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The Effect of Free and Reduced Lunch on Reading and Math Achievement

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THE EFFECT OF FREE AND REDUCED LUNCH ON READING AND MATH ACHIEVEMENT

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TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

This study examined the effect of participating in the free and reduced price meal program on reading and math performance in first grade. The students were placed in three groups: the first qualified but did not report consuming either free meal, the second qualified, but only reported eating the free breakfast, and the third qualified and reported eating both a free breakfast and lunch. Two sets of standardized assessments (fall & spring) were given to the students in order to measure their academic skills. The fall assessments were used as the covariate to control for prior achievement, and the three group means were compared to measure their performance on the spring reading and math assessment. An analysis of covariance indicated that consuming a free or reduced lunch or breakfast did not have a significant effect on the children's achievement during the 1999-2000 school year.

CHAPTER 1

LITERATURE REVIEW

In America, schools have played a vital role in improving the health, nourishment, nutritional education, as well as, the academic performance of their students. Schools are ideal venues to instill healthy principles, based on the fact that children attended school five days per week, for six hours per day in communities of every socioeconomic, racial, and ethnic group (Hollar et al., 2010). The National School Lunch Program (NSLP) was a program in position to carry out a change in the dietary intake of children enrolled in public schools. In 2009, 94% of all public and private educational institutions participated in the NSLP, with about 85% of those public schools offering a School Breakfast Program (SBP). Students that participated in these programs were eligible to receive anywhere from 25-50% of their daily dietary intake from the Food and Nutrition Service of the US Department of Agriculture (USDA), and its programs that served both lunch and breakfast (Briefel, Wilson, & Gleason, 2009). Due to the widespread use of these programs, more research is needed to study the effect of these programs on achievement. In the current study, the effects of free and reduced breakfast and lunch programs on reading and math achievement were examined. Specifically, this study examined the reading and math performance of a subset of first grade students who qualified for free and reduced price lunch during the 1999-2000 school year.

The National School Lunch Program

In 1946, Congress passed the National School Lunch Act, in response to the vast number of men that were denied entrance into the Army during the World War II draft, on the grounds of poor nutritional health. Reports suggested that roughly 33% of all of the men selected by the draft were rejected on the basis of their of nutritional deficiencies (Story, Nanney, & Schwartz,

2009). The National School Lunch Act of 1946 was presented as a solution to the problem of malnutrition afflicting the nation's school age children. Almost seventy years have passed since the passing of the National School Lunch Act, and the NSLP now imparts free and reduced price lunch to over 30 million students across the United States. The breadth of the NSLP enables it to provide a means to enhance the diets of children living in America today (Story et al., 2009). The SBP has also reached a vast quantity of children across the United States. The USDA reported that in 2008, the SBP provided breakfast to more than 10 million students. A majority of those breakfasts were served free of charge or at a reduced price (81%). These meals were served to students who qualified on the basis of their family's annual income (USDA Food and Nutrition Service Office of Research, and Nutrition and Analysis, 2008). Both the NSLP and the SBP have served millions of children throughout their histories, but how have those children obtained eligibility for the free or reduced meal?

How Do Children Become Eligible for the NSLP? The NSLP service has been available to children enrolled in a public school that actively participates in the federal program. It is important to note that although the program is always available for application, they have strict standards in place that do not guarantee free or reduced price lunch to each student who applies. In recent years programs such as the Universal Free School Lunch Pilot Program, implemented in West Virginia in 2011, started to provide free school lunches to all of their students (Meharie, et al. 2013); however, the student population that was analyzed for this current study obtained their eligibility on the grounds of their household's annual income.

During the time when data were collected, the qualifications for free and reduced price lunch were made on the basis of family income. A family obtained eligibility for free school lunch on a daily basis if their household income was found to be at or below 130% of the poverty

level. This allowed for some flexibility for families that may have earned slightly more than the poverty level, but were still in need of the NSLP free lunch service. The reduced price qualification was characterized by household incomes that ranged from 130% and 185 % of the poverty level, which provided even more wiggle room for families to benefit from the NSLP service that reported familial incomes just above the poverty line. Families that fell above the poverty line, within the 130-185 % range, were charged no more than 40 cents per child, per meal (National School Lunch Program [NSLP] Fact Sheet, 2013).

In the current study, the student population was a group of students who were enrolled in the first grade during the 2000-2001 school year. A family of four was eligible to receive a free school lunch if their annual household income was less than 130% of the federal poverty guideline of $17,050, which was $22,165 at that time. A family that reported an income of $31,543 was found to be at 185 % of the poverty level. The students whose families reported annual incomes that ranged from $22,165 to $31,543, were found to be eligible for the reduced price lunch. (US Department of Agriculture Food and Nutrition Services, 2000). The NSLP has been around for a long period of time and has provided free and reduced price lunch to millions of children over the course of the last 7 decades. A program of that type of scale begs to ask one simple question: how much money is the American public being asked to contribute to this noble cause?

How Much Money Does the NSLP Cost the Tax Payers? According to the National School Lunch Program Fact sheet for 2013, during the fiscal year of 2012 the NSLP cost Americans $11.6 billion. As time has passed the amount of funding necessary to allow the NSLP to function has increased significantly. In 1947, the NSLP's programmatic cost was about $70 million, three years after its inauguration; the overall cost of the NSLP had risen to $119.7

million. This set off a trend that would perpetuate itself over the next 65 years. In 1960, the annual cost of the NSLP was found to be $225.8 million; ten years later in 1970 the cost had more than doubled to $565.5 million. This increase in cost only became more pronounced as the yearly cost registered at $3.2 billion in 1980. Over the course of the 1980s the cost stabilized somewhat as the amount of money allocated in 1990 registered at $3.7 billion, an increase of $5 million. A dramatic increase in the expanse of the program occurred during the 1990's, which resulted in a yearly cost of $6.1 billion in the year 2000 (NSLP Fact Sheet, 2013). The significant increase in cost was attributed to several reasons; however, the fact that the program was simply serving more children appears to have been the chief reason among them.

