

The Prevalence and Nutrition Related Outcomes of Adolescents Consuming An  
Additional Breakfast at School

by

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A Thesis Presented in Partial Fulfillment  
of the Requirements for the Degree  
Master of Science

Approved August 2014 by the  
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ARIZONA STATE UNIVERSITY

May 2015

## ABSTRACT

Although many studies have looked into the benefits and consequences of consuming breakfast, most have not looked into the unintended consequences of breakfast being served at school; specifically the consumption of an additional breakfast. This cross-sectional study investigated the prevalence and health related outcomes of the consumption of an additional breakfast at school amongst youth using a survey assessing possible predictors (i.e. parental education, morning activities, race), the ASA-kids 24-hr dietary recall, and height and weight measurements. A total of fifty-eight participants (aged  $13.5 \pm 1.6$  years; 55.2% male) were recruited at after school library programs and Boys and Girls Clubs in the Phoenix, Arizona Metro Area during 2014. The main outcomes measured were BMI percentile, total calories, iron, sodium, carbohydrates, added sugar, and fiber. In the study, the prevalence of consumption of an additional breakfast at school at least once a week or more was 32.7%. There were no significant differences between the consumption of an additional breakfast and not an additional breakfast amongst the main outcomes measures. The directionality of the relationship between the consumption of an additional breakfast and overweight/obesity amongst youth was inverse (OR = 0.309; p-value = 0.121), but this was not significant. This study found that the consumption of an additional breakfast at school is not contributing to overweight/obesity in youth, nor does it alter overall caloric and nutrient intake. School breakfast programs are important for providing breakfast and key nutrients to youth.

## DEDICATION

This thesis is dedicated to my mother, father, and brother. Both my mother and father always encouraged me to do whatever it is I love. They provided me with abundant opportunities and love in order to succeed in this world. They always gave me support so that I could pursue my dreams. They also made home-cooked meals almost every night (mainly Dad), so that when I came home from class, I had food to eat (which was unbelievably wonderful). My brother showed me that higher education is an avenue I should pursue. He understood my desire to learn and always encouraged me to strive for it. I would lastly like to dedicate this thesis to my cat, copper. He forced me to take breaks and pet him while I was furiously working on my thesis.

## ACKNOWLEDGMENTS

I would like to acknowledge many people for helping to make this thesis possible and for reminding me to take breaks throughout this whole process.

I want to express my highest gratitude to my committee chair and mentor Dr. Meg Bruening. Before I even started my first day of graduate school, she pulled me aside asking if she could be my mentor, which made me feel overly excited for the future. After every single meeting to discuss my thesis, I always left feeling exuberant and inspired. She encouraged me so extensively and gave me all the right tools for success, that I never doubted myself throughout the entire process. She made my grad school experience one of the best experiences of my life.

To my other two committee members, Punam Ohri-Vachaspati and Linda Rider; I thank both for having great feedback and input at each step of my thesis process. I appreciate the kindness, encouragement, and respect both gave to me.

To my best friend Taylor; she has always been there for me throughout my entire life. She has been there for my happiest, saddest, and funniest moments. She bestowed upon me some of the best advice: take a 15-minute nap every once in a while (which I learned was a wonderful thing to do in grad school).

To my Grandma DeeDee; she taught me how to have class and elegance, as well as to take a break and enjoy life, because it's wonderful.

To my boyfriend David; I want to thank him for appreciating my intelligence, and making me feel accomplished after each step towards the completion of my thesis.

Lastly, I want to acknowledge the elder woman who lit my candle and imparted her words of wisdom to me at the ASU Moure Award ceremony. She told me: "Always remember to have fun."

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# CHAPTER 1

## INTRODUCTION

### Overview

Many people perceive breakfast as the most important meal of the day, but in the United States 20% of children (ages 9-13) and nearly a third (32%) of adolescents (ages 14-18) skip breakfast frequently.<sup>1</sup> There are a multitude of reasons as to why children may skip breakfast, but one cause of concern is when a child's family may not be able to provide breakfast due to low-income situations.<sup>2, 3</sup> School Breakfast Programs (SBP) can help children in these situations by providing breakfast at a discounted or free rate to children that qualify.<sup>4</sup> Recently public health officials have questioned whether providing breakfast in schools is appropriate.<sup>5, 6</sup> as some are concerned that children are consuming extra calories, specifically from eating an additional breakfast at school.<sup>5, 6</sup>

The commissioner of New York City's Department of Health and Mental Hygiene, Thomas Farley, was one of the first to present this notion to the public. He stated that providing breakfast in the classroom is leading to children eating a second breakfast (one at home and one at school).<sup>5</sup> He went on to further say that health issues related to obesity are more of a concern for children now, than not getting enough calories.<sup>5</sup> In 2010, nearly a third (31.8%) of children and adolescents were overweight or obese in the United States,<sup>7</sup> but 10% (3.9 million) of households with children were food insecure in 2011.<sup>8</sup> With many studies showing that breakfast is overall beneficial for the health and well-being of an individual, it seems essential to provide breakfast to children that do not get one at home.

Researchers have studied breakfast to see its possible effects on overall health of children and adolescents. Many of these studies have shown positive associations with the frequency of breakfast consumption and academics, attendance, satiety, nutrition, and lower weight/BMI.<sup>1, 3, 9-24</sup> Some studies have found different results in relation to breakfast consumption with these variables. Other studies have found no association or a decrease in BMI with children that skipped breakfast,<sup>25, 26 and 27</sup> and no effect on attendance or academics.<sup>28</sup>

Although many studies have looked into the benefits and downfalls of consuming breakfast frequently, most have not looked into the unintended consequences of breakfast being served at school. One study conducted in New York City focused on how breakfast in the classroom contributed to children's breakfast habits and nutrition.<sup>6</sup> What they found was that 44.7% of children reported eating breakfast at multiple locations in the morning, indicating the classroom was a second source of breakfast food for them.<sup>6</sup> Unfortunately the study did not look at whether more total daily calories were consumed by the children, or if their BMI and weight were higher for children that ate an additional breakfast vs. those that skipped or ate only one breakfast.<sup>6</sup> This study only focused on a small margin of kids (New York City and elementary school age). More recently, another study looked into the consumption of multiple breakfasts including 0, 1, 2, and 3 or more breakfasts amongst 4<sup>th</sup>-6<sup>th</sup> graders. Those that skipped breakfast and those that ate 3 or more breakfasts had higher mean percentile BMI's (82.16% and 74.51% respectively) than those that ate 1 breakfast (70.63%) or 2 breakfasts (68.08%), with those eating 2 breakfasts having the lowest mean percentile BMI. The major finding of the study was that significantly fewer breakfasts were eaten by obese youth than

by normal weight youth (1.13 vs. 1.31,  $p < 0.01$ ).<sup>29</sup> More research is needed to better understand the prevalence of the consumption of two breakfasts and the possible implications.

This is the first study to assess the prevalence and dietary intake of the consumption of an additional breakfast with a diverse sample of middle and high school adolescents. Further these findings will help other researchers to better understand health outcomes related to the breakfast habits of youth and may provide information to help guide policies related to the SBP.

### **The Purpose of Study**

The purpose of this study is to assess the prevalence of children and adolescents consuming an additional breakfast at schools that provided a School Breakfast Program (SBP) in the Phoenix metro area at after school programs using a survey, ASA24-kids self-administered 24-hr recall, and anthropometric measures to assess the relationships an additional breakfast has with health related outcomes.

### **Research Aim and Hypotheses**

*Research Question 1:* What is the prevalence of children consuming an additional breakfast due to School Breakfast Programs (SBP)?

- H<sub>A</sub>: There is not a high prevalence of children consuming an additional breakfast because of the SBP.

*Research Question 2:* Is there an association of consuming an additional breakfast with overweight and obesity in adolescents?

- H<sub>A</sub>: There is a positive association of the consumption of an additional breakfast and overweight and obesity.

*Research Question 3:* What is the relationship of consuming an additional breakfast with daily intake of calories?

- H<sub>A</sub>: An additional breakfast will be associated with higher overall caloric intakes for the day.

*Research Question 4:* What is the relationship of consuming an additional breakfast with the daily intake of key nutrients?

- H<sub>A</sub>: An additional breakfast will be associated with higher intakes of iron for the day.
- H<sub>A</sub>: An additional breakfast will be associated with higher intakes of sodium for the day.
- H<sub>A</sub>: An additional breakfast will be associated with higher intakes of carbohydrates for the day.
- H<sub>A</sub>: An additional breakfast will be associated with higher intakes of added sugar for the day.
- H<sub>A</sub>: An additional breakfast will be associated with higher intakes of fiber for the day.

### **Definition of Terms**

**Body Mass Index (BMI):** An indirect measure of body weight. For children and adolescents (ages 2-19) the CDC (Center for Disease Control) growth chart for specific age and gender is used to determine the BMI by following a normal growth curve based off of the height and weight for a child.<sup>30</sup>

**Overweight:** When a child or adolescent is at or above the 85<sup>th</sup> percentile for height and weight, but below the 95<sup>th</sup> percentile on the CDC growth chart.<sup>30</sup>

**Obesity:** When a child or adolescent is at or above the 95<sup>th</sup> percentile for height and weight on the CDC growth chart.<sup>30</sup>

**Breakfast:** A meal eaten during the morning hours after waking. Sometime before 11:00 am.<sup>15, 19, 24, 31, 32 and 33</sup>

**School Breakfast Program:** A program at school that offers breakfast to any child or adolescent. Children that are at or below the 185 percent poverty line receive breakfasts free or at reduced rates. The programs are funded by the government through subsidies.<sup>4</sup>

**Additional Breakfast:** Consuming a breakfast served at school after already eating a breakfast at home or on the way to school (a second breakfast).

### **Limitations and Delimitations**

Limitations to this study need to be taken into consideration. Self-reported 24-hr recalls were used to determine food and nutrient intakes. Some limitations with this method are that it may not represent a respondent's typical food intake, it requires memory, and there may be under or over reporting of certain foods and this may result in response bias. Although researchers measuring heights and weights of

participants were trained, human error can occur when taking measurements; this can lead to inaccurate measurements. Further, although consistency of a singular researcher performing anthropometric measurements was attempted, the same researcher could not always take measurements; most of the time, the same researcher did perform anthropometric measurements. Another limitation to the research was that a small, convenient sample of youth was recruited for the study. Majority of the participants were recruited from Boys and Girls Club in the Phoenix Metro area. This limited sample of the study impacts the generalizability of findings. Because the study is cross-sectional, causality cannot be determined.

A delimitation to the study was that participants were middle and high school adolescents; results may not be applicable to all age groups participating in school breakfast.

## CHAPTER 2

### REVIEW OF LITERATURE

#### **Introduction**

The importance of breakfast consumption on health outcomes has been studied profusely, but it is still controversial what effects breakfast has upon the human body and mind. Breakfast consumption tends to increase the intake of a variety of important micronutrients as well as other key nutrients for the maintenance of a healthy lifestyle.<sup>10, 11, 16, 17, and 25</sup> Other research suggests that regular breakfast consumption plays an important role in youth's academia and learning.<sup>14, 18, 19, and 24</sup> Some studies argue that breakfast is key to maintaining a healthy body weight, while others suggest that there is no relationship between breakfast and weight status for youth. Although there are plenty of research looking at youth either skipping or eating breakfast, little research has investigated what effects consuming an additional breakfast has upon health outcomes of an individual.

#### **What is Breakfast?**

The definition of breakfast is very broad because it encompasses vast amounts of foods as well as a variable time period at which it can be eaten. Typical breakfasts for Americans consist of cold cereal, eggs, or bread products like muffins and toast. Cold cereal is considered the number one breakfast food consumed by Americans, but other noted "favorite" breakfast items are cold pizza and spaghetti.<sup>34</sup>



When looking at what youth (ages 13-19) most commonly eat for breakfast, a study found that cereal and milk were the most common breakfast items consumed.<sup>35</sup>

Similarly, there is no defined time at which a meal is no longer considered breakfast, but most studies tend to suggest breakfast is a meal eaten before 11:00 a.m..<sup>15, 19, 24, 31, 32 and 33</sup> Overall, most studies seem to agree that breakfast is the very first meal eaten during the morning.

### **Beliefs about Breakfast**

Breakfast is often described as “the most important meal of the day,” but beliefs about breakfast also vary. In a survey of 1,442 children in fourth, fifth, and sixth grade, 70% believe it’s important to eat breakfast, 26% sometimes believe it’s important, and 4% don’t believe it is important at all.<sup>36</sup> On the other hand, 92% of American adults believe breakfast to be important, but surprisingly only about 46% eat it every day.<sup>37</sup> Although the vast majority of Americans consider breakfast an important meal, whether they are younger or older, there seems to be a disconnect when it comes to the actual consumption of breakfast.

### **Prevalence of Breakfast Consumption**

The prevalence of breakfast consumption has changed drastically over the past few decades.<sup>38</sup> One study looked at the meal patterns of 10-year olds in Louisiana over two decades (1973-1994). In 1973, only 8.2% of children skipped breakfast, but by 1978 this number increased to about 29.6%. Once school breakfast programs were introduced in 1981, the number of children skipping breakfast

decreased to about 12.5%.<sup>38</sup> In current times, the number of children skipping breakfast has changed for all age groups.<sup>1 and 2</sup>

Breakfast consumption patterns change across childhood. At younger ages, breakfast consumption is more frequent, but as children get older, more and more start to regularly skip breakfast.<sup>1, 2, 23, and 39</sup> During elementary school only about 9% of children skip breakfast one or two times a week.<sup>2</sup> By ages nine to thirteen, 20% of children frequently skip breakfast, and then this number increases to about 1 in 3 children (32%) by ages 14 to 18.<sup>1</sup>

Certain population groups are more likely to consume breakfast compared to others. Amongst gender groups, girls are less likely to eat breakfast regularly compared to boys.<sup>22, 36, 39 and 40</sup> Race and ethnicity also play a role in tendencies for children to eat breakfast, although the evidence is mixed. About 24% of African American adolescents skip breakfast daily compared to a lower percent in White adolescents (13%).<sup>41</sup> In another study that assessed breakfast consumption of adolescents using a 24-hr recall, found that for one day, 40% of African Americans, 32.9% of Mexican-American/Hispanic, and 28.3% of Whites skipped breakfast.<sup>1</sup> Conversely, Videon and Manning found that White adolescents were more likely to skip breakfast compared to African American and Hispanic youth.<sup>39</sup>

Children and adolescents can eat breakfast at home, on the way to school, at school, or at other restaurants/bodegas. A study in San Diego, found that of the youth that ate breakfast 48% ate their breakfast at home, 14% ate it at school, and 3% ate breakfast at home and at school; the survey only allowed for the answer choices of eating breakfast at home *or* at school.<sup>35</sup> In another study looking at youth's breakfast consumption in New York City most youth ate their breakfast at

home (69.7%) while 26.9% ate their breakfast at the school cafeteria.<sup>6</sup> Prevalence of breakfast consumption varies at different ages, with different races, and at different locations, but there are certain factors predictive of breakfast consumption.<sup>1-2, 6, 22-23, 35-36, and 39-40</sup>

### **Predictors of Breakfast Consumption**

There are many factors that can either increase the frequency of breakfast consumption or hinder the regularity of breakfast eating. These factors include socio-economic status (SES), parental education, parental presence, perceptions of weight, time, and breakfast programs at schools. Overall, those children and adolescents that eat breakfast are more likely to be white, of high SES status, more physically active, consume less sugary soft drinks, don't smoke, and don't diet.<sup>22, 40 and</sup>

