Comparison of home-prepared and school prepared lunches and parental opinions on school lunch policy in elementary schools

Lucia Ann Tuleen

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I am submitting herewith a thesis written by Lucia Ann Tuleen entitled "Comparison of home-prepared and school prepared lunches and parental opinions on school lunch policy in elementary schools." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

Paula Zemel, Major Professor

We have read this thesis and recommend its acceptance:

Betsy Haughton, Ian Rockett

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)
To the Graduate Council:

I am submitting herewith a thesis written by Lucia Ann Tuleen entitled "A Comparison of Home-Prepared and School-Prepared Lunches and Parental Opinions on School Lunch Policy in Elementary Schools". I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment for the degree of Master of Science, with a major in Nutrition.

Dr. Paula Zemel
Major Professor

We have read this thesis and recommend its acceptance:

[Signatures]

Accepted for the Council:

[Signature]
Associate Vice Chancellor and Dean of The Graduate School
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Date 4/26/94
A Comparison of Home-Prepared and School-Prepared Lunches and Parental Opinions on School Lunch Policy in Elementary Schools

A Thesis
Presented for the
Master of Science Degree
The University of Tennessee, Knoxville

Lucia Ann Tuleen
May, 1994
DEDICATION

This thesis is dedicated to my parents, Dr. and Mrs. David L. Tuleen, for their constant support and encouragement, and for giving me the opportunity to expand my mind and my horizons by attending graduate school. I would also like to dedicate this thesis to my dear sisters: Elissa T. Clark, Karin T. Dunn, and Julia T. Olson. I thank them for loving me enough to teach me the basics, on which I have built the rest of my education.
ACKNOWLEDGEMENTS

I would first like to thank my major professor, Dr. Paula C. Zemel, for her support and for her neverending confidence in my abilities and in my character. I would like to thank Mr. Phil Clear, the Knox County School Food Service Coordinator, for his help and support in this project. I would also like to thank the students, parents, teachers, and administrative staff members from the schools included in this study; without them, this research would not have been possible.

Thanks must also go to the other members of my thesis committee, Dr. Betsy Haughton and Dr. Ian Rockett, for their help and support for the last two years. In addition, I owe thanks to the many people who served as research assistants for this project.

Finally, I would like to thank Debra D. Dean, for believing in me and for her good-hearted patience and understanding. Without her, I would never have survived graduate school.
ABSTRACT

Currently, there is concern that national policies do not ensure that school lunches are in agreement with the U.S. Dietary Guidelines. Thus, the purpose of this research was twofold: 1) to assess parental opinions about the current school lunch program as well as a program which would provide universal access to school lunch; and 2) to compare the nutrient content of home-packed lunches, school lunches as selected by students, school lunches as offered by schools, and "heart-healthy" menus which are designed to address current dietary recommendations.

Using standard survey techniques, we surveyed 532 parents of third grade students in four elementary schools in a metropolitan school system for their opinions on school lunch policy. To complete nutritional analysis, we used a variation of the photographic method to photograph 50 student lunches and thus estimate foods and portion sizes. Food item and portion size data for school lunches as offered were obtained from the School Food Service Director.

We found that those parents from a lower-income area were supportive of a lunch program which would provide universal access, while those from a higher-income area were not supportive of such a program. Across both socioeconomic areas, parents were unsure of the nutritional quality provided by school lunches.
In terms of nutritional analysis of lunches, we found that of the lunches studied, the "heart-healthy" lunch menus most closely conform to the U.S. Dietary Guidelines for Americans. Overall, school lunches as selected by students and home-prepared lunches were of poorer nutritional quality than either type of school lunch as offered by schools.

Our results indicate that: 1) parents lack information about the school lunch program and about healthy meal planning; and 2) students are not adequately prepared to make appropriate nutritional decisions in the lunch line. Educational programming by nutrition professionals for parents and students is thus necessary to improve the nutritional health of children.
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PART I

Introduction, Background and Significance of the Research
Introduction

Improved nutrition for school children is a growing concern in our nation. The current National School Lunch Program, administered by the United States Department of Agriculture since 1946, is dedicated to improving the nutrition of eligible school children and thus helping them to reach their full potential (1). According to the American School Food Service Association, the current program needs to be changed to one which would provide a nutritious school lunch (containing 1/3 of the Recommended Dietary Allowance) to all school children regardless of their socioeconomic background (2).

In the consideration of such a program, there is a need to investigate its possible impact in terms of improved nutrition for all students, as well as parental opinions which would promote the program or be a barrier to its implementation. The goal of this research was to address two major aspects of this school lunch program: 1) the potential impact of Universal School Lunch on the nutritional intake of children who currently bring their lunch from home; and 2) parental opinions concerning the current school lunch program as well as the Universal School Lunch Act.

The National School Lunch Program has long been successful in providing nutritious meals for underprivileged school
children (1). With the potential advent of Universal School Lunch, however, there is a need to investigate the possible impact of such a program in terms of better nutrition for all students, as well as the potential impact of parental opinions on the USLA. The broad purpose of this research, therefore, is to address the following specific aims:

1. To examine parental opinions about school lunches and the influence of these opinions on school lunch program participation.

2. To investigate the possibility of parental barriers to implementation of the Universal School Lunch Act.

3. To determine if a typical school lunch is more nutritious than a typical lunch brought from home and/or a school lunch as chosen by a child in a self-serve setting (Appendix A).

Background and Significance

The background and significance relating to these specific aims were addressed by reviewing relevant topics pertaining to children and the school lunch program, including:

* the National School Lunch Program (NSLP),
* national concerns of child nutrition and school lunch,
* the need for good nutrition in the learning process,
* the effect of school lunch on child nutrition,
* specific research concerns of school lunch,
* attitudes affecting student participation in the NSLP, and
* the Universal School Lunch Act (USLA).
The National School Lunch Program

In 1946, the National School Lunch Act established a school feeding program, the National School Lunch Program, to safeguard the health and well-being of the Nation's children (1,3,4). Since then, the school lunch program has been considered the easiest, most widespread, and least costly means to improve the dietary habits of children (5). The federal program, administered by the United States Department of Agriculture (USDA), is dedicated to helping school children to attain their individual potential through learning as a direct result of improved nutrition (6).

National Concerns of Child Nutrition and School Lunch

In our nation as a whole, improved nutrition for school children is a growing concern. The publication Healthy People 2000 (7) includes a Nutrition Services and Protection Objective regarding the school lunch program. Objective 2.17 is to increase...the proportion of school lunch...services with menus consistent with nutrition principles in the Dietary Guidelines for Americans (7). Generally, these objectives also state a need to improve the nutritional content of the diets of children nationwide. The Maternal and Child Health Interorganizational Nutrition Group (MCHING) has issued a number of recommendations for nutritional improvement across all age groups (8).
Recommendation 18 is to strengthen and improve food services for children and adolescents; the strategic goal for this is to develop a model nutrition policy for food served at schools that meets the US Dietary Guidelines and the RDA, and to use the school cafeteria as a learning laboratory for nutrition education and increased participation in school meals (8).

The Need for Good Nutrition in the Learning Process

A child's nutritional status is vital to his/her capability to learn and succeed in school. Poor academic achievement can be explained, in part, by a deficit in a child's attentional processes (9); one factor which affects a child's attention is his/her nutritional status. Basically, adequate nutrients are necessary in order for a child to reach his/her maximum potential of both physical and psychological development (10). The U.S. Congress House Education and Labor Committee (2) examined the relationship between nutrition and learning and concluded that those children who receive food supplements are better prepared for learning in a classroom situation than those who do not; in general, they are better able to handle complex tasks, are more attentive in school, participate more in class, and are more likely to ask questions (2). For this reason, it is unfortunate that many children are not nourished adequately. In a study of the relationship of
nutrition to school function, only 1/3 of the students surveyed reported eating lunch on a regular basis (11).