The NSLP provided meals to around 7.1 million students across the country in its inaugural year of 1946. In 1970, over 20 years after the program came into existence, the program reported that about 22 million children were participating. The trend of increasing student enrollment continued throughout the decade as nearly 27 million children partook in the NSLP service in 1980. This trend fell a little in 1990, as over 24 million children consumed a free or reduced price lunch on a daily basis; however, as of 2012, over 31.6 million students were participating in the NSLP on a daily basis. Although the exponential growth rate slowed a little, the NSLP has continued to maintain a significant prevalence in schools in all across the United States. Over the course of the past 67 years the NSLP has provided roughly 224 billion midday meals to impoverished children (NSLP Fact Sheet, 2013). The increase in the amount of people taking advantage of the program may be the primary reason for the increase in cost, but it may also be important to consider the increase in the quality of the food being served to the children by the NSLP.

An additional reason for the increase in the cost of the NSLP can be attributed to the recent federal regulations on nutritional quality of the meals being served in schools. In 2010, the nutritional standards and meal patterns for the NSLP and the SBP were adjusted through the passing of the Healthy Hunger-Free Kids Act (Healthy Hunger-Free Kids Act, 2010). The nutritional standards in the Healthy Hunger-Free Kids Act were aligned with the most recent *Dietary Guidelines for Americans.* The *Dietary Guidelines for Americans* were created with the goal of meeting nutritional needs and reducing the amount of overweight/obese children in the United States. In summary, the guidelines recommended that schools boost the accessibility of nutritious items such as fruits, vegetables, and whole grains on the daily school lunch menu. The guidelines also suggested that the menu must take age appropriate caloric intake into account when providing the serving sizes for the school meals. In addition to caloric intake, the specifications suggested a need to incorporate a reduction in the sodium found in the meals that were being offered. Though these guidelines are required by the Federal Government, the government allowed for the School Food Authorities to make the specific decisions about which foods to serve and the manner in which they are prepared (Byker, Pinard, Yaroch, & Serrano, 2013).

The passing of the Healthy Hunger-Free Kids Act in 2010, significantly improved the nutritional standards for programs such as the NSLP and SBP over the past few years. These regulations have brought forth a lot of change in the quality and quantity of the foods that are being served to the children eating public school lunches. It has also been made clear that programs to help feed the children nutritious meals can be very expensive for the individual schools and their districts. Based upon the fact that both the NSLP and SBP were federal

programs, it was deemed to be important to ask the question of exactly how much of these programs are subsidized by the government.

How Much of the NSLP Is Subsidized? The Federal Government subsidized any school that chose to participate in the NSLP. The government support alleviated some of the cost and also provided incentives for schools to participate. The NSLP program has been offered to both public and not for profit private schools, for kindergarten through twelfth grade. The program has also been available to public or nonprofit private residential child-care institutions. The USDA was the establishment responsible for doling out the cash subsidies to the participants. Participants included school districts and independent schools, both public and private. Schools that chose to participate in the NSLP and were deemed eligible were able to receive the federal cash subsidies for every free lunch they served (NSLP Fact Sheet, 2013). Story et al. (2009), reported that the eligibility for the federal subsidies were awarded in the form of cash reimbursements and commodity foods to the schools that abided by the nutritional standards set forth by the Federal Government.

Research has shown that many districts find it to be a challenging task to meet these federal standards in all areas (Gordon & Fox, 2007). Some examples of the areas that the districts struggle to meet were found in a recent School Nutrition Dietary Assessment-III (SNDA-III) study (Story et al. 2009). The SNDA-III found that although most schools in the United States were able to provide foods that met the federal standards for key nutrients in their breakfasts and lunches, they struggled to meet the recommendations for total and saturated fat. The meals tended to contain a variety of healthy nutritional components, such as vitamins, calcium, iron, and protein. Although the free meals included those essential nutrients, researchers found that over two-thirds of the participating schools were unable to meet the guidelines set forth by the

USDA for total fat and saturated fat (Story et al., 2009). Even though the NSLP and SBP are federally funded programs, it has been difficult for the districts to meet the USDA expectations that were proposed because of a variety factors.

According to the United States General Accounting Office, one of the primary reasons that districts have experienced difficulties meeting the expectations set forth by the USDA was because of the fiscal pressures to which many districts have been subjected. At one time, programs such as the NSLP and the SBP were regularly found in local school district budgets. As time has passed, the schools have had to get creative when balancing their budgets due to the reduction in federal support (U.S. General Accounting Office, 2003).

The result of this financial pressure is that many of the programs were bound to serving foods that were not as healthy as they needed to be in their cafeterias. They were also forced to rely on the sale of snack foods in vending machines in order to balance their budgets (Institute of Medicine, 2005). In 2006, the School Nutrition Association (SNA) felt that the federal reimbursement rate at that time was insufficient. The districts were provided a reimbursement rate of $2.47 for every free lunch that they served. When accounting for all of the expenses that go into producing the meals it appeared as though the amount of federal funding was insufficient for many of the individual districts (School Nutrition Association, 2006). During the early 1980s, a law called the Omnibus Budget Reconciliation Act mandated cuts to the federal reimbursement levels for school meals, which have not been restored due to the amount of inflation that has occurred since that time (Martin, 2008). These cuts have had a negative effect on the quality of the foods in the free and reduced price meal programs for the past 30 years.