42

### *Sociodemographics*

The likelihood of breakfast consumption decreases when students have a higher community disadvantage or live in poverty.<sup>3</sup> Students with a lower SES were more likely to eat nothing or non-nutritious fluids (e.g., soft-drinks, coffee, tea) for breakfast (22.9%) as compared to students with middle/high SES (15.6%).<sup>43</sup> Youth from lower SES groups have also been shown to be less knowledgeable about nutrition and eat less nutritious breakfasts.<sup>43</sup> Findings have shown that children living with a single, employed mother were more likely to skip breakfast as compared to children in other living situations; researchers reported that this finding may be related to the higher likelihood of lower SES amongst single

mothers;<sup>2</sup> like previously stated, lower SES youth are more likely to skip breakfast.<sup>3</sup>  
and 43

### *Parental education and modeling*

Higher levels of parental educational achievement have also been shown to have a positive effect on the frequency of adolescents breakfast consumption.<sup>2 and 40</sup> For example, one study found that 38% of adolescents that came from parents with primary educational achievement skipped breakfast, compared to only 10% of adolescents skipping breakfast who came from households with parents with a university degree or higher.<sup>40</sup> This association was also established in a study conducted by Bartfeld and Ryu, but they considered that this association is probably due to the higher economic resources college educated parents may have or increased knowledge about the importance of breakfast.<sup>2</sup>

One very important factor contributing to the regularity of breakfast consumption was the presence of parents during meal times.<sup>3, 39 and 44</sup> Eating breakfast with parents at age 10 was associated with eating breakfast more frequently at age 16,<sup>44</sup> and just parental presence in the morning has been associated with an increased likelihood of young people's breakfast consumption.<sup>3</sup> Parental presence during the dinner meal has also been related to an increased likelihood of breakfast consumption. Specifically, Videon and Manning found that when children had four or more family meals a week, they were 39% less likely to skip breakfast; this was even higher (52% less likely to skip breakfast) for those that ate six or seven meals with their family.<sup>39</sup>

### *Youth perceptions of time and weight.*

Youth's perceptions of their time and weight have also been associated with lower breakfast frequency, again with mixed results. About half of U.S. fourth, fifth, and sixth graders reported that not having enough time in the morning was a barrier to eating breakfast;<sup>29</sup> and <sup>36</sup> feeling rushed in the morning was an even larger percent for ninth through twelfth graders (64%).<sup>35</sup> Subsequently, not being hungry in the morning was a factor for skipping breakfast, with 36.7% reporting this reason.<sup>29</sup> Interestingly, in another study 28% of adolescents reported not eating breakfast because they could not physically eat that early in the morning without becoming ill.<sup>35</sup> The literature around perceptions of weight with breakfast have been mixed. Youth who perceive themselves as overweight were associated with a higher likelihood of skipping breakfast.<sup>39</sup> However, Reddan et al, found that youth's perception about breakfast making one fat was not a significant barrier to breakfast consumption.<sup>36</sup>

### *School breakfast programs*

School breakfast programs (SBP) also have been found to contribute to children's and adolescence's increased breakfast consumption. Students that have breakfast programs at their schools consumed breakfast 7% more frequently than schools without a breakfast program.<sup>36</sup> When looking at children dealing with food insecurity, who are low income, and/or who participate in food assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP), are 10.9% more likely to eat breakfast if a SBP was in place at their school.<sup>2</sup>

SBP's can help to overcome some of the barriers related to breakfast frequency. Fortunately, by having a SBP, this can provide breakfast to those living in lower income situations, where families may not be able to afford breakfast every single day. SBP may also provide an extra opportunity to children to eat breakfast in the morning; research is needed on what factors may predict the prevalence of multiple breakfasts.

### **Breakfast Programs**

The School Breakfast Program (SBP) was first created to provide money to schools that served meals to children that were “nutritionally needy.” The program was launched in 1966 with a total of 80,000 students participating, but it was not permanently authorized until 1975.<sup>45</sup> Participation has slowly increased over the years and as of 2012, the program now serves over 12.9 million children daily, of which 10.1 million receive free or reduced-price meals.<sup>4</sup>

The Food and Nutrition Service (FNS) of the United States Department of Agriculture (USDA) administers the SBP at the federal level, while State education agencies administer the SBP at the state level. Local school food authorities manage the program in schools.<sup>4</sup> Schools (K-12) that opt into the program are provided reimbursement from the USDA for each of the breakfasts they serve.<sup>4</sup> The school must then follow Federal requirements for meals served and provide free or reduced prices to children that are eligible.<sup>4</sup> The meals must also meet all the nutritional requirements set fourth by the government. The current basic cash reimbursement rates schools in the program receive for July 1, 2013 through June 30, 2014 are: \$1.50 for a free breakfast served, \$1.28 for reduced-price breakfasts, and \$0.28 for

paid breakfast.<sup>4</sup> There are higher, “severe need” reimbursement rates given to schools that have an increased percentage (40% or more) of their lunches served at free or at reduced prices; the reimbursement can be up to \$0.30 higher for the free and reduced price breakfasts. Approximately 77% of the breakfasts served receive “sever need” reimbursement in the SBP. As of 2012, the program cost around \$3.3 billion.<sup>4</sup>

In order for a child to be eligible to receive free breakfasts, their household income must be at or below 130 percent of the poverty level.<sup>4</sup> For reduced breakfasts, where the child is charged no more than 30 cents for a breakfast, their family’s income must be between 130 and 185 percent of the poverty level.<sup>4</sup> Although the SBP was established to help children that are “nutritionally needy,” schools with the program still provide meals to any child, regardless of their income level, that wants to buy breakfast from the school.<sup>4</sup>

### **Healthy Hunger Free Kids Act**

In December of 2010, the Healthy Hunger-Free Kids Act was signed into law.<sup>46</sup> Just like the name implies, this legislation’s aim is to increase the healthfulness of meals provided to children, and provide food to children in need. The act establishes policies and authorizes funding to multiple USDA nutrition programs aimed at children including the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), the School Breakfast Program (SBP), the National School Lunch Program (NSLP), the Child and Adult Care Food Program, and the Summer Food Service Program.<sup>47</sup>

The law enacted major changes to the SBP and National School Lunch Program (NSLP), which better aligns its structure and goals to the 2005 and 2010 Dietary Guidelines for Americans.<sup>46 and 48</sup> The act was long overdue because substantial changes had not been made to the school meal programs at the federal level for over 15 years.<sup>48</sup> The changes made to the meal programs through the Healthy Hunger Free Kids Act were designed to help decrease childhood hunger and the obesity rates faced by the nation.<sup>48</sup> The act did not require changes to occur immediately; instead, it provided a 3-year time frame for the schools to adjust their meals accordingly,<sup>48</sup> a timeframe which has since been adjusted to 12 years.<sup>49</sup> The reason for the large increase in the time period was to allow for schools to modify recipes, allow for proper training of school food service workers, and adjust costs. With the addition of more fresh fruits, vegetables, and whole-grain foods, this will increase the costs of meals so the act raised the amount of money provided to the schools for meals and also for training of the food service workers.<sup>50</sup>

By July 1, 2012, there were certain nutrient changes to breakfast meals that had to be achieved in order for schools to be able to participate in the SBP and receive funding from the government. One of the changes that had to be implemented was that schools must provide fat-free milk (flavored or unflavored) and low-fat milk (unflavored only) – as compared to other milk fat levels. In addition, no more than 10% of calories from saturated fat and zero grams trans fat could be in a days serving of food. Lastly, fruits and vegetables must be in separate categories and minimum and maximum calorie ranges were established.<sup>48</sup> By the following year, 2013, changes that needed to occur were that half of the grains were whole-grain rich and meat or meat alternative will not be required.<sup>48</sup> Finally, by



2014, all the grains served must be whole grains and a serving of fruit will be required with each breakfast meal.<sup>48</sup> Over a ten-year period (by 2022), sodium will be reduced in the school breakfasts, which will result in a reduction of 25-50% of sodium levels that are currently in the meals served.<sup>49</sup> By enacting these changes throughout SBP's, students will be provided with a healthier and more nutrient dense breakfast.

### **Health Outcomes and Breakfast Consumption**

There are many studies that have looked into how breakfast consumption affects certain health outcomes like cognitive abilities, dietary quality, and weight status of children and adolescents. The studies have looked at the short-term as well as the long-term effects of breakfast consumption on these health outcomes. Many of these studies present positive findings in relation to breakfast consumption frequency and health outcomes.<sup>1, 3, 9, 10-24</sup>

### **Academics/Attendance**

Breakfast has been shown to play a role in student's academics and learning. There have been multiple studies looking at how consuming breakfast in the morning leads to higher grades and academic performances.<sup>14, 18, 19, 24 and 26</sup> One study assessed how different breakfasts (Shreddies, Cherrios, 38.3g glucose drink, or no breakfast) would effect mental tasks; 29 students between the ages of 9 and 16 participated in the study. This study reported that over time, cognitive performance and attention declined without consumption of breakfast, but there was a faster decrease in attention in the group receiving the glucose drink. In the immediate

word recall test, the no breakfast groups' scores declined by 12%, the glucose drink by 27%, the Cherrios by 3%, and Shreddies by 5% over time. Mood and alertness decreased over time in the no breakfast group, but increased in the other 3 groups, except after 10:00 am for the glucose drink group where scores fell.<sup>24</sup>

In a different study, Kleinman et al. looked at the possible changes in academics and absences of 97 fourth and six graders from Boston Public Schools before and after the implementation of the USBP. The average GPA before USBP was introduced was 2.6 and students that were nutritionally at risk (as defined by consuming less than 50% of the RDA for two or more of the following eight vitamins: A, B6, B12, C, iron, folate, calcium, and zinc; as well as consuming less than 50% of the RDA for total calories) had a lower GPA of 2.1 as well as lower reading, math, science, and social studies grades (from half to a full letter grade). The average number of tardy days for nutritionally at risk students was 5.7 days. Six months after USBP was implemented, of those students that increased their nutritional status, their math scores increased, and their number of absences decreased by an average of 4.4 days.<sup>14</sup>

Overall, studies have shown that a child's ability to learn and their cognitive ability is affected by eating breakfast, but it can have long-term effects academically when a child is able to perform at their best every day by eating breakfast.<sup>26</sup>

### **Nutrients, energy, and diet quality**

There are many positive nutritional aspects to the consumption of breakfast.<sup>10, 11, 16, 17, and 25</sup> Breakfast frequency is associated with higher intakes of fiber and calcium<sup>25</sup> as well as higher overall intakes of vegetables, milk, and grain

products.<sup>11</sup> Frequency of breakfast has also been found to be associated with higher fruit intake.<sup>16</sup> SBP participants' overall nutritional profiles have been shown to have higher levels of vitamin A, phosphorous, and potassium in their diet, but they are more likely to exceed the UL for sodium as compared to students who did not participate in the SBP.<sup>10</sup> Specific dietary components like calories, iron, sodium, carbohydrates, added sugar, and fiber are all influenced by the foods people eat for breakfast or whether or not they eat breakfast.

### *Calories*

The main function of a calorie is to create energy for the human body. One calorie is one kcal, or the amount of energy required to raise one kilogram of water from 15 to 16 degrees Celsius. A simple calorie model that is widely used is: in order to maintain weight you must consume the same amount of energy (calories) as you are expending. Then, based off of this notion, by consuming more calories than calories being expended will lead to weight gain, but in reality, this is not always true.<sup>51</sup>

The average amount of energy a child (ages 5-18 years) in the United States consumes for breakfast ranges from 275 to 669 calories.<sup>52</sup> Children that eat breakfast tend to eat more calories (as observed throughout the whole day) than children who skip breakfast,<sup>6, 15, 26, and 52</sup> but that does not mean they weigh more or have a higher BMI. Some studies found that the children that eat breakfast consume more calories than children that skip breakfast, but have lower BMI's.<sup>1 and 26</sup> Other studies have found that there is no significance in the amount of calories consumed between the two groups.<sup>53</sup> It is still controversial if skipping breakfast leads to the

consumption of more calories at subsequent meal or snack times, or if there is no compensation of calories from the skipped breakfast throughout the day.<sup>11 and 15</sup>

Other studies have looked at energy consumption of SBP participants vs. non-participants. In a study of 2376 youth ages 6 to 17, it was determined that there was no difference between energy intakes of those students that ate breakfast at school versus those students that ate breakfast elsewhere,<sup>54</sup> findings which were confirmed by others.<sup>55</sup> Conversely, two other studies found that SBP participants had higher intakes of total energy compared to students that ate breakfast somewhere other than school.<sup>6 and 56</sup> There are mixed results in the literature of whether caloric intake is different due to breakfast consumption or lack of and the consumption of breakfast at school or at home. Further, more research on assessing how caloric intake is affected with the consumption of an additional breakfast is needed.

### *Iron*

Iron is a component of hemoglobin, which is found in red blood cells. Iron helps to carry oxygen to various parts of the body and aids in muscle storage and utilization of oxygen.<sup>57</sup> This micronutrient also is a component of many enzymes that carry on reactions all throughout the body. There are two types of iron: heme and non-heme iron; the first comes from animal proteins and is absorbed two to three times better than non-heme iron, which comes from plants.<sup>57</sup> The Adequate Intake (AI) recommendation for iron in males and females ages 9 to 13 is 8 milligrams. As both sexes get older, the requirements increase to 11 milligrams for males ages 14 to 18, and to 15 milligrams for females.<sup>58</sup>

The most common nutrient deficiency in the U.S. is iron deficiency.<sup>57</sup> The deficiency can go unnoticed when iron stores are depleted, which results in no physiological impairments, but the deficiency can lead to anemia. Iron deficiency anemia is the most severe level of iron deficiency where the body produces less blood cells and hemoglobin.<sup>59</sup> Issues related to anemia are decreased energy, weakness, tiredness, difficulties maintaining body temperature, and decreased immune function.<sup>57</sup>

Breakfast consumption has been shown to help maintain appropriate levels of iron in the diet.<sup>1, 22 and 52</sup> Cereal consumers had higher intakes of iron, as many breakfast cereals are fortified with the micronutrient.<sup>1 and 60</sup> In a review of 47 studies that looked at breakfast consumption and nutrient outcomes, iron intake was found to be associated with the frequency of breakfast consumption;<sup>52</sup> the higher the breakfast frequency, the higher the iron intake. Timlin et al. conducted a five-year prospective study looking at the nutrient outcomes of children and adolescents who eat breakfast frequently versus those that skip breakfast and found that higher frequency of breakfast consumption was associated with higher intakes of iron.<sup>22</sup> Because iron is fortified in breakfast cereal, the consumption of breakfast can help to maintain iron levels in the body and contribute to a healthy lifestyle.<sup>1, 22 and 52</sup> It would be expected that children who consume more than one breakfast would have higher iron intakes, however, research is needed to confirm this hypothesis.