In some children, problem behaviors such as irritability, hyperactivity, and decreased attention span are associated with hunger (10). Undernutrition and hunger can disrupt seriously the learning process for the school age child by making him/her unable to carry out physical and mental efforts (12). Research has shown that poor growth and development are often accompanied by poor achievement in school (12). Risk of infection is increased also in an undernourished state; this may increase the number of school absences the child experiences due to sickness (12).

The Effect of School Lunch on Child Nutrition

The noon meal is considered a major source of nutrition for most school children (13). In a portion of the Bogalusa Heart Study (14) which examined the composition of school lunches in relation to total daily intake, the midday meal consistently provided 25-30% of the subjects' daily calorie intake. One-fourth to one-third of the day's total fat, protein, and carbohydrate were provided by lunch consistently (14). The results of this and similar research (13) indicate the potential for positive program effects on the diets of children (15).
One concern of research in this area is the difference between nutrient content of school lunches and those brought from home. Hanes et al (16) conducted a study to measure the impact of school lunch participation on kcalorie and nutrient intake, and found that compared to students who eat lunches from non-USDA sources (i.e., who eat home-prepared lunches), school lunch participants received greater percentages of the RDA for energy and most nutrients (16). Emmons et al (17) compared school lunches with bag lunches and found that a school lunch typically provides more of many selected nutrients. A number of other studies have been conducted in this area (3,18), and general conclusions were that participants in the school lunch program were provided with more nutritious lunches. Researchers thus have concluded that school food service appeared to have a positive impact on the food habits of children (3).

Each of the above studies examined the differences in nutritional content of school lunches vs. lunches brought from home, and each of them concluded that of the options examined, the school lunch was best in terms of providing the most nutrients. Overall, these research studies dealt only with selected nutrients (i.e. protein, calcium, and iron) and the percent of the child's RDA which was provided
Two major aspects of nutritional quality were not addressed. First, the percent of total kcalories from macronutrient sources (fat, protein, carbohydrate) was not a consideration in any of these studies. This is an important factor to consider; in the study by Johnson et al (18), the school lunch indeed provided "more" protein than the other lunch options, and in fact, provided 167% of the RDA for this age group. This might be problematic, as the "typical" American diet is considered currently too high in protein.

The second omitted aspect of nutritional quality is the conformance to the U.S. Dietary Guidelines in terms of fiber, sugar, and sodium content. As the USDA supports the concept of making school meals consistent with these guidelines (1), it is appropriate to analyze school meals and meals brought from home in these terms.

School lunch menus are designed to provide at least 1/3 of the RDA for every child; therefore, school lunches have the potential to make a substantial impact on a child's daily nutrient intake (16). The concept of allowing students to serve themselves and choose only those lunch items that they want ("offer vs. serve"), however, has changed the design of a "typical school lunch". Since it has been suggested that American children lack the essential information required to make positive nutritional choices (19), it is possible that those children who serve themselves are no longer receiving
at least 1/3 of the RDA for many nutrients. As the practice of allowing students to serve themselves from the lunch line is common in many school systems, it also is necessary to examine the nutritional choices made by children when they are given the opportunity to serve themselves.

Finally, many school systems are making efforts to decrease the fat and sodium content of their lunches (20). In Knox County, Tennessee, there exists a "Heart-Healthy School Lunch Menu". This "nutritionally improved" school lunch menu represents an effort to make school lunches healthier for children; unfortunately, this menu is offered only once per year during School Food Service Week. In order to study the feasibility of implementing this "heart-healthy" menu on a regular basis, two aspects must be addressed: 1) the actual nutritional superiority of this menu when compared with the regular school lunch menu; and 2) the cost of this menu as opposed to the regular school lunch menu.

Attitudes Affecting Student Participation in NSLP

The attitudes of students towards school lunch are believed to be important in the participation in and acceptance of school lunches. Unfortunately, these attitudes are not always positive, and are affected by a number of factors, most notably peer attitudes, social factors,
attitudes of teachers, and parental attitudes toward school lunch (16, 21).

In most elementary school settings, parents are the decision-makers concerning student participation in school lunch. For this reason, it is important to evaluate parental opinions about school lunches when evaluating the overall effectiveness of the school lunch program.

The Universal School Lunch Act (USLA)

The concept of the universal school lunch program which would supply all children with a meal containing at least 1/3 of the RDA for most nutrients dates back to the early 1970's (22). More recently, the American School Food Service Association (ASFSA) has asked Congress to enact the Universal School Lunch Act to integrate school nutrition into the total education process (2). According to the ASFSA, this program would have many benefits, including preparing children to learn, fighting childhood hunger, increasing student participation, enhancing services given to children with special needs, and use of the school lunch program as a learning laboratory for nutrition education (2). This program, according to a position paper recently published by the ASFSA, could be enacted as part of the 1994 child nutrition...bill to be phased in by the year 2000 (2).
Summary

Although the potential benefits of universal school lunch are many, before it is to be implemented, all possible implications must be examined. The current typical nutritional content of both school lunches and lunches brought from home must be studied to determine if the nutrient intake of most children would indeed improve. Potential barriers to the program must be addressed; one such barrier is parental beliefs and attitudes about school lunch, which in turn affects the attitudes of children toward acceptance of the program. This research addressed these issues, and thus studied the feasibility of a universal school lunch program at the elementary school level.
List of References
LIST OF REFERENCES


APPENDICES
DEFINITION OF TERMS

1. **nutritious**

For purposes of this research, "nutritious" was defined as meeting 1/3 of the child's Recommended Dietary Allowance (RDA) for all nutrients, as well as being in keeping with the National Research Council's dietary recommendations including <30% of calories from fat, 50-60% of calories from carbohydrate, 20% of calories from protein, and the U.S. Dietary Guidelines for Americans, which suggest a diet high in dietary fiber, and low in sugar and sodium. In addition, the number of servings of high-sugar foods and the number of servings of fruits and vegetables were tallied in order to determine the number of foods in these categories in each lunch type.
APPENDIX B: Guide to Abbreviations Used
GUIDE TO ABBREVIATIONS USED

1. **RDA =** Recommended Dietary Allowance
2. **NRC =** National Research Council
3. **NSLP =** National School Lunch Program
4. **USLA =** Universal School Lunch Act
5. **USDA =** United States Department of Agriculture
6. **MCHING =** Maternal and Child Health Interorganizational Nutrition Group
7. **ASFSA =** American School Food Service Association
8. **ADA =** American Dietetic Association
PART II

A Comparison of Home-Prepared and School Lunches and Parental Opinions on School Lunch Policy in Elementary Schools
Introduction

Although the National School Lunch Program (NSLP) was designed to provide minimum levels of nutrients to America's school children, there is concern that policies do not guarantee meals are consistent with the U.S. Dietary Guidelines (1). Current changes to align the school lunch program with the U.S. Dietary Guidelines and to provide universal access to the program have been advocated by federal agencies and professional organizations (2,3). However, there is concern that parental support of such policies may be lacking (2). Other concerns include low participation and perceptions among parents and children that the school lunch program is not designed for middle income families (4).