The effects of the continuous lack of funding to support the quality of the school provided meals, has resulted in a rise in competitive food services within the school setting. This

was a typical strategy that school districts employed in order to attempt to balance their budgets. The USDA reported that schools have not been reporting profit margins that were sufficient enough to pay for the expenses procured in purchasing the food, financing the facility, and covering the full costs incurred by the school districts, such as the salaries of food service staff (USDA Food and Nutrition Service, Office of Research, and Nutrition and Analysis, 2008). The SNDA-III study reported that almost half (42%) of participating schools were inconsistently serving fruits and vegetables that were uncooked in the reimbursable school lunches. In some cases the meals did not have any fresh fruits or fresh vegetables in the free meals. Only 5% of breads and rolls were made from whole grains (Gordon, Crepinsek, Nogales, & Condon, 2007) The primary reason for this defection from serving highly nutritious meals was because of the cost of to serving fresh fruits, vegetables, and whole grains on a large scale (Weber, 2008).

The research clearly suggested that the NSLP has experienced a long history of working under financial duress. The Federal Register reported that a school enrolled in the NSLP for the 2014-2015 school year received $2.98 for each student who qualified to receive a free lunch. That same school was awarded $2.58 for each student that consumed a reduced-price lunch. Interestingly, an NSLP school even procured $0.28 for students that paid full price to eat their school lunches. There was also the potential for the procurement of extra reimbursement for the snacks given to the children that are 18 and under and enrolled in afterschool educational or enrichment programs (NSLP Fact Sheet, 2013). Even with all of the federal support, school districts have continued to struggle to meet the regulatory guidelines set forth by the government. The NSLP fact sheet reiterated the stipulation that in order for districts to obtain full compensation from the federal government, the schools had to supply lunches that meet the federal nutritional requirements for all children deemed eligible (NSLP Fact Sheet, 2013). Even

with all of the federal support, school districts have continued to struggle to meet the regulatory guidelines set forth by the government. If the financial details were ever to be settled, and the children were provided with their recommended caloric intake, does this nourishment have a measurable effect on the academic achievement of the children that were enrolled in these programs?

Effect of Breakfast on Academic Performance

A key factor in undernourishment starts out each day with the act of not eating breakfast. Research suggested that children that missed breakfast were more likely to be subjected to consuming foods of poor nutritional value. Students that skipped breakfast were more likely to have increased total fat consumption, less fiber, and unsatisfactory micronutrients when compared to their counterparts that do eat breakfast (Wilson, Parrell, Wohlers, & Shirley, 2006). Cullen et al. (2007) found that when the most basic nutritional needs were not met, children and adolescents were not in a position to be successful within their school setting. Research has consistently shown that when children were served meals that were nutritious, they were more likely to have success in the classroom. The NSLP and SBP have proven that their programs provide excellent means to feed impoverished students; the question remains, however, does the nutritional quality of the provided meals have a positive effect on their performance in school?

Breakfast and Cognition. Recent studies have suggested that increasing the nutritional quality standards of the NSLP and SBP has played an important role in improving the overall health and well-being of the children enrolled in them, but has a measureable effect been found on cognitive and academic performance? Taras (2005) argued yes, when he conducted a review of 18 studies that found that providing a nutritious meal to start the day was a good way to improve both academic performance and cognitive functioning among populations that were

undernourished. He reported that several school performance related tasks had shown improvement as a result of serving breakfast. Specifically, the students showed improvements in verbal fluency, basic math, attentiveness, memory, creativity, physical endurance, and general tests of academic achievement and cognitive functioning. Although all of these findings were positive, the research made it clear that the methods and research designs of many of the 18 studies that were reviewed were weak. Taras made a call for further research, and consideration for longitudinal studies that analyzed school nutrition and its effect on performance.

A second literature review was analyzed to help validate this claim. Hoyland, Dye, and Lawton (2009) conducted a literature review that examined 45 different studies that evaluated the effects of breakfast on cognitive performance during the period of 1950–2008. Although the studies reviewed by Hoyland, Dye, and Lawton did not analyze the consumption of a free or reduced price lunch, their systematic review found that eating breakfast was more beneficial to cognitive outcomes than skipping breakfast.

In order to demonstrate the specific cognitive outcomes that may be demonstrated, two recent studies were cited. The first was conducted by Wesnes, Pincock, and Scholey (2012), who ran an internet based study in London, England that had a sample size of 1,386 children ranging in age from 6 years old to 16 years old. They found that children who ate breakfast showed superior performance on attention and episodic memory. A similar study was conducted in Little Rock, Arkansas, but they used a low frequency EEG to analyze the brain wave activity while the children in the research study answered math problems. They found that the neurological activity that was typically engaged when students were working on mathematical computations was actually increased in children that consumed breakfast, which as a result improved their cognitive performance. The EEG revealed that the students that did not consume breakfast were

observed exerting greater mental effort when they were asked to do the same mathematical calculations (Pivik, Tennal, Chapman, & Gu, 2012). These studies provided fascinating insight into what areas of the human mind were engaged after consuming a nutritious breakfast. Although this insight was invaluable to justifying the need for students to consume breakfast, there was still a need to find a study that examined the consumption of an NSLP or SBP breakfast over a long period of time that measured the meal's effect on academic performance.

A Step in the Right Direction. One study that attempted to analyze the effect of breakfast consumption over a school year was conducted in New Zealand. A New Zealand team of researchers confirmed that there was a limited amount of well-designed research in this field, and also a lack of empirical evidence supporting the effectiveness of free school breakfast and lunch programs on attendance and achievement. The New Zealand study was an attempt to address the following problems with research that had been conducted on this topic in the past: inconsistent findings, poor method and design, and confusion of correlation with causation (Mhurchu et al., 2010).

