

SCHOOL CHARACTERISTICS ASSOCIATED WITH
ACHIEVEMENT OF THE 2009 INSTITUTE OF
MEDICINE RECOMMENDATIONS FOR THE
NATIONAL SCHOOL LUNCH PROGRAM

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LINDSEY N. SMITH

ADVISOR- JO CAROL CHEZEM, PHD, RD

BALL STATE UNIVERSITY

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Abstract

Thesis: School Characteristics Associated with Achievement of the 2009 Institute of Medicine Recommendations for the National School Lunch Program

Student: Lindsey N. Smith

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The purpose of this quantitative study was to compare Indiana school menus, wellness policies, nutrient analyses, and demographics to the 2009 Institute of Medicine (IOM) recommendations to explore associations between school characteristics and achievement of the IOM recommendations for the National School Lunch Program (NSLP). The results of this study provide information and baseline data for school corporations. Results indicated that only 57% of school menus met the saturated fat recommendation, less than half met the trans fat recommendations and no school met the sodium recommendation. Intakes of fats and sodium were not significantly correlated with the variety or amount of fruits and vegetables served ($p>0.05$). The results suggest that past efforts to improve nutrient content of meals served through the NSLP have been successful. However, lunch menus should be targeted for additional assessment and intervention.

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Chapter One

Introduction

The National School Lunch Program (NSLP) is a federal entitlement program under the United States Department of Agriculture (USDA). The program became law when President Harry Truman signed the National School Lunch Act in 1946. This act was created to safeguard the health and wellbeing of the nation's children. Public and private schools, as well as child care facilities, are allowed to participate. Institutions participating in the program receive monetary reimbursement for meals, as well as commodity foods from the government, in exchange for providing meals that meet specific requirements set by the USDA.

Recently, the USDA requested that the Institute of Medicine (IOM) make recommendations to update the food and nutrition standards and requirements for the NSLP and the School Breakfast Program (SBP). To create relevant recommendations, the IOM committee reviewed and assessed current food and nutritional needs of school-aged children in the United States using the 2005 Dietary Guidelines for Americans and the IOM's Dietary Reference Intakes (DRIs). The IOM's goal was to create a set of practical, economical, and easily accepted standards that were consistent with current nutritional science

(Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). In October 2009 the IOM published their recommendations. These recommendations simplify menu planning techniques and standards by combining menu planning approaches, setting standard age/grade groups, creating nutrient targets, and increasing the variety and quantity of fruits, vegetables, and whole grains. These recommendations cover the area of nutrition specifically, but do not discuss the school environment in its entirety (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

The Child Nutrition and WIC Reauthorization Act of 2004 added a new requirement for all schools participating in the NSLP to create a wellness policy. The purpose of this wellness policy is to encourage healthy lifestyle habits and reduce obesity among school children through nutrition education, physical education, and nutrition guidelines. This policy covers a broad spectrum to encourage an overall healthy environment at each school (United States Department of Agriculture, n.d.).

Rationale

The National School Lunch Program is a large program with a budget of more than 9.3 billion dollars and over 101,000 public and private schools and child care institutions participating (United States Department of Agriculture, n.d.). Approximately 31.2 million children participate in the NSLP; about 62 percent of these children are provided lunches free or at a reduced price (United States Department of Agriculture, 2010). Data from the third School Nutrition Dietary Assessment (SNDA) study, conducted by the USDA during 2004-2005, provided assessment of the NSLP. Analysis of the data indicated that while children consumed about 35% of their daily energy at

school, only 5% of lunches offered whole grain products, and only 54% of students reported consuming some amount of fruit or vegetable at school (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009; Briefel, Wilson, & Gleason, 2009; Condon, Crepinsek, & Fox, 2009). The majority of school lunches studied met the recommendations for protein, vitamin A, vitamin C, calcium, iron and cholesterol; however, at least two-thirds of schools exceeded the standards for fat and saturated fat. Most schools exceeded sodium recommendations, and very few schools met the fiber recommendations (Crepinsek, Gordon, McKinney, Condon, & Wilson, 2009). The Institute of Medicine's recommendations aim to combat these deficiencies by setting more Nutrient Targets, and developing policies to increase fruits, vegetables, and whole grains in school meals.

In the state of Indiana, schools submit recipes, production records, menus, and wellness policies to the Indiana Department of Education to be reviewed for compliance to the NSLP requirements every 5 years. The information obtained gives insight into the nutritional content the school's menu, what types of foods are used, the amount of fruits and vegetables available and served, and each school's promotion of wellness and health. The objective of this study was to compare Indiana schools' menus to current standards and the 2009 IOM recommendations. In addition, it identified characteristics associated with attainment of the IOM recommendations. Hypotheses included:

(1) Schools that meet Institute of Medicine recommendations will have a higher quantity of fruits and vegetables served.

(2) Schools that meet Institute of Medicine recommendations will have a greater variety of fruits and vegetables available.

(3) Schools that meet Institute of Medicine recommendations for fruit or for vegetables will have a greater variety of fruits or vegetables available.

(4) Schools that meet Institute of Medicine recommendations for fruit or for vegetables will have a greater variety of fresh fruits or vegetables available.

(5) Schools that meet Institute of Medicine recommendations will be more likely to use the served option rather than the offer versus serve option for menu planning.

(6) Schools that meet Institute of Medicine recommendations will have higher scores on the WellSAT coding system.

(7) Schools with the offer versus serve option will have higher participation rates than those with served options.

Limitations

This study presented some limitations. Because the researcher was only able to access reviews that were available from the Indiana Department of Education, the results may not be representative of Indiana schools as a whole. In addition, the materials collected were from the 2008-2009 school year and may not have accurately represented current trends in Indiana schools. Finally, there may have been human errors because the researcher compiled all data by hand.

Definitions

Competitive foods - Foods offered at school other than through the National School Lunch Program or School Breakfast Program. These include a la carte foods, snacks, vending foods, and beverages; school store foods, snacks and beverages; foods for fundraisers, foods for classroom parties; foods for holiday celebrations; and food from home (Indiana Area School District, n. d.-a; U.S. General Accounting Office, 2005).

Dietary Guidelines for Americans (DGA) – Guidelines published every 5 years by the Department of Health and Human Services (HHS), and the Department of Agriculture (USDA) to promote health and reduce the risk for major chronic diseases. These guidelines are used as basis for the Federal food and nutrition education programs (U.S. Department of Health & Human Services, n.d.)

Dietary Reference Intakes (DRI) – Nutrient reference values that were established by the Institute of Medicine (IOM), including Estimated Average Requirement, Adequate Intake, Recommended Daily Allowances, and Tolerable Upper Intake Level (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009; Mahan & Escott-Stump, 2008).

Estimated Average Requirement (EAR) – Standard level of nutrients that are estimated to meet half of all healthy individuals in a group (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009; Mahan & Escott-Stump, 2008).

Adequate intake (AI) – A recommended level of a nutrient, based on observed or experimentally-determined estimates, that is used when there is not enough scientific evidence to create a standard requirement (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009; Mahan & Escott-Stump, 2008).

Institute of Medicine (IOM) - The Institute of Medicine (IOM) was created in 1970 by the National Academy of Sciences. It is an independent, nonprofit organization that works outside of government to provide unbiased and authoritative advice to decision makers and the public (National Academies of Sciences, n. d.).

Offer versus Serve - An option in meal service that allows students to decline up to two menu items and still qualify for a reimbursable meal. This option was created to decrease plate waste and increase acceptance of the lunch program. Legislation states this choice must be used in high schools and is optional in elementary and middle schools (Team Nutrition, 2004).

Recommended Dietary Allowance (RDA) - The amount of a nutrient needed to meet the needs of almost all of a healthy population (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009; Mahan & Escott-Stump, 2008).

School Food Authority (SFA) - The administrative unit for a school feeding program (United States Department of Agriculture, n.d.).

School Meals Initiative (SMI) – Current regulations that define how the Dietary Guidelines for Americans and other nutrition standards are applied to school meals. Includes actions to improve school meals and promotes overall healthy eating in children (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

School Nutrition Data Assessment Study (SNDA) - A study that uses nationally represented school samples to examine the school food environment, student's dietary behaviors, and weight of children (Gordon, Crepinsek, Briefel, Clark, & Fox, 2009).

Tolerable Upper Intake Level (UL)- The highest daily nutrient intake that is likely to cause no harm to a healthy person in the general population (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009; Mahan & Escott-Stump, 2008).

United States Department of Agriculture (USDA) – Federal Department of the United States that develops and executes policies regarding agriculture, farming, and food (United States Department of Agriculture, 2011).

Summary

The purpose of this quantitative study is to compare current Indiana school menus to the current standards and to 2009 IOM recommendations, as well as to examine school wellness policies, school menu, nutrition analysis, and school demographics to explore associations between school characteristics and achievement of the IOM recommendations for the National School Lunch Program. There are currently no studies that have examined the same questions. The results of this study will provide information and baseline data for school corporations. This could help predict compliance to the new recommendations and suggest areas to develop for future standards based on the IOM

recommendations. A full review of the literature is provided in chapter two, with methodology presented in chapter three.

Chapter Two

Literature Review

The National School Lunch Program (NSLP) is an entitlement program under the United States Department of Agriculture (USDA). It is used in public and nonprofit private schools and residential child care institutions. School Food Authorities participating in the program receive reimbursement for meals that meet specific nutritional requirements set by the federal government (Indiana Department of Education, n.d.). The program was initially created to safeguard the health of children in the United States by providing access to nutritional meals and to increase consumption of agricultural commodities (Gunderson, n.d.). Since its creation the program has undergone several changes in an attempt to provide the best nutritional quality possible.

At the request of the USDA, the Institute of Medicine (IOM) recently conducted an evaluation of the National School Lunch Program ("National School Lunch Act," 1946). Specifically, the IOM examined current program standards and requirements, dietary recommendations, and health concerns for children, utilizing this information to create an up-to-date set of recommendations for the National School Lunch Program (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). A report of their findings was issued in October 2009.

History of the National School Lunch Program

The origins of The National School Lunch Program (NSLP) can be traced back to 1790 in Munich, Germany. Benjamin Thompson, also known as Count Rumford, began a program to teach and feed hungry children (Gunderson, n.d.). The food served was mainly soup from barley, potatoes and peas. At its peak, approximately 60,000 people were fed daily by his program. By 1896 79 cities in Germany were using school feeding programs. During this time, Paris also began feeding programs for students and by 1909 588 schools were participating. Many other countries soon began to similar initiate programs (Gunderson, n.d.).

By the early 1900's, school feeding programs had spread through most European countries (Gunderson, n.d.). In England, the Education (Provision of Meals) Act was created in 1906 when 365 organizations came together out of concern for the lack of proper nutrition. The act permitted schools to offer lunches to students for a small fee (Education Provision of Meals Act, 1906). The program received so much attention that the United States began to try similar programs (Gunderson, n.d.).

