants taste one sample then rate it before testing the next sample; this that requires ballots to be stapled in the order of each food's position on the Styrofoam tray for evaluation by the students. Consumer testing ballots used in this study were developed and tested in the target school district as described in Warren (Chapter II, 2010). Serving order was randomized to reduce bias.

Participants

Students participating in this study were in the fourth through twelfth grades during the 2007-2008 school year. Fourth and fifth grade students were the only ones selected to participate from the elementary school due to time limitations and cognitive ability. Recruitment for the elementary and middle school was through letters sent home to parents informing them of the study. High school students were recruited during the regular school lunch period by the researchers. In order to participate in this study, students ate school lunch at least twice a week and reported no food allergies (on the parental consent forms). Parental consent and student assent documents may be found in

Appendix D. For the demographics and number of students tested in our study schools, see Table 3 below.

Table 3.
Demographics of Schools Participating in Consumer Acceptance Testing

	African American	Caucasian	Hispanic	Free or reduced-price lunch	Number of students
Elementary School	34 %	41%	25%	69%	80
Middle School	33%	16%	52%	82%	144
High School	23.5%	42.7%	33.7%	55%	54

Sample preparation for acceptance testing

Test foods were prepared on site in each school kitchen, according to standard and routine procedures. Serving sizes for each type of grain foods tested were as follows: one-quarter of a hamburger, one-quarter of a deli sandwich and one third of a deli wrap. Approximately one-quarter cup of pasta and 2 ounces of spaghetti sauce were poured over each spaghetti sample prior to presentation. As soon as the foods were cooked, they were stored inside an insulated Cambro® carrier prior to testing, to maintain the desired temperature. The sandwiches and deli wraps were prepared, wrapped with plastic wrap and stored at 34 Fº until placed in the carrier. Hamburger patties and spaghetti sauce were 165 Fº after coming out of the steamer. The pasta was cooked, drained and placed in a stainless steel pan, prior to placement in the carrier.

Consumer acceptance testing in schools

Parental consent was given for all student participants. All students provided assent to the researcher to participate prior to starting the acceptance testing of the foods. Consumer tests were carried out over a one week period in each participating school during the fall semester in 2007. Since the testing took place during the scheduled lunch period (30 minutes long), and the participating students also needed time to eat their lunch, only one food product type was presented and tested each day. Testing days for each food product type (hamburger bun, spaghetti pasta, sandwich bread, and tortilla) were randomized for each school (elementary, middle, and high), starting on Mondays (see Table 4). Fridays were reserved, if needed, for makeup days due to unexpected circumstances (weather). The testing took place over four lunch periods of a week within each of the three participating schools.

Table 4.
Testing Days for Grain Foods per School Type

	Monday	Tuesday	Wednesday	Thursday
Elementary	Sandwich	Hamburger	Tortilla	Spaghetti
Middle	Tortilla	Sandwich	Spaghetti	Hamburger
High	Spaghetti	Tortilla	Hamburger	Sandwich

For ease of testing in the middle and high schools, students sat at tables set up in the back of each cafeteria. Elementary school students were served samples during their usual lunch setting and wore a name tag each testing day signifying that they had parental consent to participate. After sitting down, students were provided a tray of

samples, the corresponding ballots for those samples and a sharpened pencil. Students were read, verbatim, the instructions on the ballot and reminded of the direction of the scale. Researchers closely monitored the students, not allowing them to talk to one another during the consumer testing.

Middle and high school students were asked to score overall liking, color, taste, and texture attributes on a 9-point hedonic scale, with 1=strongly like, 5=neither like or dislike, and 9=dislike strongly. Fourth and fifth grade students were asked to score overall liking, color, taste and texture on a 5-point smiley face hedonic scale with 1=super good, 3=okay, and 5=super bad (Guinard 2001, Popper and Kroll 2003). The texture attributes tested by all students were softness for the hamburger buns and sandwich bread and chewiness for the tortilla and spaghetti pasta. Stickiness was added to the middle and high school ballots.

Statistical analysis

Data from consumer testing were analyzed using SAS® (Version 9.1.3, Cary, N.C., U.S.A.). PROC Mixed (analysis of variance) was used to determine whether participants differed in their liking of the foods due to different levels of whole grain. Level of whole grain, food type, serving order and interactions among these effects were included in the model. We also were interested in whether overall liking was influenced by the color, taste and texture attributes of the food products. Overall liking was the dependent variable and percent whole grain (fixed effect) and participant, color, taste and texture attributes (random effect) were predictor variables. Data for serving position on the tray were incorporated into the model for the analysis of the consumer

data to take into account any potential effects of serving order of the grain foods. Gender influence on overall liking was also analyzed. Significant difference were determined at the 95% confidence level ($P<0.05$).

Results

Elementary school

Overall liking of the various foods tested did not differ in how much they liked partial whole grains containing 30-51% as compared to the same foods made from enriched refined grains (Table 5) at the elementary school.

Table 5.
Elementary School Consumer Acceptance Testing of Refined vs. Partial Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.77	<0.0001	0.01	<0.0001
Color	0.97	<0.0001	<0.0001	<0.0001
Taste	0.04	<0.0001	<0.0001	<0.0001
Softness	0.42	<0.0001		
Chewiness			0.99	<0.0001

n= 80, ($P<0.05$)

When comparing foods made of partial whole grains (30%-51%) to the same foods made with 100% whole grains, a difference in acceptance was found (Table 6). Students accepted foods made with partial whole grains. Color, taste and texture attributes did

seem to influence the overall acceptance of these foods by elementary school students conducting the evaluation.

