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## Policy Approaches To Address Childhood Obesity

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Omoadoni Roseline Obielodan, Student

Dr. Richard Ingram, Committee Chair

Dr. Richard Ingram, Director of Graduate Studies

# **POLICY APPROACHES TO ADDRESS CHILDHOOD OBESITY**

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DISSERTATION

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A dissertation submitted in partial fulfillment of the  
requirements for the degree of Doctor of Public Health in the  
College of Public Health  
at the University of Kentucky

By

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Lexington, Kentucky

2022

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## ABSTRACT OF DISSERTATION

### **POLICY APPROACHES TO ADDRESS CHILDHOOD OBESITY**

**Background:** Childhood obesity continues to be a serious international public health concern. Unfortunately, there are limited treatment options for obesity. One notable intervention option is the University of Kentucky (UK) Pediatric high BMI clinic intervention for childhood obesity. The Clinic provides intervention for childhood obesity through healthy lifestyle habits. This intervention has been reported to be effective.

Even though there is evidence that public health policies that promote healthy behaviors would substantially reduce and prevent the alarming prevalence of childhood obesity, the state of Kentucky does not have well-established practical policies that promote healthy behaviors in children. Studies have shown that a strong tool to reverse childhood obesity may be policies that provide an environment that promotes improved dietary and physical activity behavior. The school environment would be ideal for implementing policies that promote healthy environmental defaults. Replicating the UK Pediatric high BMI clinic intervention for childhood obesity in the school environment through policy changes would address the childhood obesity epidemic in the state of Kentucky.

**Objectives:** This study sought to (1) identify factors that impede the implementation of healthy lifestyle recommendations to children with obesity attending the UK Pediatric high BMI clinic, (2) identify policy changes that could address these factors at the population level, and (3) make recommendations, based on our findings, to policymakers for policy formulation.

**Methods:** Our study design was a qualitative study design employing the grounded theory approach. Our target study population was the healthcare providers to children with obesity attending the UK Pediatric High BMI Clinic. They served as key informants through whose perspectives we got information about the children. We collected data from our key informants through structured in-depth one-on-one interviews, using an interview guide modeled after a validated questionnaire. The questions were based on the Socio-ecological model (SEM). The data analysis involved transcribing the interview sessions professionally, line-by-line coding of the transcripts, and identifying themes consistent with the SEM.

**Results:** We interviewed 15 key informants who all work in various clinics within UK Healthcare. The results are the providers' perceptions indicative of their actual patient encounters. Based on the SEM levels of influence, we identified barriers to healthy lifestyle habits and policy changes that would address these barriers at the population level. We labeled these barriers and policy changes as themes. The themes include intrapersonal barriers to physical activity (PA) and healthy diet (HD), interpersonal barriers to PA and HD, organizational barriers to PA and HD, community barriers to PA and HD, and public policy changes.

**Conclusion:** Our key informants perceived that the children with obesity that attend the UK pediatric high BMI clinic encounter personal, environmental, and social barriers that impede the implementation of the healthy lifestyle counseling that they receive from the clinic. These barriers could be addressed in the school setting through policy changes that would promote healthy lifestyle habits in the school environment. This strategy would provide a population-based intervention for the obesity epidemic that has plagued the state of Kentucky. Therefore, a school-focused intervention through a mandatory routine of daily physical activity and a healthy diet is a possible solution to childhood obesity in Kentucky.

**KEYWORDS:** Childhood obesity, Physical Activity, Healthy Diet, Academic Achievement, School children

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Omoadoni Roseline Obielodan

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November 29, 2022

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Date

# **POLICY APPROACHES TO ADDRESS CHILDHOOD OBESITY**

By

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November 29, 2022

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Date

## DEDICATION

To God almighty, who has been my help and strength through the years. In Him, I live  
and move and have my being.

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## CHAPTER 1. INTRODUCTION

### 1.1 Background

Childhood obesity continues to be a serious international public health concern. [1, 2] Public health agencies, healthcare clinicians, healthcare researchers, and the general public are alarmed by the rapid increase in the prevalence of childhood obesity. [3] The incidence of overweight children and adolescents has more than tripled since the 1970s. [4] Obesity rates remain on the increase all across the United States of America (USA) despite government measures to combat this obesity epidemic. [5]

About 1 in every 5 children in the USA struggle with obesity, and more than 1 in 3 adults grapple with obesity. [6, 7] Obesity affects 19.7% of children and adolescents ages 2 – 19 in the USA, 12.7% of children 2 – 5 years old, 20.7% of children 6 – 11 years old, and 22.2% of those are ages 12 – 19. [8] In sum, about 14.7 million children and adolescents in the US are affected by obesity. During the coronavirus disease 2019 (COVID-19) pandemic, there was an increase in the national rate of obesity among kids ages 2 -19 from 19.3% in 2019 to 22.4% in 2020. [9] In nine of the states, the youth obesity rate is significantly higher than the national rate of 19.7%. [8, 10] Sadly, Kentucky is one of these nine states. [10] Indeed, Kentucky is ranked number 1 in obesity prevalence for youth, ages 10-17 years out of the 50 states in the USA. [10] Obesity costs our nation approximately \$147 billion in annual healthcare expenditures. [11] The estimated cost of childhood obesity alone in direct health expenses is \$14 billion annually. [9] The burden of obesity and its resulting chronic diseases negatively affects a nation's economy, social life, and military readiness.

Even though obesity is preventable, it has been implicated as one of the leading causes of a drastic loss of life expectancy among Americans. [12, 13] The stigma associated with excessive weight may negatively influence one's psychological and physical health. Consequently, obesity results in a decreased quality of life. Kansra et al. referred to obesity as "a complex condition that interweaves biological, developmental, environmental, behavioral, and genetic factors" [14] Childhood obesity is associated with comorbidities, such as type 2 diabetes mellitus, hypertension, non-alcoholic fatty liver disease (NAFLD), dyslipidemia and obstructive sleep apnea. (OSA) [13, 15-17] Obese children also stand the risk of developing early puberty, menstrual irregularities as adolescent girls, and metabolic syndrome. [15, 18, 19]

With the on-going COVID-19 pandemic, children suffering from obesity are more likely to encounter a more serious COVID-19 trajectory. [20] There is evidence that the COVID-19 pandemic took a toll on children with obesity and impacted them with more adverse health outcomes compared to non-obese children when infected with the virus.[21] The report of Tripathi et al. suggests that children with obesity exposed to COVID-19 are predisposed to higher risk than the risks expected from obesity alone.[21] In addition to medical conditions, obese children are susceptible to psychological issues, such as "depression, anxiety, poor self-esteem, body image, peer relationships, and eating disorders" [22, 23]

The rising prevalence of childhood obesity has given rise to an increase in the burden of these diseases and this poses a significant public health challenge. [15, 24] Therefore, it has become a worldwide public health priority to control childhood obesity.



Obesity is costly to manage and hard to reverse. [25] Unfortunately, there are limited treatment options for obesity. [25]

## 1.2 Problem Statement

Even though there is evidence that public health policies that promote healthy behaviors would substantially reduce and prevent the alarming prevalence of childhood obesity, the state of Kentucky does not have well-established practical policies that promote healthy behaviors in children. [26] For example, Kentucky does not require elementary to high school students to participate in physical education. [27]

Unfortunately, Kentucky is one of the nine states whose youth obesity rate is significantly higher than the national rate of 19.7%. The youth obesity rate in Kentucky is 23.8%. [10] Indeed, Kentucky is ranked number 1 out of the 50 states in the USA in obesity prevalence for youth, ages 10-17 years. [10] About 40% of Kentucky's school-aged children are either overweight or obese. [28] Sadly, preventive measures against childhood obesity through policies that promote healthy behaviors in the school environment have not been established in the state of Kentucky. [27, 29]

## 1.3 The Role of Policy in Combating Childhood Obesity

There is evidence that comprehensive programs and policies are very effective in reducing childhood obesity. [30-34] Policies are often required to propel environmental and social changes that would lead to a sustainable reduction in obesity prevalence. [35, 36] Swinburn indicated that a willingness to use policy instruments to propel change is an early indication of success in obesity prevention. [36] Studies indicate that public health policies that promote healthy behaviors by changing the social and physical

environment would substantially reduce and prevent the alarming prevalence of childhood obesity. [26] Schmid et al submitted that public health goals related to physical activity require policy strategies that would change the physical and sociopolitical environment. [35] According to Flyer, policies can improve access to opportunities for physical activity, regulate the quantity and quality of physical activity, and provide funding to promote physical activity programs and campaigns. [37]

Furthermore, researchers have linked policies that apply to competitive food to a better school food environment, better dietary consumption among students, and better weight outcomes. [38] Competitive foods refer to foods that are not part of the US Department of Agriculture (USDA) school meals but are present in schools. [39] Examples of such foods are “foods and beverages sold in schools through vending machines, à la carte purchases in cafeteria lines, school stores, and snack bars.” [39] Studies have shown that school food policies lead to improved diet quality and reduced weight gain among children. [40]

Frieden et al asserted that policy interventions that make healthy dietary and physical activity choices easier are crucial in the war against childhood obesity because such policies have the potentials to yield the desired results. [41] Consequently, the World Health Organization (WHO) has recommended that preventive and treatment measures for obesity should be through “policies that make regular physical activity and healthier choices available, affordable, and easily accessible to everyone, particularly to the poorest individuals.” [29]

#### 1.4 Rationale for the Study

The Centers for Disease Control, (CDC), has suggested that one of the most effective strategies for making remarkable changes in the obesity epidemic is through policy change. [42] Research has suggested that policies serve as powerful agents of influencing an entire population by expanding on the individual effects. [43] Unlike individual clinical interventions which are labor-intensive, costly, and limited in reaching a broader population, policies benefit the entire population in the environment where the policy is being enforced. [35, 44] For example, the University of Kentucky (UK) Pediatric High Body Mass Index (BMI) clinic works with children and adolescents with obesity to help them develop healthy lifestyle habits that will prevent and treat obesity and its related medical complications. These kids are counseled to indulge in healthy diet, increased physical activity, and reduced screen time. This lifestyle modification intervention provided by the UK Pediatric high BMI clinic, has been reported to be effective. [45]

However, despite the reported effectiveness of this intervention, it has not made any meaningful impact on childhood obesity in the state of Kentucky, which is the larger population. This lack of meaningful impact on the broader population may be due to the nature of the approach: an individual clinical intervention. Individual clinical interventions are labor-intensive, costly, and limited in reaching a broader population. [44] Nonetheless, the experience of clinical interventions at the individual level can help inform policy changes intended to improve population health. [43, 46, 47] For example, the UK Pediatric high BMI clinic patients may face challenges that may impede the implementation of the healthy lifestyle recommendations they receive from the clinic.