The study in New Zealand planned to utilize a design that is called a step-wedge design. It was conducted over the course of one school year, had a randomized controlled trial, and was implemented in 14 New Zealand schools in low socioeconomic resource areas that were grouped into four separate clusters, with roughly 25 students per school. They obtained a sample size of 424 children, ages 7-11, with females making up a slight majority of the children (53%). The intervention was the act of serving a free breakfast to all of the students in the school. As the school year progressed the intervention was stopped in a systematic manner. School one had the intervention removed after the first quarter, school two had it removed after the second quarter, school three had it removed after the third quarter, and school four had it removed after the

fourth quarter. The primary aim was to measure the impact of the breakfast program on student attendance. The secondary aim was to measure the impact of the breakfast program on school achievement, psychosocial function, and nutrition (Mhurchu et. al., 2010). This team of researchers created the design for this research in 2010, but did not actually implement the interventions until 2012. When they got the opportunity to conduct their research they kept the same design; however, they changed some of the secondary dependent variables.

In 2012 the researchers conducted the intervention and settled on analyzing the children's school attendance, academic achievement, self- reported grades, sense of belonging at school, behavior, short-term hunger, breakfast habits, and food security (Mhurchu et al., 2013). The results of this study did not show a clinically significant effect of the breakfast program on children's academic performance over the course of an entire school year in New Zealand. Even though they didn't find a significant effect on any of their primary variables, there was a significant positive effect on short-term satiety ratings, via a self-report. This meant that the children were significantly more satisfied during the intervention, when compared to their satiety levels after the intervention was removed from their respective school (Mhurchu et al., 2013). This clearly illustrates that the children were not as hungry when provided a free school meal, so even though this study did not demonstrate significant results when analyzing school performance it showed that the program did have a positive impact on the children that they served.

Though these results provided valuable information about the effects of free school breakfast programs in high-income countries, it is important to note that this study was conducted in New Zealand, which is not necessarily indicative of the effects of a similar program in America. Several well-designed American studies have been found to demonstrate positive

effects of breakfast consumption on academic performance, many of which were included in an English literature review conducted in 2013, by Adolphus, Lawton, and Dye. Their literature review examined the findings of research studies analyzing breakfast consumption and its effect on behavior and academic performance in students ranging in grade from preschool to high school. For the purposes of this study, only the studies that focused on academic performance were examined.

Adolphus et al. (2013) reported 21 of the 22 research articles they reviewed found that regularly eating breakfast or participating in an SBP had a significant positive effect on academic performance. It is crucial to point out that this positive effect occurred in samples that were both adequately nourished and undernourished. This effect also occurred in samples that were deemed to be impoverished (Adolphus et al. 2013). The reasoning behind highlighting the children's nourishment is to demonstrate that positive effects were found on a variety of samples, not just the poor and malnourished. Several studies that were in the Adolphus et al. (2013) review did indicate that student populations that were undernourished were more likely to demonstrate more pronounced positive effects than their peers that were well fed.

An American study that was included in the Adolphus et al. (2013) literature review found that the effects of participation in the SBP on academic performance were more evident when analyzing a sample of students that had diets within the at-risk range before enrollment and adequate range after enrollment (Kleinman et al., 2002). Kleinman et al. (2002) demonstrated that daily implementation of the SBP does have the capability to improve the dietary intake of the malnourished children within the sample. This research was building upon two studies that had been conducted in the mid-nineties, in Peru, that were also focused on a population of children that were considered to be malnourished.

Pollitt, Jacoby, and Cueto (1996) investigated free school breakfast and its effect on cognition among nutritionally at-risk children in the Peruvian Andes. While working in Peru, a second research article was published by Cueto, Jacoby, and Pollitt (1998) that found that consuming breakfast prevents delays in attention and memory functions among nutritionally at-risk boys. Although these studies were focused on impoverished sample sizes outside of the United States, they both specifically examined populations that were at least one standard deviation below their same-aged peers in height and weight, and found that significantly undernourished children were more likely to show significant improvement in their academic performance after being given a breakfast provided by a free school meal program. These studies utilized the US National Center for Health Statistics (NCHS) in order to obtain a better understanding of national averages in the categories of height and weight (Pollitt et al., 1996; Cueto et al., 1998).

Cueto and Chinen (2008) set out examine the effects of giving impoverished and poorly fed Peruvian children (two thirds were undernourished) with a mid-morning meal, which was provided by an SBP. The meal consisted of roughly 60% of what would be considered their recommended dietary intake for the day. These meals were deemed to be nutritious, based upon their contents being filled with a variety of vitamins, minerals, and a significant amount of iron. The study found the students obtained higher reading and arithmetic scores when they were compared to the control group, which also tended to be undernourished and impoverished (Cueto and Chinen, 2008). The Peruvian studies had several weaknesses to report. They looked at samples that consisted of a wide range of ages, in a foreign country, using an unstandardized test, and measured the students with American height and weight averages to compare with the Peruvian children's height and weight.

Out of the 22 studies that were reviewed in the Adolphus et al. (2013) research, only three of the articles measured breakfast and its effect on academic performance at the elementary level. Specifically, there were two studies that analyzed students that ranged in age from ages 7-12, which will provide the foundation from which to design this current study (Kleinman et al., 2002; Murphy et al., 1998). One of these two studies focused on children that were not receiving adequate nourishment (Kleinman et al., 2002), while the other focused on children that were living in poverty (Murphy et al., 1998). Both studies were of particular importance to supporting this research because they were conducted in America, with American students, and specifically looked at a meal program's effect on academic performance.

Murphy et al. (1998) utilized a 4-month intervention with a pre and post test to see if students who increased their involvement in an SBP program were more likely to increase their academic performance. Specifically, they analyzed students that were roughly 8.7 years old to 11.9 years of age. Their study consisted of 133 participants that were comprised of 44% male and 56% female. They found that students who regularly (≥80%) participated in SBP were found to have better math grades than those students that sometimes (20-79%) or rarely (<20%) participated in SBP. The researchers used three primary schools in America that had a disproportionately large amount of students that qualified for a free school meal (>70%). This study was measured through school reported grades for reading, math, and science. The study found a significant positive effect on math grades for the students that regularly participated in the program, in comparison to the students that sometimes or rarely participated in the program. The researchers also found that students who boosted their participation in the SBP were more likely to improve their math grades than those who had decreased or did not change their participation. They did not obtain a significant effect of SBP on reading, science, or social

studies (Murphy et al. 1998). Similar findings were discovered in the research conducted by Kleinman et al. in 2002; however, they analyzed a nutritionally at-risk sample for a longer duration.