Table 6.
Elementary School Consumer Acceptance Testing of Partial vs. Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.10	0.12	0.11	0.99
Color	0.11	0.35	0.52	0.74
Taste	0.32	0.20	0.43	0.23
Softness	0.22	0.52		
Chewiness			0.06	0.24

n= 80, ($P<0.05$)

Comparisons of foods tested in this study made from refined grains versus 100% whole grains, in our consumer testing, are shown in Table 7. Color, taste and texture attribute scores indicate that these sensory attributes of refined grain foods tested in this study are accepted over those made with 100% whole grains.

Table 7.
Elementary School Consumer Acceptance Testing of Refined vs. Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.63	0.17	0.36	0.87
Color	0.55	0.67	0.11	0.52
Taste	0.62	0.81	0.89	0.33
Softness	0.42	0.92		
Chewiness			0.99	0.65

n= 80, ($P<0.05$)

Middle school

Results of consumer acceptance testing conducted with middle school students are shown in Tables 8, 9 and 10. Consumer acceptance testing conducted with our middle school students showed no difference in acceptance of foods made from partial whole grains (30%-51% whole grain) compared to foods made from refined grains for bread, hamburger buns, spaghetti pasta and tortillas (Table 8). Sensory attributes of the partial whole grain foods tested did not influence our middle school students overall liking of these foods.

Table 8.
Middle School Consumer Acceptance Testing of Refined vs. Partial Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.01	0.033	<0.0001	0.023
Color	0.012	0.	0.021	0.33
Taste	0.036	0.	0.049	0.052
Softness	0.025	0.048		
Chewiness			<0.0001	0.023

n=144, ($P<0.05$)

Middle school students accepted partial whole grain foods over those made with 100% whole grains (Table 9). As seen with the elementary school students, this acceptance was influenced by the color, taste and texture attributes evaluated in this study.

Table 9.
Middle School Consumer Acceptance Testing of Partial vs.100% Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.71	0.25	0.32	0.26
Color	0.36	0.67	0.11	0.52
Taste	0.69	0.81	0.89	0.33
Softness	0.42	0.92		
Chewiness			0.99	0.65

n=144, ($P<0.05$)

Middle school students conducting the sensory evaluation in their school cafeteria indicated an acceptance of foods made from refined over those made from 100% whole grains (Table 10). Color, taste and texture may have influenced students overall liking and acceptance of the refined foods over foods made from 100% red whole wheat.

Table 10.
Middle School Consumer Acceptance Testing of Refined vs. 100% Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.65	0.78	0.36	0.87
Color	0.49	0.76	0.23	0.62
Taste	0.42	0.81	0.12	0.33
Softness	0.34	0.43		
Chewiness			0.65	0.56

n=144, ($P<0.05$)

High school

Consumer acceptance testing of sandwich bread, hamburger bun, spaghetti pasta and tortilla conducted with high school students showed similar results to the evaluations conducted with elementary and middle school students. High school students overall linking scores indicated they accepted the partial whole grain foods when compared to the refined foods tested (Table 11). The sensory attribute, softness, was slightly insignificant for the bread and hamburger buns tested. However, student scores showed a significant difference between the texture attribute, chewiness, when comparing acceptance of refined versus the partial whole grain tortillas.

Table 11.
High School Consumer Acceptance Testing of Refined vs. Partial Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.02	0.033	0.001	0.056
Color	0.012	0.02	<0.0001	0.09
Taste	0.03	0.022	<0.0001	0.001
Softness	0.049	0.051		
Chewiness			<0.0001	0.087

n=54, ($P<0.05$)

Acceptance testing of partial versus 100% whole grain foods showed a definite preference for the partial whole grain foods tested, particularly the sandwich, bread, hamburger buns and spaghetti pasta (Table 12). Color, taste and texture attributes may have influenced the acceptance of partial whole grain foods over 100% whole grains.

Table 12.
High School Consumer Acceptance Testing of Partial vs. 100% Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	0.045	0.0.13	<0.0001	0.063
Color	<0.0001	0.02	<0.0001	0.053
Taste	0.013	0.001	<0.0001	<0.0001
Softness	0.049	0.056		
Chewiness			<0.0001	0.012

n=54, ($P<0.05$)

In the test of comparing refined to 100% whole wheat foods tested, high students scored refined as more acceptable to 100% whole wheat (Table 13). Color of the 100% whole grain foods were less acceptable, as were taste, softness and chewiness. Since the whole grain products tested in this study were made from red whole wheat, sensory attributes of these 100% whole grain foods may have been the determining factors of students accepting these foods.

