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# Childhood Obesity in the United States: A Public Health Analysis

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Childhood Obesity in the United States: A Public Health Analysis

An Honors College Project Thesis

Presented to

The Department of Biology

Abilene Christian University

In Partial Fulfillment

of the Requirements for

Honors Scholar

By

Tina Ann Johnson

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This Project Thesis, directed and approved by the candidate's committee,  
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in partial fulfillment of the requirements for the distinction

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ABSTRACT

Over the past 30 years, childhood obesity has increased significantly in the United States, with a prevalence three times as high as it was in the 1970s. How do we explain this rise? What are the implications for American society? What changes can we make to reverse the epidemic? This literature review seeks to answer these questions— to explore the multifaceted nature of childhood obesity through the lens of public health. Issues discussed include designation, trends, history, risk factors, health effects and implications, and prevention strategies for combatting childhood obesity within the United States. Ultimately, this analysis synthesizes this information together to create a fuller understanding of the epidemic within both the public and academic communities.

## Childhood Obesity in the United States: A Public Health Analysis

Within the United States and developed nations, the obesity epidemic has become a significant public health concern. Over the past 50 years alone, obesity rates have doubled within the United States, topping off at nearly 35% in 2012 (“Key Findings” 7). This rise follows with increased rates of cardiovascular disease, diabetes, and certain types of cancers, which consequentially result in increased healthcare need and cost (Ward-Smith 242-3). While obesity occurs across all demographics, it particularly affects certain groups. Within the United States, Black, and Hispanic individuals, for instance, are more likely to be obese than their White or Asian counterparts. Moreover, those of low socioeconomic rank develop obesity at greater rates than affluent individuals (“Adult Obesity Facts”). The obesity epidemic, however, has especially impacted one demographic: children. American children currently experience some of the highest obesity rates in the world, with 33% of children overweight and 16% obese. This, in turn, affects physiological and psychological development, which can hinder childhood development on the whole. More significant, children tend to experience long reaching effects of obesity. Those who are obese in childhood drastically increase their odds of remaining obese in adulthood, affecting both quality of life and life expectancy (“Child Obesity”). Thus, given the public health burden, this analysis seeks to systemically review the causes and risk factors associated with childhood obesity and establish a basis for prevention strategies and policy implementation.

### Designation of Childhood and Obesity

Within the medical community, health professionals typically define “childhood” as the age range from 0-18 years old. For instance, most individuals typically visit a pediatrician for medical care until they reach the age of 18. That being said, this definition can present some challenges in epidemiological analysis and studies due to its broad range. Infants and toddlers, for example, differ substantially from their adolescent counterparts in both development and need. Thus, in studying childhood obesity, we must be aware our population is not homogenous and findings for one age group may not apply to another. Some researchers hone in on specific age groups to compensate for these difficulties, as noted later in this review.

How do health professionals diagnose obesity? One of the most standard metrics used today is Body Mass Index, or BMI. BMI is a formula that produces a weight to height ratio that can be used as an indicator of overweight and obesity. On this scale, individuals above 25 are overweight while those above 30 are obese. However, using this scale, health professionals define childhood obesity slightly differently. Instead of using a standard BMI cutoff—as with 30 in adults—health professionals compare children to their peers using reference values, which account for variability due to sex and age. Thus, any child with a BMI at or above the 95<sup>th</sup> percentile of their respective reference values is considered obese. Moreover, any child greater than 120<sup>th</sup> percent of the 95<sup>th</sup> percentile is considered severely obese (Mahmood 7; Trust for America’s Health 16). While BMI is not a perfect metric—it does not take body fat composition or muscle mass into consideration, for instance—it provides a good assessment of the general population as a whole. Thus, over time health officials can determine trends in childhood obesity rates within the American population.

### Trends in Childhood Obesity

Analyzing this BMI data and other health findings, several trends in childhood obesity have emerged over the past few decades. Without question, childhood obesity has risen markedly over the past 40 years. In 1976, the prevalence of childhood obesity was 5.5% for boys and 5.8% for girls. However, by 2008 these figures skyrocketed to 21.6% for boys and 17.7% for girls, four and three times their initial respective values. This translates to roughly a 4.5% and 3.8% annual increase in childhood obesity (Kogan and Singh 3). Most recent findings from 2011-12 National Health and Nutrition Examination Survey (NHANES) reported a 16.9% prevalence of childhood obesity in the United States, a figure that has remained relatively constant over the past decade (“Prevalence of Childhood and Adult Obesity” 806-14).