### *Sodium*

Sodium is a micronutrient mainly eaten in the form of salt and is primarily found in processed and restaurant foods of the American diet.<sup>61</sup> Approximately 75%

of American's sodium intake is from processed foods; specifically cereals and baked goods are where most of the sodium consumption is coming from.<sup>62</sup> Sodium consumption has risen over the years due to the increase in processed food use and decrease in natural food consumption in the American diet.<sup>63</sup> The increase in frequency of restaurant food intake has also lead to an increase in sodium intake in the American diet.<sup>61</sup> From 1993-1994 to 1993-1994 the percent of Americans eating food at a restaurant rose from 0.3% to 5.4%.<sup>38</sup>

A diet that is high in sodium can lead to health problems like Coronary Heart Disease (CHD), hypertension, heart attacks, and stroke.<sup>61</sup> Presented in a study by Yang et al. looking at sodium consumption by youth, they found that sodium intake was positively associated with an increase in systolic blood pressure and an increased the risk of high-blood pressure.<sup>64</sup> Although hypertension is rare in youth, it is better to prevent the onset of high blood pressure from occurring by introducing healthy habits early in life so as to avoid its possible development in adulthood.<sup>63</sup>

The AI for sodium ages 9 to 18 for both males and females is 1500 milligrams.<sup>58</sup> The UL (Upper Limit) for sodium is 2100 milligrams for males and females ages 9 to 13, and increases to 2200 milligrams for ages 14 to 18.<sup>58</sup> On average, Americans eat about 3,300 milligrams of sodium<sup>62</sup>. The National Health and Nutrition Examination Survey (NHANES) collected data of 8 to 18 year olds through 2003-2008, which revealed that the average amount of sodium consumed by youth was 3387 milligrams per day, which exceeds the upper limit by more than 1000 milligrams.<sup>64</sup> Because an excess of sodium can later in life lead to threatening health outcomes, it is important to understand how breakfast consumption effects sodium intake levels in youth.

Two studies investigated how different breakfast types contributed to sodium intake and found that sodium consumption was higher for children eating “other” breakfasts compared to children eating cereal or no breakfast.<sup>1 and 65</sup> Researchers also assessed the nutritional intake of students that participate in the SBP. What Clark found was that the students who participated in the SBP were more likely to exceed the UL for sodium compared to children that did not participate in the program.<sup>10</sup> From the studies conducted on sodium intake and breakfast, it would suggest that consuming an extra breakfast would contribute to an increase in overall sodium intake for children and adolescents.

### *Carbohydrates*

Carbohydrates are an essential nutrient and one of the three macronutrients that make up the food humans eat. They are a readily available source of energy for the body to utilize as fuel, and are composed of the molecules hydrogen, oxygen and carbon. Carbohydrates can be made up of a single sugar molecule to multiple sugar molecules. Some examples of carbohydrates are glucose, lactose, starches, glycogen, and fiber. Each carbohydrate contributes 4 calories per gram to the diet.<sup>66</sup> There are many functions that carbohydrates help with in the human body: It is the body’s primary energy source (meaning the body will choose to use carbohydrates to get energy rather than protein or fat when carbohydrates are available), carbohydrates are components of cell membranes, and they are the storage form of energy in the muscles and liver.<sup>67</sup> The Recommended Dietary Allowance (RDA) for children ages nine to eighteen is 130 grams for both males and females amounting to a range of 45-65% of the total calories in a day.<sup>58</sup>

There are differences in the consumption of carbohydrates in relation to the type of breakfast people consume. There are also differences of carbohydrate intake for people that consume breakfast versus breakfast skippers. One study showed that cereal consumers had higher intakes of carbohydrates (311 g vs. 297g, 295g) and percent energy (55.6 vs. 53.0, 52.6) compared to breakfast skippers or “other” breakfast consumers. Overall breakfast eaters consumed more carbohydrates than breakfast skippers.<sup>22</sup> Another study wanted to see if student’s intake of carbohydrates differed if they ate breakfast at home or at school. Interestingly the study found that for students that ate breakfast at school or students that ate breakfast at home, the carbohydrate intake was the same.<sup>10</sup>

### *Added Sugars*

Added sugars and naturally occurring sugars share similarities and differences in both structure and metabolism. Naturally occurring sugars are sugars that are already found in foods like fruits, vegetables, grains, and dairy products, while added sugars are those sugars that are added during the processing of food items.<sup>68</sup> Naturally occurring sugars include lactose in milk, or fructose in fruit, while common added sugars include high-fructose corn syrup, white sugar, and corn syrup.<sup>69</sup> Although most naturally occurring sugars and added sugars are similar in chemical structure and physiological metabolism, there is controversy surrounding the effects of high fructose corn syrup (found frequently in soft drinks).<sup>68</sup> and <sup>70</sup> Some studies have found higher soft drink consumption associated with poorer nutrition, higher body weight, and higher caloric intake, but causality cannot be established because of the cross-sectional nature of the studies.<sup>68</sup> The main source of added



sugars in the American diet are from soft drinks and sugary sweetened beverages (35.7%); other sources include grain-based desserts (12.9%), fruit drinks (10.9%), candies (6.1%), and ready-to-eat breakfast cereals (3.8%).<sup>69</sup> Added sugars are not represented separately on food labels, instead they are combined under the sugars section.<sup>68</sup>

Data collected from NHANES during 2001-2004 found that the average American consumes 22.2 teaspoons of added sugars per day (about 355 calories). The highest intakes of added sugars were amongst 14-18 year olds at 34.2 teaspoons per day (549 kcals).<sup>68</sup> In a later NHANES survey (2008), it was found that 31% of the added sugars were consumed at breakfast.<sup>71</sup> The DRI for added sugars is to limit the amount of added sugars to no more than 25% of total calories. Although, the 2010 Dietary Guidelines for Americans recommends people to limit their combined intake of solid fats and added sugars to only 5-15 percent of daily calories.<sup>58 and 69</sup> The average intake of added sugars for Americans is 18% (based off of a 2000 calorie diet), which does not exceed the DRI, but exceeds the 2010 recommendations. Adolescents consume 27% of their calories in added sugars, which is above the recommended amount for both the DRI's and 2010 Dietary Guidelines.<sup>69</sup>

Consuming excessive amounts of added sugars throughout life can increase the risks of certain conditions. CVD risk increases drastically with the overconsumption of added sugars. A longitudinal study of 14.6 years looked at NHANES data comparing CVD mortality risk and added sugar consumption of 11,733 individuals. The participants were classified into five groups ranging from less than 10% to at least 25% of calories from added sugars. Results from the study

found that those that consumed the highest amounts of added sugars doubled their risk of CVD mortality compared to the lowest added sugars group.<sup>72</sup>

The data on added sugar intake for breakfast skippers vs. breakfast consumers is mixed in the literature.<sup>1, 40, and 53</sup> A cross-sectional study using data from NHANES found that although youth that eat ready to eat breakfast cereal have higher percentage intakes of calories from total sugar, those that skip breakfast have a higher percentage intake of calories from added sugars.<sup>1</sup> A different cross-sectional study also assessed added sugar intake for both breakfast consumers and skippers, which found no significant differences in added sugar intake between the two groups; although, this study cannot be generalized to all youth because it assessed a specific population: obese Latino youth.<sup>53</sup> With the potential of heightened disease risks associated with higher levels of added sugar intake, and with breakfast cereals as a major source of added sugars for youth, more research is needed on how breakfast consumption is related to overall added sugar intake.<sup>72</sup>

### *Fiber*

Dietary fiber is found in the edible part of a plant. Fiber is a non-digestible carbohydrate meaning that the human body cannot break it down to utilize it for fuel; but that does not make fiber an unimportant dietary component.<sup>73</sup> There are two health claims about dietary fiber that have been approved by the Food and Drug Administration (FDA). The first is that with higher intakes of fiber and lower intakes fat (<30% of calories), fiber lowers the risk of certain cancers. The second claim is with higher intakes of fiber and lower intakes of saturated fat (10% of calories) and cholesterol, fiber lowers the risk of CHD.<sup>73</sup> There are other health

benefits of fiber that have been studied like its inverse relationship with body weight. In a twenty-month study of 252 middle-age women, the researchers found that for every one-gram decrease in fiber intake, there was about a half-pound increase in body weight. Overall those that increased their fiber intake lost weight, and those that decreased their fiber intake gained weight.<sup>74</sup> Similarly, another study conducted by Alfleri et al. discovered that people who were normal weight had higher fiber intakes than moderately or severely obese participants.<sup>75</sup> Three reasons why fiber may help in weight management are (1) dietary fiber increases satiety because of its delayed gastric emptying in the stomach, which could lead to a decrease in caloric intake<sup>76</sup>; (2) fiber can displace other calories from the diet; (3) and fiber decreases energy absorption in the small intestine.<sup>77</sup>

Most youth (9 out of 10) in the U.S. do not consume the recommended DRI for fiber set by the Institute of Medicine (IOM); usually youth only intake about 50% of recommended fiber intake.<sup>78</sup> Children that are from minority or low-income backgrounds have been shown to have lower fiber intakes than their peers.<sup>78</sup> The 2010 AI for fiber for males ages 9 to 13 is 31 grams, and at ages 14 to 18 it increases to 38 grams; for women ages 9 to 18 the recommended amount of fiber is 26 grams.<sup>58</sup>

Foods that contain a rich source of fiber are whole-grains, fruits, and vegetables.<sup>37 and 76</sup> Breakfast tends to be the meal where most whole-grain products are consumed (36%) because people usually eat foods like toast, cereal, and oatmeal for breakfast. In a study of 3291 youth, students who ate breakfast more frequently had higher fruit intakes.<sup>17</sup> A ten-year longitudinal study conducted by Larson et al with adolescents also observed that breakfast frequency and fruit intake was statistically significant.<sup>16</sup> In a study of preschoolers, there was a positive association

between breakfast frequency and the number of servings of vegetables consumed.<sup>11</sup> Because many breakfast foods normally eaten contain fiber, and fruits and vegetables have been shown to be associated with frequency of breakfast, breakfast consumption should increase the amount of fiber consumed, however, the literature is somewhat mixed on this factor.

One study found that higher frequency of breakfast was significantly associated with higher daily fiber intake, with the greatest difference between adolescents that ate breakfast all three days vs. those that ate no breakfast (1.13g).<sup>25</sup> Another study of youth found that when looking at the amount of daily fiber consumption between cereal consumers, breakfast skippers, and other breakfast eaters, cereal consumers had a higher fiber intake (14.5 g) than the other two groups (13.3g).<sup>1</sup> Conversely, a different study found no difference in the amount of fiber intake throughout the day between breakfast consumers and breakfast skippers, ages 8-13.<sup>53</sup> Fiber has been established as an important component of the human diet, and with many studies indicating that fiber is common in breakfast consumption, healthy breakfast habits may be important for a healthy lifestyle.<sup>1, 25</sup>  
and 73

#### *Additional breakfast and nutrients*

Only one study has assessed a full days nutrient intake for children eating an additional breakfast compared to children that only ate one breakfast among elementary school children attending schools with the SBP in 2001. Authors observed significantly higher intakes of total calories, carbohydrates, iron, and fiber for children eating a breakfast at home *and* at school as compared to those who just ate at one location (home or school).<sup>79</sup> Further research needs to be conducted to

assess nutrient intakes for youth eating an additional breakfast at school because changes have been made to the SBP since 2001 to provide healthier breakfasts to students.<sup>46 and 48</sup> Research also needs to be conducted to assess if the effects are different among older youth.

## **Satiety**

Satiety is the feeling of fullness, the opposite of hunger. There are certain hormones (specifically, ghrelin and leptin) in the body that help to regulate the feelings of hunger and fullness. Ghrelin will signal to the brain when the stomach is empty, which then leads to the sensation of hunger, while leptin does the opposite. Leptin is released by the adipose tissues in the body and signals the brain that the body is full, which leads to the sensation of satiety.<sup>80</sup>

Children can become distracted by their hunger or have decreased alertness in class if they are unable to eat a proper breakfast. Not having a proper breakfast can range from skipping breakfast to eating a breakfast that has inadequate components to initiate fullness and/or continue satiety until the next meal.

There are different dietary components that can lead to a decrease in hunger and an increase in satiety like fiber and calories.<sup>15, 24, 28, and 31</sup> One study assessed how a higher fiber cereal vs. a low fiber cereal affected feelings of hunger and overall caloric intake for both breakfast and lunch. The high fiber cereal produced lower energy intake at breakfast and lunch as well as an increase in people's feelings of fullness after breakfast.<sup>31</sup> A different study focused on testing subsequent caloric lunch intake after the children either ate breakfast or did not eat breakfast. There was no increase in the amount of calories eaten at lunch for either of the groups

(breakfast vs. no breakfast), but the no breakfast group felt hungrier and said they could “potentially” eat more food at lunch.<sup>15</sup> These findings demonstrate that in order to lengthen the effect of satiety, it is important that youth consume breakfast.

Not only can the type of food being consumed affect the overall hunger of an individual; having access to breakfast can help to reduce hunger. Mhurchu wanted to see how hunger was affected once a SBP was put in place at schools that previously did not have a breakfast program. What the study found, was that there was an overall decrease in children’s short-term hunger once a SBP was implemented at the schools researched.<sup>28</sup>

## **Obesity**

In 2009-2010 approximately 70% of the adult U.S. population was overweight or obese.<sup>81</sup> 36.5% of the adult U.S. population in 2011 was considered obese; the highest amongst data collected on 41 countries.<sup>82</sup> Obesity is a risk factor for many major health conditions like diabetes, heart disease, certain types of cancer, hypertension, asthma, high cholesterol, and even premature death.<sup>82</sup> The risk of obesity can affect anyone regardless of sociodemographic characteristics, but it tends to be higher in disadvantaged socio-economic groups and those with lower educational backgrounds.<sup>82</sup> Obesity is a major concern in the U.S., and healthy nutrition and lifestyle choices can help to overcome this preventable health outcome.

### *Childhood Obesity*

Nearly a third (31.8%) of children and adolescents were overweight or obese in the United States in 2010.<sup>7</sup> Additionally, of those children and adolescents, 16.9%

were classified as obese,<sup>7</sup> that's 12.5 million children.<sup>83</sup> In a survey of 41 countries in 2005, the U.S. had the highest amount of overweight and obese 11 to 15 year olds at 28.8% and 8.9% respectively.<sup>13</sup> Among children ages 2 to 5, 12.1% were obese, for ages 6 to 11, 18.0% were obese, and for ages 12-19, 18.4% were classified as obese.<sup>7</sup> Overall, the United States was amongst the top 5 countries for overweight and obesity in children.<sup>82</sup> Gender differences in obesity are relevant as boys have a higher prevalence of overweight and obesity compared to girls;<sup>7, 13 and 26</sup> boys obesity prevalence was 18.6% while girls was less at 15.0%.<sup>26</sup> There are also variations in obesity rates amongst different racial and ethnic groups.<sup>7</sup> In 2012, Hispanic and non-Hispanic African American children had higher prevalence of obesity at 21.2% and 24.3% respectively, compared to non-Hispanic white children at 14.0%.<sup>7</sup>

Overweight and obesity amongst children is a major concern because of the health impacts it can have on a child as they transition into adulthood. A child that is overweight or obese is more likely to be an overweight or obese adult.<sup>84</sup> Amongst preschoolers, those that are overweight or obese are five times more likely to be overweight or obese adults.<sup>84</sup> Assisting children at younger ages to attain nutritionally adequate diets can help impact their future diets and health outcomes.

### *Breakfast and Obesity*

Mixed results have surfaced whether the frequency of breakfast consumption is protective of people becoming overweight or obese. Some studies found that infrequency of breakfast consumption over time has been shown to increase the risk of becoming overweight or developing obesity.<sup>1, 3, 9, 12, 13, 21, 22, 23, 26</sup> A longitudinal study of 5 years looked at 2,216 teens (ages 13-16 and 17-21) to see if breakfast frequency

effected weight status. Those that sometimes or never ate breakfast had higher weights and BMI's than those teens that ate breakfast frequently.<sup>22</sup> A similar study also found that children had higher BMI's if they skipped breakfast and had larger BMI increases over a two-year period.<sup>23</sup> Because both of these studies are cross-sectional, causality cannot be determined between breakfast frequency and weight status, but associations can be seen.