Table 13.
High School Consumer Acceptance Testing of Refined vs. 100% Whole Grain Foods

	Sandwich	**Hamburger**	**Spaghetti**	**Tortilla**
Overall	<0.0001	<0.0001	0.013	<0.0001
Color	0.023	0.026	<0.0001	0.016
Taste	<0.0001	0.022	<0.0001	0.001
Softness	<0.0001	<0.0001		
Chewiness			<0.0001	<0.0001

n=54, (P<0.05)

Gender was also put into the model, but was not a significant factor at any of the three schools the testing was conducted in. The texture attribute, stickiness, was placed on the scorecards for the high school students, but was found not to be significant in influencing student's acceptance of the various grain foods used on scorecards. The mean score for stickiness was slightly above 5.0, indicating the majority of students scored stickiness at the middle of the 9-point scale (neither like nor dislike) on the 9-point scale used in this study. Stickiness may be a factor the high students in our study didn't notice, or is not important in their decision to accept a food for consumption.

Discussion

To the best of our knowledge, this is the first study to conduct consumer acceptance testing of whole grain foods available for purchase and serving in schools in the US. Another study, conducted in Italy, looked at students' preference of different food combinations for school lunch (Pagliarini 2005). Our overall results from the consumer acceptance testing conducted during lunch in our three schools indicate students in the 4^{th} -12^{th} grade, will accept a partial whole grain food made with 30-51% red whole wheat the same as foods made with refined grains. These results are similar to a study conducted in a Minnesota elementary school comparing pizzas made with a blend of 50:50 white whole wheat and refined flour to those made with only refined flour (Chan and others 2008). However, this study used plate waste analysis to determine if there was a difference in consumption between the two types of pizza crusts.

Our study found that foods made with 100% red whole wheat were not as acceptable with our students as those made with partial whole grains or enriched refined grains. This is consistent with the literature concerning children's preference for foods made from refined grains (Lin and Yen 2007). Consumer acceptance testing with foods made with 100% white whole wheat was not conducted since none were available for purchase at the time this study was conducted. Since there was some indication that color could influence overall liking of the 100% whole grains tested in this study, this could be the subject of future research.

Further research is needed to confirm and investigate the extent to which K-12 may accept whole grain foods served in their school's cafeterias and whether education

provided at the point of sale, could influence increased consumption of these foods. Even though we found that students in our sample accepted a 51% red wheat product, this needs to be tested with other grain foods, with other students using different food products (e.g. pancakes).

One unique point of this study was the fact that the consumer acceptance testing was conducted within the naturalistic environment of a school cafeteria. This is important because of the influence of children's peers on consumption of nutritious foods in schools. Since most consumer testing is done in a more controlled or laboratory type of environment, this study indicates that future studies can be conducted with a variety of foods using students in schools.

CHAPTER V

CONCLUSION

The overall implications of this research are multifaceted and multidimensional. Findings from this dissertation provide a broad overview of issues surrounding providing whole grain foods in school meals. First, students are considered consumers and determine whether unhealthy or nutritious foods are served in school meals. Their consumption preferences drive what is purchased, placed on the menu and served in their schools. Not national dietary policy. According to the school dietitians in our study, they have a customer basis to maintain each week, so they serve what their students will purchase and consume on a regular basis.

From a policy perspective, there are implications that a 51% whole grain product would be acceptable to most students. The criteria for what defines a whole grain food according to the HealthierUS School Challenge, is now 51% whole grain by weight. This is the criterion for whole grain foods served in the National School Lunch Program and School Breakfast Program.

From a practitioner's standpoint, a 51% whole grain product would be more acceptable to a broader student population than one that is 100%, particularly one that is a 100% red whole wheat food. Partial whole grain foods may also cost less and have better storage lives. Results from this study also indicate color, taste and texture influence the acceptance of whole grain foods.

Experiences with providing whole grain foods in schools were shared by Texas school dietitians participating in our roundtable discussion. Our findings indicate a balancing act between serving what students will eat on a weekly basis and what are considered nutritious foods by these dietitians. Educating staff on the preparation of whole grains, which can influence students' acceptance of these foods, was also a perceived barrier due to the number of people working in Texas school food service whose native language is not English.

Current behavior theories used to develop school interventions targeting the consumption of more nutritious foods are value-expectancy theories, based on cognitive and rational-thinking assumptions (Goodson 2010). Consumption behavior is not always rational even in adults, much less children. Theory needs to be adapted to children, who have different cognitive structures and are not analytical in their perceptions. Even adults are not analytical in their food choices.

It is a well established fact that most children can look at a table covered with different foods and pick out the 'healthy' foods. But taste determines what they choose to consume, more than any other factor. Research in this area may need to be based on sensory aspects of food and not just the linear sequence of behavior theory currently used to increase the consumption of nutritious foods. Further validations of our findings demonstrated serious implications for future research.

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APPENDIX A

INTERVIEW GUIDE – ROUNDTABLE DISCUSSION AT TEXAS ASSOCIATION OF SCHOOL NUTRITION

Interview guide – TASN 06.2007

What is the current availability of whole grain food products for purchase in your ISD?

If you currently serve whole grain foods, which are your top three (3) whole grain products in your schools in terms of acceptance by students and frequency of consumption?

What cost differential, if any, have you found between standard refined grain products and their whole grain counterparts?

How comfortable are you at plating whole grain food items within your schools?

What are you perceived barriers and biggest frustrations in plating whole grain foods within your schools?

How easy is industry making it in plating whole grain foods?

Please provide us with your definition of whole grain.

Products that are marketed and sold as whole grain may contain variable whole grain content. How do you determine what food products are whole gain and the percentage of whole grain within those products?