Studies have suggested that there are individual, social and environmental factors that constitute barriers to implementing a healthy lifestyle. [46] Identifying these factors would be vital in informing policy changes for an effective population-based intervention to prevent and treat childhood obesity. [46] A better understanding of the factors that promote or impede the implementation of these healthy lifestyle recommendations at the individual level will help propose policies that promote this intervention at the population level. [47]

### 1.5 Research Question

The crucial question is “what policy changes would be effective in expanding the individual clinical approach to obesity treatment offered by the UK Pediatric high BMI clinic to benefit the entire Kentucky children population?” This will be the research question for this study.

### 1.6 Specific Aims of the Study

The specific aims of this study are:

1. To identify factors that impede the implementation of the healthy lifestyle recommendations to children with obesity attending the UK Pediatric high BMI clinic.
2. To identify policy changes that could address these factors at the population level.
3. To make recommendations, based on our findings, to policymakers for policy formulation.

## 1.7 Significance of the Study

Studies have identified healthy lifestyle changes such as modifications of dietary and exercise habits as the cornerstone of obesity treatment.[48] Studies have also shown that a strong tool which could be used to reverse the obesity epidemic would be policies that provide an environment which promotes improved dietary and physical activity behavior. [39] Increased physical activity and healthy dietary habits are two of the healthy lifestyle habits that the Pediatric High BMI clinic at UK Healthcare recommends to its patients. If, in our study, we can identify some of the factors that prevent the Pediatric High BMI clinic patients from implementing the recommendations by the clinic, the barriers might be mitigated if policymakers enact policies that provide an environment which promotes improved and consistent dietary and physical activity behavior. This might just be the beginning of a solution to the obesity epidemic that has plagued the state of Kentucky.

## 1.8 The Role of Policy in Population Health

Health policies have been used in past and recent history to address important public health issues.[37, 49] They have a significant impact on the health and well-being of a population. [37, 49] Policies serve as powerful agents of influencing an entire population by expanding on the individual effects. [43] They are cost-efficient strategies for achieving environmental change, which may incite individual behavioral change. [44]

Amy Eyler asserted that policies have the potential to impact a broad population and remain sustainable over time. [37] Examples of major public health impacts attributable to policies include changes in sanitation, fluoridation, drunk driving, and

tobacco use. [37, 50] Research reported reduced smoking rates among students in schools that have comprehensive smoking policies. [51, 52] Tobacco taxes have been increased to reduce smoking rates, smoking is prohibited in some public areas, and limitations have been placed on the promotion and advertisement of cigarettes. [44] Additional examples of the influence of policy on public health include zoning laws that impede the sales of alcohol near schools and churches and the law that places a bar on the age to purchase or drink alcohol. [44]

Policies also limit the sales of unhealthy items to vulnerable populations, e.g., children. A common example is seen in the law that sets a minimum legal age to purchase tobacco or alcohol. [40] Another example is seen in prohibiting the sale of sugar-sweetened beverages (SSBs) on any city property and all food establishments close to any children's hospital in Boston, Massachusetts, and the state of Ohio respectively. The ban on SSBs increased the sales of milk, juice, water, and coffee and a reduction in the sales of carbonated beverages. [40]

According to Vecchiarelli et al, policies are used to discourage people from unhealthy behaviors. [44] This is evident in the study of Cullen, et al., which suggested that state school nutrition policies have the potential to improve the nutritious quality of foods consumed at school lunches. [53] In addition, extensive studies have been done on school smoking policies and researchers have reported a decline in student smoking rates as a result of policies enacted. [44] Gorski and Roberto submitted that policies are more likely to help individuals line up their food choices with their desires to live healthy lives. [40] According to Schmid, policies are productive strategies used to reduce exposure to

unhealthy behaviors without placing the burden of the inner volition to change behavior on individuals. [35]

## CHAPTER 2. LITERATURE REVIEW

### 2.1 Introduction

The following review of the literature is a summary of vital concepts fundamental to understanding the health policy implications of the effect of healthy lifestyle modifications on children with obesity. The first part of the chapter provides an overview of the need to combat obesity through policy interventions that alter environmental default conditions. The second portion of the chapter gives a narrative of the influence of environmental defaults on obesity, using the school environment as a classical example.

Educators and policymakers are often concerned that spending more time on physical activity would impact academic achievements, (especially test scores), negatively. Thus, this chapter goes further to spell out the positive effect of physical activity and healthy nutrition on the academic performance of school children. In addition, we portray the negative impact of increased weight on academic achievement. Furthermore, we discuss the role of government in policy formulation against childhood obesity. The literature review goes on to reveal some of the past efforts made to intervene in the obesity epidemic and the challenges encountered with the interventions. The review presents some examples of policy interventions for childhood obesity. Finally, we present findings from microsimulation analysis and real-world interventions against obesity.



## 2.2 Background / Overview

Evidence is growing to support the use of policy interventions to address obesity. [54-56] Policies have been shown to provide some of the most effective ways of protecting and improving public health. [43, 55, 57] They serve as powerful tools for influencing an entire population by expanding on individual effects. [43] Very few studies have evaluated, from a policy perspective, the impact of modifying obesogenic environments on health outcomes. [58, 59] Obesogenic environments contribute to high obesity rates. [60] An obesogenic environment comprises physical, political, economic, and sociocultural factors that influence an individual's calorie intake, diet composition, and the intensity of physical activity at school, work, home, or during leisure time. [61] "Physical factors" refer to the available varieties of food outlets, opportunities for participation in physical activities, access to nutrition and exercise counseling experts, information, technological innovations, and training opportunities. [62] "Economic factors" refer to the cost of food and physical activity. [62] "Political factors" refer to the rules that govern food and physical activity in an environment. [62] These rules include policies, laws, and regulations, which greatly influence a community's choice of food and level of physical activity. "Sociocultural factors" refer to a community's attitudes, beliefs, and values towards food and physical activity. [62] In sum, obesity is influenced by a complex interplay of these physical, political, economic, and sociocultural factors in any environment regarding nutrition and physical activity. Indeed, the literature indicates a strong association between environmental factors and obesity. [62]

Policies hold the potential to generate environmental default conditions that make healthy choices easier and provide opportunities to attain healthy weights. [63] Policy

interventions to change environmental default conditions have been identified as the “swiftest and most cost-effective way to creating change” [64] Therefore, policy interventions that change environmental default conditions to environments that promote increased physical activity and healthy nutrition are invaluable tools in the fight against obesity. This is evident in studies that have demonstrated that the key to obesity prevention and control is behavior change to increase physical activity and improve nutrition. [41] However, it is difficult to change behavior. The present-day environment does not make unhealthy lifestyle behavior change any easier. Today’s environment is characterized by the abundance of energy-dense food, a sedentary lifestyle, and motorized transportation, [65] an environment that impedes a healthy lifestyle and promotes weight gain within the home, school, or workplace. [62, 66]. This environment has led to the current obesity epidemic that has besieged our nation and the world at large. Sassi finds that a reduction in childhood obesity rates could be achieved through government policies that would ameliorate negative environmental default conditions for the entire population. [67]

Researchers have suggested that an effective strategy to combat childhood obesity is through policies that will create environments and opportunities that promote eating healthy foods and engaging in physical activity. [68] They argue that such policies will lead to a long-term positive and significant impact of lifestyle modification intervention in the larger population. [68] Policymakers are now leaning towards policy interventions that seek to promote behavior change to increase physical activity and healthier nutrition. [69-72] Combating obesity would require policies that alter the present-day obesogenic environment through engagements that support increased physical activity and healthy food choices.

### 2.3 The Influence of Environmental Defaults on Obesity

There is evidence that the selection and consumption of food can be influenced by defaults in the food environment. [73] For example, the findings of Schwartz and her colleagues demonstrate that the school food environment influences children's food choices, while they are at school. [74] Furthermore, Novak and Brownell asserted that "the food environment creates a set of defaults that contribute to obesity in the US." [75] Therefore, researchers have suggested that policymakers intervene in the obesity crisis through policies that control the environmental defaults. [76] Studies have found that an entire population can be affected by environmental defaults such as food prices, food marketing, and the widespread availability of unhealthy foods. [75] Consequently, members of such communities would naturally default to unhealthy food choices.

Environments can be changed by policies at the federal, state, and local levels. [77, 78] Examples of such policies include transportation planning, nutrition standards, and federal food benefits, such as Supplemental Nutrition Assistance Program (SNAP). [79] Policies that create environmental default conditions that encourage healthy eating choices and physical activity for youth and adults would result in positive population-level health outcomes. [80] However, few policies have these qualities. Nutrition and physical activity policies are feasible to implement and have the potential to reduce obesity. [80]

The school environment could be an ideal setting for the implementation of childhood obesity intervention policies that promote healthy environmental defaults. [81] Most obesity intervention programs have used schools as avenues of implementation. [82, 83] For example, Schwartz and colleagues assessed the effect of changing snack options on their consumption among middle school students. [65] The intervention involved having

three middle schools follow the nutrition guidelines for all foods sold in the school environment for two years, while three comparison middle schools made no changes to foods sold in the school environment. The results of their study revealed that the students' consumption of low nutritional items was decreased in the schools where the default food items sold were those that met the nutrition guidelines. On the contrary, the consumption of foods that did not meet the nutrition guidelines was increased in schools where no change was made in food sold in the school environment. Their findings support those of Novak and Brownell, who stated that "the food environment creates a set of defaults that contribute to obesity in the US." [75] Policies that limit the kind of food served in school cafeterias to healthy choices could be effective in the war against childhood obesity. [75] Policies that ban certain ingredients (e.g., trans fats) from foods that appeal to children would yield positive outcomes in a school environment.

Some factors that make school settings appropriate for the implementation of childhood obesity intervention policies include: [84]

1. Elementary school education is required for all children in most countries. Children from various backgrounds will be present at school.
2. A significant part of the day is spent in school daily and some of these children consume one to two meals per day at school.
3. Physical education classes are offered in schools and school recess time is a good opportunity for physical activity.
4. Interventions can easily fit into the structured environments of schools.
5. Schools provide a large population for the implementation of interventions.

6. The intervention can be easily sustained because the teaching staff can facilitate and contribute to the delivery of the intervention significantly.

