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Capstone Research Project

Childhood Obesity and Academic Performance

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## Abstract

This paper will explore the relationship between the weight of America's students and the apparent decline of academics in overweight student populations. This paper will look into the history of school nutrition, school health education, and school physical education and the changes that may have occurred over the last several decades. This paper recognizes that childhood obesity is an epidemic. This paper will explore elements of the past that started the epidemic; elements of the present that currently fuel the epidemic, and current and future solutions to the obesity epidemic. It also seeks to understand why it seems to affect academic performance negatively and if there could be other causes.

*Keywords: Obesity, Nutrition, Health Promotion, Physical Education, Academics, BMI*

## Childhood Obesity and Academic Performance

### Introduction

Childhood obesity is a current health problem in the United States. Although this paper will focus on school age children, overweight and obesity have been documented in preschool age children as well. According to the Center for Disease Control (CDC) a Body Mass Index (BMI) measured at or above the 85th percentile- but below the 95th percentile- is considered overweight. If a child is at or above the 95th percentile, the CDC classifies a child as obese. If a child's BMI reaches above the 105<sup>th</sup> percentile, that child is considered morbidly obese.<sup>41</sup> Since the early 1970's, childhood obesity rates in the United States have increased yearly. Thirty percent of children have a BMI that is considered overweight. Of that 30 percent, 18 percent are obese, and 10.9 percent are morbidly obese.<sup>26,40</sup> The physical effects of being overweight or obese are well documented, but is there a connection between obesity and academic achievement? This question can be expanded by exploring if schools are compounding the problem with calorie-dense lunches, lack of physical education programs, and failure to address health promotion and awareness. Are there local or national programs that are effective in combating obesity and raising academic performance? If there are those programs, how are they created and why are they important?

### Past Events

#### Factors Leading to Obesity

The problem with childhood obesity and weight gain started in the early 1970s in the United States. Several things happened to influence weight in children; there is not one specific cause for the weight gain. Some of the factors include: (a) the invention of high fructose corn syrup (HFCS), (b) sweeping legislation in schools allowing them to make a profit on lunches, and (c) the introduction of food alternatives that were not as healthy as the meals they replaced. Hamburgers, hotdogs, and French fries were allowed in lunch rooms as long as national school lunch nutrition standards could be met.<sup>13, 21,</sup>

<sup>22</sup> For example, pickles could be counted as vegetables, and buns were fortified to meet standards.<sup>9</sup>

Vending machines were also allowed in many cafeterias, which allowed schools to make money. What

these changes really provided students were choices. Students could choose to have fries and a soda and nothing else for lunch. Or they could choose other products that contained high fat, little fiber, and high sugar.<sup>1</sup> In 1977, United States Senator George McGovern formed a committee on “Nutrition and Human Needs,” which issued a report urging Americans to reduce fats in their diets and to increase their intake of complex carbohydrates. American food manufacturers did cut down fat in foods, but they increased sugar and simple carbohydrates.<sup>9</sup> Concurrently, TV commercials and magazine ads geared toward young people focused on sugary cereals, candy bars, and sodas.<sup>9</sup> Many of these items were readily found in schools, thanks to the vending machines that had been making their way into schools nationwide.<sup>1</sup> These factors, combined with a reduction in physical education programs throughout the 1980’s and 1990’s in many schools, contributed to students’ weight beginning to rise.<sup>25</sup>

Physical education programs in schools had been required as part of students’ academic course work until roughly the 1980s when those programs began to decline.<sup>9, 15</sup> (it is still required in many areas but not all) The sharpest decline in P.E. participation came between 1991 and 1995 according to a youth study performed by the CDC.<sup>15, 26</sup> School “Gym” programs shaped youth into model Americans during times of war. This was especially true during the cold war. Harvard University historian Chin Jou, PhD, stated, “In 1956, President Dwight D. Eisenhower created the President’s Council on Youth Fitness and Sports, an idea endorsed by his famously active successor, John F. Kennedy.<sup>9</sup> The effort to have students run, long-jump, and perform pull-ups and other calisthenics continued through the 1970’s. The idea was to make sure kids were vigorous and healthy, it was a symbol of American democracy wrapped up in how the population looked.”<sup>9</sup> As the education system evolved, students became more free to choose their own classes. Once the required P.E. credits were met, they no longer had to take P.E. if they chose not to.<sup>4, 15</sup> Children’s sedentary lifestyles, in some ways, could not be helped. Suburban sprawl made walking or biking to school impossible for many children. Instead, they were driven to school. Bus stops were made more frequent so suburbanites didn’t have to walk too far to reach one.<sup>9</sup> In inner cities, children were forced to ride busses to school because of poor neighborhood situations.<sup>5</sup> Other factors could be helped, but the dangers were not noticed quickly enough. As video games became more