Do you have any educational materials or posters available on whole grain consumption?

Do you hand out flyers/information to parents educating them about the consumption of whole grains?

Are you currently aware of any materials for promoting whole grain foods?

If yes, what are your sources of whole grain information?

Would you be interested in materials promoting consumption of whole grain foods in your schools? If, so, what kinds of materials do you think are the best for promoting foods such as whole grains?

APPENDIX B

CONSENT FORM FOR ROUNDTABLE DISCUSSION

AT TEXAS ASSOCIATION OF SCHOOL NUTRITION

CONSENT FORM

CONDUCT RESEARCH ON WHOLE GRAINS TO ASSIST FNS IN PROVIDING SCHOOLS WITH TECHNICAL ASSISTANCE TO INCREASE THE CONSUMPTION OF WHOLE GRAIN FOODS

Promotional efforts and issues with putting whole grain foods on the menus of Texas' schools

You have been asked to participate in a research study **"Conduct research on whole grains to assist FNS in providing schools with technical assistance to increase the consumption of whole grain foods."** You were selected to be a possible participant because you ***work in the area of school food service***. The project is under the direction of Dr. Peter Murano and Cynthia Warren at Texas A&M University (TAMU).

Purpose of the Study
The purpose of this study is to determine what promotional efforts for whole grain consumption are currently underway in Texas schools. We are also interested in examining what issues might exist in menuing whole grain foods in school lunches as perceived by school district's dietitians and menu planners because these issues may influence the promotion of whole grain foods in Texas schools. The information collected from this focus group will be reported to the Food and Nutrition Service (FNS) at the United States Department of Agriculture in order to provide technical assistance in increasing consumption of whole grain foods within the National School Lunch Program.

Study Methods and Procedures

How was I selected?
You were selected because you are attending the Dietitian's/Menu Planners Roundtable at the Texas Association of School Nutrition's (TASN) annual conference. These focus groups were arranged by board members of the TASN. You are not required to participate and your participation is completely voluntary. You do not have to respond to any question that you do not want to and you may leave the focus group at any time.

What am I being asked to do?
If you agree to participate, you will be asked questions provided by the interviewer about issues that menu planners from school districts across Texas may have about including whole grain foods on their schools' menus. Your answers will be audio taped and the tapes transcribed for analysis. The interviewer will be taking handwritten notes. The focus group discussion will take one hour. Your decision whether or not to participate will not affect your current or future relationship with Texas A&M University or TASN.

During the focus group, participants will be asked about their knowledge concerning what constitutes a whole grain food, costs and availability of whole grain foods vs. refined grain foods, and what whole grain foods are presently served in your schools. Participants will also be asked if they have access to any promotional and educational materials about whole grain foods.

This study is confidential. The co-investigators involved in this project will have access to the tapes and notes that you will voluntarily provide for this study. All research staff involved in this study have been trained to maintain confidentiality of research information. All tapes and data obtained from this focus group will be securely locked in a cabinet for four years at The Center for Obesity Research and Program Evaluation (office 220-N, Centeq A Bldg, 1500 Research Pkwy, College Station, TX). No identifiers, such as your name, etc. linking you to the study will be included in any sort of report that might be published.

Benefits of the Study
There are no known benefits to you for participating in this study. A potential benefit for some participants may be an increased awareness of how to increase whole grain foods on their school lunch menus and whole grain food products that have been successful in other school districts.

Risks of the Study
The risks associated with this study are minimal; however some participants may experience feelings of discomfort or loss of confidentiality.

Compensation for Participation
You will receive no compensation for participating in this focus group**.**

This research study has been reviewed by the Institutional Review Board - Human Subjects in Research, Texas A&M University.

- Contact Dr. Peter Murano at (979) 845-0122 (psmurano@tamu.edu) or Cynthia Warren at (979)845-1038 (cynthia-warren@tamu.edu) with any questions about this study.

- For research-related problems or questions regarding subjects' rights, you can contact the Institutional Review Board through Ms. Melissa McIlhaney, IRB Program Coordinator, Office of Research Compliance, (979)458-4067, mcilhaney@tamu.edu.

Please be sure you have read the above information, asked questions and received answers to your satisfaction.

APPENDIX C

INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSIONS

Interview guide – BISD 10.2007-11.2007

Hi, my name is_____ and I am a researcher and I am interested in learning from you.

I will be giving you foods to try and asking you questions about those foods.

****************Tell the student that you are going to record them****************

START THE RECORDER

Read the consent form and have them sign it.

Many of us have things we like and dislike. For instance, I like the color blue. I don't really like red.

How about you? What is your favorite color?
Go around the table. Encourage each student to provide input.

After school, what do you usually do?

Do you eat a snack? If so, what?

You must have foods that you like and other that you dislike. Tell me which foods you like.

If I say a food is soft when I bite into it, what food does this make you think of.

If I say a food is hard when it is in my mouth and I chew on it, what food might be hard like that?

If I say a food is chewy when it is in my mouth, what food might be chewy like that?

Present the food to the students.

Have the students look at the food.

Do you like the way this food looks? Why or why not?

Have the students taste the food.

Can you describe/tell me what the food feels like in your mouth/tongue/teeth.

Describe the taste of the food.

Tell me what you like and don't like about this food.