While childhood obesity has risen across the entire United States, disparities within the epidemic also need to be explored. One of the most notable trends in childhood obesity is the difference that exists between races. According to most recent data, 14.3% of white children, 20.2% of black children, and 22.4% of Hispanic children are obese, a trend that is likely associated with a host of other socioeconomic factors (“Racial and Ethnic Disparities in Obesity”). One of these factors is level of income, where an even more dramatic relationship can be observed. A 2010 CDC data brief found that 21.9% of boys living 130% above the poverty line are obese compared to 11.9% of boys living 350% above the poverty line. Similar trends for childhood obesity were observed when factoring in the education level of the head of the household. As head of household education increased, childhood obesity levels decreased. In fact, boys living with heads of household with graduate education mirrored the obesity rates of those from high-

income families, with rates at 11.8%. This trend continued on the other end of the spectrum as well; 21.1% of boys living with heads of household with less than high school education are obese (“Obesity and Socioeconomic Status” 1-3). Geographically broad inequalities also exist in childhood obesity rates. For example, southern and southeastern regions of the United States have a much greater prevalence of childhood obesity when compared to children living in other regions. For instance, in the state of Mississippi, 21.9% of children are obese compared to 9.6% of children living in Oregon. While these disparities present a challenge to nationwide efforts to reduce obesity, they do demonstrate that lower childhood obesity prevalence is attainable within the United States (Kogan, Singh, and van Dyck 598-607)

While the above findings detail childhood obesity prevalence, it is also important to consider childhood obesity incidence, or the risk of developing childhood obesity. Researchers from the Rollins School of Public Health followed a representative group of children from 1998-2007, recording their height, weight, sex, race, and affluence multiple times throughout the course of the study. Following data analysis, they observed several key trends. First, they found the prevalence of obesity among all children increased from 12.4% to 20.8% throughout the entire nine years, which mirrors the national trends described above. As with adult obesity, they observed higher prevalence of obesity among Hispanic and Black children when compared to white children. Furthermore, the wealthiest 20% of children were both less likely to begin and end the study as obese. In fact, 25.8% of children in the lowest income bracket were obese by the study’s end (Cunningham, Kramer, and Narayan 403-406).

Second, the researchers observed key differences in the risk of developing obesity. Children who began the study as obese had a four times greater incidence in obesity when compared to those who began the study at a normal weight. Meaning development of childhood obesity predisposes one to remain obese at later ages. Likewise, they found even being overweight during early childhood significantly increases the risk of obesity development; only 7.9% of those who began the study at a normal weight developed obesity compared to the 31.8% who began the study as overweight. From these findings, the investigators suggest prevention efforts begin at earlier ages among overweight and obese individuals, especially given their high risk of obesity development and maintenance (Cunningham, Kramer, and Narayan 407-11).

From this data, what can be predicted about future trends in childhood obesity? Although childhood obesity rates remain high, current data demonstrates growth is slowing. For instance, the 2011-12 NHANES found the prevalence of childhood obesity had not significantly changed within the past decade, suggesting that perhaps childhood obesity has reached a plateau in the United States (“Prevalence of Childhood and Adult Obesity...” 806-14). However, some researchers are not as optimistic. A 2012 study in the *American Journal of Preventative Medicine* predicted that if children in the United States did not reduce their caloric expenditure by an average of 64 calories a day, the prevalence of childhood obesity would rise to 21% by 2020 (Wang, Orleans, and Gortmaker 437-444). Moreover, Finkelstein predicts that by 2030 42% of the American population will be obese, a 33% increase from today’s prevalence (563-70). While this study did not specifically address childhood obesity, it still indicates that, at some level,

the United States is predicted to remain an obesogenic environment for the population at large.

When interpreting the aforementioned data, it is important to note potential discrepancies and flaws in measurement strategies. The Population Reference Bureau notes that many studies primarily rely on self-reported data when tracking childhood obesity. This method is flawed by human error, as survey respondents (typically parents) tend to underestimate children's weight. These inaccuracies, in turn, skew BMI data, which significantly affects childhood obesity measurements. That being said, national data—such as the NHANES—tend to be more reliable because researchers measure height and weight rather than relying on self-reporting. However, state and local surveys do not often have such luxury, and may underestimate the true burden of the epidemic (Cortes).