Other studies looking at breakfast have found that breakfast skipping had no effect, or decreased the risk of becoming overweight or obese.<sup>25, 26, and 27</sup> In a longitudinal research study looking at BMI in 9-14 year olds, at baseline those that ate breakfast regularly had lower BMI's than those that skipped breakfast, but when tracking BMI changes over three years, the data revealed something different. In overweight individuals, BMI decreased for those that skipped breakfast than for those who ate breakfast, while in normal weight girls and boys, BMI increased for those that skipped breakfast.<sup>26</sup> Other studies found that Breakfast consumption was not associated with BMI once confounders were accounted for. Both of these studies only looked at females, and in one of the studies the majority of the population was overweight.<sup>25 and 27</sup>

More recently, a new controversy to the breakfast and obesity debate has arisen: Are children consuming an additional breakfast at school because of programs like the SBP and BIC (Breakfast In the Classroom)? Thomas Farley (the commissioner of New York City's Department of Health and Mental Hygiene) has recently expressed his concern on the issue; he believes that BIC should be taken out of schools. He deems that childhood obesity is a bigger problem facing our children today than children who are not getting enough food. Farley thinks that by bringing



breakfast into the classrooms, that children will start to consume one breakfast at home and one breakfast at school, which will increase their overall calorie intake and contribute to the obesity problem.<sup>5</sup> One research study investigated the prevalence of children consuming an additional breakfast at school and found that 44.7% were eating both at home and school.<sup>6</sup> The study did not assess whether there was an increase in BMI for those children eating a second breakfast or if there were any other differences in nutrient intake. Lawman, Ng, Van Wye, et al. did investigate BMI of those children eating additional breakfasts and found that those that consumed 2 breakfasts had the lowest mean BMI percentile (68.08% vs 70.63% for 1 breakfast, 74.51 for 3 or more breakfasts, and 82.16 for no breakfast).<sup>29</sup> Although this study investigated BMI, they did not look at 24-hr nutrient intake, like the previous study mentioned.

### **Summary**

Consumption of a regular breakfast has been shown to have an effect on academia, dietary intake of nutrients, and weight. With regular breakfast consumption the grades and academic performance of youth increase.<sup>14, 18, 19, 24 and 26</sup> Certain nutrients have also been found to increase with breakfast consumption including iron,<sup>1, 22 and 52</sup> sodium,<sup>1, 10, and 65</sup> and carbohydrates.<sup>22</sup> There is still controversy if calories, added sugar, and fiber increase or decrease with breakfast consumption.<sup>1, 25, 26, 53 and 72</sup> Even more controversial, is if breakfast consumption is protective of overweight and obesity.

More research needs to be conducted in order to determine the role breakfast plays in children and adolescent's weight status. Although there are many studies

out there looking at how skipping breakfast can affect a child's academics, dietary intake, and health related outcomes associated with weight, there are few studies looking at the prevalence of children consuming a second breakfast (one at home and one at school) and how that effects their overall nutrient health outcomes. More research needs to be conducted in order to fill the gaps in the literature looking into the prevalence and health related outcomes of children and adolescents consuming an additional breakfast.

## CHAPTER 3

### METHODS

#### **Study Design**

The study was cross-sectional with a convenient sample of diverse youth. Middle and high school students (ages 11-18) in the Phoenix metro area that attend a public school with a School Breakfast Program were recruited by the researchers at afterschool programs including the Boys and Girls Club and the Phoenix public library program. Recruitment of after school programs began in February of 2014 through e-mails, flyers (see appendix A), and phone calls to directors of the after school programs. Parental consent was required for this study. One week before the study began, the research team attended the after school programs to inform parents about the study taking place. Participating children's parents completed a consent form available in English or Spanish (see Appendix B). Participating children provided assent (see Appendix B). Recruitment took place on Tuesdays through Fridays throughout March and May of 2014. The Arizona State University Institutional Review Board approved the study (see Appendix A).

Participants completed online surveys (see Appendix D) along with a self-administered web-based ASA24-kids 24-hr recall through provided laptops and tablets. Participants started with completing the survey, which addressed frequency of breakfast consumption, location of breakfast consumption, and predictors of breakfast consumption. After completion of the survey, participants were directed to the ASA24-kids 24-hr recall on the laptop/tablet. The trained research staff recorded heights and weights of participants. The approximate amount of time youth

participated in the study was 40-70 minutes (40-65 minutes for the survey and 24-hr recall, and 5 minutes to get their height and weight measured). Participants received \$10 incentives for participating in the study.

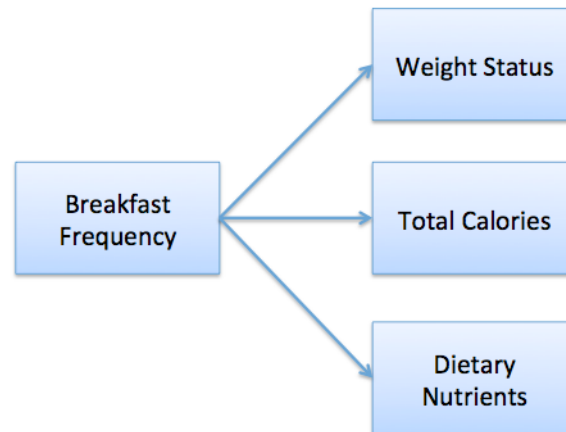


Figure 1: Relationships Being Assessed

### Measures

For this study, the relationships being measured can be identified in Figure 1 (see above). For an example, how is the consumption of an additional breakfast associated with weight status. Survey questions were asked to determine breakfast frequency and school breakfast consumption. Breakfast frequency was measured as either an additional breakfast or not and additional breakfast. Weight status was computed by the use of anthropometric measurements. Using the ASA24-kids software, the total amount of calories, iron, sodium, carbohydrates, added sugar, and fiber could be identified; the program, upon request, calculated these variables. After all data was collected from participants, statistical analyses were run to identify any relationships amongst breakfast frequency, weight status, total calories, and specific dietary nutrients.

The independent variable being studied was the breakfast frequency of middle and high school youth; specifically the consumption of an additional breakfast vs. not consuming an additional breakfast. Multiple dependent variables were being analyzed in this study. Those variables were overweight and obesity, daily calorie intake, iron intake, sodium intake, carbohydrate intake, added sugar intake, and fiber intake.

### **Anthropometric Measures**

Height was measured in centimeters (to the nearest 0.1 cm) using a stadiometer mounted against the wall. Weight was measured in kilograms (to the nearest 0.1 kg) using an electric scale.<sup>85</sup> Measurements for both height and weight were taken by the same researcher twice and recorded. If there was a 5 mm difference between the two measurements of a participant's height, then a third measurement was taken and recorded. If there was a 0.5 kg difference between the two measurements of a participant's weight, then a third measurement was taken and recorded. BMI was later determined from the data collected on the student's height and weight.

BMI is a valid standard to measure body fatness due to its strong correlation to tools like skinfold measures and underwater weighing that directly measure body fat<sup>86</sup>. For children and adolescents, BMI is determined by using the CDC growth charts for a specific age and gender of a child. The growth chart compares the child's height and weight to an average sample of children.<sup>30</sup> BMI is categorized based off of where the child places on the CDC growth chart; underweight is when the child falls below the 5<sup>th</sup> percentile, normal weight is between the 5<sup>th</sup> and 85<sup>th</sup> percentile,

overweight is between the 85<sup>th</sup> and 95<sup>th</sup> percentile, and obesity is above the 95<sup>th</sup> percentile.<sup>30</sup> For analyses, weight status was coded as overweight/obese ( $\geq 85^{\text{th}}$  percentile) or not.

## **Dietary Intake**

In order to obtain data about the students' nutrient intake and eating habits, a dependent ASA24-kids self-administered 24-hr recall was used. The ASA24-kids is a computer, web-based program built from the ASA24. This kid-friendly version (ages 10 and up) collects information about a child's previous days intake (midnight to midnight) from a list of food and drinks that are provided by the USDA's Food and Nutrient Database for Dietary Studies (FNDDS).<sup>87</sup> This 24-hr recall can be administered in English or Spanish and it uses images of food items to help determine portion sizes. It differs from the ASA24 by excluding categories like alcoholic beverages, and asks fewer questions about food preparation.<sup>87 and 88</sup>

The researchers accessed the ASA24-kids after the respondents took the 24-hr recall to obtain information about nutrient estimates like calories, iron, carbohydrates, fiber, etc. based on the FNDDS. The program also calculates estimates of food group intakes (like fruit and vegetables) based on the USDA's MyPyramid Equivalent Database (MPED).<sup>89</sup>

The initial ASA24 was based off of the validated US Department of Agriculture's Automated Multiple Pass Method (AMPM),<sup>90</sup> and currently multiple studies are looking into validating the ASA24.<sup>91</sup> One study looked at how the ASA24-kids compared to the gold standard of interviewer led 24-hr recalls, and

found that children over the ages of 9 did not experience difficulties with using the program.<sup>92</sup>

## **Survey**

The survey is composed of 27 questions that address breakfast habits including frequency, location, and whether the student consumed an additional breakfast. The survey questions were created after a review of the literature and collaboration with the thesis committee. Sociodemographic questions were also asked like gender, race/ethnicity, and parental education in order to control for confounding variables.

### *Breakfast Consumption and Attitudes Towards Breakfast*

*Breakfast Frequency.* Breakfast eating behaviors of participants were assessed from questions in the survey. The first question of the survey asked: “Did you eat breakfast today?” with the responses of either “Yes” or “No.” Overall frequency of breakfast consumption by the participants was assessed with: “On average, how many days per week do you eat breakfast?” Response options were: “0”, through and continued through “7” days per week.

*Location of breakfast.* Participants were asked how often they eat breakfast at home/on the way to school and a breakfast served at school. If the participant had eaten breakfast the day of the survey they were asked: Where did you eat breakfast today? (Check all that apply)” with the possible choices of: “At home,” “On the way to school,” and “Breakfast served at school.” An additional question presented to all participants asked: “On average, how many days do you eat breakfast at the

following locations during the school week?” The question required two responses, one for: “At home or on the way to school” and one for: “At school”. Both have the choices of: “never,” “1 day,” “2 days,” “3 days,” “4 days,” “or 5 days.”

*Additional breakfast.* In order to determine if a participant is eating an additional breakfast (a second breakfast), the question asked: “Now think about the days when you eat breakfast at home and/or on the way to school, on those days do you also eat breakfast served at school?” Possible options were: “No Never,” “Yes, 1 day per week,” “Yes, 2 days per week,” “Yes, 3 days per week,” “Yes, 4 days per week,” and “Yes, 5 days per week.” Responses were coded as “never” and “ever” additional breakfast per week.

*Attitudes towards breakfast.* If the participant answered “Yes” to eating breakfast today, then they were prompted to answer additional questions about why they chose to eat breakfast that morning. The first question asked: “What are some of the reasons why you ate breakfast this morning? (Check all that apply).” All possible responses were: “I was hungry,” “It’s part of my morning routine,” “My parent/parents made me breakfast” “My school serves breakfast,” “It gives me energy/wakes me up,” “It helps me to pay attention during school,” “It helps me to be healthy,” “It helps with my mood,” “It helps me to get good grades,” “It tastes good,” and “Other (Explain).” After answering that question, the next question asked: “From the choices you picked from the previous question, what is the most important reason why you ate breakfast this morning? (Choose 1).” If the participant answered 5 or less days per week then they were asked: “Please tell us why you usually do not eat breakfast? (You can check more than one answer)” with the available responses of: “I am not hungry in the morning,” “I feel too rushed in the



morning,” I am trying to watch my weight,” “My friends do not eat breakfast,” “I don’t like breakfast foods at home,” “I don’t like breakfast foods at school,” “My family does not eat breakfast,” “I don’t have food to eat for breakfast,” and/or “Other (Explain).”

### *Time and Extracurricular Morning Activities*

We asked participants about any activities they might be participating in before their school day starts, and it’s relation to their breakfast consumption. Two questions addressed this: “Do you currently participate in any of the following that require participation before the school day starts? (check all that apply)” and “Do you participate in any of the following at any time during the school calendar year that require participation before the school day starts? (Check all that apply).” Both questions had the response options of “Sports,” “School related activities (clubs, band/music practice, etc.),” “Other (Explain),” and “None.” If the participants never participated in any activities they were coded as “not participating in activities;” if they participated in sports or school related activities they were coded as “participating in a before school activity”. If the participant chose any of the response other than “None” they were directed to an additional three related questions to answer.

To identify if time affected breakfast eating habits, an open-ended question was included in the survey: “What time did you wake up this morning?” and was left as a continuous variable.

### *Parental Influences and Education*

To identify if parental breakfast eating habits or education had any effect on children's breakfast consumption we asked four questions. The first two addressed breakfast habits: "How many days does your mom eat breakfast during the week?" and "How many days does your dad eat breakfast during the week?" Both questions had the response options of "0" through "7" days per week. . The second two questions addressed educational attainment: "What was the highest educational attainment your mom achieved?" and "What was the highest educational attainment your dad achieved?" Both questions had the same answer choices of: "High school or less," "Some College," "College Degree or higher," and "Not applicable." These items were combined to create a variable provide "highest parental education".

### *Demographic Information*

Demographic information was collected including gender, age, grade, and race/ethnicity. Two open ended questions asked, "How old are you?," "What grade are you in?," The last question asked about their race/ethnicity: "What is your race/ethnicity?" with the possible responses of: "American Indian or Alaska Native," "Asian," "Black or African American," "Hispanic/Latino," "Native Hawaiian or Other Pacific Islander," and "White." Because of the distribution of responses, this items was recoded to "Black or African American", Hispanic/Latino, and "Other".

*Free/reduced price status.* To identify the children who receive a subsidized breakfast, participants were asked: "Do you receive free or reduced-price breakfast at school?" with the answer choices of "Yes" or "No."

## Statistical Analysis

Bivariate analysis was used to analyze if there were any associations between the consumption of an additional breakfast and weight status (BMI), and key nutrients: calorie intake, iron intake, sodium intake, carbohydrate intake, added sugar intake, and fiber intake. Independent T-tests were used to analyze differences between breakfast consumption habits, daily intakes of the key nutrients, and wake-up time, while chi-square tests were used to look at the differences between breakfast and overweight/obesity, free-reduced breakfast, parental education, gender, race/ethnicity, and participation in morning activities. The SPSS statistical software (IBM Corp. Released 2011. IBM SPSS Statistics for Mac, Version 20.0. Armonk, NY: IBM Corp.) was used for these analyses.

Multiple linear and logistic regression models were used test for differences in breakfast frequency and weight status and key dietary components. The models adjusted for gender, age, race/ethnicity, and participation in morning activities. Due to missingness and because estimates and significance did not change, participation in free-reduced priced breakfast and parental education were not included in confounders. The multivariate models were run utilizing Stata Statistical Software (Release 13, College Station, TX: StatCorp LP, 2013). Normality of data was not established, so nonparametric tests were run. Statistical significance was determined at,  $p < 0.05$ .

## CHAPTER 4

### DATA AND RESULTS

#### **Descriptive Characteristics**

A total of 58 adolescents participated in the study. There were slightly more males 55.2% (n=32) than females enrolled, with a mean age of 13.5 years ( $\pm 1.6$ ). The sample was ethnically diverse with 31% of Black or African American decent, 25.9% of Hispanic/Latino decent, and 43.1% categorized into Other. More than half of the participants' reported that their parents had an education level of some college or less. The mean BMI percentile of participants was 70.3% ( $\pm 26.3\%$ ). The amount of participants that were overweight/obese was 36.2% (n=21) (Table 1).