#### 2.4 The Role of Nutrition and Physical Activity in Improving Academic Achievements in School Children

In addition to being used as obesity control tools, researchers have linked increased physical activity and improved nutrition to higher academic performance. When access to healthy foods and physical activity is improved among students, the outcome would be a population of healthier students who are better learners. [85, 86] There is evidence that access to healthy foods and opportunities for continued physical activity has a positive impact on students' health and improves academic achievement. [87] Academic achievement refers to academic performance, education behavior, and students' cognitive skills and attitudes. [85] Academic performance is measured by class grades, standardized tests, and graduation rates. Education behavior is measured by attendance, dropout rates, and behavioral problems at school. Students' cognitive skills and attitudes are measured by concentration, memory, and mood. [88] It is noteworthy that researchers have demonstrated that a lifestyle of routine physical activity and proper nutrition would increase cognitive function. [89]

##### 2.4.1 Evidence of Physical Activity and Academic Achievement

Studies have found an association between academic performance and school-based physical activity. [90-94] Physical activity is known to positively affect brain function. [95] A study that exposed students to a 13-week exercise program revealed enhanced brain activity in the students. Consequently, there was an increase in working memory, flexible thinking, (executive function), and mathematics achievements.[96]

Studies have also found that physically active students have better standardized test scores, grades, school attendance, cognitive performance, and classroom behaviors. [97-99] Researchers reported that students' academic achievement is not negatively impacted when time spent on physical education in school is increased.[85, 93] Indeed, better cognitive function (e.g. enhanced concentration and memory) has been correlated to higher levels of physical activity. [93, 100, 101]

#### 2.4.2 Evidence of Dietary Behaviors and Academic Achievement

Studies have identified increased academic grades and standardized test scores, reduced absenteeism, and improved cognitive performance in students who participate in the School Breakfast Program (SBP) [86, 102, 103] Lack of sufficient consumption of fruits, vegetables, and dairy products is linked with lower grades among students. [104-106] Findings from research have associated decreased cognitive performance with skipping breakfast. [103, 107, 108] Researchers have associated adequate nutrition with normal mental function and academic achievement. [89]. Ickovics et al. identified a correlation between higher academic performance and good nutrition. [109] Observations from their study identified one of the predictors of academic achievement as “minimizing eating at fast-food restaurants.”[109] In addition, they demonstrated that “children who drink less soda and other sweetened drinks, are emotionally healthy, have quality sleep, feel safe in their neighborhoods, and are also significantly more likely to achieve set goals on standardized tests.” [109] Having limited screen time, and being at a healthy weight, were also mentioned as predictors of academic achievement.

### 2.4.3 Weight and Academic Achievement

Datar and Sturm reported a correlation between an increase in weight and a reduction in test scores. [110] Gable et al. reported a direct relationship between obesity and lower test scores in first to second-grade kids. [111] Researchers have associated reduced cognitive function with overweight school children. [112] Crosnoe and Muller reported an inverse relationship between academic achievement and overweight high school students. [113] Li et al reported a negative correlation between decreased mental function and youths that are overweight. [112] Studies have associated being overweight with poorer performance in school. [101, 112, 114, 115]

### 2.5 The Role of Government in Policy Formulation Against Childhood Obesity

As Lawrence and Swinburn state, “policy demonstrates government commitment to obesity prevention and provides a road map for planning, implementing, and evaluating interventions.” [116] Policy interventions could deter the continuous increase in the prevalence of obesity in the coming decades. [80] State governments especially have considerable influence over policies and regulations in the United States. State governments can exert substantial power over certain actions that affect public health through legislative and regulatory actions. [117] For example, over 230 pieces of legislation were introduced at the state level addressing school nutrition standards and vending machines between 2003 and 2005. Within the same period, over 190 pieces of legislation were introduced at the state level to address physical education and physical activity. [49]

Policies have been introduced at all levels of government to control the availability of non-nutritious foods. An example is seen in the Child Nutrition Promotion and School Lunch Protection Act of 2006 which forbids the sale of foods of minimal nutritional value in the cafeterias of school campuses. [118] The State of Connecticut takes the lead in promoting healthy food choices through its Healthy Food Certification program. This program gives monetary incentives to school districts that choose to execute the state nutrition standards for all foods sold to students outside of reimbursable school meals. [119]

In May 2010, the World Health Organization (WHO) called out to governments to embark on policies that would reduce the marketing of unhealthy food products to children and adolescents. [120] In support of this move by WHO, both the International Obesity Task Force (IOTF) and the American Heart Association (AHA) formulated powerful policy recommendations to address food and non-alcoholic beverage marketing to children and adolescents. [121] The recommendations from IOTF included the following:

- a. The adoption of an international code to market foods and non-alcoholic beverages.
- b. Food and drink products that are high in (saturated) fat, salt, or sugar (HFSS) should not be marketed to children.
- c. Food advertisement restrictions should include all advertisements between 6 am and 11 pm and should also apply to adults responsible for children.

In addition, the AHA came up with the following recommendations:



- a. The introduction of legislation that would limit the hawking of unhealthy foods and beverages.
- b. Prohibit the advertisement of foods that qualify as the risk of cardiovascular disease.
- c. Prohibit unlicensed individuals/companies from advertising foods, especially in school environments.
- d. Prohibit partnerships between toy and fast-food companies.

## 2.6 Past Obesity Intervention Efforts

Some policies that have been implemented to combat the obesity epidemic include: [69-72, 122]

- Expanded food labeling and menu disclosure requirements.
- Pricing and economic incentives such as ‘junk food’ taxes and physical activity tax credits.
- Bans on ingredients like trans fatty acids.
- Tighter regulation of foods in schools.
- Requirements for more physical activity for school children.
- Restrictions on food advertising directed at children.

## 2.7 Challenges with Past Obesity Intervention Efforts

A major challenge with many past obesity intervention efforts is that these interventions have been used separately rather than together. Therefore, the outcomes were not very impressive. [123]

Even with the increase in obesity rates among US children within the past 3 decades, there is a scarcity of effective public policies used to combat the obesity epidemic. [76] Unfortunately, identifying effective ways of reversing the increasing rates of obesity among youths remains largely ignored by policymakers, public health advocates, and even the medical industry. [76]

## 2.8 Examples of Policy Interventions for Childhood Obesity:

Policy interventions that have been proposed for childhood obesity include:

### 1. The menu-labeling law

In March 2010, the federal government adopted the Federal Menu Labeling law. This law “requires that the calorie content for each standard menu item or food be displayed.” [124] It applies to “chain restaurants and similar retail food establishments with 20 or more locations nationally, and vending machine owners or operators with 20 or more vending machines that dispense food or drinks.” [124] The menu-labeling law “provides consumers with the information they need to make healthy choices when eating away from home.” [124] However, studies have reported that menu calorie labeling policy alone may not be very effective in determining food choices, because its implementation is dependent on personal autonomy. [125] These studies noted that food choices made by children are also influenced by peer influence, parental modeling, taste, habit, and perception. [125] It is clear, as noted by Holston et al., that community-based obesity prevention programs are needed to supplement and go beyond individual strategies. [126]

## 2. Soft drink tax

Studies have shown that the consumption of an item is greatly dependent on its price. [127] Researchers have reported a reduction in soda consumption because of the tax levy. [128] Unfortunately, because the soda tax is a stand-alone intervention, the health benefits are not obvious. [129] In addition, countering arguments against taxes on sugary drinks may have contributed to the subdued health benefits of this strategy. [130] Opponents of taxes on sugar-sweetened beverages (SSBs) argue that “these taxes are not effective, are regressive (place a disproportionate burden on lower-income groups), negatively affect employment and economic growth, and violate international, regional, or national law.” [131] Even though these arguments have no evidential support, they have been used by opponents to disrupt and sabotage public and political support for a tax on SSBs.[131] For example, in 2018, the state of California passed a bill “banning new local taxes on sugary drinks until Jan. 1, 2031” [132] As of September 2019, laws prohibiting local governments from implementing taxes on SSBs had been passed in the states of Arizona, California, Michigan, and Washington. [133]

## 3. Interventions in Schools

The National School Lunch Program (NSLP) “provides nutritionally balanced, low-cost or free lunches to children each school day.” [134] This federally assisted meal program operates in public and nonprofit private schools and residential childcare institutions. The NSLP serves approximately 60% of students that are in school per day. [76] Although the NSLP was established to promote healthy food choices among its participants, the effect of the desired impact of the NSLP was sabotaged by some US school districts that partner with private beverage and food companies to sell unhealthy

food items in the cafeterias and vending machines. [76] However, by the 2012-2013 school year, the nutrition standards for school meals had been updated to improve the nutritional quality of the meals and ensure their consistency with the Dietary Guidelines for Americans. [135] Consequently, schools that meet the nutrition standards of the NSLP, have been shown to have higher student participation and lower rates of obesity among the kids. [136]

## 2.9 Obesity Intervention Efforts by The Centers for Disease Control and Prevention (CDC)

The efforts by CDC to combat obesity focus on policy and environmental strategies that will make healthy food choices and physical activity accessible and affordable. [137] The CDC has recommended the creation of a supportive environment that promotes a healthy lifestyle. Programs funded by the CDC to promote a healthy lifestyle include:

### 1. State Physical Activity and Nutrition (SPAN) Program [137]

Sixteen states are funded by CDC to execute strategies that will improve nutrition and physical activity at state and local levels. Part of the efforts of SPAN recipients is to eradicate health disparities among groups who are more likely to be exposed to poor nutrition and physical inactivity. Some states have plunged into this program and success stories abound. In Alabama, the initiative has grown since 2015, with 13 worksites participating in the Healthy Vending Machine Program. Healthier food choices have been added to the vending machines at these worksites. In Missouri, about 22 corner stores have dedicated 8.7% more shelf space to healthier food selections. About 319,000 residents, spanning 11 rural and 11 urban neighborhoods, have access to fresh fruits and vegetables close to home.

In Kentucky, fresh fruits and vegetables are now more accessible to individuals from low-income communities, through the farmers' market. More farmers' markets in Kentucky now accept federal nutrition benefits. This makes the fresh food at the farmers' market, more accessible to individuals from low-income communities. Furthermore, healthier food choices are being made available in cafeterias at three state agencies through a program known as the "a Better Bites" program. The program seeks to serve meals low in sodium, fat, and sugar and provides meals in smaller portion sizes. Their menu meets the requirements of the Dietary Guidelines for Americans. In Michigan, over 300 Early Child Care and Education (ECE) programs have implemented changes that have provided the children with reduced screen time, healthier eating habits, and improved physical activity environments.

## 2. High Obesity Program (HOP) [137]

HOP funds fifteen land grant universities to work in counties with more than 40% obese adults. Through their community extension services, these universities work on increasing access to healthier foods and places for physical activity in the community. An example of HOP is seen in the collaboration of Purdue University and extension staff in Jackson and Lawrence counties, all in Indiana. Together they are working on wellness policies in schools and healthy concession stands. Community gardens have been developed as sources of fresh fruits and vegetables. There are plans underway to use existing spaces for recreation and exercise.