In the United States, the Children's Aid Society of New York began serving meals to students in 1853 (Gunderson, n.d.). By the end of the 1909-1910 school year, 2,000 pupils were being served school lunch each day. Teachers were unanimous in the belief that the luncheons were helping the children both physically and mentally. Over time, the feeding programs spread across the states and by 1937, 15 states had laws authorizing local school boards to manage lunchrooms. The need for a stable feeding program became increasingly important for United States children (Gunderson, n.d.).

In 1946, the National School Lunch Act was signed into law by President Harry Truman, creating permanent legislation that ensured the program would have a future and appropriations to fund it ("Child Nutrition Act," 1966; Gunderson, n.d.). The new legislation's stated goal was to "safeguard the health and wellbeing of the nation's children and to encourage the domestic consumption of nutritious agricultural commodities" ("National School Lunch Act," 1946). Specifically, the program was aimed to assist states through grants to help supply food and facilities for the establishment, maintenance, operation, and expansion of nonprofit school lunch programs (Gunderson, n.d.).

Over the next several years the program was improved upon and amendments to the law were implemented (Gunderson, n.d.). In 1966, the Child Nutrition Act was signed into law. This act declared that the policy of congress would expand and strengthen efforts under the authority of the Secretary of Agriculture as a measure to safeguard the health and wellbeing of the nation's children (Committee on Nutrition Standards for National School Lunch and Breakfast Programs Food and Nutrition Board, 2008). Later amendments mandated Offer versus Serve (OVS), changed nutritional requirements to meet Recommended Daily Allowance (RDA), changed portion sizes for age groups, required the NSLP to meet the Dietary Guidelines for Americans, and made changes to menu planning approaches (Gunderson, n.d.). In 2004, The Child Nutrition and WIC Reauthorization Act of 2004 was implemented ("Child Nutrition and WIC Reauthorization Act of 2004," 2004). This required local education agencies to create a wellness policy to improve the school food environment as well as nutrition and physical activity education.

Efforts to continually evaluate the program have helped to keep the NSLP current. The National School Lunch Program is recurrently reviewed and revised to ensure the most appropriate standards and policies are set for students. For example, both the National School Lunch Act and the Child Nutrition Act are regularly amended ("Child Nutrition Act," 1966).

Eligibility

All children who attend a school participating in the National School Lunch Program may take part in the lunch services (Gleason & Burghardt, 2005). If the child is from a family with an income below 130% of the federal poverty guidelines, he or she is eligible for free meals. A child from a family earning between 130%-185% of the poverty guidelines is eligible for reduced priced meals. Thus, by eligibility guidelines, a child whose family participates in Temporary Assistance for Needy Families (TANF) or Food Stamps is automatically qualified for free school lunch (Gleason & Burghardt, 2005). Although children from families with incomes over 185% of poverty guidelines pay full price, these meals are still subsidized to a small extent (USDA, 2008). Parents must submit an application to apply for the benefits of free or reduced priced lunches (Gleason & Burghardt, 2005).

Participation

A large part of the population is made up of children under the age of 18 (Food Research and Action Center, 2011; United States Department of Agriculture, 2010). In Indiana alone there were 1,586,157 children in 2009. About 2,220 institutions in Indiana participated in the NSLP. A total of 798,559,744 children participated in Indiana, and more than half these students received free or reduced priced lunches (Food Research and

Action Center, 2011). This is consistent with national data which shows that 65% of U.S. students receive free or reduced priced lunches. Information on participation in the NSLP can help menu planners target their population, and tailor their menus. There are few studies examining the demographics of students who participate in the NSLP; however, a couple of studies have examined the profiles of students who receive free and reduced priced lunches. According to a report by Smith and Savage (2007), children make up approximately one fourth of the rural population and 40% of the rural population who depend on food stamps. About 31% of rural children receive free or reduced priced lunches compared to 25% of urban children. The study found that among all race and ethnic groups, rural children are more likely to receive free or reduced priced lunches than their urban student counterparts (Smith & Savage, 2007). Understanding this type of demographic information can help distinguish characteristics of NSLP participants.

Another study completed by the USDA, used data from two national surveys, 2001 Survey of Income and Program Participation (SIPP) and 1992-2001 National Health Nutrition Examination Survey (NHANES), to assess participation in the NSLP (Newman & Ralston, 2006). Results indicate that Whites and Asians were less likely to participate in the NSLP, and minority groups were more likely to participate. Minority groups were more likely to receive free lunches than Whites; however Whites were just as likely to receive reduced priced lunches. Full-priced lunches were most often paid by white students (Newman & Ralston, 2006). In 1999, about 48% of lunches were provided free to students. Eleven years later, in 2010, that number has increased to 65% of lunches (United States Department of Agriculture, 2010). Of all school-aged children, those aged 8-13 years old were most likely to participate, and younger children were also more

likely to receive free or reduced priced lunches. Most participating children (62%) lived in married couple households, while 30.9% lived in female headed households. Of all participants, 11.2% also participated in the Food Stamp Program (Newman & Ralston, 2006). Males were more likely to participate than females; however, there were no gender differences among reduced and free lunch participants (Mirtcheva & Powell, 2009).

Besides ethnicity, household, and gender characteristics, information on parent's education level has been shown to affect participation. A study by Mirtcheva and Powell (2009) used data from two waves of an interview study from Child Development Supplement Panel Study of Income Dynamics (CDS/PSID). The researchers found that students who ate school lunches were significantly different from students who did not. Minority students and students whose mothers had lower education were significantly more likely to participate in the NSLP. Children whose mothers had college educations were 21% less likely to participate in school lunch. The researchers also examined neighborhood factors that could affect participation. An additional grocery store or convenience store in the area increased participation in the NSLP. Having a local fast food restaurant nearby decreased participation among high school students, but did not affect other grades (Mirtcheva & Powell, 2009) .

A study by Probart, McDonnell, Hartman, Weirich, and Bailey-Davis (2006) observed characteristics associated with participation. He found schools with a larger enrollment of students had smaller participation rates. However, higher rates of free and reduced priced lunches predicted high participation rates. He also noticed that students who are eligible for free and reduced priced lunches were less likely to purchase a la carte

items, possibly because they were not subsidized. He also discovered that the earlier the start of the lunch period the higher the sales. He suggested this may be caused by students purchasing snacks for later in the day. Noting characteristics of participation in the NSLP can help identify trends and target specific areas of the NSLP for change.

Benefits and limitations of school lunch program

Several studies have reported on benefits, as well as shortcomings, of the National School Lunch Program (Crepinsek, et al., 2009; Ralston, Newman, Clauson, Guthrie, & Buzby, 2008; U.S. General Accounting Office, 2003). Concerns for the program include the quality of food provided, the use of commodities diminishing nutritional value, and the difficulty in meeting nutritional requirements without exceeding them (Ralston, et al., 2008). School Food Authorities are faced with the challenge of planning healthy, appealing meals within a strict budget. If the meals are unappealing to students, they may choose not to participate in the program. Unfortunately, this would negatively impact the budget. For this reason, some School Food Authorities are reluctant to offer healthier dishes with less butter and cream, as those dishes are popular among students. It is worrisome that this is sending a mixed message to students who are being taught nutrition education, but not seeing it practiced in the school cafeteria (U.S. General Accounting Office, 2003).

The topic of schools offering unhealthy meals leads to the concern of how well nutrition education is taught in the classroom. While many schools are now teaching some amount of nutrition education, it is not consistent (Briefel, Crepinsek, et al., 2009). Nutrition education materials are available to teachers; however, many teachers state that they sometimes are unable to find the resources or do not have time to teach it. Data from

the Third School Nutrition Data Assessment show that about three fourths of elementary and middle school children attend schools that provide nutrition education, while one fourth of high schools provide nutrition education (Briefel, Crepinsek, et al., 2009). Teachers have other required materials to cover, and it is easy for nutrition education to be pushed aside. It is difficult for School Food Authorities to balance student's acceptance of meals with the provision of being healthy.

Another concern for the program revolves around cost. Due to the rising cost of food and high labor costs, there is fear that it may lead to diminished food and nutritional quality (Ralston, et al., 2008). Other schools have reported that they use vending machine profits to fund certain school events, such as awards, or class trips. Because this is often their only resource for these funds, schools are reluctant to cut back on vending machines access within the school even though it is a typically a source of unhealthy snacks (U.S. General Accounting Office, 2003). According to a study by Park, Spappenfield, Hauang, Sherry, and Bensyl (2010) when middle schools offered vending machines with snacks and beverages almost all students (99%) purchased items from them. They also found that only 3.6 % of the students purchased healthier items while 71% purchased both a less healthy snacks and beverage (Park, et al., 2010).

While critics have identified these limitations of the National School Lunch Program, it is important to note that there are many benefits that have come from it. Each school is able to create a menu that fits their needs and budget, but it must also meet the federal nutrition requirements. The nutritional requirements are set to meet the average student's needs. There is a fine line between providing enough calories for all students without providing too many for other students. A study has shown that the program does

meet students' dietary and nutrient needs and shows that participating students have higher intakes of vitamin C, vitamin A, calcium, magnesium, potassium and fiber (Clark & Fox, 2009; Crepinsek, et al., 2009).

Some schools have come up with creative ways to comply with healthier standards (U.S. General Accounting Office, 2003). One has made meals more attractive to students by packaging it to resemble fast food, or creating a cafeteria atmosphere similar to a food court. Another has replaced vending machine items with healthier choices such as raisins and rice cereal cookies.

Limitations/Risks of the National School Lunch Program's Meal Composition

While there are several benefits to participating in the National School Lunch Program, the nutrient composition of the meals are often scrutinized. Several studies have analyzed the nutrient composition of schools' meals and their compliance to the federal standards (Clark & Fox, 2009; Crepinsek, et al., 2009). One study used SNDA-III data to analyze meals in public schools. This survey study found that the majority of schools provided lunches and breakfasts that met standards for protein, vitamin A, vitamin C, calcium and iron; however, less than one third of the schools met the standards for fat and saturated fat due to exceeding recommended levels. Only 6-7% of all schools surveyed met all of the nutrient standards (Crepinsek, et al., 2009). In a recent study used data from SNDA-III collected in the 2004-2005 school year, it was reported that school-aged National School Lunch Program participants were more likely to achieve adequate intakes of magnesium and phosphorus than non-participants. In addition, participating middle school and high school children had a reduced prevalence of inadequate intakes of vitamin A, C, B6, folate, and thiamin and a higher mean intake of calcium, potassium and

fiber compared to their non-participating peers (Clark & Fox, 2009). Although, participating in the NSLP can benefit student's daily nutrient intake, it is found to have poor nutritional quality in some areas.

There are some noted negative effects from the program. Participating children consumed a significantly higher amount of kilocalories per day (approximately 130 kcal/day more) and sodium (approximately 200 mg/day more) than nonparticipants (Clark & Fox, 2009). Overall, the differences between participants and non-participants were most pronounced during high school, suggesting the school lunch program may be influential in establishing dietary habits (Clark & Fox, 2009).