**Table 1: Study Participant Demographics**

<b>Variables</b>	<b>Total n = 58</b>
<b>Gender %(<i>n</i>)</b>	
Male	55.2% (32)
<b>Age mean <math>\pm</math> SD</b>	13.5 $\pm$ 1.6
<b>Race/Ethnicity %(<i>n</i>)</b>	
Black or African American	31% (18)
Hispanic/Latino	25.9% (15)
Other	43.1% (25)
<b>Parental Education of Father %(<i>n</i>)</b>	
High school or less	27.6% (16)
Some college	24.1% (14)
College degree or higher	24.1% (14)
Other/unknown	24.1% (14)
<b>Parental Education of Mother %(<i>n</i>)</b>	
High school or less	22.4% (13)
Some college	29.3% (17)
College degree or higher	37.9% (22)
Other/unknown	10.3% (6)
<b>Free-reduced Status %(<i>n</i>)</b>	
Yes	58.6% (34)
No	24.1% (14)
<b>BMI Percentile mean <math>\pm</math> SD</b>	70.3% $\pm$ 26.3%
<b>Weight Status %(<i>n</i>)</b>	
Not overweight/obese	63.8% (37)
Overweight/obese	36.2% (21)

On the day of data collection, 19% (n=10) of participants skipped breakfast, 74.1% (n=43) ate one breakfast, and 8.6% (n=5) of participants ate an additional breakfast. Though, on average few of the participants never ate breakfast, while 32.7% (n=19) of participants ate at least one additional breakfast during the week. On average, participants ate breakfast at school 1.96 ( $\pm$ 2.1) days of the school week, and 2.84 ( $\pm$ 2.0) days of the school week, participants reported consuming breakfast at home or on the way to school (Table 2). The median amount of total calories

consumed by participants was 1310 kcals. The median amount of nutritional intake of participants can be found in Table 2.

**Table 2: Prevalence of Key Variables: Breakfast Frequency and Dietary Nutrients**

<u>Variables</u>	<b>Total n = 58</b>
<b>Breakfast Frequency Today %(<i>n</i>)</b>	
No Breakfast	17.2% (10)
1 Breakfasts	74.1% (43)
2 Breakfasts	8.6 % (5)
<b>Breakfast Frequency on Average <i>mean ± SD</i></b>	
At home/on the way to school (days/school week)	5.0 ± 2.0
At school (days/school week)	2.84 ± 2.0
<b>2 Breakfasts %(<i>n</i>)</b>	
Never	1.96 ± 2.1
Any	67.2% (39)
32.7% (19)	
<b>Dietary Components per day <i>median ± SD</i></b>	
Total Calories (kcal)	1310 ± 818.8
Carbohydrates (g)	155 ± 95.2
Sodium (mg)	2201.9 ± 2042.6
Fiber (g)	7.4 ± 5.6
Iron (mg)	9.1 ± 6.4
Added Sugars (g)	38.7 ± 47.2

### Unadjusted Results

The results of unadjusted bivariate analyses of wake-up time, morning activities, consumption of breakfast at school, parental breakfast habits, and barriers to breakfast by breakfast frequency (the consumption of an additional breakfast or not), are found in Table 3. No significant differences were observed in these variables among participants who consumed an additional breakfast and those who did not. Participation in morning activities was reported among 69% (n=40) of

the participants, with 73.7% (n = 14) of those that ate an additional breakfast, participating in a morning activity. The majority of students, 56.9% (n=33) ate breakfast at school at least one time during the school week. Mothers' consumption of breakfast was on average 4.7 days a week. Too few of the participants recorded fathers' breakfast habits so data analysis could not be run. Participants' number one reason for skipping breakfast was "Feeling rushed" at 27.6% (n=16), followed by "Not hungry" at 19% (n=11). The consumption of an additional breakfast was not significantly associated with wake-up time, participation in morning activities, and Mother's breakfast habits. The consumption of an additional breakfast was trending towards and association with school breakfast consumption, although it was not significant (p=0.072).

**Table 3: Unadjusted Means and Percentages of Key Outcome Variables by Breakfast Frequency Status (n=58)**

<u>Variables</u>	<u>Total</u>	<u>Additional Breakfast: n = 19</u>	<u>Not Additional Breakfast: n = 39</u>	<u>p-value</u>
<b>Wake-up Time</b>	6:10 ± 1:16	5:55 ± 1:46	6:18 ± 0:58	0.279
<b>Morning Activities</b> %(n)	69.0% (40)	73.7% (14)	66.7% (26)	0.114
Sports	45.8% (27)	68.4% (13)	35.9% (14)	
School related activities	33.9% (20)	15.8% (3)	43.6% (17)	
None	30.5% (18)	21.1% (4)	35.9% (14)	
<b>Eating School Breakfast</b> %(n)				0.072
Never	43.1% (25)	26.3% (5)	51.3% (20)	
One or more times a week	56.9% (33)	73.7% (14)	48.7% (19)	
<b>Parent Breakfast Habits</b> mean ± SD				
Mom	4.7 ± 2.6	6.0 ± 2.0	5.6 ± 2.8	0.982
<b>Barriers to Breakfast</b> %(n)				
Not hungry	19% (11)			
Feeling rushed	27.6% (16)			
Watching weight	5.2% (3)			
Don't like food at home	1.7% (1)			
Don't like food at school	3.4% (2)			
Family doesn't eat breakfast	3.4% (2)			
Friends don't eat breakfast	0.0% (0)			
No food to eat	3.4% (2)			

Bivariate analysis, using chi-square and t-tests

The results of unadjusted bivariate analyses of BMI and dietary components by breakfast frequency (the consumption of an additional breakfast or not) are found in Table 4. The consumption of an additional breakfast was not significantly associated with BMI or any of the dietary components.



**Table 4: Unadjusted Means and Percentages of Key Outcome Variables by Breakfast Frequency Status (n=58)**

<u>Variables</u>	<u>Additional Breakfast:</u> n = 19	<u>Not Additional Breakfast:</u> n = 39	<u>p-value</u>
<b>BMI</b> %(n)			0.094
Not overweight/obese	25.9% (15)	37.9% (22)	
Overweight/obese	6.9% (4)	29.3% (17)	
<b>Dietary Components</b> <i>mean ± SD</i>			
Total Calories (kcal)	1458.1 ± 637.6	1402.7 ± 901.2	0.441
Carbohydrates (g)	186.5 ± 87.9	164.7 ± 98.9	0.308
Sodium (mg)	2534.2 ± 1474.6	2632.1 ± 2285.9	0.673
Fiber (g)	8.7 ± 5.1	9.1 ± 5.8	0.941
Iron (mg)	10.9 ± 6.1	10.3 ± 6.6	0.579
Added Sugars (g)	64.4 ± 54.4	40.4 ± 42.0	0.075

Bivariate analysis, using chi-square and t-tests

The results of unadjusted bivariate analyses of gender, race, highest parental education, and free-reduced breakfast status by breakfast frequency (the consumption of an additional breakfast or not) are found in Table 5. The consumption of an additional breakfast status was not significantly associated with gender, highest parental education, and free or reduced breakfast status. African Americans were significantly more likely to consume a second breakfast compared to the other races (p=0.044)

**Table 5: Unadjusted Means and Percentages of Key Outcome Variables by Breakfast Frequency Status**

<u>Variables</u>	<u>Additional Breakfast:</u> <u>n = 19</u>	<u>Not Additional Breakfast:</u> <u>n = 39</u>	<u>p-value</u>
<b>Gender</b> <i>%(n)</i>			0.157
Male	40.6% (13)	59.4% (19)	
Female	23.1% (6)	76.9% (20)	
<b>Race</b> <i>%(n)</i>			0.044
Black or African American	55.6% (10)	44.4% (8)	
Hispanic/Latino	20.0% (3)	80.0% (12)	
Other	24.0% (6)	76.0% (19)	
<b>Highest parental edu</b> <i>%(n)</i>			0.569
High school or less	26.7% (4)	73.3% (11)	
Some college	31.3% (5)	68.8% (11)	
College degree or higher	42.9% (9)	57.1% (12)	
<b>Free-reduced</b> <i>%(n)</i>			0.146
Yes	35.3% (12)	64.7% (22)	
No	14.3% (2)	85.7% (12)	

Bivariate analysis, using chi-square and t-tests

### Adjusted Results

The multivariate linear and logistic regression analyses that adjusted for gender, age, race, and participation in morning activities can be seen in Table 6. For this analysis, parental education and free-reduced breakfast status was not adjusted for in order to include all participants in the analysis; results did not differ when adjusting or not for these variables. After adjustments, there was still no significant association between breakfast frequency and weight status and the key dietary components analyzed. Those that consumed an additional breakfast had a lower odds of overweight/obesity status (OR=0.309), although this was not significant and there was a wide confidence interval (95% CI 0.07, 1.4).

**Table 6: Odds Ratio of Key Outcome Variables for Breakfast Frequency (Free-reduce and Parental Edu. Not Adjusted for, n=58)**

<u>Variables</u>	<u>Odds Ratio</u>	<u>Beta</u>	<u>p-value</u>	<u>95% Confidence Interval</u>
<b>Weight Status</b>				
Overweight/obese	0.309		0.121	0.07, 1.4
BMI-percentile		-2.56	0.727	-17.2, 12.1
<b>Dietary Components</b>				
Total Calories (kcal)		161.02	0.516	-333.0, 655.0
Carbohydrates (g)		33.66	0.240	-88.8, 90.5
Sodium (mg)		57.84	0.927	-1199.4, 1315.1
Fiber (g)		0.17	0.922	-3.2, 3.5
Iron (mg)		1.60	0.395	-2.1, 5.4
Added Sugars (g)		96.12	0.090	-15.6, 208.0

Adjusted linear and logistic regression analysis, by gender, age, race, and morning activities

## CHAPTER 5

### DISCUSSION

The purpose of the study was to assess the prevalence and relationship between breakfast frequency (an additional breakfasts versus not) and weight status, overall caloric intake, and key dietary nutrients (iron, sodium, carbohydrates, added sugars, and fiber) amongst middle and high school adolescents in the Phoenix metro area. The current study found that there was no significant difference in the amount of calories consumed or any of the key nutrients throughout the day for those youth that ate an additional breakfast versus those that did not. Further, those youth that ate an additional breakfast had a lower odds of overweight/obesity, however, this effect was not statistically significant. These findings can be used as a stepping-stone for further research in identifying weight and nutrient consumption differences amongst youth who eat an additional breakfast. The preliminary data in this study demonstrates that school breakfast programs are not contributing to childhood obesity, and should continue to be provided in schools.

#### **Prevalence of An Additional Breakfast**

In the present study, on the day of data collection, only 8.6% of participants had consumed a second breakfast; although, about 33% identified that they ate an additional breakfast at least once a week. When comparing the prevalence of an additional breakfast to previous studies that looked specifically at the SBP, one study identified a 15% prevalence of consuming an additional breakfast,<sup>79</sup> while a

more recent study found the prevalence to be 38% for those consuming 2 or more breakfasts.<sup>29</sup> Another study researched schools in New York with breakfast in the classroom programs and found the prevalence to be higher at 44.7%.<sup>6</sup> All three of the previous studies assessed elementary school children,<sup>6, 29, and 79</sup> while this study focused on middle and high school youth; this may be the reason why the prevalence of an additional breakfast is lower in this study. The literature shows that breakfast consumption decreases with increasing age for youth.<sup>1-2</sup>

### **Weight Status and Additional Breakfast**

The proportion of participants that were overweight/obese in the current study was slightly higher than the national average of 31.8%<sup>7</sup> at 36.2%. Interestingly, those that ate an additional breakfast in this study had a lower odds (69%) of being overweight/obese, but there was no statistical significance. This finding aligns with a previous study that demonstrated those participants consuming 2 breakfasts had the lowest mean BMI percentile amongst breakfast groups that ranged from 0 to 3 or more breakfasts. Further those did not eat any breakfast had the highest mean BMI percentile among the breakfast groups.<sup>29</sup> Thomas Farley, the Commissioner of New York City's department of Health and Mental Hygiene, suggested that school breakfasts are a potential contributor to childhood obesity,<sup>5</sup> this study and the only other study that has assessed multiple breakfasts and weight status,<sup>29</sup> demonstrates that a second breakfast consumption may have an inverse relationship with overweight/obesity in youth.

Major U.S. cities, including New York and Philadelphia, have seen significant declines in the prevalence of childhood obesity.<sup>94-95</sup> Between the years of 2006 and

2010, Philadelphia's obesity rates amongst youth dropped by 5%.<sup>94</sup> New York saw a similar drop of 5.5% in obesity rates in 2006-2007 and 2010-2011.<sup>95</sup> Philadelphia has had universal breakfast programs for several years.<sup>96</sup> Given these trends, coupled with findings from the current study and from Lawman, Ng, Van Wye, et al., concern that school breakfast (as a second source of breakfast) contributes to obesity thus far seems unproven. More research is needed to confirm findings presented in the current study with all ages of school-aged children, and also to assess how two breakfasts or more might be associated with weight status.

### **Calories and Dietary Nutrients Overall**

The youth enrolled in this study reported certain nutrients to be low in their diet, while other nutrients were relatively high as compared to the DRI's./AI's. The median amount of carbohydrates and sodium were both higher than the DRI/AI,<sup>58</sup> and the sodium intake was much higher than the Upper Limit<sup>58</sup> for the entire sample. Recent changes have been made to SBP so the program better aligns with the 2005 and 2010 Dietary Guidelines for Americans,<sup>6 and 48</sup> which may cause a reduction in the nutrients studied being served for breakfast in school. One of the key recommendations being made is to decrease the amount of sodium served in school meals. The reductions may already be taking place for sodium; those requirements must be met by 2022.<sup>29</sup> The median amount of iron consumed was slightly higher for 9 to 13 year olds, but low for 14 to 18 year olds according to the DRI for iron.<sup>58</sup> For both fiber and added sugars, the median amount consumed was a lot lower than the DRI.<sup>58</sup> The median amount of added sugar consumed was 38.7 grams, which when compared to the median amount of calories consumed, turns out

to be 12% of calories from added sugar. Participants' sugar intake was lower than the DRI for added sugar intake, and within the range recommended by the 2010 Dietary Guidelines for Americans.<sup>58 and 69</sup> Previous research identified adolescents to have the highest amount of added sugar intake,<sup>68-69</sup> but in the current study, added sugar intake was relatively low. This was the first study to assess added sugar intake and an additional breakfast. More research is needed on how changes in the SBP guidelines impact youth's overall nutritional intake.