### 3. Childhood Obesity Demonstration (CORD) Project

The CORD project targets low-income children. It seeks to encourage these children to engage in healthy lifestyle behaviors, such as healthy food choices, increased physical activity, less screen time, and more sleep time. In 2011, 3 grantees were funded for this project by CDC. [138] These grantees were based in Massachusetts, California, and Texas.

## 2.10 Childhood Obesity Intervention: What Works?

### 2.10.1 Microsimulations

Kristensen et al proposed that federal policies could alter the childhood obesity epidemic in the U.S. [139] They argued that federal policies would address larger populations and fund programs that would be beneficial to communities at risk for obesity. Their microsimulation analysis suggested that the long-term execution of three federal policies would reduce childhood obesity in the US. These policies include after-school physical activity programs, a sugar-sweetened beverage excise tax, and a ban on fast food television advertising targeting children. They found that these three federal policies could each reduce childhood obesity prevalence by 2032. They predicted that a “\$0.01/ounce excise tax on sugar-sweetened beverages (SSBs) would reduce obesity by 1.6 percentage points among 6–12-year-olds and 2.4 percentage points among 13–18-year-olds in 2032; a ban on child-directed fast-food TV advertising would reduce obesity among children and adolescents by nearly 1 percentage point in 2032.” [139] They predicted that a national \$0.01/ounce SSB excise tax would be the best of the three

options because of its potential to generate revenue that could further be used for additional obesity prevention activities.

Chou et al. predicted that a ban on the advertisement of all TV fast-food advertising would induce an 18% reduction in the number of obese children between the ages of 3 and 11 years. [140] In the same vein, the model of Veerman and colleagues predicted that a similar ban would result in a 2.5 percentage points reduction in obesity prevalence among children aged 6-12 years in the U.S. [141]

In their study, Gortmaker et al. reported three policy interventions that saved more in healthcare costs than they cost to implement. The interventions include “excise tax on sugar-sweetened beverages (SSBs), elimination of the tax deduction for advertising unhealthy food to children, and setting nutrition standards for food and beverages sold in schools outside of meals.” [142] Results of their study revealed that by 2025, the excise tax on sugar-sweetened beverages would have prevented 576,000 cases of childhood obesity; elimination of subsidy for advertising unhealthy food to children would have prevented 129,100 cases of childhood obesity and setting nutrition standards for food and beverages sold in schools outside of school meals would have prevented 345,000 cases of childhood obesity. For each dollar spent, the net savings to the society were estimated to be \$30.78 for excise tax intervention, \$32.53 for the elimination of advertisement subsidy, and \$4.56 for setting nutrition standards in schools. Their findings also revealed that calorie labeling of restaurant menus would be cost saving. This was evident in a study done in King County, Washington, to investigate restaurant menu calorie labeling. The study showed that restaurants had reduced their calorie content by 41 kilocalories per

entrée, 18 months after the implementation of the menu calorie labeling regulations.

[143]

Gortmaker et al asserted that setting nutrition standards for school meals would have a significant impact on childhood obesity because a very large population of children would be impacted. They projected that 1,816,000 cases of childhood obesity would be prevented at an inexpensive cost of \$53 per BMI unit change. They argued that early childcare and education policies and practices would not reach as many children, nor prevent so many cases of childhood obesity. Furthermore, Gortmaker et al projected that in addition to their effects on obesity, the excise tax on sugar-sweetened beverages would yield tax revenue of \$12.5 billion annually, while the elimination of the tax subsidy for advertising food that is unhealthy to children would yield \$80 million annually. Their findings suggested that the enactment of an excise tax of one cent per ounce in Berkeley, California, and the national implementation of an excise tax in Mexico on SSB are indicative of the growing political feasibility of this approach. They also projected that improving the quality of school meals and setting limits on portion sizes would have the largest impact on reducing childhood obesity.

### 2.10.2 Real World Findings

According to Frieden et al, a vital key to obesity prevention and control is an increase in physical activity. [41] Researchers have intimated that the implementation of school policies that support increased physical activity is a prime strategy for increasing physical activity levels among school-aged children. [144] This was demonstrated in a cross-sectional study carried out by Haug et al. that examined the association between policy-driven and individual-level interests in physical activity among middle and high school



kids. Their study found that a higher proportion of students would participate in recess physical activity when there is a written policy for physical activity and an organized non-curricular physical activity several times a week. They observed a strong correlation between written physical activity policy and involvement in physical activity-promoting projects. Even though they could not assess the direction of this association, they assumed that written school policies developed to promote physical activity would give rise to many facilities for physical activity. Furthermore, their study demonstrated that policies and policy-related changes can increase involvement in physical activity beyond that provided by the physical environmental and individual-level factors.

Cradock, et al., evaluated the impact of Boston's Active School Day policy (ASDP) initiative on child physical activity levels during the school day among students in fourth and fifth grades. [145] ASDP is an initiative that was drafted and implemented by the Boston Public Schools (BPS) in 2010. [145] The initiative seeks to integrate more moderate-to-vigorous physical activity (MVPA) into a typical school day and increase the time for physical activity within the existing Physical Education (PE) time allotted to the students. ASDP promotes the integration of 150 minutes per week of quality physical education, recess, and physical activity into classroom time. Six elementary schools participated in the study. Three of the schools served as the intervention group while the remaining three schools served as the control group. The results of the study showed that in the intervention group, there was a 6% decrease in sedentary time during school and a 24% increase in the amount of time that the students spent being moderately or vigorously active during the school day. The study also revealed that during the school day, fourth and fifth-grade students in the intervention schools attained about twenty-four

of the recommended sixty minutes/day of moderate-vigorous physical activity time. This was a significant increase from the sixteen minutes of active time recorded at baseline.

[145] These outcomes were achieved at a tolerable cost.

One of the many outcomes seen with the “Power Up for 30” program was a reduction in the prevalence of childhood obesity. [82, 146] Between 2011-12 academic year and 2016-17 academic year, the state’s student population in a healthy weight range improved from 58 percent to 61 percent. [147] Fifty-seven percent of students experienced a drop in their body mass index (BMI) percentile. [148] Obesity is defined in terms of BMI. (a BMI  $\geq$  95th percentile for age and sex) [8] Georgia’s ranking in childhood obesity has decreased to 17 from number 2 in 2009. [149]

The “Power Up for 30” program is one of the components of the Georgia Student Health and Physical Education (SHAPE) Act; a bill passed by the state of Georgia in 2009 to address the problem of childhood obesity in the state. [82, 83] It is designed to be used to increase physical activity, by integrating additional 30 minutes of physical activity into each school day. [150, 151] Having identified childhood obesity prevention as Georgia’s number one public health priority, the state of Georgia embarked on the “Power Up For 30” intervention in about 40 elementary schools in the 2012-2013 academic year. Based on each school’s data and unique situation, the intervention allowed schools to increase physical activity in a way that suits their environment. Depending on the school, the increased physical activity could be before, during, and after the school day in fun and innovative ways. By the fourth year of the implementation of the initiative, over 880 schools had “Power Up for 30” embedded in their elementary school curriculum. This exercise demonstrated that enacting and enforcing policies would

promote and allow for the desired change. The program got funding support from multi-sector partners. [82]

Slater et al. asserted that school-based physical activity opportunities can be effectively increased for youth if policies requiring physical education (PE) in schools were enacted. [152] Results of their study showed that strong district-level PE policies resulted in increased physical education and recess time. Their study population, which was a nationally representative sample of US public elementary schools, demonstrated that schools located in states or school districts that have a policy requiring 150 minutes/week of PE were more likely to have 150 minutes/week of PE. They also found out that schools that were more likely to have 20 minutes of recess daily were those schools located in states with laws that encouraged daily recess.

Ickovics, et al., reported healthier BMI trajectories over time in students who attended schools that received support for the implementation of nutrition policy. [153] They observed that these students had less than a 1% increase in BMI percentile when compared to the control group which had a 3-4% increase in BMI percentile. They also reported consumption of fewer unhealthy foods and sugar-sweetened beverages among the students in schools who had support for the implementation of nutrition policy in comparison to the control group, who had no policy implementation. They did not observe any difference in BMI between students in schools with and without the implementation of physical activity policy.

Nanney et al. evaluated the impact of school policies and practices on student behavioral and weight outcomes. [154] From their findings, they concluded that “school policies and practices, especially those that restrict vending and school store offerings,

may have small effects on weight status among ninth-grade students.” [154] They observed that the total daily intake of fruits/vegetable servings increased significantly by 40% among ninth-grade students in schools where fruits/vegetables were made available. Furthermore, they observed a 50% significant increase in soda servings among ninth-grade boys in schools where soda was made available. There was a significant 1% increase in BMI percentile among students generally in schools where less-healthy snacks and drinks were made available.

The study of Cullen, et al., suggested that state school nutrition policies have the potential to improve the nutritious quality of foods consumed at school lunches. [53] For example, a study documented significant improvements in the consumption of healthy foods by middle school students after a snack bar food policy change was enacted by a local school district in Texas. [155] Furthermore, they observed a decrease in the consumption of chips from the snack bar because of this policy. On the contrary, an increase was observed in the consumption of chips from vending machines where there was no policy against chips. [53]

## 2.11 Examples of Physical Activity and Healthy Nutrition Interventions

Taylor, et al., demonstrated that the rate of weight gain in primary school-aged children can be reduced by increasing opportunities for physical activity at school and after school. [156] The intervention sought to provide more opportunities for physical activity in the school setting of the target population while motivating the intervention group to engage in increased physical activity and eating nutritious food. The intervention children spent an average of 26 more minutes daily on physical activities

than the control children. The focus was to encourage lifestyle-based physical activity and nutrition. After one year of intervention, a significantly lower change in BMI z-score was observed in the intervention group compared to the control group.

In a randomized control study, Dan Nemet, et al., demonstrated the beneficial effects of a combined dietary, behavioral, and physical activity intervention on childhood obesity. [157] Their study compared obese subjects with age and gender-matched control subjects at the end of a 3-month intervention of a balanced hypocaloric diet and increased physical activity. The intervention resulted in significant weight loss, decreased BMI, and body fat, increased habitual physical activity, improved fitness, and reduced total and LDL cholesterol levels, among the children with obesity and adolescents who participated in the intervention program. On the contrary, the study showed that there was weight gain, increased body fat percentage, no change in habitual physical activity, and lower improvement in fitness among the children with obesity who did not participate in the intervention program.