### History of Childhood Obesity in the United States

In order to fully understand the current childhood obesity epidemic, we must also understand the events and culture that preceded it. In the 19<sup>th</sup> and early 20<sup>th</sup> centuries, childhood obesity was a rare condition that did not affect many American children; physicians were more concerned about underweight children, who had a much higher prevalence in the United States. In fact, the medical community and culture saw excess weight as a desirable trait among children, believing it provided immunological protection and the like. This attitude began to shift early in the 20<sup>th</sup> century, as height and weight measurements became a standardized practice among pediatricians. (Dawes 21-23). By the 1920s, some physicians began viewing childhood obesity as medical

condition akin to malnutrition. Moreover, the advent of germ theory and vaccinations significantly lowered mortality rates among children, prompting pediatricians to shift their concern to other conditions such as excess weight. Thus, physicians could now “diagnose” childhood obesity, normally defined as a weight 20% above the average measurements or greater (41-43; 46-7). That being said, many physicians in this time were more concerned about the social effects of obesity—ostracism from peers—than the physical ones, which had yet to be fully established in children (59). Although we have no national data on the prevalence of childhood obesity prior to the 1960s, local data from the Fels Longitudinal study suggests low prevalence in the 1930s, 40s, and 50s (von Hippel and Nahhas 2153-2155). Thus, childhood obesity largely remained a tangential issue within American society.

Despite significant reduction in malnutrition throughout developed nations, the issue still remained a concern among leaders and policymakers. The United Nations, shortly after its founding in 1945, established the Food and Agriculture Organization to combat hunger and malnutrition. To do so, they promoted the production of cheap, calorically dense foods, “primarily edible fats and sugars” (“About FAO”; Callabero 1). Within the United States itself, concern for malnutrition prompted the establishment of a national school lunch program in 1946, providing children with calorie dense foods such as “a serving of butter...whole milk and...dessert” (Flam). In fact, there were not even set limits on the amount of calories, fat, sugar or salt provided within school lunches (Flam). While these efforts undoubtedly reduced malnutrition, they also helped paved the way for shifts in the American diet and ultimately over nutrition.

The first National Health Examination Survey (NHES) documents low prevalence of childhood obesity continued into the 1960s, occurring among 4-5% of American children (“Mean Body Weight” 2). This rate remained relatively the same throughout the 1970s. However, come the 1980s, adult and childhood obesity began to rise at a remarkable rate. Between 1980 and 1988, the prevalence of childhood obesity doubled, rising from about 5% to 10% of all children. This trend continued throughout the 1990s and into the present, where prevalence stands three times as high as it did in the 1970s (Anderson and Butcher 19; 21-22).

So, what prompted this dramatic change? Many attribute the considerable rise to shifting American culture. For instance, the availability of fast food and carbonated beverages increased greatly during this period. This rise followed with increased consumption among children, which may have been prompted by extensive advertising efforts and fewer home cooked meals. Decreases in physical activity are also worth considering. Vehicular transport replaced physical activities like walking and biking to school. Moreover, opportunities for physical activity within schools themselves—such as recess and physical education—also declined within this period (Anderson and Butcher 29-35). However, others believe misguided policies of the American government triggered many of these cultural shifts. In 1977, the McGovern Senate Committee recommended a reduction of fat in the American diet. This innocuous recommendation inadvertently created a stigma against all fat within the American mindset. The food industry began creating fat free products—chips, dressings, and desserts—that replaced fat with simple carbohydrates, like high fructose corn syrup. Americans reasoned, ‘eating fat will make me fat’ and began consuming more of these processed products (Flaye).

While both of these viewpoints fail to fully address the multifaceted epidemic, they do highlight some of the failures that have escalated childhood obesity in the United States.

### Risk Factors for Childhood Obesity

#### *Genetic*

Anecdotally, many believe that genes influence obesity. It is observed that some children eating a processed diet will easily put on excess weight, while others do not gain any at all. But to what extent do genes contribute to childhood obesity? Researchers can assess this by using twin and adoption studies, analyzing identical twins, fraternal twins, and adopted siblings that are raised in the same or in different home environments (Bouchard 1495). This enables investigators to quantify the genetic and environmental relationship to BMI levels. One of these studies showed identical twins had a .74 correlation with BMI compared to a .25 correlation for siblings (“Genes Are Not Destiny”). A systematic review of such studies in *Nature* concludes that genetics have a strong relationship with BMI from childhood well into adulthood. Environment, however, tends to affect BMI in early childhood, after which the relationship between the two decreases. Despite the strong genetic relationship, the authors note that childhood obesity is still associated with individual behavior, such as dietary and exercise habits (Silventoinen et al 32-33).