sophisticated and affordable, and television gained more channels, children sat more.<sup>36</sup> Some sat by choice; others sat as parents used technology as a babysitter. The average American child spends more than two hours per day watching television or playing video games.<sup>36</sup>

In addition to physical education programs and activity in general declining, health promotion education evolved. Health promotion changed from promoting fitness and nutrition and slowly shifted to prevention.<sup>7</sup> Drug and alcohol prevention geared toward kids became the new health promotion program in the form of programs like D.A.R.E.<sup>6</sup> Those programs addressed extremely necessary problems but fell short of educating children about how to be healthy or about the dangers of obesity.

### Recognizing a Problem

At first the obesity epidemic went widely unnoticed or was dismissed. However, by the year 2000, public health professionals agreed that obesity was a serious threat to today's youth, it was appropriately documented in the journal *Pediatrics* of November, 2002, in an article titled "Childhood Obesity: A New Pandemic of the New Millennium." Also at this time, then Surgeon General Richard Carmona testified before congress that childhood obesity had become a "crisis" and an "epidemic".<sup>9</sup>

### Current Problems

#### School Meal Pros and Cons

One of the biggest problems facing today's youth is nutrition. Children with poor nutrition do more poorly in the classroom.<sup>6</sup> Children with key nutrient deficiencies in iron and zinc suffer more.<sup>6</sup> Those deficiencies were thought to be signs of child hunger in the past, one reason the National School Lunch Program was crafted the way it was, to protect children from hunger.<sup>8,22</sup> In 1933, Labor Secretary Frances Perkins reported that twenty percent of children were "showing signs of poor nutrition." Protecting children from hunger was a major priority for state and federal governments; the National School Lunch Program (NSLP) was created in 1946.<sup>9</sup> The chief purpose was to provide children with enough nutrients and to add higher levels of fat to increase calorie content.<sup>9</sup> Each lunch in 1946 had to contain a serving of butter, whole milk, and a dessert.<sup>9</sup> This reference to the historical roots of the NSLP

is to give a clear understanding of why it is difficult to change NSLP standards and regulations.

Justifiable fear of past hunger has created a culture of strong caution in NSLP administrators. Protecting children from malnutrition is still the primary purpose of the NSLP, but most children with iron deficiencies are not suffering from hunger, they are suffering from poor diet.<sup>21,22</sup>

The NSLP set standards to provide meals that are generally well balanced and nutritious.<sup>22</sup> NSLP also includes the alternative meal lines and ala carte lines.<sup>21</sup> Those lines contain foods similar to fast foods and competitive foods (*commercial foods sold inside the school*), which are not nutrient dense.<sup>11</sup> Competitive foods sold in schools, such as chips, candy, and ice-cream are high in carbohydrate, fat, saturated fat, sugar and additives.<sup>11</sup> These products make a child feel full, but are not providing the real, complete nutrition discussed above.<sup>1, 11, 33</sup> In addition to eating competitive foods at school, children snack on them at home between meals, while watching television, doing homework, or playing video games.<sup>36</sup> Occasionally, these foods can be enjoyed safely, but when added to a child's daily diet, at school and at home, calorie surplus happens rapidly.<sup>33</sup> The USDA reported that a significant portion of the school age population demonstrated deficiencies in Vitamin D, Vitamin B12, Vitamin A, Iodine, Iron, Calcium, and Fiber but over consumed calories, meaning that children were eating foods that were calorie dense but not nutrient dense.<sup>41</sup>