Kleinman et al. (2002) conducted a 6-month SBP intervention with a pre and post test that had two conditions. The first condition was free SBP for nutritionally at risk students, and the second condition was no SBP for the nutritionally at risk students. The sample consisted of 97 students enrolled at the primary school level in the United States. The children ranged in age from 9-12 years old, with 29 being considered nutritionally at-risk, and 68 were deemed to have adequate nutrition. A significant increase was found in the students math grades who went from an at-risk nutritional level pre intervention to adequate nutritional levels post intervention. There were not any other significant findings to report between the two conditions. The results from this study were commensurate with the findings of Murphy et al. in 1998. Both studies were conducted over relatively short periods of time and utilized an intervention style design.

Miller, Waldfogel, and Han (2012) conducted a study that found non-significant results in a large cohort of school-aged children aged 5-15 years; however, they obtained a sample size of 21,400 at the baseline and 9,700 at the completion of the research. The research analyzed the relationship between breakfast eating frequency and scores on standardized achievement tests. The standardized tests were for reading, mathematics, and science. They also included an adjustment for an extensive set of confounders. The manner in which they obtained the information about the frequency with which they consumed breakfast was through a parental questionnaire, which measured the frequency that the family consumed breakfast throughout the course of the week (0-7 times). It is important to note that this research did not utilize a SBP or an NSLP, but it was included because it exhibited excellent control and examined a single cohort

over the course of several years. Research suggests that it is one of the few longitudinal studies to examine the effect of regular consumption of a meal on academic performance (Miller et al., 2012). In addition to the fact that it was well designed, the Miller et al. study utilized the Early Childhood Longitudinal Study- Kindergarten (ECLS-K) class of 1998-1999 national data set, which was used for this research as well.

Miller et al. (2012) collected data for five different years. They obtained the pertinent data for the same group of students over their preschool (1999), first grade (2000), 3rd grade (2002), 5th grade (2004), and 8th grade (2007) years. They did not find a significant association between the frequency of the family breakfast consumption and standardized test scores. Extensive controls were implemented to adjust for gender, ethnicity, socio-economic status (SES), the parent's level of education, household income, parental employment, familial composition, location of residence, birth weight, quality of school district, etc. (Miller et al. 2012). This research was extensively controlled, well designed, and had a large sample size, but it focused on breakfast that was eaten with the family rather than from a school lunch program. By not controlling for the content of the meals, the time it was consumed, and the caloric amount of the meals, it remained unclear whether consuming a school provided breakfast, lunch, or both would have a positive impact on academic performance over an extended period of time.

In summary, the evidence indicated that the effects of eating breakfast were beneficial for successfully completing academic tasks while in the classroom setting, especially in the younger samples (less than 13 years of age). Positive results were found in a wide range of samples. Some examples of the populations that were examined included: students that were well-fed and healthy, students that were considered malnourished, and students that came from low SES settings. Significant positive effects were found in America, Africa, Peru, and England just to

name a few. The evidence suggested a positive effect between consistently eating breakfast and school grades/achievement test scores, especially in math (Adolphus, Lawton, and Dye 2013).

Effect of Lunch on Academic Performance.

Although many studies have examined the effect of eating breakfast on academic performance, few studies have looked at the effect of school provided lunch programs. A study conducted in Uganda in 2012 by Acham, Kikafunda, Malde, Oldewage-Theron, and Egal, showed the significant positive effect of eating two meals on unstandardized assessments. Acham et al. (2012) utilized a cross-sectional design, with a sample size of 645 students ranging in age from 9-15. Of the 645 students, 13% were deemed to be underweight and < 9% were deemed to have stunted growth. A questionnaire was utilized to assess meal consumption. The students either consumed breakfast only, breakfast and lunch, or lunch only. They found that boys who consumed two meals per day were significantly more likely to perform better on the unstandardized assessments than those who consumed only one meal.

This African study showed an effect for both well-fed and under-fed students within the 9–15 year age range. Specifically, students that reported eating both breakfast and lunch were found to be significantly more likely to obtain a higher score a standardized academic assessment when their performance was compared to those who reported consuming only one of the provided school meals. The effect pertained to only male children. It may also be important to report that students that reported only eating breakfast did not prove to demonstrate a positive effect on their school performance (Acham et al., 2012). This particular research demonstrates the importance of the children eating both breakfast and lunch before being assessed. Although these results were compelling this study was conducted in Uganda and does not accurately represent an American population; however, it does represent one of the few studies to analyze

consumption of both breakfast and lunch on academic performance.

Need for Study

The research seemed to support the relationship between good nutrition and better school outcomes; but there appeared to be limited evidence that specifically examined the relationship between student participation in the free and reduced price lunch program and higher achievement. There have been many studies that have focused upon free and reduced breakfast, and its effect on achievement, attendance, on-task behavior, and overall satiability. The research appeared to be relatively limited in regards to free and reduced lunch's effect on academic achievement. There was only one study (Acham et al.,2012), that focused upon free and reduced breakfast and lunch, and their effect on academic performance. Additionally, there was limited research on free and reduced lunch's effect on attendance, on-task behavior, and overall satiability over an extended period of time.

Purpose of Study.

The purpose of this study was to examine the effects of participation in the free and reduced breakfast and lunch program on reading and math achievement over the course of a full academic year. Specifically, this study will examine the reading and math performance of a subset of first grade students that qualified for free and reduced price lunch. These particular students participated in the free school meal programs during the 2000-2001 school year.