In addition to twin studies, genetic relationships can be measured in other ways. For instance, one can calculate a familial risk ratio for obese children, which will assess relatives’ prevalence of obesity compared to prevalence of obesity within the entire population. When assessing parents with BMIs in the 85<sup>th</sup> percentile, investigators found

their children were 1.5 times as likely to be obese. Furthermore, parents with BMIs in the 95<sup>th</sup> percentile were nearly 3 times as likely to have obese children. This suggests there is some level of heritability involved in childhood obesity, especially with more severe forms. Some investigators also turn to birth weight when analyzing this issue.

Interestingly, infants born at either end of the spectrum, those with low birth weights and high birth weights, tend to have higher BMIs as adults. (Bouchard. 1495-7). Other studies have consistently found a positive relationship between birth weight and development of childhood obesity. One study reported children born with birth weights above the 85<sup>th</sup> percentile were nearly twice as likely to develop severe obesity by age 5 (Persons, Sevdy, and Nichols 409-10).

Several genes directly have currently been related to obesity development.

Monogenic obesity occurs in children who develop mutations in single genes, genes that significantly affect metabolism, weight control, etc. Currently implicated genes include “the leptin (LEP), leptin receptor (LEPR), pro-opiomelanocortin (POMC), melanocortin 4receptor (MC4R), and prohormone convertase 1 (PCSK1) genes” (Bouchard 1497).

These genes all function to control elements of the body that influence our weight—such as appetite. However, these single gene mutations account for a relatively small percentage of childhood obesity. Polygenic obesity, obesity caused by multiple gene mutations, likely has more pertinence to the general population. Mutations in genes such as the “fat mass and obesity associated gene” (FTO) increase an individual’s likelihood of developing obesity. When paired with other genes, this effect intensifies. That being said, mutations in FTO have a much less direct effect than mutations in genes like LEP. While childhood obesity clearly has a genetic element, genetics alone do not account for

the high prevalence in the United States. Environment plays a significant role in the manifestation of obesity and particularly childhood obesity (“Genes Are Not Destiny”).

*Energy Imbalance: Diet and Physical Activity*

One of the more straightforward determinants of childhood obesity is energy imbalance. Meaning, if children consume more calories than they expend, then over time they will store the excess energy and gain weight. Obviously this varies from individual, likely due to genetics as described above, but the basic principle remains the same (Hill, Wyatt, and Peters 126). Diet and physical activity are the two main components of this “equation”; however, many argue about the extent to which each contributes to childhood obesity.

Among American children, evidence suggests that energy intake has increased in recent years. Data from the Continuing Survey of Food Intake by Individuals and the National Food Consumption Survey show children consumed 200 more calories on average from 1994-1996 compared to 1989-1991. Many believe fast food and sugary beverages contributed to this increased caloric intake. But does their consumption lead to weight gain? Some evidence indicates regular consumption of fast food is associated with weight gain in children, but we need more representative samples to confirm this relationship. However, multiple studies have consistently found a positive relationship between consumption of sugary beverages—particularly soda—and weight gain among youth. This is especially significant because these beverages make up 10-15% of children’s daily calories (Anderson and Bucher 26; Bleich, Ku, and Wang 3-4).

That being said, many researchers have found links between physical activity and childhood obesity. The American Heart Association (AHA) currently recommends

children engage in 60 minutes of moderate physical activity every day (“The AHA’s Recommendations”). However, as of 2013, only 29% of high school students met this requirement and only 48% attended a weekly physical education class (“Physical Activity Facts”). This decline in physical activity may contribute to the obesity epidemic. Multiple cross-sectional studies have found a negative correlation between physical activity levels and childhood obesity. These studies found that obese children on average participated in less physical activity than their non-obese counterparts (Prentice-Dunn 256-7). While physical activity has declined in recent years, sedentary activity—such as watching TV or surfing the web—has skyrocketed. Researchers have found positive correlations between childhood obesity and amount of time engaged in sedentary activity, especially among younger children (Must and Tybor 87-90). In fact, one study found that children who did not meet the recommendations for physical activity and sedentary activity were 3-4 times more likely to be overweight. Though presented here separately, these two factors likely work in combination to promote weight gain (Prentice-Dunn 268).

In the reality, however, this issue still remains unclear. Bleich et al. reviewed 26 studies assessing the impact of energy intake and energy expenditure among children. After analyzing the longitudinal and cross sectional studies, the researchers found no conclusive determinant for childhood obesity. Some studies found energy intake played a more significant role, while others found energy expenditure or both factors in combination caused childhood obesity (9-10). How can we account for these mixed results? Must notes that these variables are difficult to study in children and measurements like self-reporting create imprecise data (90-92). Despite these mixed

findings, most health experts agree both physical activity and diet play a significant role in the development of childhood obesity.