Bogatai, et al. provided adolescent girls with 8 weeks of high-intensity interval training (HIIT) and nutrition intervention and compared them to a control group afterward. [158] Their findings revealed a reduction in body weight and BMI, in the intervention group when compared to the girls who were not subjected to the intervention. The differences observed were not statistically significant though. However, this insignificant difference was explained away by the short intervention duration.

Epstein and colleagues evaluated the effect of increased physical activity combined with diet in children with obesity using a randomized controlled trial. [159] The study was done on two groups of obese girls who were randomly categorized into a

diet-only group and a diet-plus exercise group. In the first six weeks of treatment, the intervention kids were made to run or walk 3 times a week in addition to a controlled diet. There was a significant decrease from baseline weight and in percent overweight observed in both groups of girls during the first two months of the trial. This decrease continued for up to 6 months after the trial started in the diet plus exercise group of girls.

Hills and Parker highlighted the effectiveness of exercise, diet, and behavior modification in children with obesity. [160] Their study population which comprising of obese prepubertal children was divided into the intervention and the control groups. The children in the intervention group were subjected to a 16-week exercise program complemented by dietary counseling and nutrition education. Their findings showed that the children in the intervention group lost significant body weight after the intervention. On the contrary, the control group of the same study had an increase in body weight.

Sanchez-Martinez, et al. found that increased physical activity in schools might be a useful tool for preventing childhood obesity. Their results showed that school-based interventions could be used to promote healthy habits among children, which will ultimately lead to a reduction in obesity prevalence. The study sought to assess the impact of the Childhood Obesity Prevention in Barcelona (POIBA) intervention program after 3 years. The POIBA intervention program is a school-based intervention that also incorporates family involvement. It comprises the practice of a healthy diet, a minimum of 1-hour daily physical activity, a maximum of two hours of screen time per day, and 9 hours of sleep per night. [161] The study population comprised eight to nine years old school children at baseline who were randomly divided into the intervention and control groups.

At three years of follow-up, the proportion of children who made a change to improve both their physical activity and nutrition (global score) was significantly higher among the intervention kids when compared to the control group. The proportion of children who made a change to improve just their physical activity (global activity score) was also significantly higher in the intervention group compared to the control group. In the same vein, the proportion of children who made a change to improve just their nutrition (global nutrition score) at 1-year follow-up was significantly higher in the intervention group compared to the control group. However, this difference between the groups was no longer significant at 3 years of follow-up. Given that similar observations have been reported in the literature concerning the long-term effect of nutrition interventions, Sanchez-Martinez, et al., recommended more long-term follow-up studies to determine the long-term effect of short-term interventions. It is noteworthy that a 60.5% reduction in obesity incidence was also observed in the intervention group.

## 2.12 Failed Interventions

Unfortunately, several studies of interventions find that they failed to alter the trajectory of weight gain or BMI in the intervention group when compared to the control group. In a cluster randomized controlled trial, Adab, et al. evaluated the effect of an obesity prevention intervention on the BMI z scores of primary school children. [162] The intervention, known as the West Midlands Active lifestyle and healthy Eating in School children (WAVES) intervention employed behavior change strategies to encourage increased physical activity and improved nutritional quality in school children. The intervention kids were encouraged to participate in an additional 30-minute physical activity during school time, six-week interactive skill-based programs, and school-led

family workshops on healthy cooking skills. The primary outcomes measured were the difference in BMI at 15 and 30 months, while the secondary outcomes measured were anthropometric, dietary, physical activity, and psychological, and the difference in BMI z score at 39 months.

The findings of the study revealed that the intervention had no statistically significant difference in BMI z score between the intervention and control groups at 15 and 30 months. Also, there was no statistically significant difference observed for anthropometric, dietary, physical activity, or psychological measurements between the intervention and control groups. Given their findings, Adab, et al. concluded that school-based interventions may have no impact on childhood obesity without the wider support of the environment. [162]

Wild et al., used a high-intensity, family-based, multidisciplinary lifestyle intervention program to carry out a randomized control trial on children with obesity. [163] They randomly assigned children with obesity (aged 5-16 years) to a high-intensity intervention group or a minimum-intensity control group. The intervention comprised of weekly physical activity, dietary and psychology sessions, while the control group involved home-based assessments and advice.

The results of their study showed a reduced BMI z score after 1 year of intervention in both the intervention and control groups. They also observed a non-statistically significant difference in reduced BMI z scores between the intervention and control group. Wild and his colleagues reported that even though the intervention and control children with obesity had a reduced BMI z score after 1 year of intervention, this reduction was not sustained in both groups after 5 years. Indeed, both groups showed a



drift back to baseline BMI z scores at 5 years of evaluation. Furthermore, the subgroup analysis of the intervention group revealed a significant difference at 1 and 2 years in decreased BMI z score in kids with high attendance when compared with the kids with low attendance.

The researchers intimated that the lack of observed difference at 5 years may be due to the small sample size of the high attendance group. They also observed that the BMI trajectory in the high attendance group remained more favorable at 5 years. Therefore, Wild et al. concluded that consistency is vital to achieving a long-term reduction in BMI z score. They also suggested that services designed to be accessible and appropriate for the obese would enhance their engagement in the services.

Moore, et al., carried out a randomized controlled trial that sought to assess the effects of family-based interventions, HealthyCHANGE and SystemCHANGE, on BMI in low-income adolescents with obesity. [164] These interventions were assessed against a control group after a 3-year intervention period. In the HealthyCHANGE intervention, children and parents were taught strategies to promote target healthy living behavior. (Diet, physical activity, sleep, and stress management) [164] In the SystemCHANGE intervention, families were taught to modify their environment to promote healthy living behavior choices. [164] The intervention “emphasized restructuring family routines to establish new healthy living habits.” [165] The intervention groups were divided into smaller groups where instructions were delivered to them via face-to-face and telephone sessions during the three years of intervention. The control group comprised parents and children who received 1 hour of coaching on healthy eating and physical activity from a

registered dietician in the first intervention year. Furthermore, during the three intervention years, they received one telephone call and attended a social event.

Moore, et al., reported an increased BMI over time in all the study groups involved in their family-based obesity management intervention study. [164] They also reported that there were no differences found between the intervention and control groups with regards to diet, physical activity, sleep, perceived stress, or cardiometabolic factors. The researchers attributed the null findings in this study to a couple of factors. One of the suggested factors was the inability of the families to adhere to the instructions for healthy living. Another factor was the high baseline BMI encountered in the adolescent. Moore and her colleagues suggested that such high baseline BMI management would require a considerable behavior change. Moore et al. also attributed the null findings to parental influence as 76% of the parents involved in the study were obese.

In summary, this literature review reveals that obesity has become one of the major public health challenges of the twenty-first century. [81] There is limited knowledge about policy strategies that are most successful at obesity prevention. [166] The National Academy of Medicine has campaigned for the promotion of obesity interventions that would alter nutrition and physical activity environments. [167] There is a growing focus on obesity interventions that address changes in environments through policy formulation. These interventions go beyond individual behaviors. [168, 169] Individual-level interventions are not very effective because they are resource-intensive and have limited potential for lasting success. The success of the individual-level intervention is inhibited by an environment that promotes unhealthy behaviors and lacks access to healthy foods and opportunities for physical activity. [77, 170] Consistency is

vital to achieving long-term success in obesity reduction. [163] The school environment provides a unique setting for the consistent implementation of obesity intervention policies that promote healthy environmental defaults. [81]

## CHAPTER 3. RESEARCH METHODOLOGY

### 3.1 Conceptual Model

This study adopts two conceptual models to guide the analyses. These are the Socio-Ecological Model (SEM) and Kingdon's stream model. (KSM)

#### 3.1.1 The Socio-Ecological Model (SEM)

The SEM is used to demonstrate the factors that influence health behavior. This model postulates that "behavior is influenced by more than just an individual's perception and thoughts." [171] It states that "behavior is influenced by various factors, such as the individual's relationships with others, community, job, school, and the laws that the government has put in place." [171] The SEM portrays the interwoven relationship which exists between an individual and their environment. [172]

We chose this model because the SEM gives us a broad idea of the various factors that could influence the health of an individual: in this case, obesity. [173] The model allows for an understanding of the intricate interplay between an individual's health, the community, and the physical, social and political environments. [173, 174] The model also reveals the need to act across multiple levels of the factors that influence health in order to achieve the prevention of ill health. Therefore, outcomes of interventions using the SEM framework are more likely to have a sustainable population-level impact. [173]

Figure 1 - The Socio-Ecological Model [175]