Hypotheses. Two hypotheses were proposed. Students that consumed free-school breakfast and/or free-school lunch were more likely to obtain score higher scores on the standardized reading assessment (Reading Item Response Theory [IRT] tests), than students who did not consume free-school breakfast or free-school lunch, when prior achievement was controlled for.

Secondly, it was expected that students that consumed free-school breakfast and/or free-school lunch were more likely to obtain score higher scores on the Math Item Response Theory [IRT] tests, than the students who did not consume a free-school breakfast or free-school lunch, when prior achievement was controlled for.

CHAPTER 2

METHOD

Participants

The data for this study was taken from the first grade cohort of the Early Childhood Longitudinal Study (ECLS-K) for the 1999-2000 school year. The ECLS-K was a program that was created by the United States Department of Education and the National Center for Education Statistics (NCES), which monitored a sample of children that were enrolled in roughly 800 public and 200 private schools from the kindergarten grade level to the high school grade level (Tourangeau, Nord, Lê, Sorongon, and Najarian, 2009). The overall ECLS-K sample was 52% White non-Hispanic (N=11,723), 14% Black or African American non-Hispanic (N = 3,204); 8% Hispanic, with race (N =1,749); 9% Hispanic, without race (N = 1,983); 6% Asian (N =1,355); 1% Pacific Islander (N = 220); 2% Native American (N =377); 2% more than one race, non-Hispanic (N = 511); and 7% Unknown (N=1,544) (Tourangeau et al., 2009). The purpose of this federally funded, large-scale longitudinal study was to closely monitor the sample as they progressed in the educational setting (Pollack, Atkins-Burnett, Najarian, & Rock, 2005).

The ECLS-K was originally comprised of 21,260 kindergarteners in the fall of the 1998-99 school year (Tourangeau et al., 2009). For the purposes of this study, the ECLS-K sample was examined during their first grade year of 1999-2000. This study specifically analyzed a smaller subset of students whose families were characterized as low SES, which warranted a qualification for a free or reduced price school meal. The students' participation in the free or reduced price school meal program was reported in the school records of each individual that participated in the ECLS-K sample. This study examined 152 children that qualified for a free or reduced price meal and had evidence via school records of whether they participated in the

program or not during their first grade school year. The specific demographic information for the 152 students was not available and therefore was not reported here. Of the 152 students, 43 did not report participating in either meal (Group #1), 44 reported only participating in the free lunch program (Group #2), and 52 reported participating in both the free and reduced price breakfast and lunch programs. (Group #3).

Procedure

In order to measure whether there was a relationship between participation in the free or reduced school meal programs and academic achievement, the Item Response Theory Scores (IRT) from the ECLS-K program were examined. It is important to note that this study only analyzed archival data for the first grade cohort (1999-2000) of the ECLS-K program. The fall achievement scores were treated as a covariate to rule out any differences between groups before they participated in the free meal program. The performance of the three groups on the spring assessment was compared to analyze whether participation in the free school meal program had a significant positive effect on academic achievement.

Instruments

The reading and math performance of the students participating in the ECLS-K (first grade cohort) was measured in a multitude of ways; number-right scores, Item Response Theory (IRT) scores, standardized t-scores, and criterion-referenced proficiency scores. For the purposes of this research, only the IRT scores were used to gain understanding of the children's reading skill set.

An IRT score is a criterion-referenced assessment that was calculated by examining the pattern of correct and incorrect answers in order to better understand the child's ability to read. IRT scores essentially represent an approximation of the amount of questions that the students

would have answered correctly if they had answered all of the 186 questions in the first-stage and second-stage reading forms administered. IRT scoring enables the measurement of the longitudinal gain in achievement over time, even though the assessments that are given are not identical. The IRT scores allow for the scores to be measured on the same scale even though the two-stage testing design changes to account for the children's growth as time passes.

IRT scale scores are criterion-referenced measures, which means that the scores represent status with respect to achievement on a particular criterion set of assessments. This is in contrast to standard scale scores, which provide norm-referenced measurements of achievement that would be relative to the population as a whole (Tourangeau et al., 2009). The ECLS-K manual recommended that the IRT scores be used in order to see if the small set of participants in the study have mastered the particular set of reading and math skills, instead of comparing their skills to the national average that may or may not have mastered the particular skill that is in question.

Reading Achievement. The ECLS-K *Reading Test* was employed to get a better understanding of the participant's reading skills. The creators of the assessment followed the standards taken from the National Assessment of Educational Progress, and took the state standards into account when creating the reading skills assessment. Some of the material was modified from published assessments, which included *the Peabody Picture Vocabulary Test-Revised,* the *Woodcock Johnson Tests of Achievement – Revised,* in addition to materials supplied by The Educational Testing Service and feedback from primary school curriculum specialists, as well as, teachers (Tourangeau et al, 2009). The assessment quantifies a student foundational reading skill set. Examples of the areas included on the assessment consisted of letter recognition, beginning and ending phonemic awareness, sight word recognition, breaking

down multisyllabic words, listening comprehension, vocabulary, and passage comprehension. Reliability scores for the early reading assessments ranged from .92-.96 over the course of the first four semesters of schooling (Tourangeau et al. 2009).

Mathematical Achievement. Similarly to the Reading skills IRT assessment, the *ECLS-K* also developed their own *Mathematics Test* to get a better understanding of the participants' basic math skills. The *Mathematics Test* was created by adhering to the standards set by the National Assessment of Educational Progress, National Council of Teachers of Mathematics, American Association of the Advancement of Science, and the National Academy of Science. The test was designed to measure conceptual knowledge, procedural knowledge, and problem solving skills in the areas of number sense, basic addition and subtraction, and other basic mathematical operations. Reliability scores for the first four semesters (K-1) ranged from .91-.94, which were considered to be acceptable (Tourangeau et al., 2009).