Many schools have attempted to increase participation by planning "special" menus that address current dietary issues (1), and by allowing students to choose their own lunches (5). However, there is some doubt as to whether American school children have adequate information to make appropriate dietary choices (6). In addition, parents who prefer to prepare lunches for their children may not have adequate information about menu planning to consider the dietary guidelines when planning lunches. Prepackaged convenience foods also may contribute to high fat, sugar, and sodium content of home-packed lunches.
Thus, the purpose of this study was twofold: 1) to assess parental opinions about the current school lunch program as well as a program which would provide universal access to school lunch; and 2) to compare the nutrient content of home-packed lunches, school lunches as selected by students, school lunches as offered by schools, and "special" menus which address current dietary recommendations.

**Methods**

**Overall Design**

This descriptive study included a survey of parents of third grade students in four elementary schools in a metropolitan school district, and the evaluation of the nutritional content of home-packed lunches, meals as planned and served by school lunch personnel, and meals as served by students. Third grade students were chosen because at this age children generally still eat what they are served, but are beginning to make some food choices of their own (7).

**Parental Opinions About School Lunch**

A survey was developed to explore reasons why parent(s) make the decision for their child(ren) to take or purchase
his/her lunch, assess what parents "typically" pack in a home-packed lunch, and determine concerns parents have about Universal School Lunch.

The survey was evaluated for face validity (8) by a panel of parents of third grade students and registered dietitians and was pilot tested in a school which was not involved in the final study. The final survey (Appendix A) was distributed by providing each third grade child in the four study schools (n=532) with a copy for his/her parent(s) for return by business reply mail. The four schools were chosen based on their rate of participation in the free and reduced-price lunch program; three with a high rate (57%) indicating low-income areas and one with a low rate (9%) indicating a higher-income area (9).

Assessment of Lunch Composition

Data were collected from all third grade students in an elementary school where parents provided written consent and students subsequently gave verbal assent to participate. This elementary school had a large enrollment and low free and reduced price lunch participation to ensure adequate sample size for data analysis.

Nutrient content of home-prepared lunches and meals as served by students was evaluated using a modification of a photographic method described by Elwood and Bird (10). This
method involved photographing the meal, including a standard measuring ruler for the estimation of food portions. Each lunch tray was photographed, demographic data were collected and a code number was assigned.

For photographing of the meals, a 35 mm camera was mounted onto a portable slide platform with attached mobile light fixtures. Tungsten film (Kodak 160T, Rochester, NY) and 500-watt tungsten photoflood bulbs (General Electric, Cleveland, OH) were used to assure clarity of color. The photographs were taken with slide film, the developed slides were projected onto a screen, and estimated portion sizes of each food were recorded onto Evaluator Viewing Forms (Appendix B).

Determining Nutrient Content of Lunches

Four nutritionists were trained to estimate accurately food portion sizes with slides of standard portion sizes and then identified foods and portion sizes on the slides of school meals. A 10% random selection of slides were viewed by all nutritionists to establish inter rater reliability and within rater reliability across foods which appeared on more than one slide. Information about food items and portion sizes for the planned school lunch menu for the week of data collection and the one-week "Heart-Healthy" school lunch menu were obtained also (Appendix C).
Nutrients evaluated included kcalories, percent of kcalories from fat, carbohydrate, and protein, sodium, dietary fiber, calcium, iron, vitamin A, and vitamin C, nutrients which relate to the U.S. Dietary Guidelines and which affect growth and learning in children (7). Nutrient content of meals was determined by the primary researcher using a commonly used nutrient database (11). A 10% sample of meals was randomly selected and coded by a second researcher. Inter rater reliability on nutrient analysis for a 10% subset of randomly selected viewing forms was determined for kilocalories and percent kilocalories from fat.

In addition, servings of high-sugar foods and of fruits/vegetables were tallied using completed Evaluator Viewing Forms. Servings of fruits, vegetables, and high sugar foods were based on the exchange lists for meal planning (12). The category of fruits and vegetables included all raw, cooked, and/or processed fruits and vegetables, and the category of "high-sugar" foods included only items such as cakes, cookies, candies, and ice cream novelties.

Statistics

Data were entered into a computerized database (13) and statistical analysis was performed using SPSS-PC (14). All
nutrient data were evaluated for normality of distribution and equality of variance prior to analysis. Data that were not normally distributed were log transformed prior to analysis (14).

Frequency of distribution and descriptive statistics were determined as appropriate. Differences in parental opinions between schools were assessed by unpaired t-tests. Differences in nutrient contents of home-prepared, planned school lunches, and meals as served by students were evaluated by ANOVA and significant differences were assessed using the LSD comparison (14). All analyses were considered significant if p<0.05.

Results

Survey of Lunch Practices

Of the 532 surveys distributed, 154 usable surveys were returned for a response rate of 29%. This response rate is similar to that obtained by Jensen et al (15) in a survey of parents about the food habits of children. Response rates by school ranged from 27-35% and did not vary by socioeconomic level of the school. Respondents were primarily female (88%); the median age was 31-40 years. Over 41% stated their child always obtains the school lunch, 19% always bring lunch from home, and 40% sometimes obtain
lunch and sometimes bring lunch from home. Parents who sent a home-packed lunch for their children did so because they preferred to make lunch or thought it was of better quality than the school lunch (35%), their child's friends brought lunches from home (9%), or the school lunch was too expensive (13%).

Home-packed lunches usually included a sandwich (96%), juice or juice drinks (79%), fruit (75%), packaged snacks (74%), cookies/cakes (61%), or cheese/crackers (50%). Foods included less frequently were pudding (36%), vegetables (25%), milk (25%), yogurt (20%), soup (13%), leftovers (8%), and candy (7%).

Of those parents whose children bring lunch from home either sometimes or always, 70% stated they give their children money to purchase other items at school. Parents indicated this money was intended for milk (62%), ice cream (65%), packaged snacks (7%), fruit (3%), desserts (6%), and soft drinks (10%). The school's policy about the purchase of "other" food items allows students to purchase any of these school-approved items, as well as additional servings of items on the serving line, during mealtime only (16).

Opinions About Universal School Lunch

Parental opinions about the proposed Universal School Lunch Act (USLA) are shown in Table 1. Results indicate
Table 1. Responses of Parents of Third Grade Students
Statements About the Universal School Lunch Acta

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<tr>
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<th>strongly agree/agree</th>
<th>don’t know</th>
<th>strongly disagree/disagree</th>
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<tr>
<td>1. The way lunch is provided to children right now is just fine</td>
<td>58%</td>
<td>17%</td>
<td>25%</td>
</tr>
<tr>
<td>2. The USLA would be good for a lot of children</td>
<td>70%</td>
<td>13%</td>
<td>17%</td>
</tr>
<tr>
<td>3. I would like for my child to participate in a program like the USLA</td>
<td>47%</td>
<td>23%</td>
<td>30%</td>
</tr>
<tr>
<td>4. Lawmakers should pass this program as soon as possible</td>
<td>46%</td>
<td>21%</td>
<td>33%</td>
</tr>
<tr>
<td>5. Universal School Lunch would be better than the current school lunch program</td>
<td>44%</td>
<td>28%</td>
<td>28%</td>
</tr>
<tr>
<td>6. The current school lunch program provides all the nutrition that children need at lunch</td>
<td>43%</td>
<td>24%</td>
<td>32%</td>
</tr>
</tbody>
</table>

*\( n = 154. \)
that the majority of parents (70%) agree with the statement "the USLA would be good for a lot of children".

Respondents were grouped also by school (high free and reduced-price lunch participation vs. low free and reduced-price lunch participation) to determine if opinions differed among these groups (Table 2).