The previous study focused on nutrients, while other studies were concerned with actual foods consumed. Another study using SNDA-III data found that about 54% of school children were consuming some amount of any fruit or vegetable from school (Briefel, Crepinsek, et al., 2009). Consumption of solid fruits, 100% juices, and vegetables declined as the grade level increased. A large portion of total vegetables consumed came from French fries, especially in high school. Participating in the NSLP was associated with significantly higher consumption of solid fruit and vegetables excluding fried potatoes (Briefel, Crepinsek, et al., 2009). Whole and low fat milk were the leading contributor of both saturated fat and energy intake from the lunches. French fries were the leading source of fiber among vegetables, while apples were the leading contributor among fruit. Whole grain breads were rarely offered and provided <1% to the average fiber in lunches offered. Sodium levels were found to greatly exceed the Recommended Daily Allowance (RDA); however the USDA does not currently have a standard sodium requirement for the NSLP. These results suggest that even in schools

offering low-fat meals, students tended to choose the high fat options more often (Crepinsek, et al., 2009). It was also noted that schools often met children's nutrient needs, but exceeded recommended intakes of fat, saturated fat, and sodium. While participating in the NSLP was associated with consuming solid fruits and vegetables, it was also associated with consuming French fries for fiber, and fewer whole grains.

Some research examines children's consumption of fruits and vegetables unrelated to the NSLP. Di Noia and Contento (2010) found that when they offered adolescents at least 9 servings of fruits and vegetables daily, the children consumed at least 5 servings of fruits and vegetables each day. These results led the authors to suggest that by offering several servings of fruits and vegetables, adolescents are more likely to consume more. They also suggested that improving presentation and making the fruits and vegetables more appealing would also increase consumption (Di Noia & Contento, 2010). In a different study, reported by Wright and Rowell (2010), gardening was introduced into an elementary school. The resulting produce was served on a salad bar line at lunch. The authors observed that students' consumption of vegetables increased during intervention while the salad bar was new but rates soon diminished. The researchers observed varying rates of vegetable consumption throughout the study and believe students may have been deterred from the salad bar if a favorite entrée an option that day. They suggest that increased lessons on vegetables to boost awareness could raise children's likelihood of choosing them at lunch (Wright & Rowell, 2010).

Federal and State Requirements

Schools who participate in the National School Lunch Program must meet specific nutrient requirements to receive reimbursement for meals (U.S. Department of

Agriculture Food and Nutrition Service, 2008). The requirements include the following: (1) over a school week, meals must meet one third of the 1989 Recommended Dietary Allowances (RDA) for calories, protein, calcium, iron, vitamin A, and vitamin C; (2) meals must be consistent with the 1995 Dietary Guidelines for Americans; (3) meals must not exceed 30% fat and 10% saturated fat; and (4) lunches must contain four food components - protein, milk, grains/breads, and fruit or vegetables. The state of Indiana complies with these requirements.

Dietary Guidelines for Americans

The Dietary Guidelines for Americans are published every five years by the United States Department of Health and Human Services (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). They provide dietary advice for people two years of age and older. These guidelines encourage good dietary habits, promote health and reduce the risk of major chronic diseases. They are also used as the basis for Federal food and nutrition education programs (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

Menu Planning

School Foodservice Authorities may plan menus using five different methods - Food-Based Traditional, Food-Based Enhanced, Nutrient-Based, Nutrient-Based Assisted, or any reasonable approach (U.S. Department of Agriculture Food and Nutrition Service, 2008). All of the menu planning approaches must meet the requirements set by the federal government. Each way varies slightly in the age/grade groups used, serving sizes, and by the method of assessment. There are noticeable differences in serving sizes among the each menu planning approaches and age/grade

groups. The groups are important because the calorie and nutrient needs of children vary by age, gender and activity level. The School Food Authorities must meet the correct serving sizes for their school's age/grade groups and chosen approach. Sixth grade is an important dividing line for menu planners, as this is when students are about 10-11 years old. At this age, the greatest changes in children's calorie and nutrient needs occur (U.S. Department of Agriculture Food and Nutrition Service, 2008)

Traditional Food-Based Menu Planning

The goal of both the Traditional and Enhanced Food-Based menu planning approaches is to meet the nutrient standards. The state agency reviews production records, nutrient data, recipes, and menus to determine if the menus meet these standards (U.S. Department of Agriculture Food and Nutrition Service, 2008).

There are two established age/grade groups for Enhanced Food-Based. These include grades k-3, and grades 4-12. An optional third age/grade group is for grades 7-12. The USDA requires that schools meet the minimum amounts required for the two established groups and highly recommend meeting the minimum requirement for the third group.

In order for the meal to be reimbursable, it must meet the nutrient standards and each component must meet serving criteria. The minimum meal components serving size criteria for the k-3 age/grade group are 1-1/2 oz meat/meat alternative, 1 serving of grain/bread with 8 servings per week, half cup of vegetables or fruit, and 8 oz of milk. The 4-12 age/grade group is similar, with increased serving sizes of meat/ meat alternative and fruit or vegetables. The serving sizes for the optional 7-12 age/grade

group further increase the meat/meat alternative, and bread/grains servings (U.S. Department of Agriculture Food and Nutrition Service, 2008).

Enhanced Food-Based Menu Planning

The Enhanced Food-Based menu planning approach is designed to provide one third of the calories needed for specific age/grade group for lunch. This approach encourages lower fat versions of foods, such as skinless chicken, and lower fat cooking techniques, such as baking. The two established age/grade groups are k-6 and 7-12. An additional optional group, highly recommended for inclusion by USDA, is grades k-3. In order for the meal to be reimbursable, correct serving sizes must be met. For the k-6 group, meals must provide similar servings of meat/meat alternative, grains/bread, fruits or vegetables, and milk to the Traditional Food-Based menu planning methods. The 7-12 age/grade group has slightly increased servings of each group and has the highest requirement of fruit or vegetables of 1 cup. The optional k-3 group meal pattern requires slightly less meat/meat alternative, and bread/grains (U.S. Department of Agriculture Food and Nutrition Service, 2008).

Nutrient-Based Menu Planning and Assisted Nutrient-Based Menu Planning

The Nutrient-Based Menu Planning approach is similar to the Food-Based approaches in that they all must meet the same nutrient requirements. However, Nutrient-Based menus must be analyzed with USDA-approved software to determine if requirements are met. The School Food Authority planning the menu must continually analyze their menus to identify if they are meeting the standards. Using the Assisted Nutrient-Based menu planning approach involves having an outside agency, such as the State agency or a different school district, plan and evaluates the menu instead of the

local School Food Authority. This approach is typically used in schools that lack the technical resources to analyze menus.

Another difference between Food-Based and Nutrient-Based planning is the age/grade groups. The established age/grade groups for the Nutrient-Based approach are grades k-6 and 7-12. Menu planners can choose to add an optional age/grade group or set a customized age group; nutrient requirements for these are generated by the computer software after entering the ages of the children within the group. If more than one of the school's age/grade groups is outside of the established ranges, the school must make changes to their age/grade groups. For example, if a school included grades k-8, the school would use age/grade groups of k-6 and 7-12 because both 7th and 8th grade students fall outside of the k-6 age/grade group. It is important for menu planners to follow the age/grade groups in order to best meet their students' needs.

Certain criteria must be followed in order for a meal to be reimbursable under the Nutrient-Based menu planning approach. The meal must meet the nutrient standards for each age/grade group over a week and contain a minimum of three menu items, including an entrée, a fluid milk, and a side dish. A menu item can be a single food or a combination food, with the exception of items of low nutritive value (e.g. soda water, chewing gum, condiments, and candy). However, all foods, including the low nutritive value items that are served as part of the meal, are included in the nutrient analysis. Menu items can be served as one item or two depending on the School Food Authority's choice. For example, a hamburger could be served as 1 item, a burger with a bun, or as 2 items, a burger and a bun (U.S. Department of Agriculture Food and Nutrition Service, 2008).

This approach focuses primarily on the nutrients provided by food rather than what foods are offered.

Because the approach is based around meeting specific nutrient goals rather than food goals, a nutrient analysis is required for Nutrient-Based Menu Planning. Menus undergo a computerized nutrient analysis by the state during their scheduled review of the program. The software used is approved by the USDA and includes a Child Nutrition Database. This database includes information on foods commonly used in schools, including USDA commodity foods and brand-name items. If an item is not already in the system, the recipe can be entered into the program. The nutrient analysis can be weighted or un-weighted. A weighted nutrient analysis gives more weight to items that are selected more frequently by students, while an un-weighted analysis is an average, giving all menu items equal credence. During reviews by the state, Offer versus Serve menus are weighted, while served menus are un-weighted.

Offer versus Serve

Offer versus Serve (OVS) is a concept that was first adopted into the NSLP in 1975. It was implemented to increase acceptability of school lunch by allowing students to choose foods they prefer. This would therefore decrease plate waste. It was first implemented only in senior high schools, but in 1977 it was authorized for use in middle and junior high schools. In 1981, it became an option for elementary schools. Currently, OVS is required in high schools and is optional in all other grade groups. Implementing OVS varies slightly depending on the menu approach (Team Nutrition, 2004).

Offer versus Serve allows students to decline some of the foods offered in a school lunch. All menu approaches may use this technique, with the meal still counting as

a reimbursable meal and costing the same price (U.S. Department of Agriculture Food and Nutrition Service, 2008). In the Food-Based approaches, the schools must offer five food items and high school students can decline up to two items. The School Food Authority can decide whether to allow younger students to decline one or two items. In the Nutrient-Based approaches to menu planning, School Food Authorities must offer three menu items- an entrée, milk, and a side menu item. Students must select at least two of the three items, one of which must be the entrée. If more than three items are offered, students may decline no more than two items, never declining the entrée (U.S. Department of Agriculture Food and Nutrition Service, 2008). OVS is used to help increased acceptability of meals and decreased plate waste.

Wellness Policy

The Child Nutrition and WIC Reauthorization Act of 2004 stated that by the beginning of the school year after June 30, 2006, any school participating in the National School Lunch Program or Child Nutrition act of 1966 would be required to create a wellness policy ("Child Nutrition and WIC Reauthorization Act of 2004," 2004). The law stated that the policy must address certain areas. First, the policy must cover goals that promote student wellness specific for nutrition education, physical activity, and other school-based activities. The policy must also include nutrition guidelines that have been chosen by the local educational agency. These guidelines must promote student health and reduce childhood obesity. Finally, the policy must establish a means for implementation and include parents, students, school board, representatives of the school food authority, school administrators, and the public in its development ("Child

Nutrition and WIC Reauthorization Act of 2004," 2004). The implementation of these wellness policies is another step towards creating a healthy environment for students.