### *Surrounding Environment*

Today many children in the United States live in “obesogenic” environments. As its name implies, this term describes environments that promote the development of obesity. Children are especially susceptible to these environments because they have limited control over their surroundings, especially at earlier ages. Specifically, obesogenic environments function at a micro and macro scale. Microenvironments consist of an individual’s immediate surrounding, which include places such as the home, daycare, school, neighborhood, and food retailers. These microenvironments, particularly the home, play a large role in shaping a child’s perceptions of and relationship to healthful behaviors. Over the past 50 years, aspects of the microenvironment have shifted dramatically. For instance, today Americans rely on more processed foods rather than home cooked meals. Moreover, daycares and schools tend to provide unhealthy food choices to children, often choices loaded with sugar and saturated fat.

Macroenvironments, in contrast, function beyond the individual level and encompass systemic elements of the environment. This includes aspects such as governmental policy, media/marketing, societal attitudes, urbanization, and health care systems (Gauthier and Krajicek 203-4). As with the microenvironment, macroenvironments can dramatically shape children’s attitudes and choices concerning diet, physical activity, etc. The food industry spends roughly two billion dollars advertising its products to children—or more than five million dollars a day promoting poor food choices to children (“The Facts on Junk Food”). Urbanization has also contributed to childhood

obesity. Children living in urban settings, especially in disadvantaged areas, have less opportunity to participate in recreational activities—such as organized sports (Gauthier and Krajicek 205). While the macroenvironment has a more indirect influence on children, over time it makes a powerful impact.

### *Socioeconomic Level*

As previously discussed throughout this review, childhood obesity has a strong association with socioeconomic rank. A 2015 review found that low socioeconomic level increased a child's risk of being overweight by 10% and being obese by 41% (Wu et al. 5-6). There are likely several reasons for this observed trend, many of which relate to discussion of the surrounding environment. Take food price, for instance. Over the past 30 years, the price of processed foods—such as soda and fast foods—has fallen, while the price of fresh fruits and vegetables has risen. This trend tends to affect poor families disproportionately because they have less flexibility in their budgets compared to affluent families (Cawley 364). Education level also contributes to socioeconomic disparity in childhood obesity. Poor individuals typically have lower levels of education, and many are less aware of healthy foods and behaviors to introduce to their children (Frederick, Snellman, and Putnam 1338). Additionally, poor families likely experience greater levels of stress, anxiety, and depression, likely because of their additional economic and social constraints. These mental health concerns contribute to obesity by affecting individuals' hormones, metabolism, diet, and physical activity. Furthermore, poor families often cannot meet their healthcare needs because of limited access to insurance and providers. Thus, chronic health issues like childhood obesity are less likely to be recognized and addressed (“Why Low-Income and Food Insecure People”).

Today, millions of Americans reside in food deserts, areas where healthy foods are difficult to obtain. In America, poor families typically have less access to fresh, nutritious food. Instead, these families must rely on cheap, processed foods that provide immediate gratification and few nutrients. More specifically, urban residents of food deserts live more than one mile away from a grocery store and rural residents live more than 10 miles away (Thomsen et al. 1-2). While wealthy, suburban areas have the lowest percentage of residents living in food deserts, poor communities have the highest (Chinni). Poor communities are especially vulnerable to this issue because residents cannot easily commute outside of their own neighborhoods. Lack of transportation is the main root of this issue, but time contributes as well. Poor families do not have as much time to invest in trips to the grocery store, especially outside of their immediate vicinity. Rather than commuting to grocery stores, residents of food deserts obtain food through convenience stores, gas stations, and fast food restaurants. As expected, these retailers provide few healthy products, forcing residents to purchase calorically dense foods stripped of their nutrients. If there is a small grocery store in the area, it usually monopolizes the market and overcharges for healthful options. Research demonstrates those living in food deserts consume less fruits and vegetables and likely have a higher incidence of cardiovascular diseases, diabetes, and other chronic conditions. (Alviola, Nayga, and Thomsen 106-107). Thomsen et al. observed children living in food deserts had higher BMIs than children who did not, though they were not able to establish a causal relationship (2). Food deserts likely work in combination with the factors mentioned above—education, healthcare, etc.—to promote childhood obesity in poor communities, creating a disparity within the United States.