What would you change about this food to make it better?

Hand out the ballot to the students (not kindergarten or 1st and 2nd graders)

APPENDIX D

PARENTAL CONSENT AND STUDENT ASSENT FORMS

Parent Consent for my son or daughter to participate Whole Grain Foods Study

In September 2007, Bryan ISD will be involved in a taste testing study funded by the United States Department of Agriculture. The purpose of this study is to understand what whole grain foods, such as breads, rolls, pasta and tortillas, students would eat in school lunches.

The purpose of this consent form is to grant a doctoral student and research assistant from Texas A&M University permission for your child's participation in taste tasting whole grain foods. Bryan ISD's Child Nutrition Services is assisting in this study. This information will assist the USDA in providing other schools with ways to increase the consumption of whole grain foods in school lunches.

Your child's participation in this project is completely voluntary and your child can decide not to participate themselves. There are no known benefits to your child for participating in this study. Your child will receive a small compensation for participation in the study.

Participation in the study is completely confidential. Your child's name will not appear in any report or publication. Children involved in focus group discussions, will be audio-taped and handwritten notes taken by the researcher. All information collected from the study will be kept in a locked cabinet The Center for Obesity Research and Program Evaluation, Office 220-M, Centeq A Bldg, 1500 Research Pkwy, College Station, TX.

There are no physical risks involved with participating in this study. Your child will be taste testing different whole grain foods and telling the researchers if they like the foods or not and why. If your child does not choose to give answers to the questions about the whole grain foods, it will not affect your or your child's relationship with their teachers, principal, or the researchers.

Should you have any questions about the study, you may contact Dr. Peter Murano at (979) 845-0946 (psmurano@tamu.edu) or Cynthia Warren at (979)845-1022 (cynthia-warren@tamu.edu) with any questions about this study.

I have indicated below if I grant permission for my child to participate in this study.
Student's name_____

_____I do wish for my child to participate

_____ I do not wish for my child to participate

Parent/guardian signature _____Date _____

Consentimiento paternal para participar en una investigación sobre los alimentos de granos integrales

En septiembre del 2007, el distrito escolar de Bryan participará en un estudio de pruebas del gusto patrocinado por el Departamento de Agricultura de los Estados Unidos [USDA (siglas en inglés)]. El propósito del esta investigación es para identificar los alimentos de granos integrales como el pan, los bolillos, la pasta y las tortillas, que comerían los estudiantes en los almuerzos escolares.

El propósito de este consentimiento paternal es autorizar a un estudiante posgrado del programa doctoral y a un asistente de investigación de la Universidad de Texas A&M para que su hijo participara en una prueba del gusto de alimentos de granos integrales. El Servicio de Nutrición del distrito de Bryan ayudará en este estudio. Los hallazgos o la información provista por la investigación ayudará al USDA a proveer a otras escuelas información para aumentar el consumo de alimentos de granos integrales en los almuerzos escolares.

La participación de su hijo en este proyecto es totalmente voluntaria y su hijo puede decidir por su cuenta no participar. No hay ningún beneficio conocido de la participación de su hijo en esta investigación. Su hijo recibirá una pequeña recompensa por su participación.

La participación en esta investigación es totalmente confidencial. El nombre de su hijo no será publicado. Toda información recolectada de este estudio será guardada en un archivo bajo llave en The Institute for Obesity Research and Program Evaluation, Office 220-M, Centeq A Bldg, 1500 Research Pkwy, College Station, TX..

No hay ningún riesgo físico al participar en este estudio. Su hijo probará distintos alimentos de granos integrales y luego reportará a los investigadores si le gustaron los alimentos o no y por qué. Si su hijo no quiere contestar las preguntas acerca de los alimentos de granos integrales, no afectará ni su relación de Ud. ni la de su hijo con el maestro del salón, el director de la escuela o los investigadores.

Si tiene alguna pregunta acerca del estudio, puede comunicarse con el Dr. Peter Murano al (979) 458-0946 (psmurano@tamu.edu) o con Cynthia Warren al (979) 458-0946 (cynthia-warren@tamu.edu) para más informes sobre este estudio.

He indicado abajo si autorizo a mi hijo que participe en este estudio.

Nombre del estudiante_____

_____Quiero que participe mi hijo

_____ No quiero que participe mi hijo

_____ _____

Firma del padre/tutor Fecha

Assent Form for High School Participation in Focus Groups
Whole Grain Foods Taste Test Research

You are invited to participate in a whole grain foods (such as breads, rolls, pasta and tortillas) research project at Bryan High School. Researchers from Texas A&M University are trying to determine what whole grain food products you would like to eat in your school cafeteria.

You are being asked to participate in this study because you attend Bryan High School, and you eat school lunch there. You will be asked to taste test different whole grain foods and to tell the researchers if you like the foods or not. If you choose not to give answers to the questions about the whole grain foods, it will not affect your relations with your teachers, principal, or the researchers. Your answers will be audio-taped and handwritten notes will be taken by the researchers. The procedures for the focus group participation were explained to you.

The information gathered from this study will be confidential. Confidentiality means that no one outside of the study will know your name or be able to connect your name to your answers. The consent forms, handwritten notes, audiotapes and data obtained from these focus groups will be stored securely at the Center for Obesity Research and Program Evaluation (1500 Research Parkway, Centeq Bldg. A, Suite 220-M, College Station, TX 77845).