#### Differences in Student Performance

The consequences of poor diet in children with relation to their academic performance can be severe.<sup>31</sup> Not every school is able to do enough to ensure students get adequate nutrition from their meals.<sup>27</sup> The reasons for schools not offering adequate nutrition are varied, but no matter the reasons, the consequences are the same.<sup>13</sup> Poor nutrition does lower academics, and there is a strong correlation between how poor a child's diet is, and how poorly his or her academic performance becomes.<sup>25, 37</sup>

This is easily seen in children who eat fast food.<sup>27, 35</sup> Fifty-two percent of students reported eating fast food one to three times per week.<sup>35</sup> Ten percent of those report eating fast food four to six times per week, and still another ten percent of that report eating fast food daily.<sup>35</sup> Two percent of those children report eating fast food for every meal.<sup>35</sup> Test scores consistently declined in correlation with the amount

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of fast food that children eat.<sup>35</sup> Students that reported eating fast food one to three times per week scored 18.25 points lower than their peers.<sup>35</sup> Students who reported eating fast food once or more daily had their test scores decline by an average of 33.88 points lower than their peers.<sup>35</sup>

### Fat Impacts Critical Thinking

The reasons that fast food and foods like fast food cause poor performance are physiological. These foods are low in fiber, vitamins, and minerals, but high in simple sugar, carbohydrate, and fat.<sup>35</sup> This can lead to fluctuating blood sugar levels which are shown to affect students' ability to remain focused in the classroom.<sup>25, 26</sup> High fat and saturated fat decreases DHA as well as plasticity of the brain, effectively reducing the brain's ability to think and learn.<sup>30</sup> High saturated fat has also been linked to increased anxiety and depression which reduce a student's time in the classroom.<sup>30</sup> Fast foods are low in essential minerals such as iron and zinc, most "kid's meals" have only eight percent of the daily recommended value (DRI) of iron for a child.<sup>35</sup> Iron deficiencies negatively impact academics, with anemic children scoring below average on standardized math scores specifically.<sup>31, 35</sup> Unfortunately the youth of America, do eat fast food regularly and other calorie dense foods regularly also.<sup>27</sup> By incorporating foods that are pre-packaged and high in fat and additives, Americans are replacing fast food for another form of fast food.<sup>27, 23</sup>

### The Current State of Physical Education

Most children are not getting the recommended amount of exercise.<sup>36, 38</sup> Exercise can be vigorous play for smaller children or structured sports and exercise programs for older children.<sup>38</sup> Smaller children need to play sixty minutes per day, and older children should be active at least 150 minutes per week according to the American College of Sports Medicine (ACSM). That just isn't happening in every school, children are not being offered the opportunity to be active. Currently, forty eight percent of American high schools do not offer physical education programs.<sup>15</sup> Many schools are not able to fund programs not required under the No Child Left Behind Act. The average P.E. budget for an American high school is \$764 per year, according to PHIT America (*per school, not per student*). There is also a national teacher shortage in all subjects and P.E. programs are short as well.<sup>3</sup> That same shortage has also

shown to severely impact younger students.<sup>3</sup> Schools are not able to hire qualified staff to watch students while they play at recess.<sup>3, 34</sup> The solution to schools' hiring problem and teacher shortage has been to simply cut out recess altogether. It is more prevalent in socioeconomically depressed areas where districts and schools do not have funds to support their students in the same way as more affluent areas.<sup>34</sup> By evenly distributing funds throughout a state and not relying on an area's property taxes to support local schools, education could be made more equal in poor areas. Teachers would also be more likely to take jobs in those areas.<sup>34</sup>

Overweight and obese children who do have the opportunity to enroll in physical education often do not. When they do, they are often discriminated against in group activities based on their appearance. Because of harsh physical punishments and taunting, obese children withdraw from their peers during gym activities, fearing further embarrassing situations they choose not to participate.<sup>32</sup>

#### A Problem with Depression

An overweight or obese child may have similar academics to a slim child, the reason is that both students eat a high fat diet.<sup>30</sup> As noted earlier, nutrition can reduce brain plasticity and impair function leading to poor test scores.<sup>30</sup> However, teachers and peers may perceive that the obese child more unmotivated, and that is why his or her grades are not as good as those of his or her peers.<sup>32</sup> That line of thinking is false. Youth with healthy body weights but high levels of interstitial fat have equally low grades; but are not as likely to be judged as lazy.<sup>30, 32</sup> Unfair judgments may cause a student to withdraw which can be further construed as a lack of motivation. All of these negative elements can damage a child mentally and emotionally leading to depression.<sup>32</sup>