Some recent studies have assessed the implementation and strength of these policies since they were mandated. Longely and Sneed (2009) surveyed schools before and after the WIC Reauthorization law was mandated. They reported that the legislation has made an impact by bringing together various disciplines and creating policies that specified nutrition (Longley & Sneed, 2009). A study using SNDA-III data assessed the use of wellness policies. The study was done in spring of 2005, soon after the act was mandated. About 44% of public schools had a wellness policy established. About three fourths of elementary and middle school children attended schools that provided nutrition education, while one fourth of high school students did. At that time, children had increasing access to competitive foods as they moved from elementary school to high school (Briefel, Crepinsek, et al., 2009). While this study assessed the use of wellness policies, a study in Utah examined the strength of the wellness policies. The researchers examined thirty wellness policies and found that 77% of them met all the required components by the Child Nutrition WIC Reauthorization Act. Areas that were likely to be left out were, pricing that encouraged healthy foods, identifying safe walking and biking routes to school, prioritizing recess during the elementary school day, and having fruits and vegetables available where all foods are sold. The most commonly missed area was guidelines for competitive foods. The study found that there were no differences in participation based on ethnicity or size. Urban schools were more likely to include guidelines for foods sold at school, and schools that served high numbers of low-income students were most likely to mandate wellness policy items rather than just make

recommendations (Metos & Nanney, 2007). Shortly after the law was created, schools were already implementing wellness policies in their schools and were found to be fairly consistent with the law's requirements.

Other studies looked at wellness policies related to the school environment. Kubik, Wall, Shen, Nanney, Nelson, and Laska (2010) found that in high schools there was no association between having a strict or less strict wellness policies and availability of junk food at school. They suggested that including school nutritionists and other health professionals in creating and implementing rigorous policies promotes a healthy school environment (Kubik, et al., 2010). Another study examined the strength and compliance of wellness policy's and how closely they came to meeting IOM recommendations. This study found that no district had a policy that met all of the IOM's previous recommendations. Two areas that wellness policies lacked in were having restrictions against marking unhealthy food, and few placed emphasis on the implementation of the policies (Chriqui, et al., 2010).

Indiana Area School District Student Wellness Policy

Indiana has a student wellness policy consistent with the federal and state requirements. The policy states that a wellness committee should be formed with at least one school board member, district administrator, district food service representative, student, parent/guardian, and a member of the public. The committee should act as an advisory committee for student health issues and be charge of developing the wellness policy compliant with the law. This policy should cover guidelines that schools must provide access to reasonably priced foods and beverages that meet nutrition guidelines. Physical education courses and opportunities for appropriate physical activity during the

day must be offered. Curriculum and programs for k-12 should be designed to educate students on nutrition and lifelong physical activity (Indiana Area School District, n. d.-b).

The nutrition guidelines within the policy should promote student health and reduce childhood obesity as well as comply with the federal nutrition standards. Competitive foods sold in middle and high schools must comply with the Indiana Nutritional standards for competitive foods. Competitive foods in elementary schools must comply with the Pennsylvania department standards for competitive foods (Indiana Area School District, n. d.-a, n. d.-b; Pennsylvania Department of Education Division of Food and Nutrition, 2006). Additionally, at least 75% of the snack foods sold in vending machines, snack bars, school stores, a la carte, and concession stands must meet certain criteria. This criteria includes: no more than 200 calorie per package, no more than 35% calories from fat, no more than 10% calories from saturated fat, no more than 480 mg sodium, no more than 35% sugar by weight, excluding fruits, vegetables, nuts, seeds, and nut butters. Guidelines for beverages include: 100% fruit or vegetable juice, limited to a 12 oz portion size, only fat free or 1% milk in a 8-16 oz serving, water and flavored caffeine free water without added sugar with an unlimited portion size, carbonated water and carbonated 100% fruit juice with USDA approval.

Institute of Medicine Recommendations on Competitive Foods

In 2007, the Institute of Medicine (IOM) came out with recommendations for competitive foods in schools. The IOM organized foods and beverages sold in competition with the NSLP meals into two tiers. The tiers represent how consistent the items are to the Dietary Guidelines for Americans (DGA). Tier 1 items are foods to be encouraged, as defined by the DGA. These foods include items such as, fruits,

vegetables, non fat or low fat dairy and whole grains. Tier 2 items do not quite fit into the tier 1 criterion but do not fall outside of DGA recommendations for nutrients such as sodium and fat. These foods include items such as, processed foods, baked potato chips, graham crackers, and animal cookies. The IOM recommended thirteen standards for these foods. A few of these standards include, no more than 35% of total calories from fat, less than 10% saturated fat, zero trans fat, and 200 calories or less per snack item. They also stated that items offered during school hours should be tier 1, while items offered after school hours may be tier 2 (Committee on Nutrition Standards for National School Lunch and Breakfast Programs Food and Nutrition Board, 2008). Compliance with these recommendations could provide a healthier school environment.

Wellness Policy Coding System

A coding system was recently published to measure the quality of school wellness policies. This tool has a 96 item coding system which evaluates seven goal areas. The goal areas addressed include; (1) Nutrition Education, (2) Standards for United States Department of Agriculture Child Nutrition Programs and School Meals, (3) Nutrition Standards for Competitive and Other Foods and Beverages, (4) Physical Education, and (5) Physical Activity, (6) Communication and Promotion, and (7) Evaluation (Schwartz, et al., 2009). These areas are consistent with the federal legislation's five areas that must be addressed within the wellness policy (P.L. 108-265, 118 Stat. 780, 2004). This tool is used to measure the comprehensiveness of wellness policies and to score policies for analysis.

The tool was developed by combining several different evaluation tools and refining them to one coding system. To use the tool, the evaluator scores each of the 96 items with

a zero, one or a two. A score of zero means the topic was not mentioned, a score of one means the topic was mentioned in vague terms, and a score of two means the topic was addressed in a specific and direct manner. Some items may be determined by state policy; for example, if a state already has guidelines on beverages allowed in schools then that item would be coded as having a strong guideline in place whether or not it appeared in the wellness policy.

A recent study describes the development of the coding system and tests its range, and internal and inter-rater reliability (Schwartz, et al., 2009). The results indicated that the coding system was a reliable and valid tool for measuring the quality of school wellness policies. Recently the 96 item tool was simplified into a 50-item tool. The tool is available at WellSAT.org. This tool covers five specific areas, (1) Nutrition Education and Wellness Promotion, addresses the promotion of nutrition education and healthy food choices, (2) Standards for USDA Child Nutrition Programs and School Meals, addresses compliance to the NSLP standards and the meal environment, (3) Nutrition Standards for Competitive and Other Foods and Beverages, addresses competitive food and beverage regulations, (4) Physical Education and Physical Activity, addresses physical activity education and promotion, and (5) Evaluation, addresses plans for implementation and review of the policy (Appendix D). After completing the online evaluation, two scores are generated- a total comprehensiveness score and a total strength score. The comprehensiveness score reflects the extent to which the areas are covered in the policy. The strength score reflects how strongly the content is stated. Both scores can range from 0-100, with higher scores reflecting more content and detailed language (Schwartz, et al., 2009; Yale Rudd Center, 2010).

Bridging the Gap research (2010) used the original coding system to score wellness policies in a recent study. They found that while most schools had a wellness policy most did not include all of the required provisions. They also found that many schools had weak wording in their policies which lead to low strength scores and were lacking implementation guidelines. They also found that some policies included information that was not required by the act, such as guidelines for physical education (Chriqui, et al., 2010).

2009 Institute of Medicine Recommendations

In October 2009, the Institute of Medicine came out with School Meals: Building Blocks for Healthy Children, which details their key recommendations for the National School Lunch Program (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). The IOM created nutrient targets and meal requirements for both the NSLP and the School Breakfast Program. Their recommendations are consistent with the Dietary Guidelines for Americans and the Dietary Reference Intakes (DRI). The IOM's goal for their recommendations is to improve children's diets and reduce the amount of insufficient and excessive intakes of food, nutrients, and calories (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

The IOM has recommended setting several Nutrient Targets as opposed to the current standards, which provide specific requirements for only vitamin A, vitamin C, calcium, and iron (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009; Gunderson, n.d.). These Nutrient Targets and meal requirements will simplify the menu planning process and make monitoring simpler.

They should be easier to implement in new menus being developed and easily incorporate healthy options that are appealing to all students (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

The committee began by determining the appropriate age/grade groups by considering evidence on current school grades and the Dietary Reference Intake (DRI) age groups (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). The committee decided on the following grade spans; grades k-5 (ages 5-10), grades 6-8 (ages 11-13), grades 9-12 (ages 14-18). The k-5 group includes children from two DRI age groups so the committee gave it special attention. The energy requirements for males and females from ages 5-18 were estimated using Estimated Energy Requirement equations and DRIs. Centers for Disease Control (CDC) growth chart data was used to estimate the height and weight of the average child within the age/grade groups. The energy requirements were then calculated and estimated as follows; 5-10 year old group, 1,800 calories, 11-13 year old group, 2,000 calories, 14-18 year old group, 2,400 calories. Each proportion of calories was multiplied by 0.3 to estimate the calorie needs at lunch. Due to concerns of low food security and childhood obesity, the committee tried to make the calorie requirements meet most individual's needs but not be excessive (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

To develop new recommendations for nutrient needs, the committee assessed nutrient data from Diet Quality of American School Age Children by School Lunch Participation Status and the Third School Nutrition Dietary Assessment Study to identify food group and nutrient intakes by school children (Committee on Nutrition Standards for

National School Lunch and Breakfast Programs, 2009; Gordon, et al., 2009; Nancy Cole & Mary Kay Fox, 2008). The committee then used DRI's as reference values for children's dietary intake (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). Each nutrient's usual intake distribution was compared against its Estimated Average Requirement (EAR), Adequate Intake (AI), and/or Tolerable Upper Limit (UL) levels. The committee averaged results between females and males and adjusted for inadequate or excessive intakes of each nutrient and created School Meal Target Median Intakes (SM-TMI) which estimate daily needs. These were then adjusted to represent one third of the child's daily needs, or 32% of their daily intake. Protein targets were found by averaging weight from SNDA data for each age/grade group. Because SNDA data had higher weights for children, using it ensured it would cover almost all children's protein needs. The committee set maximum daily targets for sodium based on specific age Tolerable Upper Intake Levels. This would be 1.2 g per day for children 5-8 years old, and 1.5 g per day for older children (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

An important task for the committee was recommending a new menu planning technique that would be consistent with Dietary Guidelines and DRIs. The committee decided the best approach was to combine the four approaches currently in place (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). Using only the Food-Based approach was not sufficient, as it did not ensure that the menus were meeting calorie content and Dietary Guidelines. Using only the Nutrient-Based approach would be difficult with the new nutrient recommendations, as nutrient information on the new nutrient targets is not always easily accessible. Also, the

Nutrient-Based method is not consistent with the Dietary Guidelines, which places emphasis on foods. The committee expects their recommended menu approach to be more dependable because it can quantify nutrient information as well as emphasize important foods. The committee used MyPyramid intake patterns as a basis for planning meals as they are consistent with the Dietary Guidelines as well as provide nutrients in amounts that are current with Dietary Reference Intakes. This led to the first IOM recommendation which states, “The Food and Nutrition Service of the U.S. Department of Agriculture (USDA) should adopt the Nutrient Target as the scientific basis for setting standards for menu planning for school meals but should not adopt a nutrient based standard for school meal planning and monitoring” (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

While the first recommendation encourages use of the Nutrient Targets the second encourages healthy food choices (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). It details the importance of school meals being consistent with the Dietary Guidelines for Americans and improving the healthfulness of school meals. To do this, the IOM recommends that the Food and Nutrition Service adopt standards for menu planning that increase the amounts of fruits, vegetables, and whole grains; increase the focus on reducing the amounts of saturated, trans and total fat and sodium provided; and set a minimum and maximum level of calories. The meal patterns were created under the assumption that fruits are fresh, frozen without sugar, dried, or canned in fruit juice, water or light syrup; canned vegetables contain no salt or have reduced sodium content; whole grain-rich foods meet specific criteria; meats are lean, soy extenders are acceptable, cheese and yogurt are low fat; unsaturated oils are used in food

preparation; and commercially purchased foods have zero grams trans fat per serving. In order to be consistent with the Dietary Guidelines, the committee decided to limit the fat content of milk to 1 percent and to keep fat free flavored milks. They also noted that it may not be realistic to require only whole grain foods, as they are not accepted well by children, they are more expensive, and choices may be limited. The committee expects changes can be made to increase the healthfulness of food items sold. One important change is lowering the amount of sodium served. Because the change will be so drastic and rely on student acceptance, the committee set a target date of 2020 to reach sodium goals (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). These goals may take significant effort and time to meet.