There are no physical risks involved in participating in this study. You must have permission from your parents to participate if you are under the age of 18, and you must not have any known food allergies.

Your involvement is very important to this study. Your signature at the bottom means that you agree to participate in this study. You have been given a copy of this form.

_____ _____

YOUTH NAME (Please Print) YOUTH SIGNATURE

_____

Date

_____

RESEARCHER'S SIGNATURE

Cynthia A. Warren
Graduate Research Assistant
Texas A&M University
Dept of Nutrition and Food Science
2254 TAMU
College Station, TX 77845-2254
Ph. 979-458-0946
e-mail: cynthia-warren@tamu.edu

Assent Form for Middle School Focus Group Participation
Whole Grain Foods Taste Testing

You are invited to participate in a whole grain foods (such as bread, rolls, pasta and tortillas) research project in your school's lunch room. Researchers from Texas A&M University are interested in knowing how you feel about eating whole grain foods.

You were one of the students chosen to participate in this study because you attend a middle school in Bryan ISD, and you eat lunch there. You will receive a small, monetary compensation for participation in the study.

You will be asked to taste test different whole grain foods and to tell the researcher your level of like or dislike of the food product. Your answers will be audio-taped and handwritten notes will be taken by the researcher. The procedures for the focus group participation have been explained to you. If you choose not to give answers to the questions about the whole grain foods, it will not affect your relations with my teachers, principal, or the researchers.

The information gathered from this study will be confidential. Confidentiality means that no one outside the study will know your name or be able to connect your name to your answers. The consent forms, handwritten notes, audiotapes and data obtained from these focus groups will be stored securely at the Center for Obesity Research and Program Evaluation (1500 Research Parkway, Centeq Bldg. A, Suite 220-M, College Station, TX 77845).

There are no physical risks involved in participating in this study. You must have permission from your parents to participate, and you must not have any known food allergies.

Your involvement is very important to this study. Your signature at the bottom means that you agree to participate in this study. You have been given a copy of this form.

_____ _____

YOUTH NAME (Please Print) YOUTH SIGNATURE

_____

Date

_____

RESEARCHER'S SIGNATURE

Cynthia A. Warren
Graduate Research Assistant, Dept of Nutrition and Food Science
Texas A&M University
2254 TAMU
College Station, TX 77845-2254
Ph. 979-458-0946
e-mail: cynthia-warren@tamu.edu

Assent Form for Elementary School Participation in Focus Groups
Whole Grain Foods Taste Test Research

You are being asked to taste whole grain foods (such as rolls, bread and tortillas) in your school's lunch room for a research project. Researchers from Texas A&M University want to know how you feel about eating whole grain foods.

You were picked to participate because you go to school in Bryan ISD, and you eat lunch there. You will be given a $5 gift card to WalMart for participation in the study.

You will be asked to taste test whole grain foods and to tell the researchers if you like or do not like the foods. Your answers will be tape recorded and notes will be taken by the researcher. The procedures for the focus group participation have been explained to you. The information gathered from this study will be kept a secret. Nobody outside of the study will know your name or be able to connect your name to your answers.

If you choose not to give answers to the questions about the whole grain foods, it will not affect your relations with your teachers, principal, or the researchers. You must have permission from your parents to participate, and you must not have any known food allergies.

Your involvement is very important to this study. Your signature at the bottom means that you agree to participate in this study. You have been given a copy of this form.

_____ _____

YOUTH NAME (Please Print) YOUTH SIGNATURE

_____

Date

_____

RESEARCHER'S SIGNATURE

Cynthia A. Warren
Graduate Research Assistant, Dept of Nutrition and Food Science
Texas A&M University
2254 TAMU, College Station, TX 77845-2254
Ph. 979-458-0946 e-mail: cynthia-warren@tamu.edu

Script for students under the age of seven (7)

My name is _____ and I am a researcher studying about what kids, like you, would like to eat while at school.

I will be having you taste some foods and asking you questions about them because I would like to know if you would like to eat them if they were offered during your school lunch time. I will be recording your answering with a recorder so that I will remember everything that you tell me about the foods.

You will receive a small, non-monetary compensation for participation in the study.

Assent Form for High School Participation
Whole Grain Foods Taste Test Research

You are invited to participate in a whole grain foods (such as breads, rolls, pasta and tortillas) research project at Bryan High School. Researchers from Texas A&M University are trying to determine what whole grain food products you would like to eat in your school cafeteria.

You are being asked to participate in this study because you attend Bryan High School, and you eat school lunch there. You will receive a $10 gift certificate to Wal-Mart for participation in the study.

The information gathered from this study will be confidential. Confidentiality means that no one outside of the study will know your name or be able to connect your name to your answers.

There are no physical risks involved in participating in this study. You will be asked to taste test different whole grain foods and to tell the researchers if you like or dislike the foods. If you choose not to give answers to the questions about the whole grain foods, it will not affect your relations with your teachers, principal, or the researchers. You must have permission from your parents to participate if you are under the age of 18, and you must not have any known food allergies.

Your involvement is very important for this study. Your signature at the bottom means that you agree to participate in this study. You have been given a copy of this form.