### **Calories, Dietary Nutrients, and An Additional Breakfast**

We found no statistical significant differences in the amount of calories, or any of the dietary nutrients studied, consumed throughout the day amongst youth who consumed an additional breakfast as compared to those who did not. While we did not observe any differences in caloric intake, iron, sodium, carbohydrates, added sugar, and fiber for the breakfast groups, previous literature presented different results. A USDA study identified higher caloric intakes throughout the day for students that ate an additional breakfast, but the study was conducted over 10 years ago, which could lead to different results because of the changes being made to the SBP<sup>79</sup> through the Healthy Hunger Free Kids Act, like minimum and maximum calorie ranges.<sup>48</sup> The low levels of iron consumed contradict previous literature identifying higher iron intakes for those eating breakfast frequently<sup>22 and 52</sup> and for those eating an additional breakfast.<sup>79</sup> This is surprising because of the fortification of iron in cereal,<sup>1</sup> which has shown cereal consumers to have higher intakes of iron.<sup>60</sup> Previous research identified those students eating breakfast at school to have a higher consumption of sodium<sup>10</sup> as well as those eating an additional breakfast,<sup>79</sup> but

despite having consumed an additional breakfast at school, the current study observed no differences in sodium intake. This lack of differences in nutrient intake among students who consume an additional breakfast as compared to those who did not, could be a result of the changes that are being made to the SBP to better align with the 2005 and 2010 Dietary Guidelines for Americans, which lowered the allowable amount of sodium served in school breakfasts. In a previous study, carbohydrate consumption was higher for those that consumed an additional breakfast,<sup>79</sup> however the present study found there to be no statistical significance between the two breakfast groups. This was the first study, to assess added sugar intake and an additional breakfast. Although not statistically significant, those that ate an additional breakfast trended towards a higher intake of added sugar. There was no significance between the amount of fiber consumed by those that ate an additional breakfast, and those that did not, however previous literature identified higher intakes of fiber for those that ate an additional breakfast compared to those eating only one breakfast.<sup>79</sup> Fiber is important for the health of youth, and further modifications may need to be made to the SBP and in other settings in order to increase the intake of fiber in youth.

An additional breakfast did not impact the overall nutritional quality for participants. This finding demonstrates that the consumption of an additional breakfast is not lending towards more unhealthy food consumption behaviors or overconsumption as compared to those not eating an additional breakfast; children who eat an additional breakfast may be compensating their intake throughout the day to have an overall similar diet. More research is needed to assess overall caloric and nutrient intakes of an additional breakfast due to the current body of limited



research. Overall in the present study, there was no significance between any of the dietary nutrients observed as compared to the consumption of an additional breakfast or not.

### **Predictors of Breakfast Consumption**

Similar to other studies, the main barriers to breakfast consumption identified in this study were feeling rushed in the morning (27.6%) and not feeling hungry (19%).<sup>29, 35-36</sup> For this study the percentages are likely lower than the previous studies because participants were able to choose multiple reasons as to why they may skip breakfast in the morning.

Interestingly, in this study African American youth were more likely to have consumed an additional breakfast, and this was statistically significant (p-value = 0.044). This finding was consistent with other studies that identify African American youth to be more likely to skip breakfast.<sup>1 and 41</sup> However, others show that white youth are more likely to skip breakfast.<sup>39</sup> In this study we were unable to compare an additional breakfast to breakfast skipping due to the low sample size, but there was a higher prevalence of African American youth consuming an additional breakfast (55.6%), than not consuming an additional breakfast (44.4%). Due to the mixed body of literature, additional research is needed on Sociodemographic predictors of consuming an additional breakfast.

In the present study, there was no significance between highest parental education and an additional breakfast. Previous studies have found higher parental education to have a positive effect on breakfast eating patterns in youth; those with higher parental education are less likely to skip breakfast.<sup>2 and 40</sup> There was no

significance between mother's breakfast habits and the consumption of an additional breakfast. Verloigne, Van Lippevelde, Maes, et al. found that eating breakfast with parents at a young age was predicative of breakfast frequency in the teen years.<sup>44</sup>

The proportion of youth that ate breakfast at school was similar to the results from the New York City study which assessed Breakfast in the Classroom. About 60.3% of participants ate breakfast at home/on the way to school, which was about 10% less than the NYC study, while more participants in the current study ate breakfast at school (34.5%) compared to the NYC study at 26.9%.<sup>6</sup> The higher prevalence of breakfast consumption at school may be because of age differences between the participants in the two studies. With adolescents, parents may believe their son/daughter to be responsible for their own breakfast, thus increasing school breakfast consumption rather than home consumption. More research is needed with the adolescent age group and consumption of an additional breakfast. The current study did not assess differences in additional breakfast consumption based on types of school breakfast programs (Breakfast in the Classroom, Universal Breakfast, Grab-n-Go, etc.). More research is warranted to identify possible differences among the prevalence of an additional breakfast and dietary and weight outcomes in these programs.

### **Strength and Weaknesses**

The present study's strengths and weaknesses should be considered when interpreting the findings. One of the main strengths of the study was that a validated 24-hr recall of nutrient intake was used to assess how participants may compensate their intake as a result of consuming an additional breakfast.<sup>90-91</sup>

Previous studies assessed the amount of calories and nutrient content of breakfast items consumed, rather than the entire days' worth of food intake.<sup>6 and 29</sup> Further, those studies did not assess portion sizes and the amount of the food item consumed, rather they assumed that all of the food was eaten.<sup>6 and 29</sup> Although a previous study did assess 24-hr recall of food intake, the study was conducted in 2001-2002, and many changes have been made to the SBP since that study was conducted.<sup>46, 48, and 79</sup> Another strength of the study was that we asked a survey question that eliminated the guesswork of what counts as a second breakfast. Previous researchers identified any caloric food or beverage item consumed in the morning time before lunch to be considered breakfast, which may not accurately capture multiple breakfasts; they may be capturing a snack. Although studies from New York and Philadelphia mentioned that the schools did not offer snacks between breakfast and lunch,<sup>6 and 29</sup> there is a possibility that students brought/purchased snacks beforehand, and ate them before lunch (and the researchers considered those snacks as breakfast). In the current study, we asked specifically if participants ate an additional breakfast at school: "Now think about the days when you eat breakfast at home and/or on the way to school, on those days do you also eat breakfast served at school?" This question also provided more than a single day's assessment of additional breakfast frequency, unlike the previous studies that only observed one day.

Another strength of the study was that height and weights were taken by trained researchers rather than relying upon self-reported heights and weights. Additionally, the study composed of a diverse population of youth (African American, Hispanic, and white), which improves the generalizability. Lastly, the study

participants were middle and high school youth, which have not been assessed in either of the three other studies examining the consumption of multiple breakfasts.

Along with the strengths of the study, weaknesses are also present. The main weakness of the study was the small sample size of 58 participants. Much of the statistical insignificance could be due to such a small sample size. Further, the 95% confidence intervals were very large, indicating low levels of precision in the estimates. Although the ASA24-kids 24-hr recall is a valid tool that helps to determine nutrient content of foods consumed, it may not accurately represent a typical days intake because it only looks at one day of food consumption. The study would have been strengthened with more than one 24-hr recall. The study could also have been strengthened with identifying those participants that attended schools with the SBP or with Breakfast in the Classroom; because we did not identify the different breakfast program types, this was a limitation. Another weakness of the study was that almost all of the participants belonged to the Boys and Girls Club. There could be specific characteristics of this population that would not be representative of the general middle and high school population. Finally, this study was cross-sectional, so causality between the dependent and independent variables cannot be determined.

### **Summary**

The current study's results demonstrate that although there is no statistical significance between overall calories and the dietary nutrients studied amongst youth eating an additional breakfast and youth not eating an additional breakfast, there is a trending inverse relationship between overweight/obesity and an

additional breakfast, although this is not significant. It is important to recognize that the SBP, in this study, did not contribute to a higher intake of calories or dietary nutrients. Further, the consumption of an additional breakfast did not contribute to overweight/obesity amongst middle and high school youth in the present study.

## CHAPTER 6

### CONCLUSION

Childhood overweight and obesity is cause of concern with about 1/3 of children in the United States being overweight/obese.<sup>7</sup> Some health officials have suggested that childhood overweight/obesity could be attributed to breakfast being provided in schools, amongst many other factors. The reasoning behind this concern is youth could potentially be eating breakfast at home, and then a second breakfast at school. This study assessed the prevalence and health related outcomes of youth consuming an additional breakfast at school in the Phoenix metro area. Health outcomes assessed were weight status and dietary nutrients (total calories, iron, sodium, carbohydrates, added sugar, and fiber).

None of the hypotheses for this study were upheld. The prevalence of the consumption of an additional breakfast was not uncommon; the prevalence was significantly higher than originally hypothesized. Participants who ate an additional breakfast before school did not have a positive relationship with overweight/obesity; the relationship actually was trending towards an inverse association, although not significant. Lastly, those who ate an additional breakfast did not have a higher intake of total calories or any of the nutrients studied; there was no significance between the consumption of an additional breakfast and not. The insignificant results obtained from this study could be due to the small sample size of participants, but this preliminary research is still important for future research and considerations with the continuation of school breakfast programs.

School breakfast programs provide the opportunity for students to eat high quality, nutritional breakfasts, preparing them for a day of learning. The Healthy Huger Free-Kids Act continues to enforce higher standards for healthy breakfasts and lunches served in schools. With a trending inverse relationship between an additional breakfast and overweight/obesity in the current study, until more research is conducted, it is important for the continuation of SBP's because this study observed that the consumption of an additional breakfast is not contributing to overweight/obesity.

Further modifications to the foods served at school breakfast will likely continue to take place in the upcoming years. Fiber and iron guidelines may need to be considered into the programs. Although iron was relatively borderline low for participants in this study for recommended intakes, modifications may still need to be made in order to ensure adequate amounts are being consumed because with low levels of iron intake, anemia can develop and lead to decreased energy, weakness, and a weakened immune system.<sup>57</sup> Fiber was below the recommended amount for all participants, indicating that more fiber rich foods may need to be incorporated into school breakfast programs, or other eating occasions for youth because fiber has many health benefits including decreasing the risk of certain cancers, decreasing the risk of CHD, and maintaining weight.<sup>73-75</sup>

This study helps to add to the small body of literature about the consumption of an additional breakfast and youth's weight and health. Previous studies have only assessed elementary school children; this was the first study to assess middle and high school youth and the consumption of an additional breakfast. More research is needed to assess nutrient intake and health outcomes of youth that eat an additional

breakfast. A larger study with more participants will help to provide an in-depth look at these outcomes. Further, more research needs to be conducted with middle and high school age populations and an additional breakfast because these populations also have the opportunity for school breakfast, yet studies looking at an additional breakfast have focused solely on the elementary school age population. Given that this study found no adverse health outcomes when children consumed an additional breakfast at school, continuation of school breakfast programs are important for the health of youth.



## REFERENCES

1. Deshmukh-Taskar PR, Nicklas TA, O'Neil CE, Keast DR, Radcliffe JD, Cho S. The relationship of breakfast skipping and type of breakfast consumption with nutrient intake and weight status in children and adolescents: the National Health and Nutrition Examination Survey 1999-2006. *J Am Diet Assoc.* 2010;110(6):869-878.
2. Bartfeld JS, Ryu J. The School Breakfast Program and Breakfast-Skipping among Wisconsin Elementary School Children. *Soc Serv Rev.* 2011;85(4):619-634.
3. Merten MJ, Williams AL, Shriver LH. Breakfast consumption in adolescence and young adulthood: parental presence, community context, and obesity. *J Am Diet Assoc.* 2009;109(8):1384-1391.
4. United States Department of Agriculture (USDA). (2013). *The School Breakfast Program*. Retrieved from [www.fns.usda.gov/sites/default/files/SBPfactsheet.pdf](http://www.fns.usda.gov/sites/default/files/SBPfactsheet.pdf)
5. Saul MH. Obesity debate over where to serve school breakfasts. *The Wall Street Journal.* 2012.
6. Van Wye G, Seoh H, Adjoian T, Dowell D. Evaluation of the new york city breakfast in the classroom program. *Am J Public Health.* 2013;103(10):e59-64.
7. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA.* 2012;307(5):483-490.
8. Coleman-Jensen A, Nord M, Andrews M, Carlson S. Household food security in the united states in 2011. *USDA.* 2012;141.
9. Albertson AM, Anderson GH, Crockett SJ, Goebel MT. Ready-to-eat cereal consumption: its relationship with BMI and nutrient intake of children aged 4 to 12 years. *J Am Diet Assoc.* 2003;103(12):1613-1619.
10. Clark MA, Fox MK. Nutritional quality of the diets of US public school children and the role of the school meal programs. *J Am Diet Assoc.* 2009;109(2 Suppl):S44-56.
11. Dubois L, Girard M, Potvin Kent M, Farmer A, Tatone-Tokuda F. Breakfast skipping is associated with differences in meal patterns, macronutrient intakes and overweight among pre-school children. *Public Health Nutr.* 2009;12(1):19-28.

12. Haines J, Neumark-Sztainer D, Wall M, Story M. Personal, behavioral, and environmental risk and protective factors for adolescent overweight. *Obesity (Silver Spring)*. 2007;15(11):2748-2760.
13. Haug E, Rasmussen M, Samdal O, et al. Overweight in school-aged children and its relationship with demographic and lifestyle factors: results from the WHO-Collaborative Health Behaviour in School-aged Children (HBSC) study. *Int J Public Health*. 2009;54 Suppl 2:167-179.
14. Kleinman R, Hall S, Green H, et al. Diet, Breakfast, and Academic Performance in Children. *Ann Nutr Metab*. 2002;46(0 1):24-30.
15. Kral TV, Whiteford LM, Heo M, Faith MS. Effects of eating breakfast compared with skipping breakfast on ratings of appetite and intake at subsequent meals in 8- to 10-y-old children. *Am J Clin Nutr*. 2011;93(2):284-291.
16. Larson N, Laska MN, Story M, Neumark-Sztainer D. Predictors of fruit and vegetable intake in young adulthood. *J Acad Nutr Diet*. 2012;112(8):1216-1222.
17. Lazzeri G, Pammolli A, Azzolini E, et al. Association between fruits and vegetables intake and frequency of breakfast and snacks consumption: a cross-sectional study. *Nutr J*. 2013;12(1):123.
18. Liu J, Hwang WT, Dickerman B, Compher C. Regular breakfast consumption is associated with increased IQ in kindergarten children. *Early Hum Dev*. 2013;89(4):257-262.
19. Mahoney CR, Taylor HA, Kanarek RB, Samuel P. Effect of breakfast composition on cognitive processes in elementary school children. *Physiol Behav*. 2005;85(5):635-645.
20. Pereira MA, Erickson E, McKee P, et al. Breakfast frequency and quality may affect glycemia and appetite in adults and children. *J Nutr*. 2011;141(1):163-168.
21. Smith KJ, Gall SL, McNaughton SA, Blizzard L, Dwyer T, Venn AJ. Skipping breakfast: longitudinal associations with cardiometabolic risk factors in the Childhood Determinants of Adult Health Study. *The American Journal of Clinical Nutrition*. 2010;92(6):1316-1325.
22. Timlin MT, Pereira MA, Story M, Neumark-Sztainer D. Breakfast Eating and Weight Change in a 5-Year Prospective Analysis of Adolescents: Project EAT (Eating Among Teens). *Pediatrics*. 2008;121(3):e638-e645.
23. Tin SP, Ho SY, Mak KH, Wan KL, Lam TH. Breakfast skipping and change in body mass index in young children. *Int J Obes (Lond)*. 2011;35(7):899-906.