Results suggest that parents from a higher income area generally agreed that the current NSLP is adequate. They did not necessarily believe that the USLA would benefit a great deal of children, and did not want their children to participate in a program like the USLA. In addition, they disagreed that the USLA would be an improvement over the current program and did not feel that lawmakers should be concerned with passing the program. Generally, those from a higher income area were not supportive of such a program.

Parents from lower income areas, however, were unsure whether the current program is adequate, and they agreed that the USLA would benefit many children. They also felt that the USLA would be better than the current program, and that this program should be a priority for lawmakers. Those parents from lower income areas were generally supportive of the USLA.

Both groups were unsure about the nutritional quality of school lunches (Table 2), suggesting a need for programming which would educate parents about the high nutritional quality offered by school lunches.
Table 2. Responses of Parents to Statements About the Universal School Lunch Act as Grouped by School Lunch Participation Rates

<table>
<thead>
<tr>
<th>Statement</th>
<th>Free/Reduced-Price Lunch Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>high(^a)</td>
</tr>
<tr>
<td></td>
<td>(n=74)</td>
</tr>
<tr>
<td>1. The way lunch is provided to children right now is just fine</td>
<td>2.9 +/- 1.2(^c)</td>
</tr>
<tr>
<td>2. The USLA would be good for a lot of children</td>
<td>1.7 +/- 1.2</td>
</tr>
<tr>
<td>3. I would like for my child to participate in a program like the USLA</td>
<td>2.0 +/- 1.3</td>
</tr>
<tr>
<td>4. Lawmakers should pass this program as soon as possible</td>
<td>2.0 +/- 1.3</td>
</tr>
<tr>
<td>5. Universal School Lunch would be better than the current school lunch program</td>
<td>2.0 +/- 1.2</td>
</tr>
<tr>
<td>6. The current school lunch program provides all the nutrition that children need at lunch</td>
<td>2.8 +/- 1.2</td>
</tr>
</tbody>
</table>

\(^a\)high participation rate = 57%
\(^b\)low participation rate = 9%
\(^c\)mean +/- standard deviation
\(^d\)1=strongly agree, 3=don't know, 5=strongly disagree
*p<0.05
**p<0.01
***p<0.001
Nutritional Analysis of Selected Lunches

Of those students whose parent(s) consented for their participation in the study, 93% agreed to participate (n=50). Of those students whose lunches were photographed, 52% were male and 48% were female; 98% of this sample were caucasian. This was reflective of general student population demographics in the third grade at the study school (17). Inter rater reliability for the viewing of slides was 84%, and within rater reliability across 5 foods that appeared on more than one slide was 100%. Inter rater reliability on nutrient analysis for the randomly selected 10% of viewing forms was 95% for kilocalories and 92% for percent kilocalories from fat.

Nutrient contents of lunches are shown in Table 3. Significant differences between groups were found for kilocalories, percent kcals from fat, percent kcals from carbohydrate, percent kcals from protein, and sodium levels (p<0.05). School lunches as selected by students had a significantly higher percentage of kcalories from fat than either school lunches as offered or the "heart-healthy" school lunch menus. The self-selected lunches also had a significantly lower percentage of kcalories from carbohydrate than did the home-packed lunches. The "heart-healthy" menus contained significantly less sodium than either the home-packed lunches or the school lunches as
Table 3. Nutrient Content of Home-Prepared and Three Different Types of School Lunches for Selected Nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Home-prepared lunch (n=18)</th>
<th>School lunch (selected) (n=30)</th>
<th>School lunch (offered) (n=5)</th>
<th>Healthy lunch (offered) (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kcals</td>
<td>$740\pm263^{**}$</td>
<td>$611\pm119^b$</td>
<td>$494\pm93^b$</td>
<td>$494\pm103^b$</td>
</tr>
<tr>
<td>% Fat</td>
<td>$34%\pm9^a^b$</td>
<td>$36%\pm7^a$</td>
<td>$28%\pm3^b$</td>
<td>$27%\pm8^b$</td>
</tr>
<tr>
<td>% Cho</td>
<td>$51%\pm10^a^b$</td>
<td>$44%\pm6^a$</td>
<td>$48%\pm7^ab$</td>
<td>$50%\pm13^ab$</td>
</tr>
<tr>
<td>% Pro</td>
<td>$15%\pm5^a$</td>
<td>$20%\pm4^b$</td>
<td>$24%\pm7^b$</td>
<td>$23%\pm6^b$</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>$1020\pm443^b$</td>
<td>$1012\pm408^b$</td>
<td>$963\pm497^ab$</td>
<td>$500\pm129^a$</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>$4\pm4$</td>
<td>$3\pm4$</td>
<td>$5\pm3$</td>
<td>$6\pm2$</td>
</tr>
</tbody>
</table>

*non-matching superscripts denote statistical significance (p<0.05)
** mean ± standard deviation.
selected by students. Home-packed lunches had significantly more kcalories than any of the other lunch types, and also had a significantly lower percentage of kcalories from protein.

The average number of servings of high-sugar foods and the average number of servings of fruits and/or vegetables in each lunch type were compared also (Table 4). Both the home-prepared lunch and the school lunch as selected by students were found to have more servings of high-sugar foods and fewer servings of fruits and vegetables (p<0.05) than the "heart-healthy" school lunch as offered.

Finally, the lunches were analyzed for their calcium, iron, vitamin A, and vitamin C content; these averages were compared to RDA values for this age group (Table 5). All lunch types provided at least 30% of the RDA for calcium and vitamin C; only the lunches as chosen by students did not provide at least 30% of the RDA for iron, and only the heart-healthy lunches provided at least 30% of the RDA for vitamin A.

Thus, significant differences were found in the nutrient content of the four lunch types, and the "heart-healthy" school lunch as offered came closest to meeting U.S. Dietary Guidelines. The typical school lunch as selected by students and the home-prepared lunch contained similar amounts of many nutrients, and were therefore similar in overall nutritional quality.
Table 4. Number of Servings of High-Sugar Foods and Fruits/Vegetables in Home-Prepared and Three Different Types of School Lunches

<table>
<thead>
<tr>
<th>Food</th>
<th>Home-prepared lunch (n=18)</th>
<th>School lunch (selected) (n=30)</th>
<th>School lunch (offered) (n=5)</th>
<th>Healthy lunch (offered) (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Sugar</td>
<td>1.0±0.7**</td>
<td>0.9±0.4a</td>
<td>0.8±0.6ab</td>
<td>0.2±0.6b</td>
</tr>
<tr>
<td>Fruits/</td>
<td>0.9±0.5a</td>
<td>0.7±0.8a</td>
<td>1.7±0.5ab</td>
<td>1.9±0.4b</td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*non-matching superscripts denote statistical significance (p<0.05)
**mean ± standard deviation
Table 5. Content and Percent RDA for Calcium, Iron, Vitamin A, and Vitamin C in Home-Prepared and Three Different Types of School Lunches

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Home prepared lunch (n=18)</th>
<th>School lunch (selected) (n=30)</th>
<th>School lunch (offered) (n=5)</th>
<th>Heart-Health lunch (offered) (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (mg)</td>
<td>443±187*</td>
<td>370±144</td>
<td>451±984</td>
<td>10±74</td>
</tr>
<tr>
<td>% RDA</td>
<td>55%±23%</td>
<td>46%±18%</td>
<td>56%±12%</td>
<td>51%±9%</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>3±1</td>
<td>2±1</td>
<td>4±1</td>
<td>3±2</td>
</tr>
<tr>
<td>% RDA</td>
<td>30%±10%</td>
<td>20%±10%</td>
<td>40%±10%</td>
<td>30%±20%</td>
</tr>
<tr>
<td>Vit. A (IU)</td>
<td>501±1226</td>
<td>306±396</td>
<td>583±167</td>
<td>743±393</td>
</tr>
<tr>
<td>% RDA</td>
<td>22%±53%</td>
<td>13%±17%</td>
<td>25%±7%</td>
<td>32%±17%</td>
</tr>
<tr>
<td>Vit. C (mg)</td>
<td>42±44</td>
<td>22±31</td>
<td>30±19</td>
<td>22±15</td>
</tr>
<tr>
<td>% RDA</td>
<td>93%±98%</td>
<td>49%±69%</td>
<td>67%±42%</td>
<td>49%±33%</td>
</tr>
</tbody>
</table>

*mean ± standard deviation.
Discussion

Because of current concerns about the relationship between lifetime nutrition habits and chronic disease, it is necessary to examine the school lunch program not only in terms of the nutrients provided, but also in terms of its potential impact on the future health of children. Emmons et al (18) reported in 1975 that a school lunch was of higher nutritional quality than a home-packed lunch; the results of this study are similar but help to update the information by comparison with current dietary concerns.