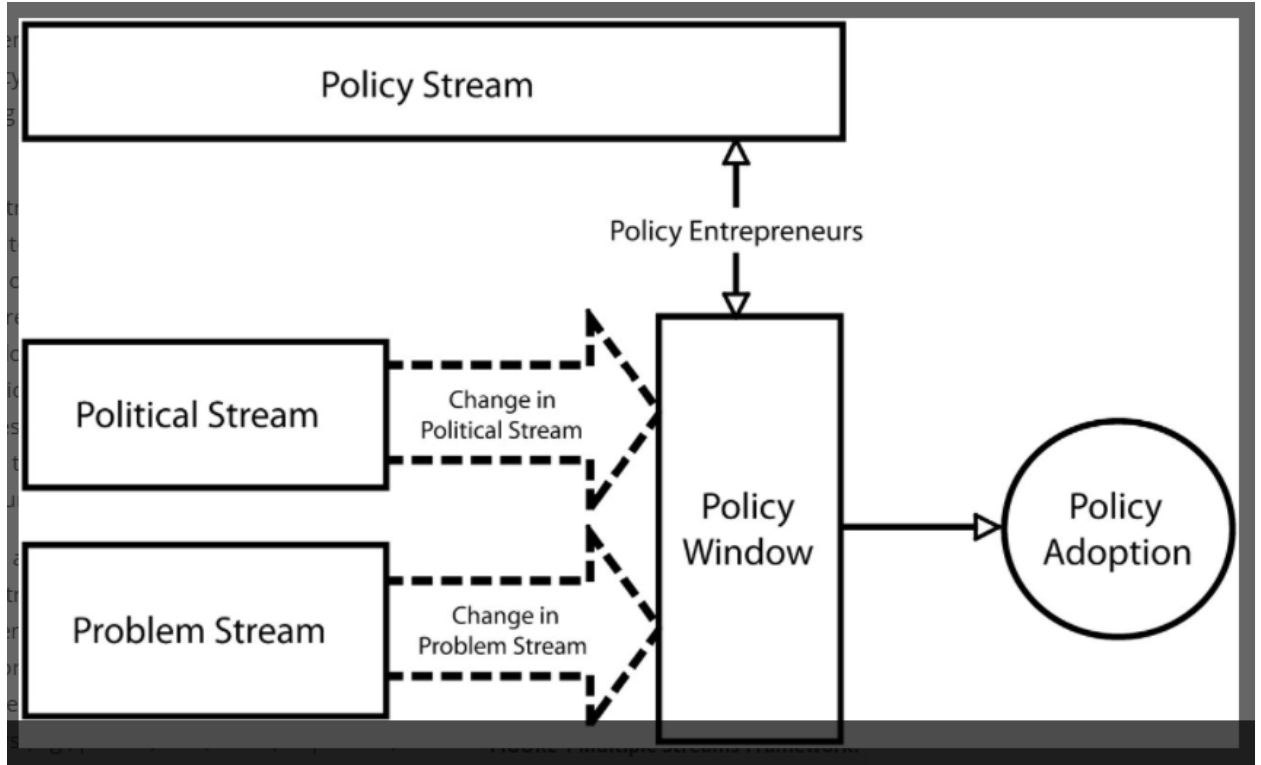


Based on this model, we project that though the onus lies on an individual to institute and maintain the lifestyle necessary to treat obesity, this behavior is determined by family and friends, community norms and values, regulations, and policies. (i.e., the social environment) [172] The family and friends can encourage healthy behaviors by providing support and encouragement. The community can promote health behaviors through policies and environmental factors like healthy cafeteria meals, sidewalks, bike paths and parks. [172] The community should provide safe, accessible places for children to play, or ride their bikes, the school lunchrooms should provide healthy and appealing food choices, and daily physical activity should be required in schools. [27] This model will guide us in fulfilling our first and second aims of study. (Identify barriers to healthy lifestyle behavior and policy changes that could address these barriers at the population level.)

### 3.1.2 The John Kingdon's Multiple Stream Model (KMS)

The third aim of this study is to make recommendations, based on our findings, to policymakers for policy formulation. We intend to model John Kingdon's multiple stream model (KMS) to achieve this aim. Kingdon argues that three independent "streams operate in the public policy realm: the identification and prioritization of problems, the political environment, and the formulation of potential policy solutions to those problems." [176] The model suggests that the key to successful policy implementation is when these three streams connect. [176, 177] The three streams would operate independently until an opportunity presents when they intersect. This opportunity is referred to as a "window of opportunity". It is at this juncture that entrepreneurs conveniently advance their goals. [178] The window of opportunity is a short period when problems emerge and solutions to these problems are politically recognized at the same time. [178] It would usually open when there is a change in problem or political streams and with the advocacy of a policy entrepreneur, feasible, acceptable, and affordable proposals emerge from the policy stream. KMS shows that while the three streams may be operating independently of one another, all three need to come together in order for a policy to emerge." [177]

Figure 2 - Kingdon's Multiple Stream framework [178]



The problem stream is mirrored by the various issues that require governmental action, the political stream represents the current disposition of policymakers and the public, while the policy stream is the possible solutions to the problem. [178] In line with this model, the problem stream would be the unprecedented rise and prevalence of obesity among US children which has become a serious international Public Health concern [1] The political stream is mirrored by the notion that the burden of obesity and its resulting chronic diseases has made obesity interventions and prevention “become a major priority for policymakers, healthcare professionals, economists and the general public.” [179] Policy changes that would address the barriers preventing the implementation of healthy lifestyle modifications would represent the possible solution to the problem.

## 3.2 Study Design

The study design is a qualitative study design, and we used the grounded theory (GT) approach. The grounded theory is a “research approach in which a theory (an explanation for what is happening) develops from the information systematically collected during the research process” [180-182] The researcher systematically collects data, analyzes the data, and then generates a theory based on (“grounded” in) the data. The GT approach is unlike other research methods where the researcher starts with a hypothesis and then goes on to prove or disprove the hypothesis. With the grounded theory, “they neither develop nor test hypotheses” [183] The researcher generally begins the study with a question based on “disciplinary interests, background assumptions, and an acquaintance with the literature in the domain”. [183]

GT is usually appropriate for studies of social interactions, as the main idea of GT is to develop theories concerning social phenomena. [183] Thus, we used the GT approach because our study sought to identify and address the factors in the social environment that impede the implementation of a healthy lifestyle in children with obesity.

## 3.3 Study Setting and Sampling Method

### 3.3.1 Study Population

This study was designed to obtain the perspectives of key informants on the factors that impede the implementation of a healthy lifestyle by children with obesity who attend the Pediatric High BMI Clinic at UK HealthCare, and the policy changes that would address these factors. Thus, the target study population for this study were the



healthcare providers to children with obesity attending the Pediatric High BMI Clinic at UK HealthCare. We got information about the children, through the perspective of their healthcare providers, who served as key informants.

In research, key informants are a select (nonrandom) group of experts who are most knowledgeable of an organization or issue; in this case, children with obesity. [184] The key informant is a proxy for his or her associates at the organization or group. [184] We figured using their healthcare providers as key informants would give us a global perspective of the barriers that these children encounter and policy changes that would address these barriers at the population level.

### 3.3.2 Research Procedures / Subject Recruitment Methods:

All research procedures were approved by the University of Kentucky Institutional Review Board (IRB). We interviewed healthcare providers who provide some form of care to children with obesity. Potential participants were identified through recommendations from the UK Pediatric high BMI clinic, and they were contacted via email. We had to depend on recommendations from the BMI clinic because they are familiar with the healthcare providers of their patients, and we needed information about their patients since their patients were our population of interest. The informed consent was waived by the IRB and replaced by a Survey/Questionnaire Cover Letter.

### 3.3.3 Sample Size

The desired sample size of between 10 - 15 participants was derived from literature, which suggests that in a qualitative study data saturation may occur after twelve (12) samples in a reasonably homogeneous population. [185] We reached

theoretical saturation after 15 interviews of key informants. Theoretical saturation is the “point in data collection, when no additional issues or insights emerge from data and all relevant conceptual categories have been identified, explored, and exhausted.” [186] It is an indication that the conceptual categories and emerging themes are exhaustive and tenable. [186]

### 3.3.4 Data Collection

We conducted semi-structured in-depth interviews with key informants to access their perspectives on the barriers to healthy lifestyle modifications encountered by children attending the UK Pediatric high BMI clinic and policy changes that could address these barriers. A semi-structured in-depth interview is a data collection method that involves conducting one-on-one intensive interviews with individuals to access their perspectives on a particular subject matter and allows the interviewer to ask open-ended questions within a predetermined thematic framework. [187-189] Semi-structured in-depth interviews are usually suitable for getting detailed information about an individual’s perspective because such interviews allow for a scope of possible answers from informants. [189, 190] Such forms of interviews “provide much more detailed information than what is available through other data collection methods, such as surveys.” [189]

To establish consistency between the interviews, and consequently, the reliability of our findings, we developed an interview guide that contained the list of questions that we would ask during each individual interview. (*See Appendix 1 for a copy of the interview guide*) The interview guide was modeled after a questionnaire that has been pilot-tested and validated in a study that “examined a range of perceived personal, social

and environmental barriers to physical activity and healthy eating for weight maintenance among young women”. [191] For the purpose of this study, the validated questionnaire was modified with no alterations to its contents to fit a semi-structured in-depth interview format.

The questions on the interview guide were mirrored after the Socio-Ecological Model. (SEM) The SEM states that “behavior is influenced by various factors, such as the individual’s relationships with others, community, job, school, and the laws that the government has put in place.”[171] Furthermore, studies have suggested that individual, social, and environmental factors constitute barriers to implementing a healthy lifestyle, and identifying these factors would be vital in informing policy changes for an effective population-based intervention to prevent and treat childhood obesity. [46] Therefore, we used the SEM as a guide for our questions to access the perspectives of key informants on the barriers to healthy lifestyle modifications encountered by children attending the UK high BMI clinic and policy changes that could address these barriers. We figured that answers to the questions would enable us to fulfil our first and second aims of study. (Identify barriers to healthy lifestyle behavior and policy changes that could address these barriers at the population level.)

The interviews were held over Zoom video conferencing, each lasting from about 15 to 60 minutes. At the beginning of the interview, the key informants were given a general overview of the study and subsequently asked questions in line with the questions on the “Key Informants semi-structured interview guide. (Appendix 1) These questions are modeled after a questionnaire that has been validated. [191]

The interview sessions were audio recorded via zoom recording. Audio recordings were uploaded to Otter.ai (<https://otter.ai/home>), a web-based transcription company, and were transcribed professionally.

### 3.3.5 Data Analysis

The researcher reviewed the transcripts for accuracy and edited them to correct obvious errors and to increase readability and clarity. The transcripts were also coded by the researcher using the structural coding method. Structural coding is a form of coding method where data are coded based on research questions, an interview guide, or topics. [192] The data were coded based on the interview guide. (*Appendix 1*) The transcripts were coded line-by-line. This involved aggregating the data text into small categories of information and assigning a label to the code based on the different forms of barriers addressed in the “Key Informants semi-structured interview guide” [193]. These codes were ultimately refined by the researcher to identify themes consistent with the SEM. [194]

## CHAPTER 4. RESULTS

We interviewed 15 key informants who are healthcare providers that provide some form of care to children with obesity attending the UK Pediatric High BMI Clinic. The key informants all work in various clinics within UK HealthCare, including the pediatric high BMI clinic, the pediatric gastroenterology clinic, and the pediatric nephrology clinic. They provide some form of healthcare to children with obesity attending the UK Pediatric High BMI Clinic. Table 4.1 shows the number of participants from various areas of specialty.

Table 1 - Participating key informants and their area of specialty

Area of specialty	Number of Participants
Pediatric Obesity Physician	2
Pediatric gastroenterologist Physician	4
Pediatric Physician Assistant	1
Pediatric Nurse practitioner (Gastroenterology)	2
Registered Nurse	2
Dietitian	4
Total number of Participants	15

We identified themes consistent with the Socio-Ecological Model. (SEM) The SEM uses an approach that impacts health behaviors and outcomes by integrating different levels of influence: intrapersonal, interpersonal, organizational/institutional, community, and public policy. [195] Table 4.2 shows a description of the SEM levels of influence.

Table 2 - A socio-ecological perspective: levels of influence [195]

<b>Levels of influence</b>	<b>Description</b>
Intrapersonal	Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personality traits
Interpersonal	Interpersonal processes, and primary groups including family, friends, and peers that provide social identity, support, and role definition
Organizational	Rules, regulations, policies, and informal structures, which may constrain or promote recommended behaviors
Community	Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations.
Public policy	Local, state, and federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control and management.