### The Health Effects and Implications of Childhood Obesity

Childhood obesity can significantly lower a child's quality of life, especially through the many associated health burdens. Within childhood itself, some obese children begin developing conditions like hypertension, dyslipidemia, low self-esteem, and type 2 diabetes, a disease medical professionals used to only observe in adults. These conditions usually extend beyond just childhood. For example, obese children are much more likely to maintain their obesity into adulthood, a trend that intensifies among obese adolescents. Moreover, more serious conditions can begin to develop in adulthood. In fact, obese adults who have a history of childhood obesity tend to experience more significant health concerns compared to individuals who became obese in later in life. Some of these more serious health concerns include chronic conditions such as cardiovascular disease, stroke, and certain forms of cancer.

Though many chronic health conditions manifest in adulthood, many obese children begin developing them early in life. Evidence suggests that male adolescents with higher BMIs begin developing atherosclerosis and fatty streaks in their arteries, both of which increase the risk of cardiovascular disease later in life. Researchers have also detected other risk factors for cardiovascular disease in obese children such as calcification of the coronary arteries and higher blood levels of C-reactive protein. Though most prevalent in adults, type 2 diabetes can also develop in children—especially in Hispanic, Black, and Native American children. This manifestation can lead to more serious conditions later in life because “diabetic complications are related to the duration of the disease” (“Obesity in Children” 285-288). Even if children do not develop type 2

diabetes, they can still become prediabetic, a condition that is associated with later development of diabetes and cardiovascular disease in adulthood. Nonalcoholic fatty liver disease, a condition wherein fat accumulates in the liver, occurs in nearly half of all obese children (288). Though most patients do not develop harmful symptoms or side effects, the disease can progress in certain individuals. Those with nonalcoholic steatohepatitis develop inflammation of the liver, which leads to cirrhosis, or scarring of the liver. Nonalcoholic cirrhosis can be especially harmful and can eventually lead to liver failure (“Nonalcoholic Fatty Liver Disease”). These medical conditions—and the countless others linked with childhood obesity—unnecessarily burden individuals, inflicting a great deal of pain and medical expense.

Collectively, childhood obesity and its associated conditions directly cost patients \$14.3 billion dollars every year in the United States. However, this figure only accounts for the “immediate costs [of childhood obesity]” and does not account for the “future direct costs given that overweight children and adolescents may become obese adults” (Hammond and Ross 287). Researchers estimate that the current population of obese children in the United States will incur \$45 billion dollars in direct medical costs from 2020 to 2050. Outside of direct medical costs, childhood obesity also creates indirect costs to society through early retirement, disability, premature mortality, etc. Recent estimates predict the current population of obese children will indirectly cost our economy \$208-\$256 billion dollars from 2020 to 2050 (288; 290-291). Clearly, childhood obesity harms the United States at both a societal and an individual level. These costs will only intensify if we do not take serious efforts to change our nation and ourselves.

## Prevention of Childhood Obesity

### *Individuals and Families*

As previously discussed, home environment plays a significant role in the development of childhood obesity. Adults tend to maintain the health behaviors they acquired as children (Gruber and Haldeman 2). Therefore, many prevention strategies have focused on modifying the home environment to instill healthful behaviors in families. In terms of food, parents largely control what their children eat, especially at a young age. This dynamic includes the contents of the meal, the portion size, and the frequency of feeding. For example, many parents do not provide their children with nutritious foods in their day-to-day diets. Up to one third of children consume no fruits and vegetables in any given day, and the potato—often in the form of French fries—is the most consumed vegetable. Moreover, when presented with bigger portion sizes, children typically consume more food—a practice that can promote obesity over time. Increasing the frequency of feeding or forcing children to eat when they are not hungry also causes overconsumption in the home. Outside of food, the home environment also largely controls the physical activity level of children. For instance, children can pick up harmful habits from their parents—such as watching television for long periods of time—that prevent them from getting enough daily exercise.

That being said, parents may have to overcome major obstacles in instilling healthful habits in their children. Presenting children with healthy foods, for example, does not guarantee consumption of the food. Children tend to reject new foods and tastes. Instead they naturally prefer sweet and salty foods, foods that are usually the least

nutritious and most calorically dense. Parents also need to be aware of how they present their children with healthful foods. If parents pressure children to eat certain foods and restrict others, children can grow to dislike the pressured (“healthy”) food and crave the restricted food. This can create lifelong barriers to healthful living, as the pressured foods tend to remain disliked into adulthood (Birch and Ventura 77-78). Additionally, a parent’s work schedule or neighborhood of residence can hamper inclusion of regular exercise in a child’s life.