Across all lunch types, the provision of 1/3 of the RDA for most selected nutrients was fairly consistent; however, the "heart-healthy" school lunch menu was the only lunch type to provide 1/3 of the RDA for vitamin A. The home-prepared lunch provided more vitamin C than other lunch types; this was due to the high number of vitamin C-fortified juice drinks which were present in home-prepared lunches.

The U.S. Dietary Guidelines were most closely met by the "heart-healthy" school lunch menu and the school lunch as offered by schools (12). Many school districts across the country have begun to implement special menus to address dietary concerns (1). This study indicates that these efforts have the potential to impact positively the nutritional habits of school children.
This research also indicates that the "heart-healthy" lunch menu and the school lunch as offered provide more servings of fruits/vegetables than either the home-packed lunch or the school lunch as selected by students. Because they offer more servings of fruits and vegetables than home-packed lunches, the school lunch program provides a basis for nutrition education programs to encourage children to consume 5 or more servings of fruits and vegetables per day, in accordance with the national health promotion and disease prevention objective (19).

Overall, the school lunch as offered by schools and the "heart-healthy" school lunch menu were of consistently better nutritional quality than the school lunch as selected by students. Although allowing students to select their own school lunches may help to increase participation in the school lunch program, this may be done at the expense of nutritional quality. The results of this research support the idea that elementary school children are not currently prepared to make good nutritional choices (6), and that nutrition education for school children is necessary to help them learn to make nutritional choices in the lunch line. A program of nutrition education in schools is consistent with current national goals for health promotion and disease prevention (19).

Finally, the results of this research also suggest that parents who prefer to pack their child's lunch may not be
adequately prepared to make good nutritional choices, as nutritional quality was consistently higher in school lunches as offered and in "heart-healthy" lunches than in the home-packed lunch. In addition, survey results indicate that many parents are not aware of the nutritional quality provided by school lunches. Educational programming is needed therefore to help parents understand the importance of good menu planning skills, as well as the nutritional impact which school lunches could have on their children.

Although the results of this study may not be generalizable for whole populations, they indicate a need to examine school lunch policy in terms of allowing students to serve themselves. The next logical step in researching this topic would be to examine actual consumption of foods by students; this, however, was outside the scope of this particular research project.

Applications

Our findings suggest that school meals have the potential to improve the nutritional intake of children, but that unfortunately parents lack information about the NSLP and may therefore be reluctant to participate in this program. Registered dietitians have the opportunity to improve this situation by forming working coalitions within communities
to educate parents, and by advocating for nutrition education which integrates the school lunch program as a learning laboratory for children (19). This is in accordance with recommendations made to the USDA by the American Dietetic Association for overall improvement of children's diets (3). By working with parent organizations, teachers, and administrators at all levels, nutrition professionals can continue to have an impact on the health of future generations.
List of References
LIST OF REFERENCES


APPENDIX A: School Lunchtime Survey
SCHOOL LUNCHTIME SURVEY

Your opinion is important!!
Please circle the letter that best corresponds with your opinion.

1. My 3rd grade son or daughter:
   a. always brings lunch from home
   b. sometimes brings lunch from home, and sometimes eats school lunch
   c. always eats the school lunch
      (if you answered "c", then go directly to number 6)

2. Why does your son or daughter bring lunch from home?
   (circle all that apply)
   a. My son or daughter doesn't like school lunch.
   b. I prefer to make my child's lunch.
   c. My child's friends bring their lunches from home.
   d. I can make a better lunch than the school lunch.
   e. The school lunch is too expensive.
   f. Other (please describe)

PLEASE TURN OVER FOR QUESTION #3
3. What is usually included in your child's home-prepared lunch? (circle all that apply)
   a. sandwich
   b. juice or juice drinks
   c. candy
   d. fruit
   e. packaged snacks (chips, pretzels)
   f. vegetables
   g. milk
   h. cookies or cakes
   i. yogurt
   j. main dish or leftovers
   k. puddings
   l. soup
   m. crackers
   n. cheese
   o. other (please describe)

4. Do you give your child money to purchase other food items?
   a. yes (if "yes", then go to number 5)
   b. no (if "no", then go directly to number 6)

5. What items does he/she purchase? (circle all that apply)
   a. milk
   b. dessert
   c. packaged snacks (chips, pretzels, snack cakes)
   d. ice cream
   e. fruit
   f. sodas/soft drinks
   g. other (please describe)

PLEASE TURN PAGE FOR QUESTION #6
Some school experts are proposing the Universal School Lunch Act (USLA) which, if passed, would provide a free lunch to all school children regardless of their income. Through this plan, all children in grades K-12 would receive a free lunch every day at school.

Please read the following statements about the Universal School Lunch Act (USLA) and circle the number that best describes your opinion.

1 = Strongly Agree  
2 = Agree  
3 = Don't Know  
4 = Disagree  
5 = Strongly Disagree

6. The way school lunch is provided to children right now is just fine.  
   1  2  3  4  5

7. The USLA would be good for a lot of children.  
   1  2  3  4  5

8. I would like for my child to participate in a program like the USLA.  
   1  2  3  4  5

9. Lawmakers should pass this program as soon as possible.  
   1  2  3  4  5

10. Universal School Lunch would be better than the current school lunch program.  
    1  2  3  4  5

11. The current school lunch program provides all the nutrition that children need at lunch.  
    1  2  3  4  5
12. Do you have anything else that you would like to say about the way lunch is served at your child's school? Please use the space provided below to write your comments.

Information about You: (check spaces that apply)

I am _____ male _____ female

_____ 25 years or younger
_____ 26-30
_____ 31-35
_____ 36-40
_____ 41 years or older

Thank you very much for completing this survey. Please place the completed survey in the enclosed addressed pre-paid envelope, seal the envelope, and place it in the mail.

We appreciate your participation in this research study.

THANK YOU VERY MUCH!!!!!
APPENDIX B: Evaluator Viewing Form
EVALUATOR VIEWING FORM

Directions:
1. Examine each individual slide closely.
2. Record the subject # (placed on tray) in the appropriate space on this form.
3. Look carefully at each food item to discern exactly what is in the food, especially in the case of combination foods.
4. Estimate the portion sizes and record all foods on the tray in the appropriate spaces below. Be sure to describe all foods in as much detail as you can (i.e. "nacho cheese Doritos" instead of "Doritos").
5. Be sure to include brand names, weights, and volumes (where applicable) for all prepackaged foods.
6. If any food is unknown, please describe it as accurately as you are able to on this form (i.e. "blue thermos--contents unknown"). DO NOT omit unknown food items from the form.
7. Once you have carefully recorded all of the foods on the tray, please place your initials in the space provided.