In order to help meet these goals the committee suggests changes in meal preparation to not only increase nutritional quality, but to increase students' acceptance (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). The committee believes if meals were prepared on site with appetizing recipes, healthier food items would appeal more to students. In addition, when preparing onsite, the cooks can control ingredients and choose to use less fat and sodium in the preparation. The committee was aware that this type of a change may require not only more equipment and space in the kitchens, but more training for staff (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

The committee discovered some shortcomings of the Offer versus Served legislation (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). They noted that if a student omits two vegetables from their meal, the fiber and potassium content would be less than 80% of the Nutrient Targets for all grades.

Also, if milk is omitted, calcium, phosphorus, potassium, vitamin D and/or riboflavin content could fall to below the nutrient target depending on the age/grade group. This leads to the third recommendation which states, “To achieve reasonable balance between the goals of reducing waste and preserving the nutritional integrity of school meals, the Food and Nutrition Service, in conjunction with state and local educational agencies and students, should weigh the strengths and limitations of the committees two options when setting standards for the meals *as selected* by students” (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

The committee suggested changing the language of Offer versus Served to “As Selected” (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). In addition, they recommend using one of two approaches. Option one is the committee’s preferred choice and allows two items to be declined, but the student must take at least one fruit or one vegetable. The alternative option is to allow three items to be declined; however, the student must take at least one fruit or vegetable.

The next five recommendations involve incorporating various groups and services to ensure the program has support needed to make the changes suggested. The fourth and fifth recommendation advise Food and Nutrition services to work together with state and professional agencies to provide support to food service operators for the many changes required by the revised meal requirements (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). This is to include technical assistance, new procedures for monitoring the quality of school meals, as well assist in ways to limit sodium and increase whole grains while maintaining student’s acceptability and cost.

The sixth recommendation is to the Food and Drug Administration (FDA) to take action in labeling whole grain contents of food products (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). The seventh and eighth recommend USDA agencies and other federal departments to provide support and funding for studies to evaluate the revised meal requirements and their impact on children's dietary intake, as well as studies related to the implementation of the IOM recommendations (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

The IOM's recommendations are clearly stated for the USDA. The USDA will need to review the recommendations and decide how to implement them. Implementing these recommendations in school operations will take special attention and planning as well as technical and operational support. Monitoring and evaluating the implementation will help to improve standards in the future (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

Summary

The National School Lunch Program has come a long way since the legislation was first signed into law in 1946. Due to constant criticism and review, the program has gone through many reviews and revisions, and had several amendments made to the law (Gunderson, n.d.). Recently, the USDA asked the IOM to review the program, as well as current nutritional standards and needs of children, and make recommendations to revise the program (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). The IOM diligently analyzed the program and delivered eight recommendations in October 2009 for the USDA to consider. These recommendations

aim to create an up-to-date and nutritionally sound lunch program while keeping cost and children's preference in mind.

Chapter Three

Methodology

In this quantitative study, the researcher examined associations between school menus, wellness policies, demographics and achievement of the Institute of Medicine's new recommendations for the National School Lunch Program as well as current standards for the program. This information will help provide baseline data to identify areas that need development in order to comply with future standards based on the IOM recommendations. This will help School Food Authorities to better predict how well schools are meeting IOM recommendations based on their school characteristics and can help to address areas of improvement in the future.

Sample

Every five years, schools are required to submit one week's lunch records including production records, menus, recipes, and food labels to the state agency for review. After the review is completed, a nutrient analysis and profile data sheet are created. The state agency had 75 of these completed reviews from the 2008-2009 school year available for analysis. In addition, the researcher contacted each school with a completed review by telephone or email to request their most recent wellness policy. Some policies were found on the school's website.

Instrumentation

Each wellness policy was evaluated using an online tool at www.WellSAT.org (Appendix D). This instrument was simplified from a 96 item tool to a 50 item tool. A recent study by Schwartz et al (2009) describes the development of the coding system and tests its range, and internal and inter-rater reliability. The results indicated that the coding system was a reliable and valid tool for measuring the quality of school wellness policies (Schwartz, et al., 2009). The process used to grade the policies is described below.

Procedures

The data was collected from four main sources and compiled into spreadsheets for analysis. From an online database at www.doe.in.gov/data/, the researcher obtained descriptive information on each school corporation. Demographic type was listed as rural, metropolitan, town, or suburban. A metropolitan is inside of a Metropolitan Statistical Area (MSA) with about 200 students per square mile or containing all of a central city of the MSA, an area with only a MSA in the immediate area and having a city of at least 50,000 people or an urbanized area of at least 50,000 with a total metropolitan population of at least 100,000. Suburban is defined as inside a MSA with a density between 20 and 200 students per square mile. Town is described as outside MSA with a density between 20 and 200. Finally, rural is characterized as less than 20 students per square mile. Also listed on the website were percent below poverty and percent of free and reduced priced lunches which were obtained for use as socioeconomic status indicators. Enrollment numbers for the entire corporation were also taken from this online database.

The finalized school lunch program review from the Indiana Department of Education included a School Meals Initiative review profile sheet as well as nutrient analysis of the one week menu that was reviewed. Both of these documents were initially created during the 2008-2009 school year. The School Meals Initiative Review profile sheet provided several pieces of data including, school type (elementary, middle, or high), type of menu approach (Traditional or Enhanced Food-Based, or Nutrient-Based), the meal plan used (Offer versus Serve or Served), location of the meal preparation, (at the school, production kitchen in another location, or a combination), age/grade groups used, and participation rate.

The nutrient analysis sheets received from the state agency's School Meals Initiative review packet cover a one week menu. This analysis included individual days broken down by day and a weekly average. Information on nutrients were obtained from this analysis. Specific dietary components included vitamin A, vitamin C, iron, calcium, fat, saturated fat, trans fat, cholesterol, sodium, fiber, protein, and calories. In addition, the researcher was able to gather information about fruits and vegetables offered from menus. This information included amount available, type (fresh, frozen, canned/dried), and starchy, potato, non-starchy, solid fruit or fruit juice.

The wellness policies were graded using the WellSAT online tool (Appendix D). This process involves grading the policy on 50 different items. A score of zero indicated the topic was not mentioned, a score of one indicated the topic was mentioned in vague terms, and a score of two indicated the topic was addressed in a specific and direct manner.

Statistical Analyses

SPSS was used to analyze the data. The purpose of the analysis was to describe current school/menu characteristics and to identify those associated with attainment of the IOM recommendations. The current standards and IOM recommendations are shown in Tables 1 and 2.

Univariate analysis of variance was used to test hypothesis one, “Schools that meet Institute of Medicine recommendations will have a higher quantity of fruits and vegetables served;” hypothesis two, “Schools that meet Institute of Medicine recommendations will have a greater variety of fruits and vegetables available;” hypothesis three, “Schools that meet Institute of Medicine recommendations for fruit or for vegetables will have a greater variety of fruits or vegetables available;” hypothesis four, “Schools that meet Institute of Medicine recommendations for fruit or for vegetables will have a greater variety of fresh fruits or vegetables available;” hypothesis six, “Schools that meet Institute of Medicine recommendations will have higher scores on the WellSAT coding system;” and hypothesis seven, Schools with the Offer versus Serve option will have higher participation rates than those with served options.”

A chi-square test was used to analyze the fifth hypothesis, “Schools that meet IOM recommendations will be more likely to use the served option rather than Offer versus Serve option for menu planning.” However, due to small sample size the results of this analysis were not valid. In addition, the reliability of the wellness policy scores were tested using Cronbach’s alpha.

Table 1
Current Standards and IOM Recommendations for Quantity of Fruits and Vegetables

Current standards	Quantity of fruits and/or vegetables per day	
Traditional		
Grades k-3	½ cup	
Grades 4-12	¾ cup	
Grades 7-12	¾ cup	
Enhanced		
Grades k-3	¾ cup	
Grades 7-12	1 cup	
Grades k-6	¾ cup + ½ cup over the week	
Nutrient based ^a		
Grades k-6		
Grades 7-12		
Grades k-3		
IOM recommendations	Quantity of fruits per week	Quantity of vegetables per week
Grades k-5 (5-10 year olds)	2 ½ cups	3 ¾ cups
Grades 6-8 (11-13 year olds)	2 ½ cups	3 ¾ cups
Grades 9-12 (14-18 year olds)	5 cups	5 cups

^a Nutrient based menu approach does not specify amount of fruits and vegetables to provide. This method is based on the nutrients provided by the meal.

Table 2
Current Standards and IOM Recommendations for Nutrients

Age/Grade Groups	Calories (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Vitamin C (mg)	Total fat (% of kcal)	Saturated fat (% of kcal)	Cholesterol (mg)	Sodium (mg)	Fiber (g)	Trans fat (g)
Current Standards												
Traditional												
Grades k-3	633	9	267	3.3	200	15	<30	<10				
Grades 4-12	785	15	370	4.2	285	17	<30	<10				
Grades 7-12	825	16	400	4.5	300	18	<30	<10				
Enhanced												
Grades k-3	633	9	267	3.3	200	15	<30	<10				
Grades 7-12	825	16	400	4.5	300	18	<30	<10				
Grades k-6	664	10	286	3.5	224	15	<30	<10				
Nutrient based												
Grades k-6	664	10	286	3.5	224	15	<30	<10				
Grades 7-12	825	16	400	4.5	300	18	<30	<10				
Grades k-3	633	9	267	3.3	200	15	<30	<10				
IOM recommendations												
Grades k-5	550-650	15.2	332	3.4	192	24	25-35	<10	<96	636	8.5	0
Grades 6-8	600-700	32.2	440	5.2	241	30	25-35	<10	<96	704	9.4	0
Grades 9-12	750-850	32.5	481	5.9	277	39	25-35	<10	<96	736	10.7	0

Note: There are no current standards for cholesterol, sodium, fiber, or Trans fat.

Institutional Review Board Consent

This study was approved by the Ball State University Institutional Review Board under the exemption category (Appendix A). This study evaluated a public benefit program and used previously collected documentation and had no identifiers to human subjects.