Obviously there are some clear challenges to overcome in the home environment, but sustainable change is possible. Research demonstrates that prevention strategies aimed at families helps both adults and children, particularly, maintain healthful changes. In order to make these changes in the home, parents need to become educated about nutrition and healthy eating patterns—including matters such as calories, macronutrients, vitamins and minerals, portion sizes, etc. With this knowledge, parents will be able to interpret food labels, serve appropriate portions, and ultimately provide healthy options for their families (Golan and Weizman 102-104). Another positive change is for families to eat dinner together, which has been associated with increased consumption of nutritious foods in children (Gruber and Haldeman 3). Parents may also need to change their parenting style to support healthful living. As the leaders of their families, parents need to take responsibility for their children’s health. This includes setting guidelines for eating practices, enforcing rules, establishing good communication with their children, etc. That being said, it is important than the parent establish an authoritative relationship with their child rather than an authoritarian one, as to prevent resentment of healthful behaviors and practices. In the home environment, parents should provide a variety of

healthy foods for their children to choose from, rather than dictating what they should or should not consume. In this model, the parent promotes positive associations with these foods instead of negative ones. Moreover, parents should try not to control a child's eating outside of the home. Rather, they should empower their children to independently make these decisions, which will facilitate healthful behaviors in adulthood. There are also many ways for parents to promote physical activity within the home. For instance, instead of—or perhaps in addition to—watching television as a family, parents can take their children on walks to the park, go bike riding, or plan active family vacations (Golan and Weizman 105-106). The goal of these changes is to create a sustainable routine that involves the entire family, to “emphasiz[e] a healthy lifestyle rather than weight reduction” (106).

#### *Local Communities*

Prevention efforts have also been focused at the local level, as a child's surrounding environment has great impact on their health status. While homes are children's primary environments, they also spend a great part of their day at school. As such, the school provides a substantial amount of their daily calories—anywhere from 19-50 percent. This includes the breakfasts and lunches provided by the school as well as foods from vending machines, fundraisers, and other vendors within the school. This latter group “compete[s] with the nutritionally regulated school meal program” (Story, Nanny, and Schwartz 73). For instance, these vending machines and outside vendors often offer unhealthy options such as sugary beverages and highly processed snacks. Unfortunately, these foods are widely available in schools. As of 2007, a third of all elementary schools and nearly 90% of all high schools had stores and vending machines

where children could purchase foods and beverages outside of the school meal program. Moreover, the availability of these foods has been associated with higher intake of saturated fat and lower intake of fruits and vegetables (74-75). Currently, there is no federal mandate to include physical education within school curriculum—however; some states do have policies mandating such programs. That being said, many children do not meet their daily requirements for physical activity and on any given day do not engage in any physical activity at all (84-87).

To address these concerns, local governments have many options to promote healthy living in the school environment. With policy, officials can regulate which foods and beverages are sold in schools—for instance, only allowing the sale of items complying with the Dietary Guidelines for Americans. Alternatively, governments can encourage children to consume healthy foods and beverages by lowering their prices while simultaneously raising the prices of unhealthy options. Some have even gone so far as to limit or ban vending machines and outside vendors from the school environment all together. Schools can also partner with local farms, providing nutritious meals to children as well as supporting the local economy. To promote physical activity, schools and governments can implement daily physical education classes and minimum physical activity levels. Additionally, new schools should be built close to residential areas so that children have the opportunity to walk or bike to school (Khan et al.).

Outside of the school, communities can band together to combat broader obesogenic environments. For instance, governments can discourage the purchase of sugary beverages by implementing policies such as a soda tax, as evidenced in Berkeley, California in 2014. Conversely, communities can encourage consumption of produce by

facilitating purchase from farmer's markets and providing support and incentives to local farms. Officials can also work to change the infrastructure of their communities. To address food deserts, for instance, local governments can implement policies requiring a minimum number of supermarkets in underserved areas. Furthermore, officials can incentivize inclusion of healthy products within existing retailers, such as providing tax benefits, loans, grants, etc. Governments should also invest in bike lanes and paved sidewalks as well as safely designed crosswalks as to encourage physical activity in the community. These changes ultimately can create an environment that promotes healthful living within all sectors of the community.

### *Government and Society*

Currently, the United States has a macroenvironment that promotes childhood obesity on a wide scale. Broad reaching environmental factors, or macro-level factors, are the primary root of these systemic issues, as previously discussed. These include aspects of society such as marketing and advertising, cultural norms, federal policy, healthcare systems, etc. Unlike factors at the individual and communal level, these factors work more indirectly. However, they still have a significant impact on health behavior. In order to address these wide reaching effects, prevention efforts also need to be aimed at the national level.