Depression is a major concern for overweight and obese youth of any age but especially for adolescents.<sup>32, 14</sup> It is common for obese and overweight youth to show signs of depression early and to become progressively more withdrawn as they age.<sup>32, 14</sup> Many of them suffer from chronic health problems that keep them out of the classroom. They are prone to orthopedic issues which cause them pain as well as immobility that deepens depression.<sup>25, 14</sup> Their immune systems are weakened so they have more colds and flues, as well as other conditions such as uncontrolled diabetes, respiratory problems, and



heart issues that cause them to lose time in school.<sup>14</sup> Because of health problems, depressive behavior, body image concerns, and social withdrawal, obese and overweight children are also less likely to enroll in P.E. courses.<sup>32</sup> By staying sedentary and not trying to be active for ACSM recommended amounts of time, it further complicates all of the health problems that already affect them.

Social withdrawal and depression lead to unintended consequences for teens. Teens skip class to avoid peers and teachers which lowers grades and impacts graduation.<sup>14</sup> Many overweight or obese students never do finish school, they simply drop out.<sup>14</sup> Obese and overweight students have a higher rate of high school dropout than their peers because of depression, social anxiety, and social withdrawal.<sup>14, 32</sup> To address rising dropout rates and score discrepancies, schools needed professional help. In many areas, health promotion professionals were hired to identify a need and create plans to address that need.<sup>28, 42, 8</sup>

### The Role of Health Promotion

To initiate change in a population, health promotion workers get involved in the planning, implementation, and review process when creating an actual plan for change.<sup>8</sup> Health promotion professionals are able to act as a bridge between a student's home and the school.<sup>8</sup> Because many work for local governments and health departments they can create and promote plans that start and end at home but still incorporate a student's school and other activities.<sup>8, 28</sup>

Health promotion workers start by managing the planning process. Planners engage stakeholders and administrators, plan the use of resources, and set a timeline. A needs assessment is done, it may seem obvious that students are gaining weight, but a needs assessment can pinpoint what the concern is, how severe it is, and the demographic most affected.<sup>8, 28</sup> Once that information is collected and analyzed, health promotion experts make plans to address the concerns found in the needs assessment. After forming plans, health promotion workers set attainable objectives using the resources available that contribute to the program goals and objectives.<sup>8, 28</sup> Next, workers gather planned indicators or variables that can be used to measure whether the program goals or objectives have been met and to what extent. Once those steps are complete, the planners review the plan to clarify objectives, guarantee contributions, secure needed resources, identify gaps, and ensure consistency.<sup>8, 28</sup>

This approach was used to create prevention and reactive strategies that have shown positive results in areas of Massachusetts and California.<sup>24</sup> In these states, needs assessments address all elements of a student's health and have been implemented on small groups of students.<sup>24, 18</sup> These have been expanded as more resources have been secured and more personnel have been trained. Starting with modern health promotion programs to address childhood obesity, schools have seen a positive response in their students.<sup>24, 18</sup>

Massachusetts specifically, has used a statistical needs assessment approach to determine what can be done to change their students' knowledge and activity levels.<sup>19, 28</sup> The results of the assessment showed that students did not know how to be healthy.<sup>19, 28</sup> In 2012, Massachusetts collected behavior, BMI, education, and activity data on students from K - 12.<sup>19</sup> The study collected the following alarming data: Twenty-five percent of students were overweight or obese.<sup>19</sup> Eighty-six percent ate fewer than five servings of fruits and vegetables per day.<sup>19</sup> Eighteen percent reported drinking at least one can or glass of soda per day.<sup>18, 19, 20</sup> Sixty-three percent skipped breakfast on some days.<sup>19</sup> Fifty-seven percent of high school students and Sixty percent of middle school students did not meet the recommended sixty minutes of physical activity on even five days per week.<sup>19</sup> Sixty-nine percent of high school students and Sixty-three percent of middle school students did not walk or bike to school.<sup>19</sup> Twenty-eight percent of school age children watched three or more hours of television on an average school day.<sup>19, 28</sup> (*The CDC recommends no more than two hours of non-school media time per day.*<sup>20</sup>)