Summary

The researcher anticipated significant results that associate characteristics in a school to meeting the new IOM recommendations for the National School Lunch Program. The researcher collected data from school reviews from the 2008-2009 school year, as well as scored school wellness policies. The data was analyzed using univariate analysis of variance and chi square analyses. The results of this study are important because they provide baseline data that identifies factors that are associated with the likelihood of meeting the IOM recommendations and give information on how well Indiana schools are meeting the current recommendations. The USDA will likely be implementing the new recommendations soon, and school corporations will be charged with making changes. Indiana schools will have a unique opportunity to use this information to proactively identify and address potential areas of improvement before the IOM recommendations are implemented.

Chapter Four

Results

A total of 113 school meal initiative reviews from the 2008-2009 school year were identified by the Indiana Department of Education. After retrieving each completed review within the Indiana Department of Education's filing system, only 75 reviews met inclusion criteria. Of the 113 reviews, 20 of the reviews were listed on the master list twice, 9 were from a different school year, 3 were missing nutrient analyses, 4 were not regular schools (i.e. youth centers, psychiatric facilities, detention centers), and 2 could not be found.

School demographics are shown in Table 3. The majority of schools were elementary or middle schools, and approximately one-half of school corporations had an enrollment of less than 1,000 students. The majority of schools had lunch participation rates above 75%, although most had less than 25% of students receiving free and reduced priced meals. Most schools used the Traditional Food-Based menu planning approach (76%) and the Offer versus Serve meal plan option (71%). After correction for effects of free and reduced priced meals on lunch participation rate, there was no statistically significant difference in lunch participation rate between schools with Offer versus Serve (75 ± 19 , $n=46$) and those with served (83 ± 18 , $n=16$) meal plan options ($p = 0.281$).

The number of fruits and vegetables available was assessed using weekly menus provided for review. Details are listed in Table 4. On average, 18.5 ± 11.2 fruits and

Table 3
School Demographics

Characteristic	n (%)
Schools type ^a (n= 74)	
Elementary (k-6)	36 (48)
Middle (7-8)	27 (36)
High school (9-12)	11 (15)
Menu planning approach (n= 74)	
Food-based traditional	57 (76)
Food-based enhanced	12 (16)
Nutrient based	5 (7)
Meal plan (n=74)	
Offer vs Serve	53 (71)
Served	21 (28)
Meal preparation location (n= 73)	
At School	65 (87)
Combination	5 (7)
Other	3 (4)
Demographic type (n= 75)	
Town	4 (5)
Suburban	13 (17)
Metropolitan	6 (8)
Rural	19 (25)
Charter	3 (4)
Private	30 (40)
Corporation enrollment (n= 75)	
< 299	25 (33)
300-599	8 (11)
600-999	6 (8)
1,000-2,499	17 (23)
2,500-4,999	6 (8)
5,000-9,999	5 (7)
10,000-24,000	8 (11)
Percent free and reduced priced meals (n=73)	
0-24%	39 (52)
25-49%	20 (27)
50-74%	8 (11)
75-100%	6 (8)
Lunch participation rate (n= 63)	
0-24	1 (2)
25-49	5(8)
50-74	18(29)
75-100	39(62)

^a Although menus were made for multiple schools, for analysis purposes they were categorized by the highest grade group.

Table 4
Number of Fruits and Vegetables Available

Total options available	Number available per week (mean \pm SD)
Total fruit and vegetable ($n=72$)	18.5 \pm 11.2
Fruit ($n=72$)	8.3 \pm 6.0
Solid fruit ($n=61$)	7.1 \pm 4.9
Fruit juice ($n=61$)	1.3 \pm 2.6
Vegetable ($n=72$)	10.2 \pm 6.3
Non-starchy vegetables ($n=44$)	5.1 \pm 4.1
Starchy ^a ($n=44$)	3.8 \pm 1.6
Potato ($n=72$)	2.2 \pm 1.3
Fruit and vegetable type ($n=72$)	
Fresh ($n=72$)	6.7 \pm 7.0
Frozen ($n=72$)	2.5 \pm 1.7
Canned/dried ($n=72$)	4.4 \pm 3.2
Unknown ^b ($n=72$)	4.9 \pm 4.1

^a Some vegetables could not be distinguished between starchy and non-starchy and were not used for the calculation (e.g. vegetable blend).

^b Based on information available the type could not be determined.

vegetables were included on menus each week. Vegetables appeared on weekly menus approximately 10 times, with non-starchy vegetables (5.1 ± 4.1) more frequent than starchy vegetables (3.8 ± 1.6). Fruits appeared about 8 times, with solid fruit (7.1 ± 4.9) more frequent than fruit juice (1.3 ± 2.6). For fruits and vegetables that could be categorized by source from the menu, roughly one-half were fresh (6.7 ± 7.0), with the remainder described as frozen (2.5 ± 1.7) or canned/dried (4.4 ± 3.2).

Weekly menus provided information on nutrient content as served. In Table 5, this information is compared to current standards and IOM recommendations. Overall, school menus most often met current standards and IOM recommendations for calcium (98.6% and 87.5%, respectively) and vitamin A (98.6% and 100%) and least often for calories (34% and 38%, respectively) and iron (59.2% and 47.2%). The greatest discrepancy between schools' achievement of current standards and IOM recommendations was in protein content, with 100% and 66.7% achievement, respectively. Attainment of IOM recommendations for nutrients not addressed in the current standards was also identified. These nutrients included cholesterol (97.1%), fiber (5.6%), trans fat (22.4%) and sodium (0%).

The amount of fruits and vegetables served was compared to current guidelines and IOM recommendations. Overall, quantity of fruits and vegetables served exceeded the current guidelines (133.7%), with 91% of schools achieving the standard. However, schools were less likely to meet the higher IOM recommendations. For fruits, the average percent IOM was $88.1\% \pm 36.5$; with only 42% of schools meeting the recommendation.

Table 5
Comparison of Nutrient Content in Weekly Menus As Served

Nutrient	% Current standards	% Met current standards	% IOM recommendations	% Met IOM recommendations
Calories ^a (n= 71)	95.6±11.6	33.8	--	37.5
Cholesterol ^b (n=70)	--	--	65.9±18.7	97.1
Protein ^b (n=72)	231.9±54.9	100.0	142.1±49.2	66.7
Fiber ^b (n= 71)	--	--	67.9±16.7	5.6
Fat ^a (n=73)	--	63.0	--	80.8
Trans fat ^{b, c} (n=67)	--	--	--	22.4
Sat fat ^a (n=73)	--	58.9	--	58.9
Sodium ^b (n=75)	--	--	211.4±30.7	0.0
Iron (n=72)	121.2±76.5	59.2	113.4±78.1	47.2
Calcium (n=72)	146.9±40.6	98.6	129.1±35.3	87.5
Vitamin A (RE) (n=71)	271.6±145.9	98.6	331.9±187.1	100.0
Vitamin C (n=71)	159.1±80.4	70.4	95.4±51.9	37.5

^a Percent of IOM recommendations cannot be calculated for calories and fat and saturated fat because the recommendation is a range.

^b There are no current standards for cholesterol, fiber, trans fat, and sodium.

^c The recommendation for Trans fat is zero making it not possible to calculate the percentage.

For vegetables, the average percent IOM was $61.9\% \pm 19.9$, with only 7% of schools meeting the recommendation.

Comparisons were made between number of fruits and vegetables available and the attainment of IOM recommendations. There were no differences in the number of fruits and vegetables available between schools that did and did not meet the IOM recommendations for calories, fiber, iron, vitamin C, protein, saturated fat, trans fat, cholesterol, vitamin A, and sodium. See Table 6 for details. There was no differences in the total number of fruits available between schools that did (9.1 ± 5.9 , $n= 27$) and did not (7.7 ± 6.4 , $n=37$) meet IOM recommendations for fruit ($p= 0.387$). There were also no differences in the number of vegetables available between schools that did (9.5 ± 2.6 , $n=4$) and did not (8.6 ± 4.2 , $n=54$) meet IOM recommendations for vegetable ($p= 0.658$). Furthermore, there was no difference in the total number of fresh fruits and vegetables available between schools that did (6.1 ± 6.7 , $n= 27$) and did not (6.5 ± 7.0 , $n= 37$) meet IOM recommendations for fruit ($p= 0.830$). Finally, there was no difference in the total number of fresh fruits and vegetables available between schools that did (3.0 ± 1.6 , $n=4$) and did not (4.9 ± 5.0 , $n=54$) meet IOM recommendations for vegetables ($p=0.454$).

After collection, 68 school wellness policies were available for evaluation using the WellSAT assessment tool. Reliability of the WellSAT subsections was described using Cronbach's alpha. Values for Cronbach's alpha were 0.699 for nutrition education and wellness promotion, 0.803 for physical education and physical activity, 0.830 for standards for USDA school meals, 0.839 for evaluation, and 0.926 for nutrition standards for competitive and other foods and beverages. Wellness policy scores are shown in Table 7. On average, the overall comprehensive WellSAT score was 52.4 ± 19.5 , overall

Table 6
Number of Fruits and Vegetables Available Compared to IOM Recommendations

Nutrients	Number of fruits and vegetables available		P value
	Met IOM recommendations	Did not meet IOM recommendations	
Calcium	18.24±11.6 (n=62)	20.2±8.6 (n=9)	0.625
Fiber	9.75±1.3 (n=4)	18.9±11.4 (n=66)	0.116
Iron	17.7±8.1 (n=33)	19.2±13.5 (n=38)	0.582
Vitamin C	18.1±10.8 (n=27)	18.8±11.6 (n=44)	0.808
Protein	19.0±11.4 (n=47)	17.6±11.1 (n=24)	0.629
Saturated fat	18.9±13.1 (n=41)	17.9±8.3 (n=30)	0.707
Trans fat	15.5±5.7 (n=15)	19.3±11.8 (n=51)	0.230
Cholesterol	18.4±11.4 (n=66)	11.0±0.0 (n=2)	0.361
Vitamin A ^a	18.5±11.2 (n=71)	0.0 (n=0)	--
Sodium ^b	0.0 (n=0)	18.43 (n=69)	--

Note: The sample number for each item differed based on the information given in the menu analysis. Sample number is provided for each dietary component.

Calories and fat are not included because the recommendations for these components are given in a range. Reasons for not meeting these items could be because it was too high or too low.

^a Because all schools met the vitamin A recommendation, the analysis could not be completed.

^b Because no school met the sodium recommendation, the analysis could not be completed.