24. Wesnes KA, Pincock C, Richardson D, Helm G, Hails S. Breakfast reduces declines in attention and memory over the morning in schoolchildren. *Appetite*. 2003;41(3):329-331.
25. Affenito SG, Thompson DR, Barton BA, et al. Breakfast consumption by African-American and white adolescent girls correlates positively with calcium and fiber intake and negatively with body mass index. *J Am Diet Assoc*. 2005;105(6):938-945.
26. Berkey CS, Rockett HRH, Gillman MW, Field AE, Colditz GA. Longitudinal study of skipping breakfast and weight change in adolescents. *International Journal of Obesity & Related Metabolic Disorders*. 2003;27(10):1258.
27. Schembre SM, Wen CK, Davis JN, et al. Eating breakfast more frequently is cross-sectionally associated with greater physical activity and lower levels of adiposity in overweight Latina and African American girls. *Am J Clin Nutr*. 2013;98(2):275-281.
28. Mhurchu CN, Gorton D, Turley M, et al. Effects of a free school breakfast programme on children's attendance, academic achievement and short-term hunger: results from a stepped-wedge, cluster randomised controlled trial. *J Epidemiol Community Health*. 2013;67(3):257-264.
29. Lawman HG, Ng J, Van Wye G, et al. Breakfast patterns among low-income, ethnically-diverse 4th-6th grade children in an urban area. *BMC public health*. 2014;14:604.
30. The Centers for Disease Control (CDC). (2012). *Basics About Childhood Obesity*. Retrieved from <http://www.cdc.gov/obesity/childhood/basics.html>
31. Hamedani A. Reduced energy intake at breakfast is not compensated for at lunch if a high-insoluble-fiber cereal replaces a low-fiber cereal. *Am J Clin Nutr*. 2009;89(5):1343.
32. LaCombe A, Ganji V. Influence of two breakfast meals differing in glycemic load on satiety, hunger, and energy intake in preschool children. *Nutr J*. 2010;9:53-2891-9-53.
33. Schroeder N, Gallaher DD, Arndt EA, Marquart L. Influence of whole grain barley, whole grain wheat, and refined rice-based foods on short-term satiety and energy intake. *Appetite*. 2009;53(3):363-369.
34. Langer, G. What Americans Eat for Breakfast. abcNews website. abcnews.go.com. Updated May 17, 2005. Accessed November 16, 2013.

35. Sweeney NM, Horishita N. The breakfast-eating habits of inner city high school students. *The Journal of school nursing : the official publication of the National Association of School Nurses*. 2005;21(2):100-105.
36. Reddan J, Wahlstrom K, Reicks M. Children's Perceived Benefits and Barriers in Relation to Eating Breakfast in Schools With or Without Universal School Breakfast. *Journal of Nutrition Education & Behavior*. 2002;34(1):47-52.
37. 2008 food & health survey consumer attitudes towards, food, nutrition, and health. *IFIC*. 2008.
38. Nicklas TA, Morales M, Linares A, et al. Children's meal patterns have changed over a 21-year period: the Bogalusa heart study. *J Am Diet Assoc*. 2004;104(5):753-761.
39. Videon TM, Manning CK. Influences on adolescent eating patterns: the importance of family meals. *Journal of Adolescent Health*. 2003;32(5):365-373.
40. Lien L. Is breakfast consumption related to mental distress and academic performance in adolescents? *Public Health Nutr*. 2007;10(4):422-428.
41. Affenito SG. Breakfast: A Missed Opportunity. *J Am Diet Assoc*. 2007;107(4):565-569.
42. Bruening M, Larson N, Story M, Neumark-Sztainer D, Hannan P. Predictors of Adolescent Breakfast Consumption: Longitudinal Findings from Project EAT. *Journal of Nutrition Education and Behavior*. 2011;43(5):390-395.
43. O'Dea JA, Wilson R. Socio-cognitive and nutritional factors associated with body mass index in children and adolescents: possibilities for childhood obesity prevention. *Health Educ Res*. 2006;21(6):796-805.
44. Verloigne M, Van Lippevelde W, Maes L, Brug J, De Bourdeaudhuij I. Family- and school-based predictors of energy balance-related behaviours in children: a 6-year longitudinal study. *Public Health Nutr*. 2013;16(2):202-211.
45. United States Department of Agriculture (USDA). *School Breakfast Program (SBP): Program History*. Retrieved from [www.fns.usda.gov/sbp/program-history](http://www.fns.usda.gov/sbp/program-history)
46. Wootan MG. The Healthy, Hunger-Free Kids Act: one year later. *NASN Sch Nurse*. 2012;27(1):18-19.
47. United States Department of Agriculture (USDA). (2013). *Healthy Hunger-Free Kids Act of 2010*. Retrieved from: [http://www.fns.usda.gov/cnd/governance/legislation/CNR\\_2010.htm](http://www.fns.usda.gov/cnd/governance/legislation/CNR_2010.htm)

48. Marcason W. What are the new national school lunch and breakfast program nutrition standards? *Journal of the Academy of Nutrition and Dietetics*. 2012;112(7):1112.
49. Nutrition standards in the national school lunch and school breakfast programs. *FNS*. 2012;17(77).
50. *The Healthy, Hunger-Free Kids Act of 2010: Provisions That Improve the School Food Environment*. ChangeLab Solutions; 2012.  
[http://changelabsolutions.org/sites/default/files/HHFKA\\_SchoolEnvironments\\_FINAL\\_20120806.pdf](http://changelabsolutions.org/sites/default/files/HHFKA_SchoolEnvironments_FINAL_20120806.pdf).
51. Buchholz AC, Schoeller DA. Is a calorie a calorie? *Am J Clin Nutr*. 2004;79(5):899S.
52. Rampersaud GC, Pereira MA, Girard BL, Adams J, Metz JD. Breakfast Habits, Nutritional Status, Body Weight, and Academic Performance in Children and Adolescents. *J Am Diet Assoc*. 2005;105(5):743-760.
53. Alexander KE, Ventura EE, Spruijt-Metz D, Weigensberg MJ, Goran MI, Davis JN. Association of breakfast skipping with visceral fat and insulin indices in overweight Latino youth. *Obesity (Silver Spring)*. 2009;17(8):1528-1533.
54. Hanson KL, Olson CM. School meals participation and weekday dietary quality were associated after controlling for weekend eating among U.S. school children aged 6 to 17 years. *J Nutr*. 2013;143(5):714.
55. Bhattacharya J, Currie J, Haider SJ. Breakfast of Champions? The School Breakfast Program and the Nutrition of Children and Families. *J Hum Resour*. 2006;41(3):445-466.
56. Gordon AR, Devaney BL, Burghardt JA. Dietary effects of the National School Lunch Program and the School Breakfast Program. *Am J Clin Nutr*. 1995;61(1 Suppl):221S.
57. The Centers for Disease Control (CDC). (2013). Iron and Iron Deficiency. Retrieved from:  
<http://www.cdc.gov/nutrition/everyone/basics/vitamins/iron.html>.
58. Dietary Reference Intakes (DRIs): Estimated Average Requirements. Food and Nutrition Information Center (FNIC) Web site.  
[http://www.iom.edu/Activities/Nutrition/SummaryDRIs/~media/Files/Activity%20Files/Nutrition/DRIs/5\\_Summary%20Table%20Tables%201-4.pdf](http://www.iom.edu/Activities/Nutrition/SummaryDRIs/~media/Files/Activity%20Files/Nutrition/DRIs/5_Summary%20Table%20Tables%201-4.pdf).  
Updated 2010. Accessed November, 2013.
59. Recommendations to Prevent and Control Iron Deficiency in the United States. *MMWR*. 1998;3(47):1-36.

60. Allen L, de Benoist B, Dary O, and Hurrell R, ed. *Guidelines on the food fortification with micronutrients*. France: World Health Organizations and Food and Agriculture Organization of the United Nations; 2006.  
[http://www.who.int.ezproxy1.lib.asu.edu/nutrition/publications/guide\\_food\\_fortification\\_micronutrients.pdf](http://www.who.int.ezproxy1.lib.asu.edu/nutrition/publications/guide_food_fortification_micronutrients.pdf). Accessed 2013.
61. The Centers for Disease Control (CDC). (2013). Most Americans Should Consume Less Sodium. Retrieved from: <http://www.cdc.gov/salt/>
62. Brown IJ, Tzoulaki I, Candeias V, Elliott P. Salt intakes around the world: implications for public health. *International Journal of Epidemiology*. 2009;38(3):791-813.
63. Falkner B, Michel S. Blood pressure response to sodium in children and adolescents. *Am J Clin Nutr*. 1997;65(2 Suppl):618S.
64. Yang Q, Tian N, Cogswell ME, et al. Sodium intake and blood pressure among US children and adolescents. *Pediatrics*. 2012;130(4):611.
65. Grieger JA, L Cobiac. Comparison of dietary intakes according to breakfast choice in Australian boys. *Eur J Clin Nutr*. 2012;66(6):667.
66. Brown JE, *Nutrition Through the Life Cycle*, 4<sup>th</sup> Edition, Thomson/Wadsworth, 2010.
67. Gropper SS, Smith JL, Groff JL. *Advanced Nutrition and Human Metabolism*. 5<sup>th</sup> ed. Belmont, CA: Wadsworth, Cengage Learning; 2009.
68. Johnson RK, Appel LJ, Brands M, et al. Dietary sugars intake and cardiovascular health: a scientific statement from the American Heart Association. *Circulation*. 2009;120(11):1011-1020.
69. U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Dietary Guidelines for Americans, 2010*. 7th Edition, Washington, DC: U.S. Government Printing Office, December 2010.
70. Libuda L, Alexy U, Buyken AE, Sichert-Hellert W, Stehle P, Kersting M. Consumption of sugar-sweetened beverages and its association with nutrient intakes and diet quality in German children and adolescents. *Br J Nutr*. 2009;101(10):1549-1557.
71. Welsh JA, Sharma AJ, Grellinger L, Vos MB. Consumption of added sugars is decreasing in the United States. *Am J Clin Nutr*. 2011;94(3):726-734.
72. Yang Q, Zhang Z, Gregg EW, Flanders W, Merritt R, Hu FB. Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults. *JAMA Intern Med*. 2014.

73. Lattimer JM, Haub MD. Effects of dietary fiber and its components on metabolic health. *Nutrients*. 2010;2(12):1266-1289.
74. Tucker LA, Thomas KS. Increasing total fiber intake reduces risk of weight and fat gains in women. *J Nutr*. 2009;139(3):576-581.
75. Alfieri MAH, Pomerleau J, Grace DM and Anderson L. Fiber Intake of Normal Weight, Moderately Obese and Severely Obese Subjects. *Obesity Research*. 1995;3(6):541-547.
76. Riccioni G, Sblendorio V, Gemello E, et al. Dietary fibers and cardiometabolic diseases. *International journal of molecular sciences*. 2012;13(2):1524-1540.
77. Slavin JL. Dietary fiber and body weight. *Nutrition*. 2005;21(3):411-418.
78. Kranz S, Brauchla M, Slavin JL, Miller KB. What do we know about dietary fiber intake in children and health? The effects of fiber intake on constipation, obesity, and diabetes in children. *Advances in nutrition (Bethesda, Md.)*. 2012;3(1):47-53.
79. Bernstein LS, United States, Food and Nutrition Service, Abt Associates, Office of Analysis, Nutrition, and Evaluation. Evaluation of the School Breakfast Program pilot project: final report. Alexandria, VA: U.S. Dept. of Agriculture, Food and Nutrition Service; 2004.
80. Williams J, Mobarhan S. A Critical Interaction: Leptin and Ghrelin. *Nutr Rev*. 2003;61(11):391-393.
81. The Centers for Disease Control (CDC). (2013). *Obesity and Overweight*. Retrieved from <http://www.cdc.gov/obesity/childhood/basics.html>.
82. OECD (2013), *Health at a Glance 2013: OECD Indicators*, OECD Publishing. [http://dx.doi.org/10.1787/health\\_glance-2013-en](http://dx.doi.org/10.1787/health_glance-2013-en)
83. Cynthia L. Ogden PD, Margaret D. Carroll MSPH, Brian K. Kit, M.D., M.P.H., and Katherine M. Flegal, Ph.D. Prevalence of Obesity in the United States, 2009–2010. *NCHS Data Brief*. 2012;82.
84. The Centers for Disease Control (CDC). Vital Signs: Obesity Among Low-Income School-Aged Children-United States, 2008-2011. *MMWR*. 2013; 62(31):629-634.
85. Himes JH. Challenges of Accurately Measuring and Using BMI and Other Indicators of Obesity in Children. *Pediatrics*. 2009;124(Supplement):S3-S22.
86. Dietz WH, Bellizzi MC. Introduction: the use of body mass index to assess obesity in children. *Am J Clin Nutr*. 1999;70(1):123S.

87. ASA24-Kids-2012. Applied Research Cancer Control and Population Science Web site.  
<http://appliedresearch.cancer.gov/tools/instruments/asa24/respondent/childrens.html>. Updated 2013. Accessed November, 2013.
88. The U.S. Department of Health and Human Services (2013). *Automated Self-Administered 24-hr Dietary Recall (ASA24)*. Retrieved from:  
[http://appliedresearch.cancer.gov/tools/instruments/asa24/asa24\\_fact\\_sheet.pdf](http://appliedresearch.cancer.gov/tools/instruments/asa24/asa24_fact_sheet.pdf).
89. Researcher Web Site Features. Applied Research Cancer Control and Population Science Web site.  
<http://appliedresearch.cancer.gov/tools/instruments/asa24/researcher/features.html>. Updated 2013. Accessed November, 2013.
90. Blanton CA, Moshfegh AJ, Baer DJ, Kretsch MJ. The USDA Automated Multiple-Pass Method accurately estimates group total energy and nutrient intake. *J Nutr.* 2006;136(10):2594-2599.
91. Evaluation and Validation. National Cancer Institute Web site.  
<http://appliedresearch.cancer.gov/tools/instruments/asa24/respondent/validation.html>. Updated 2013. Accessed November, 2013.
92. Baranowski T, Cullen KW, Subar AF, et al. Comparison of a Web-based versus traditional diet recall among children. *Journal of the Academy of Nutrition and Dietetics.* 2012;112(4):527-532.
93. Robert Wood Johnson Foundation (RWJF) (2013). *Philadelphia: Signs of Progress Toward Reversing the Childhood Obesity Epidemic*. Retrieved from  
<http://www.rwjf.org/en/about-rwjf/newsroom/newsroom-content/2013/07/philadelphia--signs-of-progress.html>
94. Robert Wood Johnson Foundation (RWJF) (2013). *New York City: Signs of Progress Toward Reversing the Childhood Obesity Epidemic*. Retrieved from  
<http://www.rwjf.org/en/about-rwjf/newsroom/newsroom-content/2013/07/new-york-city--signs-of-progress.html>.
95. The School District of Philadelphia. USDA Under Secretary Visits Hunter Elementary In Honor Of National School Breakfast Week.  
<https://webapps.philasd.org/news/display/articles/2070>. Updated March 5, 2014. Accessed July 15<sup>th</sup> 2014.



APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL AND RECRUITMENT FLYERS



APPROVAL: EXPEDITED REVIEW

Meredith Bruening  
 SNHP - Nutrition  
 602/827-2266  
 Meg.Bruening@asu.edu

Dear Meredith Bruening:

On 2/25/2014 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	The Prevalence and Nutrition Related Outcomes of Adolescents Consuming An Additional Breakfast at School
Investigator:	Meredith Bruening
IRB ID:	STUDY00000600
Category of review:	(4) Noninvasive procedures, (7)(b) Social science methods, (7)(a) Behavioral research
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> <li>• Spanish Consent Form, Category: Consent Form;</li> <li>• Parental Consent Form, Category: Consent Form;</li> <li>• Child Assent Form, Category: Consent Form;</li> <li>• Breakfast IRB Form, Category: IRB Protocol;</li> <li>• Breakfast Survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);</li> <li>• Boys and Girls Club letter of support, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc);</li> <li>• Measurement ht. and wt.pdf, Category: Technical materials/diagrams;</li> </ul>

The IRB approved the protocol from 2/25/2014 to 2/24/2015 inclusive. Three weeks before 2/24/2015 you are to submit a completed "FORM: Continuing Review (HRP-212)" and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 2/24/2015 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Julie Simpson  
Erik-Jon Hammond  
Gabriel Rivas  
Salma Hanna  
Vanessa Bonfim  
Kristin Johnson  
Heather Busot  
Sarah Appleby  
Chloe Diamond  
Meredith Bruening  
Macy Focken  
Emily Sullivan  
Alexandra Hauser  
Julie Simpson  
Taylor Bamonte

## ***The Prevalence and Nutrition Related Outcomes of Adolescents Consuming An Additional Breakfast at School***

### **Background**

Breakfast has been studied to see the effects it has on overall health of children and adolescents. There is significant evidence that breakfast promotes better learning and memory, improves academic outcomes, promotes healthier dietary quality, prevents against obesity and protects against hunger. However, there are some public health professionals concerned that kids breakfast at school may be resulting in excess intake, and ultimately obesity. However, there is absolutely NO data to support this. Most studies have not looked into the unintended consequences of breakfast being served at school. Thus, the purpose of this study is to assess the prevalence of middle school and high school adolescents (ages 11-18) consuming a second breakfast at schools that provided a School Breakfast Program (SBP) and the association this has with specific health related outcomes (weight/BMI, intake of calories, carbohydrates, sodium, fiber, added sugars and iron) in the Phoenix metro area at after school programs.