In addition to this information collected about students, the Massachusetts study showed that sixteen percent of schools did not require any health education courses.<sup>19, 28</sup> Twenty-six percent did not have a written curriculum for health education, and forty-one percent did not have plans for how to assess student performance.<sup>19, 28</sup> Twenty-three percent did not have a lead health education teacher with a Massachusetts teaching certification to teach health education.<sup>19</sup> And forty-two percent did not have a health education curriculum that covered all health skills in the National Health Education Standards.<sup>19, 20</sup>

In addition to poor health education, physical education and physical activity were equally poor. Eighteen percent of schools did not require physical education in every grade.<sup>19,28</sup> Thirty-three percent of schools allowed students to be exempted from physical education for participation in sports, other courses, or activities. Twenty-seven percent had not administered a physical fitness test to students in any grade in the past year.<sup>19,28</sup> Sixty-five percent did not have a policy prohibiting or discouraging the use of physical activity as punishment.<sup>24, 28</sup>

Based on the findings, state health promotion workers came up with four simple “solutions.” Kids must be healthy to learn, but they must also learn to be healthy through

- High Quality Health and Physical Education
- Healthy Food Choices
- Strong Physical Activity Programs
- Safe Routes to School

The solutions seem simple but it was a long planning and implementation process before the school system saw results. The physical education program overhaul was beneficial in two ways: First, grades went up even before students lost weight. Second, students lost weight.<sup>18, 19, 24, 28</sup>

### Modern Solutions

#### A Better Way to Eat

Reforming school lunch is a long and slow process. As mentioned previously, the NSLP is a safeguard against child hunger, so making sweeping changes on a national scale is not realistic.<sup>13, 22</sup> Working with dieticians the NSLP has been able to make small changes to help meet the recommended DRI values for essential nutrients to all children who utilize the program.<sup>13, 21</sup> Students must now choose a vegetable, fruit, entrée, and milk with each lunch in elementary schools. In middle schools and high schools the students must be given a choice to have these foods, they are not, however, required to put them on their tray.<sup>21</sup> But allowing states, districts, and individual schools to modify their own programs has shown to be very effective in combating poor diet in schools. Some areas of America are finding

ways to combat poor nutrition by taking steps into the past. For example, a target group of high schools in Connecticut were only given the option of their main line.<sup>17</sup> It was shown that weight fell in students by up to 4.1 percent simply by removing all vending machines and ala carte lines from the school.<sup>17</sup> Other school systems have modified their vending machines to serve healthy options.<sup>1</sup>

More schools are also “cooking” again, not just heating prepackaged food.<sup>21, 22</sup> This approach to meal reform serves several different purposes. The meals are healthier; they contain lower saturated fat, sodium, and preservatives but; they also contain higher values of dietary fiber, calcium, iron, vitamin C, vitamin A, and vitamin E.<sup>21, 22</sup> The meals typically cost a school less money than the pre-packaged meals that are shipped to them, this is especially true if the school is a long way from the shipping warehouse. Schools that buy their supplies for meals locally also stimulate their local economies.<sup>21, 22, 27</sup>

Massachusetts has begun a still different approach, property taxes were are collected and dispersed as evenly as possible throughout districts with the goal of creating uniform meal programs for each school. This has shown to give poor schools a boost in their ability to purchase healthy foods for students, which in turn has contributed to lower behavior problems and higher academic performance in schools that had traditionally lagged behind their more affluent peers.<sup>18</sup>

### A Better Approach to Exercise

According to Physical Health Investment Today America (PHIT), describes the current epidemic interventions on its website as, “a cause and campaign dedicated to increasing physical activity and fitness to improve the health of America,” Eighty percent of American children are at risk of disease, but they remain inactive. Children must learn how to be active safely. In states such as Massachusetts, Virginia, and California that have started the process of overhauling their physical education, teachers focus on education.<sup>15, 28</sup> They no longer simply tell students to run laps and do pushups and play ball. Instead, more modern methods involve showing students how to perform cardio exercise, what the recommended time of cardio exercise is (*150 minutes per week*), and how to properly lift weights or perform strength enhancing exercises.<sup>4</sup> They also instruct children in the basic skills to play various sports, and explain the benefits of physical exercise and participation in sports.<sup>4</sup> P.E. teachers also inform

students why they need to perform exercises or participate in physical sports.<sup>4</sup> Students are being taught that cardio exercise strengthens the heart, prevents cardiovascular disease, lowers the risk of heart attack, reduce hypertension, and decreases the risk of stroke and type two diabetes.<sup>4,8</sup> These health problems are usually found in adults, but in recent years have been affecting children in larger numbers. In addition to health benefits, P.E. and exercise increase development of motor skills and coordination.<sup>4</sup>