Table 7

Mean ± SD of Wellness Policy Scores

WellSAT sub sections

Nutrition education and wellness promotion

Comprehensiveness 55.7±22.9

Strength 36.9±21.6

Standards for USDA child nutrition programs and school meals

Comprehensiveness 43.9±28.0

Strength 33.7±27.2

Nutrition standards for competitive and other foods and beverages

Comprehensiveness 35.9±33.0

Strength 12.5±19.3

Physical education and physical activity

Comprehensiveness 39.0±22.9

Strength 27.3±19.6

Evaluation

Comprehensiveness 74.6±33.0

Strength 48.9±37.8

Overall

Comprehensiveness 52.4±19.5

Strength 32.7±17.8

Note: n= 68.

strength was 32.7 ± 17.8 , comprehensive score for standards for USDA school meals was 43.9 ± 28.0 , and strength score for standards for USDA school meals was 33.7 ± 27.2 . WellSAT sub scores for strength and comprehensiveness of Standards for USDA Child Nutrition Programs and School Meals, and strength and comprehensiveness of Overall were compared to IOM recommendations. Details are shown in Table 8. First, overall strength score was significantly higher in schools that met the IOM recommendation for fruit (36.6 ± 20.0 , n=26) compared to those that did not (26.0 ± 11.5 , n=32) ($p = 0.021$). In addition, overall strength score was significantly higher in schools that met the IOM recommendation for protein (35.9 ± 17.8 , n=45) compared to those that did not (23.8 ± 13.9 , n=21) ($p = 0.008$).

Table 8
Wellness Policy Scores for Subsections Compared to IOM Recommendations

Nutrient	Standards for USDA strength			Standards for USDA comprehensive			Overall strength			Overall comprehensive		
	Met	Did not meet	<i>P</i> value	Met	Did not meet	<i>P</i> value	Met	Did not meet	<i>P</i> value	Met	Did not meet	<i>P</i> value
Calcium	34.3±27.0	20.0±21.6	0.149	44.6±28.4	37.4±21.5	0.489	32.8±17.9	26.9±13.8	0.376	52.7±19.7	44.4±15.3	0.255
Fiber	57.0±38.0	31.4±26.0	0.108	36.7±31.2	44.1±27.9	0.654	38.0±22.7	31.7±17.5	0.547	55.3±22.4	51.3±19.4	0.729
Iron	35.2±29.1	30.0±24.2	0.418	40.2±27.8	47.3±26.3	0.296	35.7±18.1	26.4±16.3	0.089	54.6±19.4	48.9±19.0	0.233
Vitamin C	35.9±30.0	30.1±24.8	0.428	42.7±29.8	44.4±26.5	0.814	35.0±19.4	30.27±16.3	0.290	54.0±22.6	50.3±17.1	0.484
Protein	32.8±27.0	32.1±26.7	0.932	41.8±27.3	48.1±28.4	0.392	35.9±17.8	23.8±13.9	.008	54.8±18.6	45.1±19.4	0.057
Saturated fat	35.5±28.6	28.0±23.2	0.266	43.3±29.2	44.5±25.5	0.869	32.2±19.7	31.9±13.9	0.944	51.5±21.2	52.0±16.2	0.903
Trans fat	37.5±25.7	30.5±27.0	0.410	59.4±25.3	39.2±26.4	0.017	35.5±13.4	30.6±17.3	0.355	60.0±15.4	49.2±18.7	0.061
Cholesterol	31.7±27.2	43.0±0.0	0.563	42.4±28.0	57.0±0.0	0.000	32.2±17.8	33.0±12.7	0.947	51.7±19.5	56.5±7.8	0.730
Vitamin A ^a	32.6±26.7			43.8±27.6			32.1±17.5			51.7±19.3		
Sodium ^b		32.7±27.1			43.6±28.0			32.3±17.5			52.0±19.1	
Fruit met IOM	40.0±30.0	27.3±22.7	0.070	42.6±28.0	48.7±25.6	0.565	36.6±20.0	26.0±11.5	0.021	56.2±21.3	46.4±15.0	0.053
Vegetable met IOM	25.3±7.5	34.8±26.7	0.481	46.3±24.4	46.3±26.7	0.996	26.3±19.7	32.4±16.5	0.415	39.3±27.6	52.8±17.8	0.164

^a Because all schools met vitamin A recommendations the analysis could not be completed.

^b Because no school met sodium recommendations, the analysis could not be completed.

Chapter Five

Discussion

This study made two important observations about Indiana's school lunch menus. First, while the quantities of both fruits and vegetables served met current standards, they were low in comparison to the IOM recommendations. Second, the menu content of sodium and fiber, two dietary components not addressed by the current standards, rarely met IOM recommendations. However, these findings should be taken within the context of the study limitations. One limitation was the small sample size. Only schools that had School Meals Initiative reviews completed for the sample school year were included. Not only did this limit sample size, but also forced a sample of convenience. Nevertheless, the sample appears representative of Indiana schools as a whole, with similar enrollment rates, free and reduced price lunch rates, and demographic characteristics. Another limitation to the study was the risk of human error. Data were collected and entered into an Excel database by the researcher, leaving room for inaccuracy. Also, many computations were completed by hand, such as calculating servings and converting servings into cups, for comparison to the IOM recommendations. In order to reduce this risk, the researcher and advisor did each computation independently using the same resource, Food Buying Guide for Child Nutrition Programs (United States Department of Agriculture, 2001). The results were then reconciled for consistency. A final limitation of this study was missing information within the School Meals Initiative review packets.

Schools submitted food labels, recipes, and production sheets to the state agency for review; however, this information was discarded by the IDOE after the review was completed. If this information had been available to the researcher, it would have been able to answer many questions about food type and method of preparation. Despite these limitations, the findings provided an initial comparison of Indiana school menus to the newly released IOM recommendations.

One of the unique aspects of this study was the use of the WellSAT tool to observe connections between wellness policies and nutrient content of school menus. In general, the current study found no associations between WellSAT subsection scores and nutritional content of menus. The lack of findings was likely not due to problems with the tool; the average scores and reliability testing suggested the tool provided a valid assessment of the wellness policies. One possible explanation is that the WellSAT tool was not sensitive to the nutritional content of menus. For example, questions asked within the USDA subsection included, “ensures adequate time to eat” and “addresses school meal environment.” Another possibility is that the wellness policy does not impact practice inside the cafeteria, but instead applies mostly to food served outside the cafeteria, such as classroom parties and vending machines (Belansky, et al., 2010). A final reason may be that wellness policies in general may not influence school practice. (Finkelstein, Hill, & Whitaker, 2008; Kubik, et al., 2010). Based on the results of the current study, wellness policies do not appear to have an influence on nutrient content of school meals.

One of the major recommendations put forth by the IOM was the separation of fruits and vegetables into separate categories. The rationale for this suggestion was to be

consistent with the Dietary Guidelines for Americans and also to increase intake of fruits and vegetables among children and adolescents (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). In the current study, there was a large discrepancy between the percentage of menus meeting the current standards and those meeting the IOM recommendations. This discrepancy highlights the near doubling of fruits and vegetables within the new IOM recommendations. There are a number of strategies recommended by the IOM to promote increased intake of fruits and vegetables. These include changing the Offer versus Serve option to require selection of a fruit or vegetable, increasing nutrition education, and offering options and preparation methods that increase acceptance. These changes have the potential to dramatically affect nutrient content, decreasing fat, sodium, and increasing fiber and vitamins A and C (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009).

There is a general positive association between variety and intake of fruits and vegetables (Di Noia & Contento, 2010; Wright & Rowell, 2010). However, in the current study, there was no relationship between number and fruits and vegetables available and quantity of fruits and vegetables served. There are a number of reasons to explain these findings. First, several schools serving high amounts of fruits and vegetables were excluded from analysis due to insufficient information. Second, the total amount of fruits and vegetables served were low overall. Finally the sample size was relatively small. Additional research is needed to better understand the impact of fruit and vegetable availability on quantity served in the school food service setting.

A second major recommendation put forth by the IOM was setting a range, rather than a minimum, for calories. This range was based on growth chart data of healthy

children (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). The grounds for setting a range were to allow for the differing energy needs between males, females, and more or less active students; to reduce the intake of inadequate and excessive calories and to be consistent with the Dietary Guidelines for Americans. The current study found inadequate calories to be prevalent using current standards and excessive calories to be a common problem using IOM recommendations. This seeming contradiction can be explained by differences in age/grade groups, the change in the goal (minimum versus range), and method of calculation between the two guidelines. Use of this IOM recommendation may be helpful to promote appropriate caloric intake among students participating in the NSLP.

Although there is not a current standard for sodium content of menus, there is evidence that sodium content is excessive in school meals (Clark & Fox, 2009; Crepinsek, et al., 2009). The IOM recommends a major decrease in sodium content of school meals. The values set for the maximum allowance are based on the DRI's Tolerable Upper Intake Levels for the age/grade groups. Because the IOM recognizes the current average sodium intake in the United States is significantly higher than the recommended level, they have set a goal to reach the new maximum sodium recommendation by the year 2020. The IOM suggests gradual reduction in sodium content by using fresh ingredients, low sodium canned products, and frozen salt-free vegetables. The current study reported that no school met the IOM recommendations for sodium. These results are consistent with previous research (Clark & Fox, 2009; Crepinsek, et al., 2009). Crepinsek (2009) found the sodium content in school menus to greatly exceed the 2005 Dietary Guidelines, and Clark and Fox (2009) reported that

students who participated in the NSLP consumed about 200 mg more sodium in a day than nonparticipants. Reducing sodium intake will result in decreasing student's risk of hypertension and promotes a healthy heart (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

The NSLP does not currently have a standard for fiber. Studies have reported low fiber content of school menus and low intake by students (Clark & Fox, 2009; Crepinsek, et al., 2009). A recent study by Crepinsek (2009) found fewer than 5% of school menus met the 2005 Dietary Guidelines for fiber. This same study noted the major sources were entrees, vegetables, and fruit, with whole grain bread contributing <1% of the fiber content. A related study by Fox and Clark (2009) observed that students participating in the NSLP were consuming more fiber than nonparticipants (Clark & Fox, 2009). The IOM committee recognized the low fiber intake among children and set a target for fiber content in school meals. Suggested strategies to increase fiber content include increased fruits, vegetables, and whole grains in school menus. The results of the current study found that school menus contained about two thirds of the recommended fiber content and only 6% of schools met the IOM recommendation. Increasing fiber through the strategies above can lead to a healthier heart, and reduced risk of obesity and type 2 diabetes (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

Summary

Although no previous study has examined the same questions, findings from the current study are consistent with previous research. Both current study and prior research have identified that school meals are often low in fiber, and high in sodium

(Crepinsek, et al., 2009). In addition, many children are not consuming adequate amounts of fruits and vegetables. The new recommendations nearly double the required servings of fruits and vegetables at school lunch. Although it will take much effort to meet these new recommendations, they will offer a healthier choice for students. The increase in fruits and vegetables, and subsequent decrease in sodium and increase in fiber will promote a heart healthy diet for students and decrease their chances of obesity and type 2 diabetes (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

Chapter Six

Conclusion

The current research study examined the relationship of Indiana school lunch menus, wellness policies, and demographics to the attainment of the 2009 IOM recommendations. While many studies have examined the school lunch program, no previous study has examined the same questions. The findings from this research can assist schools in making changes to their meal program to achieve the IOM recommendations.