_____ _____

YOUTH NAME (Please Print) YOUTH SIGNATURE

_____

Date

_____

RESEARCHER'S SIGNATURE

Cynthia A. Warren
Graduate Research Assistant
Institute for Obesity Research and Program Evaluation
Texas A&M University
2254 TAMU
College Station, TX 77845-2254
Ph. 979-458-0946
e-mail: cynthia-warren@tamu.edu

Assent Form for Middle School Participation
Whole Grain Foods Taste Test Research

You are invited to participate in a whole grain foods (such as bread, rolls, pasta and tortillas) research project in your school's lunch room. Researchers from Texas A&M University are interested in knowing how you feel about eating whole grain foods.

You were one of the students chosen to participate in this study because you attend a middle school in Bryan ISD, and you eat lunch there. You will receive a $10 gift certificate to Wal-Mart for participation in the study.

The information gathered from this study will be confidential. Confidentiality means that no one outside the study will know your name or be able to connect your name to your answers.

There are no physical risks involved in participating in this study. You will be asked to taste test different whole grain foods and to tell the researchers your level of like or dislike of the food product. If you choose not to give answers to the questions about the whole grain foods, it will not affect your relations with your teachers, principal, or the researchers. You must have permission from your parents to participate, and you must not have any known food allergies.

Your involvement is very important to this study. Your signature at the bottom means that you agree to participate in this study. You have been given a copy of this form.

_____ _____

YOUTH NAME (Please Print) YOUTH SIGNATURE

_____

Date

_____
RESEARCHER'S SIGNATURE

Cynthia A. Warren
Graduate Research Assistant, Institute for Obesity Research and Program Evaluation
Texas A&M University
2254 TAMU
College Station, TX 77845-2254
Ph. 979-458-0946
e-mail: cynthia-warren@tamu.edu

Assent Form for Elementary School Participation
Whole Grain Foods Taste Test Research

You are being asked to taste whole grain foods (such as rolls, bread and tortillas) in your school's lunch room for a research project. Researchers from Texas A&M University want to know how you feel about eating whole grain foods.

You were picked to participate because you go to school in Bryan ISD, and you eat lunch there. You will receive a $5 gift certificate to Wal-Mart for participation in the study.

The information gathered from this study will be kept a secret. Nobody outside of the study will know your name or be able to connect your name to your answers.

If you choose not to give answers to the questions about the whole grain foods, it will not affect your relations with your teachers, principal, or the researchers. You must have permission from your parents to participate, and you must not have any known food allergies.

Your involvement is very important for this study. Your signature at the bottom means you agree to participate in this study. You have been given a copy of this form.

_____ _____

YOUTH NAME (Please Print) YOUTH SIGNATURE

Date _____

_____

RESEARCHER'S SIGNATURE

Cynthia A. Warren
Graduate Research Assistant, Institute for Obesity Research and Program Evaluation
Texas A&M University
2254 TAMU
College Station, TX 77845-2254
Ph. 979-458-0946
e-mail: cynthia-warren@tamu.edu

APPENDIX E

BALLOTS USED IN CONSUMER PREFERENCE TESTING

NAME_____ AGE_____

1) Circle the words below the faces that tell how much you LIKE or DISLIKE this food.


Super


Good


Okay


Bad


Super

2) Circle the face that shows how much you LIKE or DISLIKE the COLOR of this food:


Super


Good


Okay


Bad


Super

3) Circle the face that shows how much you LIKE or DISLIKE the TASTE of this food:


Super


Good


Okay


Bad


Super

4) Circle the face that shows how much you LIKE or DISLIKE the SOFTNESS of this food as you chew it:


Super


Good

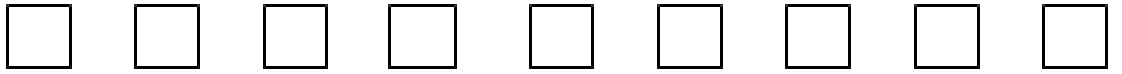

Okay


Bad


Super

NAME_____ Sample #_____

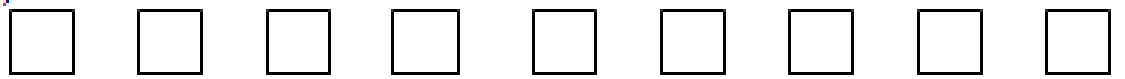
1) Tell us your overall like or dislike of the food:



Strongly Like — Neither Like nor Dislike — Dislike Strongly

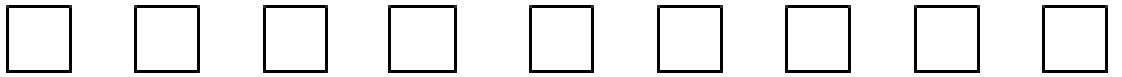
HOW MUCH DO YOU LIKE OR DISLIKE THIS FOOD IN TERMS OF:

2) The COLOR of the food:



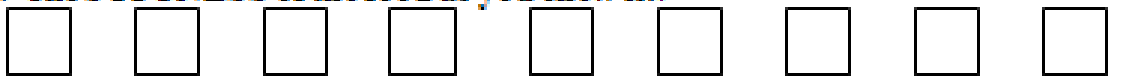
Strongly Like — Neither Like nor Dislike — Dislike Strongly