Policies within the United States have significant impact within both the government and society. Agricultural policies, such as the Farm Bill, currently favor the production of certain crops, particularly grains, corn, and soybeans among others. Compared to other crops, these tend to offer less nutritional value—especially when they are processed into their fatty and sugary counterparts. Corn, for instance, can be easily

processed into both high fructose corn syrup and hydrogenated vegetable oils, both of which cause detrimental health effects. By lowering the cost of these crops, our government inadvertently furthered our obesity epidemic by facilitating the inclusion of sugars and fats in food products. From 1970 to 2000, added sugars and fats in foods rose by 20% and 38% respectively. And today they comprise approximately half of the calories in the American diet. Conversely, the United States does not subsidize nutritious fruits and vegetables that have been shown to have positive health effects. Thus, many fruits and vegetables have high costs, while their sugary and fatty counterparts remain inexpensive. To address these concerns, we can change our policies. For instance, our government can also partner with farmers themselves to combat obesity—by providing financial and occupational incentives for those producing healthful produce. We can also address affordability issues by making healthy produce more affordable and accessible for Supplemental Nutrition Assistance Program (SNAP) recipients (Story et al. 253-261). To create long-term change, the government can create an organization that routinely analyzes the impact of nutrition and agriculture policies within the United States—as with the Food Commission in the United Kingdom (Wallinga 408-410).

Outside of the political sphere, mass media and advertising have also contributed to childhood obesity. Food companies inundate children with advertising campaigns—particularly on television, where children watch as many as 21 food related ads a day (Story et al. 264). Unsurprisingly, the majority of these advertisements promote unhealthy products—such as fast food, candy, and sodas. Although an individual advertisement may have little effect on behavior, the Institute of Medicine (IOM) found that collectively food advertisements considerably impact childhood eating patterns and

preferences. To counter these effects, the United States can regulate food advertisements through the Federal Trade Commission (FTC), an organization that can regulate “unfair or deceptive” advertising. Such advertisements to children might qualify as “unfair or deceptive” because children do not have the mental capacity or agency “to understand the bias inherent in advertising” (Mello, Studdert, and Brennan 2601-2605). Thus, the FTC could place additional restrictions on food advertisements directed at children—such as limiting quantity, content, and time. Similar changes have already been enacted in other countries, such as the United Kingdom and Canada. That being said, enacting such changes could be difficult, as there would likely be major opposition from industry to these regulations (2605-2606).

To combat the prevalence of unhealthy products within the United States, the federal government can also use taxation. For instance, one idea that has gained traction in recent years is a tax on sugary beverages. These drinks—such as soda—contribute a substantial amount of calories to the American diet but little nutritional benefits. Not to mention, consumption of such beverages has been associated with both weight gain and negative health outcomes. The United States could implement an excise tax on sugary beverages, or a tax aimed at their manufacturers and distributors. These producers would then raise the price of the beverages, discouraging consumers’ purchase. Current estimates predict up to a 20% reduction in consumption of sugary beverages if implemented on a national level. Furthermore, the revenue generated from the tax could be used to “further obesity prevention efforts” (Novak and Brownell 2349). One such tax has already been implemented on a local level in Berkeley, California in 2014. However, as with additional advertising regulations, implementing this policy on a national level

would not be easy. Through the American Beverage Association, the soda industry has spent millions of dollars lobbying against such changes (2349). However, if more local and state governments enact similar policies, support could increase at the federal level. These aforementioned prevention strategies are only a sampling of the proposals to combat childhood obesity. In fact, there are limitless prevention strategies we can develop to create significant change within the United States.

### Conclusions and Future Directions

Although prevalence of childhood obesity remains high within the United States, many emphasize these rates have leveled off for the past ten or so years. While this plateau may reflect increased awareness, advocacy, and policy against childhood obesity, we still have a great deal to left to accomplish and change. America still has some of the highest rates of childhood obesity in the world, which signifies that our society has failed to truly address this issue. Ultimately, the future of our nation is at stake, as childhood obesity places a toll on the health of millions of Americans. In fact, Dr. David Ludwig estimates childhood obesity could potentially shorten the American life span by 2-5 years, an effect which he deems “equal to that of all cancers combined” (2325).

However, as a society, we don’t have to continue down this path. We can begin to take the public health our country seriously and actively choose to make healthy living a priority within all facets of the United States—regardless of race, income, or geographic location. As a nation, we must make a concerted effort at the individual, local, and national level. Broad public health changes have been successful in the past when we put aside our differences and target the heart of the issue—as evidenced through the war on

tobacco. If we make these serious efforts, we can be sure that childhood obesity will not be our future but will rather be our past.

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