Another reason for the recent push to increase student activity is that research shows that when students are active, they strengthen and stimulate their brains.<sup>12</sup> Safely increasing a child's physical activity level directly results in better grades.<sup>12,25</sup> One theory behind this has its roots in anthropology. Hunting and gathering are what shaped humans in their adolescent years, when the brain was developing and fairly plastic.<sup>12</sup> Both hunting and gathering required a great deal of physical activity, far more than 150 minutes per week, and the process of performing both required the brain to take in and process massive amounts of sensory data to achieve the desired goal.<sup>12</sup> It is thought that this activity paved new neural networks and promoted overall neural growth in young brains, leading to more advanced critical thinking and problem solving.<sup>12</sup> Modern physical exercise, specifically outdoor exercise such as running, hiking, and sports, are thought to mimic the sensory input of the hunting and gathering of ancient peoples, and so may still create new networks and pathways in adolescent brains.<sup>12</sup> It can, therefore, be argued that participation in sports that do not cause harm to a child's brain (*concussions and CTE*) can actually make a child smarter and a better student.

Other benefits that can help a student in the classroom have also been shown when students get the recommended amount of exercise of sixty minutes of play for small children and 150 or more minutes per week for adolescents and teens.<sup>25,26</sup> They show fewer signs of stress and reduced tension, and they report less anxiety.<sup>25,31</sup> Physical education and exercise can improve self-confidence and self-esteem in students. Confident students demonstrate higher test scores than non-confident students. Students who do engage in the recommended amount of activity do not suffer from depression at the same rate as less active or sedentary children. Even if a child does not have their ideal weight, they still have lower rates of depression if they are physically active.<sup>32</sup>

### Educate For The Future

Health promotion in schools is slowly evolving to focus on creating better education and awareness programs.<sup>8</sup> Health promotion professionals recognize that simply raising health awareness is useless if students do not have knowledge of how to be healthy.<sup>8, 16</sup> Health promoters are currently working with education professionals to craft nutrition education, health education, and physical education in areas that had previously stripped schools of those programs.<sup>8, 16, 26</sup> They are also serving as liaisons to the community and fund raising strategists for schools as part of their efforts to implement new programs.<sup>8</sup> This is especially common in rural and poor areas, where the school may need to build relationships with businesses or apply for non-federal funds to buy current text books, teaching supplies, and even hire qualified teachers.<sup>5</sup>

### Conclusion

In conclusion, it is a perfect storm of factors that is leading American children toward obesity and declining academics. It does seem that academic decline starts with poor nutrition and further declines as the student gains weight. But simply being overweight or obese is not the only reason for a student's academic fall, for an obese student may well be poorly nourished with the attendant brain problems explained in this paper. And as for the growing obesity epidemic itself, it is another perfect storm of factors that students may have little to no control over. For example: a student may not get to choose if he/she walks or rides to school, or if their school has proper health, nutrition, and physical education programs. Students do not choose if their district or state has the money to hire and train teachers, and students are likely not doing the grocery shopping for the family. Things like lunch may not even be in a student's control. If students do not receive education on health and nutrition, it is not entirely their fault if they make poor lunch choices. They may simply not have the knowledge to be healthy and active, which makes them vulnerable to obesity, sickness, and possible academic struggles. There do seem to be positive signs, listed in this paper were examples of success. BMI was reduced in areas, and modern education can influence students away from the classroom. It is imperative that education become the

“norm”, it cannot only be in limited focus or control groups or in affluent areas. The lack of education about their own bodies may be one of the most damaging things society can do to a child. Indeed, it can be said that ignorance is the cause of our students’ physical and mental decline, and if society can enrich and strengthen the body, the mind will follow.

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