3. The TASTE of the food:



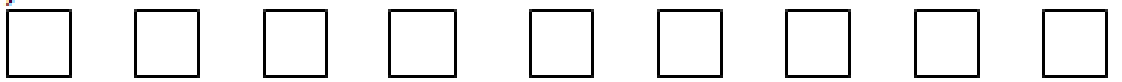
Strongly Like — Neither Like nor Dislike — Dislike Strongly

4. The SOFTNESS of the food as you chew it::



Strongly Like — Neither Like nor Dislike — Dislike Strongly

5. The STICKINESS (does the food stick to your teeth when you chew it) of the food:



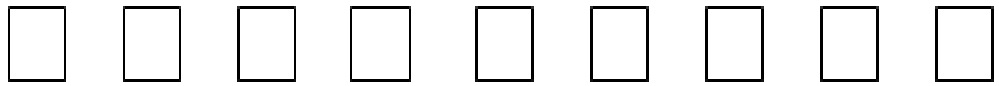
Strongly Like — Neither Like nor Dislike — Dislike Strongly

Middle/High School
USDA-FNS study
Fall 2007

*Consumer Random #*_____

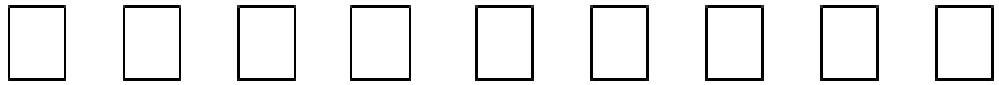
NOMBRE_____ Muestra #_____

1. ¿Cuánto TE GUSTA o NO TE GUSTA esta muestra?



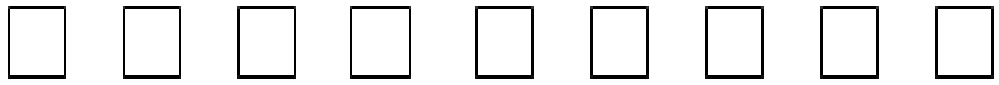
Me gusta muchísimo — Ni me gusta ni me disgusta — No me gusta para nada

2. ¿Cuánto TE GUSTA o NO TE GUSTA el COLOR de esta muestra?



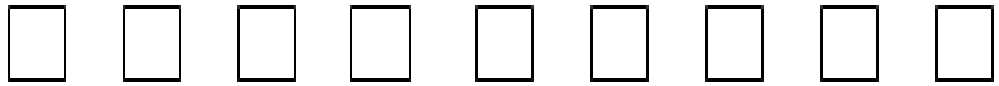
Me gusta muchísimo — Ni me gusta ni me disgusta — No me gusta para nada

3. ¿Cuánto TE GUSTA o NO TE GUSTA el SABOR de esta muestra?



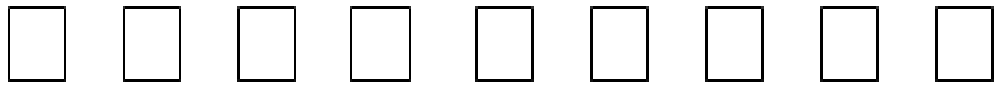
Me gusta muchísimo — Ni me gusta ni me disgusta — No me gusta para nada

4. ¿Cuánto TE GUSTA o NO TE GUSTA la TEXTURA SUAVE de esta muestra?



Me gusta muchísimo — Ni me gusta ni me disgusta — No me gusta para nada

5. ¿Cuánto TE GUSTA o NO TE GUSTA la TEXTURA PEGAJOSA (se te pega a los dientes cuando la masticas) de esta muestra?



Me gusta muchísimo — Ni me gusta ni me disgusta — No me gusta para nada

Middle School
USDA-FNS study
Fall 2007

Consumer Random #

APPENDIX F

FOODS TESTED

Product name	Whole grain content
Heartland Perfect Balance spaghetti	8g - Whole Grain Stamp
Barilla Whole Grain spaghetti	51% whole wheat
Barilla Traditional spaghetti	0%

Spaghetti pasta tested

Product name	Whole grain content
Harvest Selects 100% Whole Grain Bread	100%
Sara Lee *Soft & Smooth*	30%
Butter Krust Family Style	0%

Sandwich bread tested

Product name	Whole grain content
HEB 100% Whole Wheat Flour Tortillas	100%
Mission Multi-Grain Flour Tortillas	8g - Whole Grain Stamp
Mission Flour Tortillas Soft Taco Size	0%

Tortillas tested

Product name	Whole grain content
Mrs. Baird's 100% Whole Grain Sandwich Buns	100%
Sara Lee *Soft & Smooth*	30%
Enriched Hamburger Buns	0%

Hamburger buns tested

VITA

Cynthia Ann Warren received a Bachelor of Science in both biomedical science and animal science in August 1979 from Texas A&M University. Following careers as a reproductive physiologist, horse breeder and mom, she returned to school to receive a Bachelor of Science degree in nutritional science from Texas A&M University in May 2001. She received her Master's of Science degree in nutrition in May 2004. In May 2010, she received a PhD in food science and technology from Texas A&M University. Her research interests include the interface between public health and the food industry, particularly child and school nutrition.

Dr. Warren may be reached at the Institute for Obesity Research and Program Evaluation, 1500 Research Parkway, Suite 220M, College Station, TX 77843-2254.