We are seeking partners to help us assess this among **middle school and/or high school students**. The reason we are asking for this age group is that we need the youth to report on what they ate; this is a difficult for younger children. Further, findings will help researchers to better understand health outcomes related to breakfast habits in youth.

### **Partner requests**

- Identify a single date for us to conduct the study on-site. Tuesday and Fridays work best for our team, but we will absolutely work around your schedule. Given that we want to assess what the kids ate school the day before, Mondays will not work.
- Once a date is determined, we would like 10-15 minutes to talk to the kids about the study prior to the date. Here we will provide the youth with consent forms for their parents to sign and/or discuss the study directly with parents at pick-up if possible. Our research assistants will collect these forms.
- Allow us to conduct the study on-site (in a semi-quiet space), which is planned for day only. The study should take 60 minutes to 90 minutes.
- Youth will complete surveys and 24-hr recalls on ASU laptops and tablets. Wi-Fi is appreciated, but we can bring a ~~hot-spot~~ if necessary.

### **Participant requests**

Before beginning research, parental consent will be required, with child assent following. Parental consent forms are available in English and Spanish, while the child assent forms are only in English. The amount of time participants will have to commit to the study is approximately 60 to 90 minutes (10-15 minutes for the survey, 40-60 minutes for the 24-hr recall, and 5-10 minutes for height and weight measurements). During this time, the participants will be requested to complete the following:

- Read and understand parental consent and youth assent forms. The research staff will be there to answer any questions and help explain the study to parents and participants. In order to protect confidentiality and privacy, names will not be used in data collection. The study is voluntary and participants can withdrawal at any point.
- Fill out a short survey on breakfast habits. The following topics are included in the survey:
  - Frequency of breakfast consumption, reasons for skipping/eating breakfast, location of breakfast consumption, time of breakfast consumption, parental/guardian breakfast habits, extracurricular activities and breakfast, eating breakfast at home and at school, and school breakfast.
- Complete a self-administered 24-hr recall that details the previous days food intake. The research staff will be present to help and answer any questions of participants.
- ~~Height and weight of participants will be collected by the trained research staff.~~

### **Benefits**

- Youth who participate will receive a \$10 gift card.
- After data collection, ASU faculty and students are happy to conduct a hands-on workshop on nutrition for the kids.

### **About the researchers**

Dr. Meg ~~Brouning~~ is a public health nutrition researcher and dietitian who is interested in promoting healthy eating and development among underserved youth and families. She plans on sharing these findings with policy makers and schools. Ms. Julie Simpson is a Master's student in the Nutrition Program in the School of Nutrition and Health Promotion at ASU. Once she finishes her program and becomes a dietitian, Julie would like to work in school or community nutrition.

APPENDIX B

PARENTAL CONSENT AND CHILD ASSENT FORMS

**EXAMINING HEALTH OUTCOMES RELATED TO BREAKFAST HABITS OF  
ADOLESCENTS**

PARENTAL LETTER OF PERMISSION

Dear Parent:

I am a nutrition graduate student under the direction of Dr. Meg Bruening in the College of Health Solutions at Arizona State University. I am conducting a research study to investigate the eating habits of young people at breakfast. We want to better understand the how breakfast effects health outcomes.

I am inviting your child's participation, which will involve filling out a survey with information regarding breakfast habits, completing a 24-hr recall of the food they have eaten during the previous day, and allowing trained researchers to take heights and weights of your child in a private area. We expect that your child will spend no more than 90 minutes participating in this study. Your child's participation in this study is completely voluntary. If you choose not to have your child participate or to withdraw your child from the study at any time, there will be no penalty (it will not affect your child's grade, academic standing, or participation in the after school program). Likewise, if your child chooses not to participate or to withdraw from the study at any time, there will be no penalty.

Although there may be no direct benefit to your child, the possible benefit of your child's participation is helping the researchers to better understand health outcomes related to breakfast habits of youth. There are no foreseeable risks or discomforts to your child's participation.

In order to protect confidentiality, names will not be used and your child's participation will be kept anonymous. The results of this study may be used in reports, presentations, or publications but your child's name will not be used.

If you have any questions concerning the research study or your child's participation in this study, please call me, Julie Simpson at (480)-648-7203 (or Dr. Meg Bruening) at (602) 827-2266 or jssimpso@asu.edu

Sincerely,

Julie Simpson.

By signing below, you are giving consent for your child \_\_\_\_\_ (Child's name) to participate in the above study.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Date

If you have any questions about you or your child's rights as a subject/participant in this research, or if you feel you or your child have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the Office of Research Integrity and Assurance, at (480) 965-6788.

**ESTUDIO DE COMO LOS HÁBITOS DE COMER DESAYUNOS EN LOS ADOLESCENTES AFECTA  
LOS RESULTADOS DE SALUD.**

**CARTA DE PERMISO DE LOS PADRES**

Estimado Padre :

Soy un estudiante de posgrado de nutrición bajo la dirección de la Dra. **Meg Bruening** en el Colegio de Soluciones de la Salud de la Universidad Estatal de Arizona. Estoy realizando un estudio de investigación para investigar los hábitos alimenticios de los jóvenes en el desayuno. Queremos comprender mejor cómo el comer desayuno afecta los resultados de salud.

Estoy invitando a la participación de su hijo/a, lo que incluye completar una encuesta con información sobre hábitos de desayuno , completando un diario de 24 horas de los alimentos que han comido durante el día anterior , y permitir a los investigadores entrenados medir la altura y el peso de su hijo/a en un área privada . Esperamos que la participación de su hijo/a en el estudio no sea más de 90 minutos. La participación de su hijo/a en este estudio es completamente voluntaria. Si usted elige que su hijo/a no participe en este estudio o si decide retirar a su hijo/a del estudio en cualquier momento , no habrá penalización ( su acción no afectará a la calificación de su hijo , nivel académico , o la participación en los programas después de la escuela) . Del mismo modo , si su hijo/a decide no participar o retirarse del estudio en cualquier momento, no habrá penalización.

Aunque puede que no haya un beneficio directo por participar en el estudio para su hijo/a , un posible beneficio de la participación de su hijo es en ayudar a los investigadores a entender mejor los resultados de salud relacionados con los hábitos de desayuno en los estudiantes de escuela superior. No debe de haber ningún riesgos o molestias previsibles por la participación de su hijo en este estudio.

Para proteger su identidad y mantener confidencialidad, no se utilizarán los nombres de los participantes y la participación de su hijo/a se mantendrán en el anonimato. Los resultados de este estudio pueden ser utilizados en informes , presentaciones o publicaciones, pero el nombre de su hijo/a no será utilizado .

Si usted tiene alguna pregunta relacionada con el estudio de investigación , o la participación de su hijo en este estudio , por favor llamar a la Dra. **Meg Bruening** al ( 602) 827-2266 o puede escribir una carta electrónica a **Julie Simpson** ([jssimpso@asu.edu](mailto:jssimpso@asu.edu))

Atentamente,

**Julie Simpson.**

Con su firma, usted está dando su consentimiento para que su hijo/a \_\_\_\_\_ ( Nombre del niño/a) a participar en el estudio anterior .

\_\_\_\_\_  
Firma

\_\_\_\_\_  
Nombre Impreso

\_\_\_\_\_  
Fecha

Si usted tiene alguna pregunta acerca de sus derechos y los derechos de su hijo/a como sujeto / participante en esta investigación, o si usted siente que usted o su hijo/a ha sido colocado en una situación de riesgo , usted puede ponerse en contacto con el Presidente de la de Sujetos Humanos Junta de Revisión Institucional , a través de la Oficina de Integridad de la Investigación y de Garantía , al ( 480) 965- 6788 .

**EXAMINING HEALTH OUTCOMES RELATED TO BREAKFAST HABITS OF  
ADOLESCENTS**

My name is Julie Simpson and I am with Arizona State University.

I am asking you to take part in a research study because I am trying to learn more about the breakfast habits of children and adolescents. Your parent(s) have given you permission to participate in this study.

If you agree, you will be asked to fill out a survey, and ANSWER QUESTIONS ABOUT YOUR EATING HABITS, and have the trained researchers measure your height and weight in a private area. You will be asked how often you eat breakfast and you will also be asked the kind of foods you eat. Answering these questions will take about 1 hour. You do not have to put your name on the survey. You do not have to answer any questions that make you uncomfortable.

You do not have to be in this study if you do not want to. No one will be mad at you if you decide not to do this study. Even if you start the study, you can stop at any time. You may ask questions about the study at any time.

If you decide to be in the study all the information will be kept private. You will also receive a gift card of \$10.

Signing here means that you have read this form or have had it read to you and that you are willing to be in this study.

Signature of subject \_\_\_\_\_

Subject's printed name \_\_\_\_\_

Signature of investigator \_\_\_\_\_

Date \_\_\_\_\_



APPENDIX C  
PAPER VERSION OF SURVEY

## Breakfast Study

This survey is a set of questions about your breakfast habits. Honestly answering each question to your best ability will help us to achieve the best results! You do not need to write your name anywhere on this survey. We thank you for your time and participation. This survey will take about 5-10 minutes to complete. To begin survey, please enter the ID given to you by the researchers below:

Q1 Did you eat breakfast today?

- Yes
- No

If No Is Selected, Then Skip To 2c. On average, how many days per week...If Yes Is Selected, Then Skip To 2a. What are some of the reasons why y...

Q2a What are some of the reasons why you ate breakfast this morning? (Check all that apply)

- I was hungry
- It's part of my morning routine
- My parent/parents made me breakfast
- My school serves breakfast
- It gives me energy/wakes me up
- It helps me to pay attention during school
- It helps me to be healthy
- It helps with my mood
- It helps me to get good grades
- It tastes good
- Other (Explain) \_\_\_\_\_

Q2b From the choices you picked in the previous question, what is the most important reason why you ate breakfast this morning? (Choose 1)

Q2c On average, how many days per week do you eat breakfast?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Q3 Please tell us why you usually do not eat breakfast (Check all that apply)

- I am not hungry in the morning
- I feel too rushed in the morning
- I am trying to watch my weight
- My friends do not eat breakfast
- I don't like breakfast foods at home
- I don't like breakfast foods at school
- My family does not eat breakfast
- I don't have food to eat for breakfast
- Other (Explain) \_\_\_\_\_

Q3 How do you typically get to school in the morning?

- I get a ride from family members or a friend's family member
- I take the School Bus
- I ride my bike, skateboard, scooter, or roller-blades
- I walk
- I take the City Bus/Lightrail

Q5 How much time in the morning does it usually take you to get to school? (Please answer in minutes)

Minutes: \_\_\_\_\_

Q6 Where did you eat breakfast today? (Check all that apply)

- At home
- On the way to school
- Breakfast served at school

Q7 On average, how many days do you eat breakfast at the following locations during the school week?

	Never	1 day	2 days	3 days	4 days	5 days
At home or on the way to school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8 Now think about the days when you eat breakfast at home and/or on the way to school, on those days do you also eat breakfast served at school?

- No Never
- Yes, 1 day per week
- Yes, 2 days per week
- Yes, 3 days per week
- Yes, 4 days per week
- Yes, 5 days per week

Q9 What time did you wake up this morning? \_\_\_\_\_

Q10 At what time does your school day start? \_\_\_\_\_

Q11 I think the breakfast served at school is:

	Strongly Agree	Agree	Disagree	Strongly Disagree
Healthy and Nutritious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Just the right amount	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tastes good	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Culturally Appropriate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 Who do you live with? (Check all that apply)

- Mother
- Step-mother
- Other Female Guardian
- Father
- Step-father
- Other Male Guardian
- Other (Explain) \_\_\_\_\_

Answer If Who do you live with? (Check all that apply) Mother Is Selected

Q12a How many days does your mother eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Answer If Who do you live with? (Check all that apply) Step-mother Is Selected

Q12b How many days does your Step-mother eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6

Answer If Who do you live with? (Check all that apply) Other Female Guardian Is Selected

Q12c How many days does your Female Guardian eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Answer If Who do you live with? (Check all that apply) Father Is Selected

Q12d How many days does your Father eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Answer If Who do you live with? (Check all that apply) Step-father Is Selected

Q12e How many days does your Step-father eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Answer If Who do you live with? (Check all that apply) Other Male Guardian Is Selected

Q12f How many days does your Male Guardian eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Answer If Who do you live with? (Check all that apply) Other (Explain) Is Selected

Q12g How many days does your  $\{q://QID12/ChoiceTextEntryValue/7\}$  eat breakfast during the week?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Q13 Do you currently participate in any of the following that require participation before the school day starts? (Check all that apply)

- Sports
- School related activities (clubs, classes, band/music practice, etc.)
- None
- Other (Explain) \_\_\_\_\_

If Sports Is Selected, Then Skip To 13a. As a result of participation in t...If School related activities ... Is Selected, Then Skip To 13a. As a result of participation in t...If Other (Explain) Is Not Empty, Then Skip To 13a. As a result of participation in t...

Q14 Do you participate in any of the following at any time during the school calendar year that require participation before the school day starts? (Check all that apply)

- Sports
- School related activities (clubs, classes, band/music practice, etc.)
- None
- Other (Explain) \_\_\_\_\_

If None Is Selected, Then Skip To Do you receive free or reduced-price ...

Q13a As a result of participation in these activities, does the number of times you eat breakfast at home:

- Increase
- Decrease
- Stays the same

Q13b As a result of participation in these activities, does the number of times you eat breakfast served at school:

- Increase
- Decrease
- Stays the same

Q13c As a result of participation in these activities, do you eat breakfast served at school in addition to the breakfast you ate at home or on the way to school?

- No Never
- Yes, 1 day per week
- Yes, 2 days per week
- Yes, 3 days per week
- Yes, 4 days per week
- Yes, 5 days per week

Q15 Do you receive free or reduced-price breakfast at school?

- Yes
- No
- Don't know

Q16 What is your gender?

- Male
- Female

Q17 How old are you? \_\_\_\_\_

Q18 What grade are you in? \_\_\_\_\_

Q19 What school do you go to? \_\_\_\_\_

Q20 What was the highest education attainment your mother achieved?

- High School or less
- Some College
- College Degree or higher
- Not Applicable

Q21 What was the highest education attainment your father achieved?

- High School or less
- Some College
- College Degree or higher
- Not Applicable

Q22 What is your race/ethnicity? (Please check all that apply)

- American Indian or Alaska Native
- Asian
- Black or African American
- Hispanic/Latino
- Native Hawaiian or Other Pacific Islander
- White