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Evaluator Initial___________
APPENDIX C: School Lunch Patterns and School Lunch Menus for Analysis
SCHOOL LUNCH PATTERNS

In order to qualify for federal reimbursement, schools must meet the following meal pattern to offer students specific minimum amounts of food items. Unless otherwise specified, all amounts of foods are to be offered every day.

Meal Pattern:

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat or meat alternate</td>
<td>2 ounces</td>
</tr>
<tr>
<td>Vegetable and/or fruit</td>
<td>3/4 C</td>
</tr>
<tr>
<td>Bread or bread alternate</td>
<td>8 servings (per week)</td>
</tr>
<tr>
<td>Milk</td>
<td>8 oz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato Soup</td>
<td>Chicken Patty on Bun</td>
</tr>
<tr>
<td>Grilled Chicken Nugget</td>
<td>Tamale Pie</td>
</tr>
<tr>
<td>Pork Choppette on Bun</td>
<td>Whipped Potatoes</td>
</tr>
<tr>
<td>Potato Wedge</td>
<td>Calif. Blend Vegetables</td>
</tr>
<tr>
<td>Oriental Blend Vegetables</td>
<td>w/Cheese</td>
</tr>
<tr>
<td>Vegetarian Beans</td>
<td>Onion Rings</td>
</tr>
<tr>
<td>Juice</td>
<td>Pineapple</td>
</tr>
<tr>
<td>Crackers</td>
<td>Lettuce/Tomato/Pickle</td>
</tr>
<tr>
<td>Red/Green Gelatin Cubes</td>
<td>Holiday Cake</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 3</th>
<th>Day 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baked Ham</td>
<td>Pizza</td>
</tr>
<tr>
<td>Chipped Turkey on Bun</td>
<td>Manager's Choice</td>
</tr>
<tr>
<td>Sweet Potato Casserole</td>
<td>Whole Kernel Corn</td>
</tr>
<tr>
<td>Green Beans</td>
<td>Breaded Squash</td>
</tr>
<tr>
<td>Broccoli w/Cheese</td>
<td>Assorted Fruit</td>
</tr>
<tr>
<td>Lettuce/Tomato/Pickle</td>
<td>Bread</td>
</tr>
<tr>
<td>Congealed Fruit Salad</td>
<td>Dessert</td>
</tr>
<tr>
<td>Fresh Fruit</td>
<td></td>
</tr>
<tr>
<td>Hot Rolls</td>
<td></td>
</tr>
<tr>
<td>Holiday Cookie</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Stew</td>
</tr>
<tr>
<td>Scalloped Potatoes</td>
</tr>
<tr>
<td>Okra</td>
</tr>
<tr>
<td>Seasoned Cabbage</td>
</tr>
<tr>
<td>Tossed Salad</td>
</tr>
<tr>
<td>Orange Wedges</td>
</tr>
<tr>
<td>Corn Muffin</td>
</tr>
</tbody>
</table>
"HEART-HEALTHY" SCHOOL LUNCH MENUS FOR ANALYSIS

Day 1
Grilled Chicken Nuggets
Lean Roast Beef w/Au Jus
Potato w/Skins
Steamed Broccoli
Tossed Salad
Carrots
Peaches
Whole Wheat Roll

Day 2
Taco w/Beans and Meat
Chef Salad w/Low Calorie Dressing
Corn on Cob
Calif. Blend Vegetables
Mustard Greens
Shredded Lettuce/Tomato Cheese
Applesauce

Day 3
Low Fat Pizza
Crunchy Tuna Salad in Pita Bread
Parsley Tiny Whole Potatoes
Green Beans
Stewed Tomatoes w/Macaroni
Raw Vegetables w/Low Fat Dip
Fruited Gelatin

Day 4
Turkey w/Whole Wheat Pita
Macaroni and Cheese
Pinto Beans
Sweet Potatoes
Baked Apples
Mixed Vegetables
Juice
Coleslaw
Fresh Fruit
Corn Muffin

Day 5
Hamburgers on Whole Grain Bun
Sweet-N-Sour Chicken on Rice
Oven Baked French Fries
Oriental Vegetables
Beets
Lettuce/Tomato/Pickle/Onion
Peaches
Oatmeal Raisin Cookie
PARENTAL CONSENT FORM

A Comparison of Home-Prepared and School-Prepared Lunches and Parental Opinions on School Lunch Policy in Elementary Schools

I agree to allow my child to participate in the research study being conducted. I understand that sometime this term my child's lunch will be photographed during the lunch period to provide a better understanding of what children typically eat for lunch while at school. After going through the lunch line, my child's lunch will be placed on a platform by a University of Tennessee nutrition graduate student who will be using safe food handling practices. A picture will be taken of the lunch. No picture will be taken of my child. My child will then continue to the lunch table with his/her classmates. My child's total involvement in the study will take less than 5 minutes, and he/she will receive stickers for participation.

I understand that the risks of my child's participation are minimal. Photos will be taken quickly so that he/she will not miss any of the designated lunch period. The results of this project will not benefit my child directly, but will help us understand how to assure quality lunch experiences for all children. I understand that my child's name will not be used on the photograph, and that all information will be confidential and stored in a locked filing cabinet in Dr. Paula Zemel's office at the University of Tennessee. No one other than the researchers will have access to any information.

I understand that I may contact Lucia Tuleen or Dr. Paula C. Zemel at the U.T. Department of Nutrition (974-5445) or Lucia Tuleen at home (523-0473) if I have any questions or concerns. My consent as well as my child's decision to participate is voluntary, and I or my child may withdraw from this project at any time without any penalty.

______________________________
3rd Grade Child's Name

What type of lunch does your child usually eat? (circle one)

- home-packed
- school lunch

______________________________
Parent or Guardian Signature

______________________________
Date

______________________________
Investigator Signature (upon receiving)

______________________________
Date Received

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APPENDIX E: Dialogue Guide and Verbal Assent Form
DIALOGUE GUIDE

(to be read by the researcher or research assistant to each 3rd grade child whose parent has consented to his/her participation in the study)

We are working on a project to look at the types of foods that children eat when they are at school. To do this, we need to look at a lot of different lunches.

When we come to your school to look at the lunches, we will set up a camera near the lunchroom cashier to take pictures of the lunches. If you decide to participate, we may ask you to bring your lunch tray to the camera. Someone wearing plastic gloves will help you open your sandwich and any other containers you may have on your tray, and the tray will be put on a platform. A card with a number on it will be put on the tray, and a picture will be taken of your lunch tray. We will not be taking any pictures of you, and your name will not be on the tray, so no one will know that it is your lunch.

Do you understand everything I have said so far? (If yes, proceed; if not, explain again and ask the child for any questions.)

After the picture is taken, you may take your lunch tray to your normal assigned table and eat lunch with the rest of your class. Taking the picture will take no more than 5 minutes, and you will not miss the normal lunch period. For helping us in the study, you will receive some stickers, and so will the rest of your classmates.

Do you understand everything I have said so far? (If yes, proceed; if no, explain again and ask the child for any questions.)

If you do not want to be a part of this project, you do not have to. This project has nothing to do with your grade in Mr./Ms. (insert teacher's name) class, and if you decide not to participate, it is okay.

Do you understand that you do not have to participate, and that it is your choice? (If yes, proceed; if no, explain again and ask the child for any questions.)

Do you have any questions?