CHAPTER 3

RESULTS

Data Analysis

A one-way between-subjects ANCOVA was calculated to examine the effect of participation in the free or reduced school meal program on spring reading achievement, controlling for the effect of prior achievement (fall reading achievement). Spring reading achievement was significantly higher than fall reading achievement ($F(1,135)=176.002$, $p < .001$). The main effect for the three groups was not found to be significant ($F(2,135)=1.700$, $p > .05$), with students who participated in two free meals not scoring significantly better on the spring reading assessment ($m=59.94$, $sd=13.75$) than students who participated in one free meal ($m=68.43$, $sd=18.72$), or students who qualified for the free meals but chose not to participate in either ($m=79.38$, $sd=26.42$), even after controlling for the effect of prior achievement.

A second one-way between-subjects ANCOVA was calculated to examine the effect of the three groups on spring math achievement, controlling for the effect of prior achievement (fall math achievement). Spring math achievement was significantly higher than fall math achievement ($F(1,148)=147.311$, $p < .001$). The main effect for the three groups was not significant ($F(2,148)=.310$, $p > .05$), with students who participated in two free meals not scoring significantly better on the spring math assessment ($m=48.85$, $sd=14.13$) than students who participated in one free meal ($m=52.99$, $sd=11.98$), or students who qualified for the free meals but chose not to participate in either ($m=60.25$, $sd=18.66$), even after controlling for the effect of prior achievement.

CHAPTER 4

DISCUSSION

This study was designed to address the lack of research that has been conducted on the NSLP's effect on academic performance. An examination of the archival data taken from the first grade cohort for the 1999-2000 school year of the students enrolled in the ECLS-K data set revealed that participation in the NSLP and SBP did not have a significant effect on reading or math performance. A significant positive effect was indicated between fall academic performance and spring academic performance in both reading and math. This indicated that students tended to score significantly higher on academic measures at the completion of their first grade year in comparison to the beginning of the first grade year, which was expected based on the amount of exposure to qualified instruction over the course of one year.

This study's findings were not commensurate with the results of past research that utilized American samples and well designed research. Kleinman et al. (2002) found a significant increase in the students' math grades that went from an at-risk nutritional level pre-intervention to adequate nutritional levels post intervention, after students participated in the school breakfast program. Murphy et al. (1998) also examined participation in the school breakfast program and found that those who boosted their participation in the free school meal programs reported significantly higher math grades than those who decreased or did not change their participation in the free meal programs. Neither study reported a significant effect on any other academic area. Similarly, researchers in Arkansas analyzed brain wave activity that occurred when the children were asked to answer math problems. They reported that the neural activity typically engaged when students worked on math related problems was intensified in cildren that consumed breakfast (Pivik, Tennal, Chapman, & Gu, 2012).

There were also several other studies that were inconsistent with this study's findings. According to Adolphus et al. (2013), 21 of the 22 research articles they reviewed found that regularly eating breakfast or participating in an SBP had a significant positive effect on academic performance. Finding a way to control for the regular consumption of breakfast appeared to be an integral part of finding a significant positive effect on academic performance in several of the studies reviewed by Adolphus. Cullen et al. (2007) also found that when a child's most basic nutritional needs are not met, the children were not in position to be successful within their school setting. This premise was supported by prior research, which was compiled in a literature review by Taras (2005) that reported that providing a nutritious meal at the beginning of each day is an excellent way to improve both academic performance and cognitive functioning among populations that were undernourished. Hoyland, Dye, and Lawton (2009) also conducted a literature review which systematically analyzed 45 different studies and found that breakfast consumption was beneficial to cognitive outcomes. Many of these studies demonstrated an improved academic effect when the children were provided with some form of a breakfast. This effect was observed in both well-fed and undernourished samples, in experimental interventions, school meal program evaluations, and self-reports on breakfast consumption.

There are several possible reasons why the results from this study were not consistent with previous research. First, the current study differs from the previous studies because it examined breakfast and lunch, as well as, lunch in isolation instead of analyzing breakfast only. Secondly, there was no monitoring for the consumption of the meal; therefore the researchers did not know exactly how much of the free meal was consumed by each child over the course of each day. The children may have reported that they took a school meal, but only consumed a small portion of it. Thirdly, there was not any information gathered concerning breakfast eaten at

home, lunches brought from home, or absences from school. While students reported that they did not eat the school meals, it was unknown if they were eating meals from home. This finding may be correlated with SES. After examining the academic scores in this study, it was found that students who did not eat the meals at school had the highest reading and math scores, which was commensurate with the prior research on SES. Caldas and Bankston, (1997) found that SES is correlated with academic achievement. Children whose families were at the upper levels of low SES may have been able to refuse school meals on the basis of consuming their breakfast in the home setting and bringing a lunch from home. There was also no measure of the nutritional value of the meals. This cohort study was from an era before the nutritional content of school meals was improved, therefore meals with higher fat and sodium content may not have the beneficial effects on academic performance. Finally, no data was collected on the students' level of nourishment or their attendance rates during their first grade school year. Additional confounding variables such as family income, intelligence, and parents' education were intended to be ruled out because of a large sample size; however, the filtration of the data set yielded three relatively small groups, which may also have contributed to the findings not being significant.

Mhurchu et al. (2013) from New Zealand found results that were commensurate with this research. They did not find a significant effect of a free school breakfast on academic achievement, as represented by a standardized assessment that was given at the beginning and end of the year. This research showed that it is challenging to find a measurable effect of a free school meal on academic performance, in a high-income, relatively well-nourished, sample. Their study had several limitations as well including: poor nutritional content of their free meals, a wide range of household incomes, considerable differences in parental education, as well as, missing/unreported data (Mhurchu et al. 2013).