We identified barriers to healthy lifestyle habits and policy changes that would address these barriers at the population level, using the SEM levels of influence. Table 3 summarizes the emergent themes and sub-themes identified from interviewing the key informants. These results are the providers’ perceptions and are indicative of their actual patient encounters.

Table 3 - Emergent Themes and Sub-Themes Matrix

Emergent Theme	Sub-Themes
Intrapersonal Barriers to PA	<ul style="list-style-type: none"> <li>• Lack of motivation due to:               <ul style="list-style-type: none"> <li>▪ Physical and health limitations</li> <li>▪ Lack of skills</li> <li>▪ Too much screen time</li> <li>▪ Low self-esteem</li> <li>▪ Lack of skills</li> <li>▪ Lack of enjoyment of PA.</li> </ul> </li> <li>• Lack of knowledge due to:               <ul style="list-style-type: none"> <li>▪ Unaware of physical activity ideas</li> <li>▪ Do not know how much physical activity they need to do for it to count.</li> <li>▪ Do not know the importance of PA.</li> </ul> </li> <li>• Lack of time due to:               <ul style="list-style-type: none"> <li>▪ Busy nature of family life today</li> </ul> </li> </ul>
Intrapersonal Barriers to HD	<ul style="list-style-type: none"> <li>• Lack of enjoyment of healthy food</li> <li>• Lack of prior experience in forming healthy habits</li> <li>• Lack of satiety</li> <li>• Personality traits</li> <li>• Resistance to parents' help from the kids themselves</li> </ul>
Interpersonal Barriers PA	<ul style="list-style-type: none"> <li>• Not enough parental or family support</li> <li>• Not enough peer group support</li> <li>• Cost</li> </ul>
Interpersonal Barriers to HD	<ul style="list-style-type: none"> <li>• Lack of funds for a healthy diet</li> <li>• Lack of appropriate knowledge about healthy food in the family</li> <li>• Lack of parental or family support for a healthy diet</li> <li>• Lack of motivation by parents to use healthy food</li> <li>• Lack of time to prepare healthy foods</li> <li>• Lack of good examples to follow</li> <li>• Lack of friends' support for a healthy diet</li> <li>• Inappropriate media advertisement</li> </ul>
Organizational Barriers to PA	<ul style="list-style-type: none"> <li>• Not enough school support for PA</li> </ul>
Organizational Barriers to HD	<ul style="list-style-type: none"> <li>• Not enough school support for HD</li> </ul>
Community Barriers to PA	<ul style="list-style-type: none"> <li>• Lack of appropriate place and “built environment” for PA</li> <li>• Lack of accessibility to low-cost PA place</li> <li>• Lack of safe neighborhood</li> <li>• Cultural factors</li> </ul>

Community Barriers to HD	<ul style="list-style-type: none"> <li>• Not having familial accessibility to a healthy diet</li> </ul>
Public policy changes	<ul style="list-style-type: none"> <li>• Policies that encourage physical activity in schools</li> <li>• Policies that require and enforce the proper implementation of healthy dietary recommendations in the school cafeterias and environment</li> <li>• Provide appropriate places for PA and make them accessible to kids of every socioeconomic status.</li> <li>• Provide more educational programs at schools &amp; having better food quality at school</li> <li>• Improve access to fresh healthy foods</li> <li>• Sugar tax</li> </ul>

#### 4.1 Intrapersonal Barriers

The Intrapersonal level comprises the various traits and identities of an individual that have the capacity to influence the behavior of such an individual. [196] These traits include knowledge, attitudes, beliefs, and personality traits, [195, 197]

#### 4.2 Intrapersonal Barriers to Physical Activity

The intrapersonal barriers to increased physical activity (*PA*) identified by the key informants interviewed, (as shown in table 4.3) include lack of motivation, lack of time, and lack of knowledge about ideas for PA. A couple of factors were responsible for the lack of motivation. These include physical and health limitations, too much screen time, low self-esteem, lack of skills and lack of enjoyment of PA.



## 4.2.1 Lack of Motivation

### 4.2.1.1 Physical and Health Limitations

Some of the key informants reported that engaging in PA may be challenging to some of the children because of their body size or other health conditions. One of the key informants remarked, *"Sometimes if they have asthma, or allergies, the parents may be reluctant. So, when we recommend like going outside and play, they will say, oh, his allergies or his asthma and cannot go outside to play."*

### 4.2.1.2 Low self-esteem, too much screen time, and lack of skills

Our key informants disclosed that excessive screen time, low self-esteem and lack of skills for physical activity contribute to the lack of motivation in kids to engage in PA. One of them said *"So I see a lot of patients that, you know, lack that motivation because they are somewhat hooked on to electronics and can't get past that."* Speaking of low self-esteem, one of the key informants stated, *"many of those patients that suffer from obesity also suffer from low self-esteem and that it's well known to be a barrier to implement the recommendations that we make at the clinic."* It was also stated that some kids may be uncomfortable trying out new activities because they feel they lack the skills for the activity and as such might not be the greatest at the activity. The following quote reflects the thoughts of one of the key informants. *"They're scared to try a new activity or a new sport, because they might not be the greatest at it."*

#### 4.2.1.3 Lack of enjoyment

Our key informants disclosed that kids need to enjoy any PA that they are engaged in. One of the key informants remarked that *"a sport that the child is enjoying and having peers that they can play with will make it more pleasant for them, and they will be more likely to do it."*

#### 4.2.2 Lack of time

Generally, the lack of time for kids to be involved in PA was attributed to the busy nature of family life today. The key informants disclosed that families struggle to find time in the evenings for physical activity. Speaking of lack of time as a barrier to PA, one of the informants stated, *"I think, our kids are busy.; the family structure as a whole are busy."*

#### 4.2.3 Lack of knowledge

The lack of knowledge barriers ranged from being unaware of physical activity ideas, not knowing how much physical activity they need to do for it to count, to not knowing the importance of PA. Our findings revealed that for some parents, the mentioning of increased PA is synonymous with some organized sports, whereas it could be just as simple as going outside to walk. One of our key informants remarked; *"I think sometimes they are unaware of ideas to do as physical activity."* Another key informant said, *"I have heard many times where parents aren't even sure what to do to provide that activity. (PA)"* Unfortunately, though, even those who know better, may not know how much they must walk per day or how much energy they must expend to make it count for

weight loss. One of our key informants remarked, *“And then also knowledge, right? I go outside and I walk. But do I know what exactly how much energy I need to expend in order to lose weight.”* Our findings also revealed that there is yet another group of parents who do not even see the need for PA. According to one of our key informants, *“You have to actually convince the parents that this is very important.”*

### 4.3 Intrapersonal Barriers to Healthy Diet

The study's key informants identified several personal barriers to a healthy diet (HD). *The barriers they identified include lack of enjoyment of healthy food, lack of prior experience in forming healthy habits, lack of satiety, resistance to parents' help from the kids themselves, and certain personality traits.*

#### 4.3.1 Lack of enjoyment of healthy food & Lack of prior experience in forming healthy habits

Results of our interviews revealed that kids are not exposed to diet variety early enough and so their palates get accustomed to junk food. Therefore, when they are presented with the better diet alternatives, like fruits and vegetables, they resist eating them because their taste buds are not used to such options and, as such, they don't enjoy eating them. One of our key informants remarked; *“I do hear kids tell me that at school they're served vegetables. They just don't eat them.”* Another key informant said, *“there is a very strong addiction to sugar that has been fostered since infancy, then there's a strong desire to continue drinking sweet things”* One other key informant commented; *“I think enjoyment of eating healthy food is a barrier. I think children are not as exposed to diet variety.”*

#### 4.3.2 Lack of satiety

Our findings revealed that a serious barrier to healthy diet could be kids' inability to self-regulate their amounts of food intake beyond satisfying their hunger and not eating more after fullness. According to one of the key informants, *"you try to cut down your food, it's like a drive that is hard, it's an urge that is so hard and you have to be so motivated. Even as an adult when we try to lose weight, it's so hard to do as your body cries for the food"* We found from our interview that some kids would eat breakfast at home and then also get breakfast at school. One of our key informants reported, *"Another barrier that I've heard too is some families may feed their child breakfast at home and then that child also gets breakfast at school. So sometimes we find that they're having two meals instead of just one"*

#### 4.3.3 Personality traits & Resistance to parents' help from the kids themselves

Our interviews revealed that kids with type A personality would work towards meeting the goals set for them to lose weight by adhering to the diet and PA plans. In the same vein kids with laid back personality would be laid back in meeting set goals. *"I feel like personality factors in as well. If people are more, like type A, they tend to meet the goals, versus type B who don't necessarily always meet the goals."* On the contrary, the personality of some kids would make them resist efforts by their parents to make them eat right. In that vein, one of our key informants made the following remark. *"I also think that there're parents that try to enforce it but are met with a lot of resistance from their kids because they don't like the food that they prepare."*

#### 4.4 Interpersonal Barriers

An individual's behavior is also impacted by his or her relationships and social networks, such as families, friends, and traditions. [196] The interpersonal barriers to physical activity that we identified include, not enough parental or family support, not enough peer group support, and cost.

##### 4.4.1 Interpersonal Barriers to Physical Activity

###### 4.4.1.1 Not Enough Parental or Family Support

We gathered from our interviews that a lot of kids with obesity do not have enough family support. The family culture does not include exercise because the parents are so busy with work and other activities that take precedence over exercising. In line with this finding, some key informants made the following remarks.

*"Another barrier is the family culture. A lot of times, family culture does not include exercise or just being active."*

*"So many parents, you know, do work. And it is difficult to kind of integrate that activity in daily when mom or dad gets home at six o'clock and just tries to make dinner and get homework done and get them to bed."*

*"You're more likely to be successful if you have support"*

Furthermore, our interviews revealed that some of the parents are not good examples to their children when it comes to PA. Our key informants reported that sedentary parents are unlikely to be enthusiastic about engaging their kids in PA. In the words of one informant *"if parents aren't super active kids tend also not to be super*

*active.*” Our findings also revealed that if a parent is not convinced that the child is obese, then that parent will not be enthusiastic about engaging in activities that would treat the obesity. One of our key informants remarked, *"Sometimes it's hard to convince the family that he's obese because he's not the biggest one in the household: And they don't understand because he's the small one"*

#### 4.4.1.2 Not enough peer group support

One of the key informants told us that even though she makes her son to go outside to play, he is lonely out there because the other kids who he would have played with are not out there with him. According to her, this could be boring for the kid. Sadly, when faced with such situations, the kids *"retreat back inside doing the things that they can do on their own, which a lot of times is a sedentary activity."* In the words of another key informant *"having peers that they can play with will make it more pleasant for them, and then they will be more likely to do it"* Yet another key informant remarked: *"when I ask can you go outside and play? They say there are no other kids to play with because everybody's playing video games indoors."*

#### 4.4.1.3 Cost

Our key informants reported that finances might be a constraint for some families. Some families may want to engage in physical activity, but they lack the resources to do so. According to them, some parents complain that membership to gymnasiums is very costly, and not all the parents especially the ones that need the clinic can afford the cost. A key informant remarked, *"and patients who may be motivated by the family may not have resources: some of them may have limited financial resources to pay membership in a*

*gym."* Another key informant commented that *"the other thing is that there are some Ys, but they cost money. And sometimes that's not the priority."*

#### 4.5 Interpersonal Barriers to Healthy Diet

The interpersonal barriers to healthy diet identified by key informants in our study include lack of funds for a healthy diet, lack of appropriate knowledge about healthy food in the family, lack of motivation to use healthy food, not having enough time to prepare healthy foods, lack of parental or family support for a healthy diet, lack of friends' support for a healthy diet, and a lack of good examples to follow.