I will now ask you to tell me whether or not you want to participate in the study by letting us take a picture of your lunch. Are you willing to let me take a picture of your lunch? (note child's answer on the child's VERBAL ASSENT FORM)
VERBAL ASSENT FORM

(to be completed only after parent has completed parental consent form)

Child's Name: ____________________________

Was verbal assent freely given? Yes____ No____

Investigator Signature ____________________________ Date __________

Witness Signature ____________________________ Date __________
APPENDIX F: Guide to Abbreviations Used
GUIDE TO ABBREVIATIONS USED

1. **RDA =** Recommended Dietary Allowance
2. **NRC =** National Research Council
3. **NSLP =** National School Lunch Program
4. **USLA =** Universal School Lunch Act
5. **USDA =** United States Department of Agriculture
6. **MCHING =** Maternal and Child Health Interorganizational Nutrition Group
7. **ASPSA =** American School Food Service Association
8. **ADA =** American Dietetic Association
APPENDIX G: Expanded Methodology
EXPANDED METHODOLOGY

Introduction

As was stated in the Specific Aims portion of this thesis, this research was designed to examine the nutritional content of both school lunches and those lunches brought from home, as well as opinions of school children which might affect the passage of the Universal School Lunch Act. This study is descriptive in nature, and combines many methods, including survey/questionnaire, and the photographic method, described by Elwood and Bird (1), which will be described in further detail within this section.

Selection of schools for research

Following approval of the project by the University of Tennessee Office of Research Compliance and the appropriate Knox County school administrators, schools were chosen for participation in this research based on their rate of participation in the current NSLP, including free and reduced-rate lunches. Data on school lunch participation in Knox County were ascertained from the School Food Service Director, and a total of three schools were chosen: one with a below average rate of free and reduced lunch participation, thus indicating a higher income area, and three with an above average rate of free and reduced lunch participation, thus indicating lower income areas. (For the purposes of this research, the schools in lower income areas have been designated as schools #1, #2, and #3, and the school in a higher income area has been designated as school #4.)

Parents in all four study schools were given the "School Luncheon Survey", which is described in further detail within the Methods section of this thesis. Lunches of third grade students were photographed and analyzed only in the school within a higher income area; this is due to the fact that all schools in lower income areas of the county in which we performed this study have such high percentages of school lunch participation that very few children who "typically" bring their lunch from home could be found in those areas. For purposes of comparison between school lunches and home lunches, the researchers felt that more significant results could be found by using a school with lower free and reduced participation. After the study schools had been chosen, the researchers proceeded with the survey and the photographing of student lunches.
The subject population for this study was composed of third grade elementary students, as well as the parents of these students. For purposes of photographing the lunches, the major criteria for subject selection was that the student's parent sign a parental consent form, and that the student freely give verbal assent. In terms of the parent sample, the criteria for selection was that his/her child attend the third grade in one of the designated schools, since opinions of parents across all socioeconomic groups and lunch patterns were desired. Because the objective of this research was to examine in detail the current NSLP, it is appropriate that schoolchildren be chosen as subjects. Third grade students were chosen for this study because children in this age group (8-10 yrs) have eating habits which are still dictated somewhat by their parents, but also are beginning to make their own food choices, particularly in the school lunchroom setting (2).

Assessment of Parental Opinions

The opinions of parents toward both the current NSLP and the proposed USLA were assessed through the use of a descriptive research tool: the survey. The objectives of this survey were: 1) to explore reasons why parents make the decision for their child to take or purchase his/her lunch; 2) to assess what parents "typically" pack in a home-packed lunch; and 3) to determine what concerns parents have about a Universal School Lunch.

The survey was developed using standard survey development techniques (3). Objectives of the survey were used to write a number of sample survey questions, which were evaluated then by a panel of 5 nutritionists knowledgeable about the School Lunch Program and 5 parents of students who attend school in the county in which we performed this study in order to establish face validity for the survey. A pilot group of parents of third grade students from a school which was not chosen as a study school was chosen to complete a sample survey, as well as an open-ended questionnaire to determine the appropriateness of the survey questions, as well as to identify questions which parents tended to misinterpret, omit, or answer inappropriately. The response rate to the pilot survey was 28%; this is similar to the response rate for the final survey tool (see RESULTS section of Part II of this thesis).

The use of two separate pre-testing groups, the original panel and a separate pilot group, helped to establish construct validity in developing a construct of opinions toward school lunch, and also helped to test the reliability of the final survey tool. Subject bias on the survey was avoided because no subjects from the panel or the
pilot group were included in the final parent sample.

The final survey tool to assess opinions of parents was sent home through the students to parents of third grade students at the four chosen study schools. Survey forms were color-coded by school so that: 1) response rates could be kept accurately; and 2) correlations between survey answers and income level could be made later. In the three schools where only the survey was performed, the surveys were accompanied by a cover letter of introduction which also described the objectives of the survey, and assured parents that their responses would remain anonymous. These parents also were provided a sealable, pre-addressed, pre-paid envelope in which to return the survey to the researchers via the U.S. Mail; this was done in order to increase response rate by making it simple for parents to return the survey.

In the one school where photographs were taken of student lunches, the surveys were accompanied by this cover letter, as well as human subjects release forms for parents to fill out to indicate their written consent for their child to participate in the research. Parents were instructed to indicate their own consent to participate simply by completing the survey. These parents were provided with two separate sealable, pre-addressed, pre-paid envelopes and instructed to place the survey in one and the parental consent form in the other for return to the researchers via the U.S. Mail. This was done for two reasons: 1) to increase the response rate by making it simple for parents to return the survey as well as the parental consent form; and 2) to increase the response rate and participation of children by assuring parents that responses on the survey would not be linked in any way to their name or their child's name. All information was kept confidential.

Once the surveys had been returned to the researchers, each survey was given a unique subject number, and the responses were entered into the LotusWorks computer spreadsheet program (4). This information then was translated into an SPSS computer program and analyzed using that program (5). All individual written answers were recorded into a word processing file using WordPerfect 4.2 (6) and then analyzed to determine if they differed greatly from the majority of survey responses. Analysis techniques using SPSS included frequency counts of responses and determination of the number of valid responses to verify all data and find problems with data entry or human error. Cross tabulation and classification of responses then was done to determine possible correlations between individual factors. As the objective of this survey was to assess the
opinions of parents regarding the School Lunch Program/Universal School Lunch Act, the survey analysis was performed in order to obtain both individual and consensus responses.

Assessment of Student Lunches

For the purposes of this project, four categories of lunches were analyzed for nutritional quality and then compared: the home-prepared lunch, the school lunch as selected by students, the school lunch as offered, and the "heart-healthy" school lunch menu as offered. Nutritional quality of the lunches was analyzed based on a number of criteria. First, since a school lunch is designed to provide at least 1/3 of the RDA for every child for key nutrients, this was one criteria upon which the lunches were evaluated. Second, the researchers analyzed the percent of calories in the meal from carbohydrate, fat, and protein, and compared these percentages to the current recommendation for good health and disease prevention: at least 50-60% carbohydrate, approximately 20% protein, and no more than 30% fat. Finally, since the United States Department of Agriculture (USDA) is in support of making school lunches consistent with the U.S. Dietary Guidelines, it is appropriate to analyze school meals and meals brought from home in these terms. Therefore the lunches were examined in terms of fiber, sugar, and sodium content, in accordance with the 1989 U.S. Dietary Guidelines (7).