The results of this study confirm previous research which indicates school lunches are low in fiber, and high in sodium. In addition, although fruit and vegetable servings are meeting current standards, they are well below the IOM recommendations. By following IOM recommendations to increase fruit, vegetable, and whole grain intake, the sodium content can be expected to decrease while fiber content will likely increase. There are many details that will need attention in order to make these changes in the school lunch program. It is expected that schools will spend more money on fruits, vegetables, whole grains, and fresh ingredients. In addition, production methods would require modification, leading to increased labor costs, and possibly a change in kitchen equipment. School Food Authorities may be reluctant to make these changes due to the expense and potential for poor acceptance by students. To increase the chances of

success, the IOM recommended support from federal and state agencies as well as professional organizations and child advocacy groups (Committee on Nutrition Standards for National School Lunch and Breakfast Programs, 2009). In addition, the involvement of students and parents will promote a positive outcome. To make the significant changes recommended by the IOM, schools will require increased resources and students will require nutrition education to promote acceptance of the changes.

Although the recommended changes cause concern for poor acceptance and increased cost, the changes will ultimately promote a healthier choice for students. Utilizing resources, promotions, and education can help in making the changes and increase the likelihood of student acceptance. Future research focusing on students' fruit and vegetable consumption in the school meals setting, and acceptance of low sodium, and high fiber foods will help to address these changes. In addition, research focusing on outcomes of wellness policy implementation can help to guide schools towards a healthier school food environment. Over time, through these recommendations, the National School Lunch Program will provide students with a nutritionally sound meal.

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Appendix A



Institutional Review Board

DATE: March 25, 2010
TO: Lindsey Smith, BS in Dietetics
FROM: Ball State University IRB
RE: IRB protocol # 160917-1
TITLE: School Characteristics Associated with Achievement of the 2009 Institute of Medicine Recommendations for the National School Lunch Program
SUBMISSION TYPE: New Project
ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: March 24, 2010

The Institutional Review Board reviewed your protocol on March 24, 2010 and has determined the procedures you have proposed are appropriate for exemption under the federal regulations. As such, there will be no further review of your protocol, and you are cleared to proceed with the procedures outlined in your protocol. As an exempt study, there is no requirement for continuing review. Your protocol will remain on file with the IRB as a matter of record.

While your project does not require continuing review, it is the responsibility of the P.I. (and, if applicable, faculty supervisor) to inform the IRB if the procedures presented in this protocol are to be modified or if problems related to human research participants arise in connection with this project. **Any procedural modifications must be evaluated by the IRB before being implemented, as some modifications may change the review status of this project.** Please contact Amy Boos at (765) 285-5034 or akboos@bsu.edu if you are unsure whether your proposed modification requires review or have any questions. Proposed modifications should be addressed in writing and submitted electronically to the IRB (<http://www.bsu.edu/irb>) for review. Please reference the above IRB protocol number in any communication to the IRB regarding this project.

Reminder: Even though your study is exempt from the relevant federal regulations of the Common Rule (45 CFR 46, subpart A), you and your research team are not exempt from ethical research practices and should therefore employ all protections for your participants and their data which are appropriate to your project.

Appendix B

3/17/2010

Completion Report

CITI Collaborative Institutional Training Initiative**Social & Behavioral Research - Basic/Refresher Curriculum Completion Report**

Printed on 3/17/2010

Learner: Lindsey Smith (username: lnsmith2)

Institution: Ball State University

Contact Information Department: Dietetics (Family and Consumer Science)

Email: lnsmith2@bsu.edu

Social & Behavioral Research - Basic/Refresher: Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in Social/Behavioral Research with human subjects.

Stage 1. Basic Course Passed on 03/04/10 (Ref # 4178943)

Required Modules	Date Completed	Score
Belmont Report and CITI Course Introduction	03/02/10	3/3 (100%)
Students in Research - SBR	03/02/10	10/10 (100%)
History and Ethical Principles - SBR	03/02/10	4/4 (100%)
Defining Research with Human Subjects - SBR	03/02/10	4/5 (80%)
The Regulations and The Social and Behavioral Sciences - SBR	03/02/10	4/5 (80%)
Assessing Risk in Social and Behavioral Sciences - SBR	03/02/10	5/5 (100%)
Informed Consent - SBR	03/02/10	5/5 (100%)
Privacy and Confidentiality - SBR	03/02/10	2/3 (67%)
Research with Prisoners - SBR	03/04/10	4/4 (100%)
Research with Children - SBR	03/04/10	4/4 (100%)
Research in Public Elementary and Secondary Schools - SBR	03/04/10	4/4 (100%)
International Research - SBR	03/04/10	3/3 (100%)
Internet Research - SBR	03/04/10	5/5 (100%)
HIPAA and Human Subjects Research	03/04/10	2/2 (100%)
Workers as Research Subjects-A Vulnerable Population	03/04/10	4/4 (100%)
Conflicts of Interest in Research Involving Human Subjects	03/04/10	2/2 (100%)
Ball State University	03/04/10	no quiz

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered

citiprogram.org/members/.../crbystage.a...

1/2

scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
 Professor, University of Miami
 Director Office of Research Education
 CITI Course Coordinator

Appendix C

Sent: Thursday, March 18, 2010 8:25 AM

To: [Smith, Lindsey Nicole](#)

Cc: [Bales, Gretchen L.](#); [Spangler, Alice A.](#)

Lindsey,

I am writing to let you know that your thesis proposal was approved by the Graduate School and you can now register for THES 698. Please see your departmental area coordinator to set up a section of THES 698 for you.

Please let me know if you should have any questions.

Jackie

Jacquelyn S. Nelson
Associate Dean
Graduate School
Ball State University
Muncie IN 47306
Phone: 765-285-1301
Fax: 765-285-1328
Email: jnelson@bsu.edu

Appendix D

Section 1. Nutrition Education and Wellness Promotion

NEWP1	Provides nutrition curriculum for each grade level.
NEWP2	Links nutrition education with the school food environment.
NEWP3	Nutrition education teaches skills that are behavior-focused.
NEWP4	Encourages staff to be role models for healthy behaviors.
NEWP5	Specifies district using the Centers for Disease Control and Prevention's (CDC) Coordinated School Health Program model or other coordinated/comprehensive method.
NEWP6	Specifies how district will engage families to provide information and/or solicit input to meet district wellness goals (e.g., through website, e-mail, parent conferences, or events).
NEWP7	Specifies marketing to promote healthy choices.
NEWP8	Specifies restricting marketing of unhealthful choices.
NEWP9	Establishes an advisory committee to address health and wellness that is ongoing beyond policy development.
Subtotal for Section 1	Comprehensiveness Score: Count the number of items rated as "1" or "2" and divide this number by 9. Multiply by 100. Do not count an item if the rating is "0."
	Strength Score: Count the number of items rated as "2" and divide this number by 9. Multiply by 100.

Section 2. Standards for USDA Child Nutrition Programs and School Meals

US1	Addresses access to and/or promotion of the School Breakfast Program (USDA).
US2	Addresses nutrition standards for school meals beyond USDA (National School Lunch Program / School Breakfast Program) minimum standards .
US3	Specifies strategies to increase participation in school meal programs.
US4	Ensures adequate time to eat.
US5	Ensures nutrition training for food service director and/or onsite manager (or other person responsible for menu planning).
US6	Addresses school meal environment.
US7	Nutrition information for school meals (e.g., calories, saturated fat, sugar) is available.
Subtotal for Section 2	Comprehensiveness Score: Count the number of items rated as "1" or "2" and divide this number by 7. Multiply by 100. Do not count an item if the rating is "0."
	Strength Score: Count the number of items rated as "2" and divide this number by 7. Multiply by 100.

Section 3. Nutrition Standards for Competitive and Other Foods and Beverages

NS1	Regulates vending machines.
NS2	Regulates school stores.
NS3	Regulates food service a la carte OR food sold as an alternative to the reimbursable school meal program (if not defined as to what this means).
NS4	Regulates food served at class parties and other school celebrations.
NS5	Addresses limiting sugar content of foods sold/served outside of USDA meals.
NS6	Addresses limiting fat content of foods sold/served outside of USDA

	meals.
NS7	Addresses limiting sodium content of foods sold/served outside of USDA meals.
NS8	Addresses limiting calorie content per serving size of foods sold/served outside of USDA meals.
NS9	Addresses increasing "whole foods" (whole grains, unprocessed foods, or fresh produce) sold/served outside of USDA meals.
NS10	Addresses food not being used as a reward.
NS11	Addresses limiting sugar content of beverages sold/served outside of USDA meals. (If the policy specifies guidelines for limiting added sugar in food, do not assume these guidelines apply to beverages).
NS12	Addresses limiting regular (sugar-sweetened) soda sold/served outside of USDA meals. (If the policy specifies guidelines for limiting added sugar in food, do not assume these guidelines apply to beverages).
NS13	Addresses limiting fat content of milk sold/served outside of school meals. (If the policy addresses limiting the fat content of foods, do not assume these policies apply to milk).
NS14	Addresses serving size limits for beverages sold/served outside of school meals.
NS15	Addresses access to free drinking water.
NS16	Regulates food sold for fundraising at all times (not only during the school day).
Subtotal for Section 3	Comprehensiveness Score: Count the number of items rated as "1" or "2" and divide this number by 16. Multiply by 100. Do not count an item if the rating is "0."
	Strength Score: Count the number of items rated as "2" and divide this number by 16. Multiply by 100.

Section 4. Physical Education and Physical Activity

PEPA1	Addresses written physical education curriculum/program for each grade level.
PEPA2	Addresses time per week of physical education for elementary school students.
PEPA3	Addresses time per week of physical education for middle school students.
PEPA4	Addresses time per week of physical education for high school students.
PEPA5	Addresses teacher-student ratio for physical education.
PEPA6	Addresses adequate equipment and facilities for physical education.
PEPA7	Addresses qualifications for physical education instructors.
PEPA8	District provides physical education training for physical education teachers.
PEPA9	Addresses physical education waiver requirements (e.g., substituting physical education requirement with other activities).
PEPA10	Regular physical activity breaks are provided for elementary school students during classroom time, not including PE and recess.
PEPA11	Addresses structured physical activity before or after school through clubs, classes, intramurals or interscholastic activities.
PEPA12	Addresses community use of school facilities for physical activity outside of the school day.
PEPA13	Addresses not restricting physical activity as punishment.
PEPA14	Addresses provision of daily recess in elementary school.
Subtotal for Section 4	Comprehensiveness Score: Count the number of items rated as "1" or "2" and divide this number by 14. Multiply by 100. Do not count an item if the rating is "0."
	Strength Score: Count the number of items rated as "2" and divide this number by 14.

	Multiply by 100.
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Section 5. Evaluation

E1	Establishes a plan for policy implementation.
E2	Addresses a plan for policy evaluation.
E3	Addresses providing a progress report to a specific audience.
E4	Identifies a plan for revising the policy.
Subtotal for Section 5	Comprehensiveness Score: Count the number of items rated as "1" or "2" and divide this number by 4. Multiply by 100. Do not count an item if the rating is "0."
	Strength Score: Count the number of items rated as "2" and divide this number by 4. Multiply by 100.

Overall District Policy Score

Total Comprehensiveness Add the comprehensiveness scores for each of the seven sections above and divide this number by 5.	District Score 100
Total Strength Add the strength scores for each of the seven sections above and divide this number by 5.	District Score 0