In summary, the research has shown that the effects of eating breakfast have helped students in younger samples (below 13 years of age) perform better academically. This effect tended to be more prominent in undernourished populations; however, the evidence appeared to generally suggest a positive association between eating a nutritious breakfast on a regular basis and doing better in school, especially on math related material (Adolphus, Lawton, and Dye, 2013). Although an effect was found in several studies over the course of the past 20 years, there were a variety of additional limitations that contributed to the insignificant results of the current study.

Limitations of the Present Study

The primary limitation of this study was the fact that the archival data analyzed was compiled during the 1999-2000 school year, which does not take into account all of the nutritional regulations and advancements that have been put in place over the course of the last 15 years. Additionally, the content of the meals was not available, so if the children were eating foods that were high in saturated fats, salt, and starches, the meals may have been detrimental to their academic performance. Essentially, the nutritional quality of the free school meals that were being served to the sample of children in this study was unclear, which made it difficult to compare this 1999-2000 research with studies that were completed from 2002-2013.

As was previously mentioned, there was also a limited amount of information in the ECLS-K data set that pertained to the fidelity with which the consumption of free schools meals was monitored. It was unclear what time they ate, whether each child's participation was consistently observed, whether they ate before school, at a vending machine during school, or if they packed their own lunch when they didn't like what was being served. Additionally, there was also no way to control for whether they consumed a free meal or a reduced price meal, and

therefore low SES was not controlled for within the three groups that were compared. It was also unknown whether all of the students in the first grade sample attended kindergarten, preschool, both kindergarten and preschool, or neither prior to their enrollment in the first grade class. Finally, the specific demographic information for the children that were examined in this study could not be obtained, and therefore was not analyzed. These were some of the primary limitations that may have contributed to the fact that this study did not yield significant results.

Areas for Future Exploration

Free school meal programs were designed to reduce hunger, improve nutrition and educational attainment, as well as, alleviate some of the financial burden that is placed on low-income families. The research has found that programs that provide free school meals have had positive effects on the students' nutritional intake, school attendance, and academic performance for children of poverty in both in developing and developed countries. One of the areas of need for further exploration was the effect of the NSLP has on academic achievement, especially in developed nations (Mhurchu et al. 2013).

Research that specifically focused on the consumption both the SBP and the NSLP and their effect on academic performance is relatively limited. There was a considerable amount of data that examined the SBP's effect on achievement; however, the NSLP was not addressed. Many of the studies reviewed resulted in inconsistent findings, were constructed with insufficient methods and design, and tended to misinterpret correlation with causation (Mhurchu et al., 2010). Further areas for consideration if a comparable design was constructed should include: large randomized sample of students currently enrolled in school, a longitudinal data set, a design that utilized a meal intervention, researchers on site to help ensure fidelity, as well as, controls for

prior achievement, low socio-economic status, consumption of meals provided or prepared at home, and eating outside of the predetermined meal times.

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APPENDIX A:
TABLES

Table 1
Descriptive Statistics for Group 0(No Breakfast or Lunch), Fall and Spring Reading IRT scores, and Fall and Spring Math IRT Scores. (N =44)

Variable	1	2	3	4	5
1. Group 0 No Free Meal					
2. Fall Reading IRT					
3. Spring Reading IRT					
4. Fall Math IRT					
5. Spring Math IRT					
6. *M*	-	54.30	79.34	43.18	60.25
7. *SD*	-	18.54	26.42	15.23	18.66
8. Skew	-	.35	.69	1.45	1.02

Note. Item response theory scores = IRT. * $p < .01$

Table 2
Descriptive Statistics for Group 1(Lunch Only), Fall and Spring Reading IRT scores, and Fall and Spring Math IRT Scores. (N =50)

Variable	1	2	3	4	5
1. Group 1 Lunch Only					
2. Fall Reading IRT					
3. Spring Reading IRT					
4. Fall Math IRT					
5. Spring Math IRT					
6. *M*	-	46.58	68.43	34.84	52.99
7. *SD*	-	10.54	11.98	9.06	18.66
8. Skew	-	2.60	.91	.07	-1.00

Note. Item response theory scores = IRT. * $p < .01$

Table 3

Descriptive Statistics for Group 2(Both Breakfast and Lunch), Fall and Spring Reading IRT scores, and Fall and Spring Math IRT Scores. (N =58)

Variable	1	2	3	4	5
1. Group 2 Both Meals					
2. Fall Reading IRT					
3. Spring Reading IRT					
4. Fall Math IRT					
5. Spring Math IRT					
6. *M*	-	42.03	59.94	32.21	48.85
7. *SD*	-	7.51	13.75	10.51	14.13
8. Skew	-	.55	.58	.75	-.15

Note. Item response theory scores = IRT. * $p < .01$

APPENDIX B:
LETTER FROM INSTITUTIONAL RESEARCH BOARD

MARSHALL UNIVERSITY
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Office of Research Integrity
Institutional Review Board

April 23, 2015

Teresa P. Clark
Assistant Professor
Marshall University College of Education and Professional Development
School Psychology Program
100 Angus E. Peyton Drive Room GC 109
South Charleston, WV 25303

Dear Ms. Clark:

This letter is in response to the submitted thesis abstract for student **Landon Evans** to examine the effect of Free and Reduced Price Lunch on Math and Reading growth in first grade. After assessing the abstract it has been deemed not to be human subject research and therefore exempt from oversight of the Marshall University Institutional Review Board (IRB). The Code of Federal Regulations (45CFR46) has set forth the criteria utilized in making this determination. Since the information in this study does not involve human subjects as defined in the above referenced instruction it is not considered human subject research. If there are any changes to the abstract you provided then you would need to resubmit that information to the Office of Research Integrity for review and a determination.

I appreciate your willingness to submit the abstract for determination. Please feel free to contact the Office of Research Integrity if you have any questions regarding future protocols that may require IRB review.

Sincerely,

Bruce F. Day

Bruce F. Day, ThD, CIP
Director