As was explained earlier in this section, one school with a low percentage of free and reduced-price lunches (thus indicating a higher income area) was chosen as the site for the photographing of students' lunches. Prior to the photographing of lunches, steps were taken to ensure that study subjects were made aware of all potential benefits and risks associated with participation in the study. First, the parents of each third grade child at the school were given the opportunity to sign a parental consent form, thus giving permission for each child to participate in the study. Investigators then visited the school to talk individually with each child, explaining the research project and all possible benefits and risks associated with participation in the project, and obtain freely given verbal assent from each child. All children whose parents had returned a completed parental consent form and who had freely given verbal assent to participate were used by researchers as study subjects.

The photographic method for dietary assessment, described by Elwood and Bird (1) has been found to provide a more accurate estimation of food quantity than other
methods (8). A variation of Elwood and Bird's photographic method therefore was chosen for this project as an appropriate method of evaluating student lunches. This variation was developed within the month before data collection.

Researchers took slide photographs of lunches using a 1970 Canon FX non-automatic camera which was mounted on a portable slide platform with attached mobile light fixtures. Although photographic prints could have been used, slides were chosen as the method of recording because they are easily enlarged. A non-automatic camera was chosen because it allowed more flexibility in terms of light settings. Researchers chose to use an air pressure release cord to take the slides in order to avoid jarring the camera during photographing. Five-hundred watt photographic tungsten light bulbs were used in the photographic process, and 160 speed professional tungsten film was chosen to decrease the effects of fluorescent lights on the color of the food in the slides. The researchers found that the color and clarity of slides taken with tungsten film under the light of tungsten bulbs was much better than those taken with 200 speed color slide film and standard 100-watt bulbs.

In order to validate this method for the purposes of this study, a short validation study was completed to compare the researchers' estimation of food portion sizes from slides to actual pre-recorded portions. A set of standard slides depicting portions of various foods together with a card displaying the actual portion sizes of the foods also were developed during this validation. These standardized slides later were used for the training of nutritionists to enter food item and portion size data into the Nutritionist III computer database for nutritional analysis (9).

Prior to data collection, a team of 5 researchers was trained to photograph the lunches as quickly as possible, so that the children would miss only very little of the lunch period. One researcher was responsible for choosing subjects from the lunch line to have their lunch photographed. Another researcher was responsible for recording simple demographic data (sex, race) with regard to each subject for later use in data analysis. Two additional researchers (both wearing latex gloves and using sanitary food handling procedures) opened each lunch so that all food items were visible, placed a measuring ruler on the tray for purposes of portion estimation when the slides were later viewed, and placed the tray in a previously specified location under the camera. One final researcher checked to be sure that the camera was focused and that all food items were within the scope of the camera lens, and then quickly
took the slide photograph. For purposes of training this 5-person team, sample "lunches" were prepared by the principal investigator.

Before the actual day of data collection, the researchers visited the school where the pictures were to be taken to perform a pilot test and thus perfect this variation of Elwood and Bird's photographic method (1). During this pilot test, all those children whose parents had signed a consent form, had freely given verbal assent, and who had brought their lunch from home on that day were chosen to have slide photos taken of their lunches. The researchers found that the 5-person team, which had been trained according to the methods listed above, was able to complete the taking of each slide photo in less than 3 minutes, thus ensuring that each child would miss only very little of the scheduled lunch period. After completing the pilot test, the researchers re-scheduled a time to go back and take the slide photographs which would later be used to evaluate students' lunches at the third grade level.

On the day of data collection, all children in the third grade at the study school were asked to wear nametags during the scheduled lunch period. These nametags were pre-printed by the researchers, and were color-coded such that the first researcher in the team could quickly identify those children whose parents had signed a consent form and who had freely given verbal assent. All those children who met those criteria were used as subjects.

After all of the slide photos were taken by the 5-person research team using a variation of Elwood and Bird's photographic method (described earlier), these slides were taken to a local photographic company for development.

For the purposes of viewing the slides of students' lunches, four research assistants were chosen who did not participate in the photographing of students' lunches. This was done to eliminate the possibility of researcher bias in recalling what was pictured on the lunch trays. These four research assistants, graduate students in nutrition, were trained to view slides and estimate portion sizes from these slides. For the purposes of training these assistants, the standardized slides used in the short validation study (described above) also were used to train assistants to estimate portion sizes. The training process was begun by asking research assistants to identify portion sizes of individual foods, and the training slides progressed gradually to showing photos of sample lunches; some of these slides were the same slides produced during the training of the 5-person photographing team.
After all research assistants had been trained to identify foods and food portions, each research assistant was given a unique tray of slides and asked to identify all foods and food portions on each slide. A random 10% of the 50 slides depicting student lunches was chosen to be viewed by all four researchers in order to test for overall reliability of the photographic method. The remaining slides were each viewed two separate times by two of the four separate research assistants. The 50 slides were divided into two groups, and slides #1-#25 were viewed by two researchers, and then slides #26-#50 were viewed by the other two researchers. In order to eliminate time bias among the research assistants, the slides were arranged in ascending order (i.e. #1-#25 plus the random 10%) for one of the researchers, then in descending order (i.e. the random 10% plus #25-#1) for the other who was to view those particular slides.

The slides for viewing by each research assistant were placed in a slide carousel in an automatic slide projector. After the training was complete, each research assistant was asked to view the designated slides in the order they were provided, and to record the foods and portion sizes on the Evaluator Viewing Form. While viewing the slides, the research assistant was left completely undisturbed by others in order to both encourage concentration on the slides and to avoid the introduction of information bias.

After all slides were viewed by the research assistants, the viewing forms were reviewed by the researchers and the overall reliability, based on the 10% of the slides which were chosen for viewing by all research assistants, was found to be within 86% agreement across all research assistants. Each of the other slides was viewed and portion sizes were estimated and recorded by two separate research assistants; the viewing forms for these slides were then evaluated by the researchers. For each food item on these slides, if the inter rater agreement on portion size was <80%, indicating that agreement was low, the food item was re-evaluated by the researchers. If, however, the inter rater agreement for the food item was >80%, indicating a very high level of agreement, the mean of the two estimations was recorded and used for the entering of all foods into the computer database for analysis of the lunches on the previously outlined parameters. Researchers compiled all evaluator viewing forms used by the research assistants so that each individual slide had one evaluator form from which portions were then entered into the computer database.

After the inter rater agreement for each food item had been evaluated and one individual evaluator viewing form had
been prepared for each individual student lunch, each lunch was entered into the Nutritionist III computer database for analysis on the outlined parameters. In order to account for the possibility of human error in computer data entry, a random 10% of the final evaluator forms were chosen and the information entered into the database two times, each time by a different trained nutritionist. For each of these randomly chosen lunches, the mean was used if the inter rater agreement was >80%. If, however, the inter rater agreement was <80%, the form was re-evaluated and the food items re-entered into the computer database.

Once all data entry was completed, nutritional data for each separate student lunch was printed from the Nutritionist III program (9), and this nutritional data for each lunch then was recorded into a LotusWorks spreadsheet. This spreadsheet, containing all information about the nutritional content of all student lunches, then was translated into SPSS (5) for final data analysis.
List of References
LIST OF REFERENCES


VITA

Lucia Ann Tuleen was born on December 20, 1970, in Ankara, Turkey, where her father was on assignment through Vanderbilt University. Her family soon moved back to their home, Nashville, Tennessee, where she attended elementary, middle, and high schools in the Metro-Davidson County Public Schools, and graduated from Hillsboro High School in 1988. She received the degree of Bachelor of Science in Family and Consumer Sciences with a major in Dietetics from Miami University of Ohio in 1992. She entered the University of Tennessee in May of 1992 and in May of 1994 she received a Master of Science degree in Nutrition with a minor in Public Health.