##### 4.5.1 Lack of funds for a healthy diet

The number one barrier to healthy diet that we identified from our key informants was lack of funds for a healthy diet. We gathered from our key informants, that some of the families that they see just imagine that they cannot afford to eat healthy because eating healthy is expensive. Even though some of the key informants did not believe that the concept of "healthy eating is expensive" is completely true, others attested that *"sometimes the cheaper things are the more processed foods in some of those areas."*

One key informant remarked that *"it comes back to purchasing choices because sometimes soda or juices or things that are not nutrient-dense, are brought into the home; that's money that could be spent on more nutritious food."*

The views of other key informants concerning funds for a healthy diet are reflected in the following quotes.

*"The financial barriers play a very, very important role. Many of those kids will be on food stamps, they have a limited income."*

*"Healthy diet usually costs more. So being able to afford fruits and vegetables is an issue. Fast food is cheap and readily available."*

#### 4.5.2 Lack of appropriate knowledge about healthy food in the family

Another top barrier to healthy diet that we identified during our interviews is the lack of appropriate knowledge about healthy food in the family. Our findings revealed that there is a gross lack of education on what is healthy in the general populace. A good number of parents lack understanding of what a healthy meal is, neither do they understand the concept of serving size. Our findings revealed that parents teach their kids their perception of what healthy food is, which is wrong most of the time, and they load their kids up with high calorie foods. One of the key informants had this to say; *"many, many times, parents will come to me saying they're concerned because their child has gained quite a bit of weight in the last year, and then they will say, but they hardly eat anything. But then when you go through their foods, they're very high caloric foods that they're consuming and though they're not overeating, they are consuming a lot of calories."* Another key informant had this to say: *"There are families that think that potatoes and corn are vegetables."* The following quotes are remarks from our key informants regarding lack of appropriate knowledge about healthy food.

*"There is a lack of education for the general population on what is healthy."*

*"I typically think there's a lot of misinformation: Misunderstanding of what is healthy."*



*"Number one is lack of education or lack of knowledge about the importance of healthy dietary habits, and what exactly a healthy diet is, because they may eat like fruit gummies because they are advertised, like fruit, fruit."*

*"People have no concept of serving size."*

*"I think there's a lack of understanding among parents about how much their child needs."*

#### 4.5.3 Lack of parental or family support for a healthy diet

Our key informants reported that kids lack parental or family support because some parents are unwilling to change their eating habits. One of them attested that for *"a parent that has grown up drinking soda, eating convenience gas station food, eating fast food, eating southern style cooking,"* it could be a huge and tough *"cultural shift to limit sugary drinks and eat more fruits and vegetables."* Furthermore, some parents do not even know how to cook. We also gathered that some of these kids with obesity are being singled out by their families and made to eat healthy. According to one of our key informants, *"healthy eating is so hard when it's not a whole family effort: a lot of times we'll have like, one kid singled out and told to eat healthy, when their skinnier, siblings are kind of allowed to eat whatever they want."* The following quotes reflect the views (on parental support) of some of the key informants that we interviewed.

*"If the parent doesn't personally eat that way and doesn't want to change their own habits, that can be a lack of support to the child"*

*"This is a generation where the parents may not have this concept of cooking, or they may not know how to cook. Many families may not even have a stove that they can cook on."*

*"A lot of families also have this kind of fast-food culture mentality where they're going out to fast food restaurants for meals, which of course is like another facet of culprit in the obesity epidemic."*

#### 4.5.4 Lack of motivation by parents to use healthy food

Our interviews revealed that some parents would even lie, just to avoid packing a healthy lunch for their kids. One of the key informants had this to say: *"a lot of times, we ask, can you pack your lunch and use our lunch planner that we give? They'll say oh, we can't bring lunch to school. And that's sometimes just not true."* Our findings showed that providers perceive that some parents are just not motivated to improve their dietary habits. Another key informant remarked; *"and then there are some that just aren't motivated to make changes in their diet because they've gotten accustomed to their ways"*

#### 4.5.5 Lack of time to prepare healthy foods

The interviews revealed that parents are so busy with many other things that making out time to prepare healthy meals for their families is not a priority to them. Families end up eating fast foods routinely because it's very convenient. According to one of our key informants, *"you do have to make the time to cook healthy meals and purchase healthy foods."* Another key informant remarked; *"a lot of these parents have a lot on their plates; they're working, they're taking care of multiple children and a lot of times our families are eating a fair amount of fast food, a fair amount of like*

*prepackaged or convenience foods because that's what works for the family's lifestyle. And in budget, honestly, those options are usually much cheaper than good quality fresh food."*

#### 4.5.6 Lack of good examples to follow

According to our key informants one challenge the kids with obesity face is that they lack role models. Obesity seems to be a trend in the family. One key informant remarked:

*"One barrier is, there is no good example as to how to eat healthy. Because they are now at least two maybe three generations where it's been okay to be overweight."*

#### 4.5.7 Lack of friends' support for a healthy diet

Our study revealed that peer support may be positive or negative. If the friends are the kind that eat healthy, then there is the tendency to go with the flow and eat healthy, but if the friends eat junk food, then the tendency will be to eat junk food. Key informants also disclosed that some kids would eat breakfast both at home and at school, not because they are hungry, but because they want to socialize with their friends. They also disclosed that it only takes as few as two kids to influence an entire group of kids. One key informant reported, *"it only takes two kids and the whole thing, this is gross, this is gross, and you can't be caught eating it because then that would be shameful"* Another key informant said that *"they (kids) do have the tendency to copy what the other friends are doing. If everybody is eating unhealthily, most likely, the child that is looking into making healthy changes is going to end up eating unhealthily. If other peers are having healthy food, they may even try that even if it's not offered at home."*

*"The older the child is, the less likely the family will influence them, and the more likely that their friends are going to influence them."*

#### 4.5.8 Inappropriate media advertisement

Our findings revealed that the media misinforms the populace on what is healthy. Items like fruit juice are advertised as healthy, even though their sugar content is very high. Fruit gummies are advertised as "good for you" because they have "natural fruit flavor". One of the key informants rightly said that the media would usually not advertise *"how to make vegetables and incorporate them into your dinner menu."* The results of our interview showed that media advertisement is done in a very unfair manner to the population. The following are remarks from our key informants.

*"You don't see the advertisement on TV for the vegetables and fruits that Kroger has on sale this week: You see what McDonald's got on special this month"*

*"You know, sitting down and watching a basketball game, you can't make it through a basketball game without a Coke or Pepsi commercial."*

#### 4.6 Organizational Barriers to Physical Activity and Healthy Diet

Organizations enforce regulations and restrictions that determine behavior. [196] Schools are great examples of organizations that influence an individual's behavior. The results of our interview revealed that children with obesity do not have enough school support for increased physical activity and healthy diet.

#### 4.6.1 Not enough school support for Physical Activity

Our findings suggest that there is minimal physical education and physical activity occurring in schools these days. The key informants also reported that the older kids (middle and high school kids) have even lesser opportunities for physical activity. They remarked that there is not enough physical activity built into the school curriculum. We also found out that physical activity is becoming less of a priority in schools because the school programs are pushed towards academics. The school administrators are more interested in test scores. Our key informants made the following comments.

*"It appears that there's much less physical activity actually scheduled. And then when it is scheduled, it's not very rigorous. And there isn't a whole lot of actual education about how to stay active, there's no idea of how you can create a personal fitness program that you can realistically continue to do on your own without new equipment."*

*"Not all schools offer physical education. And when they do, especially for younger kids, maybe just once a week or every few days. High school children will have gym one year in the four years"*

*"I feel like as they get older, they tend to have gym class less often based"*

*"School programs are pushed more towards academics: So, being active in school is becoming less of a priority and therefore not as widely available as before."*

*"The school system does not support PA for high school teenagers. There is not enough physical activity built into their school curriculum"*

*"From the time you start in kindergarten, you're geared towards a sedentary life, sitting most of the time listening to the teachers. And so, their activity level that they get each day is just limited to recess time, or the little bit of play time that some kids may get after school."*

#### 4.6.2 Not enough school support for Healthy Diet

The lack of support for healthy diet from the school system was the major organizational barrier to healthy diet echoed by our key informants. We gathered from our interviews that school lunch and breakfast are not so good, schools lack knowledge about healthy food, and teachers use unhealthy items, like candies to reward students. Our key informants reported that the kids are not encouraged even by the adults in the cafeteria to make healthy food choices. They also disclosed that for fear of food being rejected by the kids, the kids are served food that they like to eat. And most times, this is unhealthy food. The following are remarks from our key informants.

*"Because the food budget for many of these schools is not very high, they're often serving more processed foods, foods that can be easily batched-cooked for a large group of people. So, they don't necessarily have salad bars or foods that weren't frozen."*

*"A lot of cafeterias struggle with serving healthy foods if the kids will not eat it, and so they want to serve them things that they will eat."*

*"If you give Pop Tarts because they are whole grains that is not a healthy food. Yes, you check the box whole grain, but the Pop Tart even if it is whole grain is not healthy, not at all. If you give juice because it's fruit juice instead of the fruit that is completely unhealthy"*

*"The school lunch and breakfast, I mean, that's another topic.... like, breakfast is often Pop Tarts, muffins, it's really sugary cereal or offerings that have a lot of extra sugar added to them."*

#### 4.7 Community Barriers

The community can influence physical activity and healthy diet through the cultural norms of the community, the kind of businesses available and the “built environment” such as sidewalks, bike paths and parks. [172, 196, 198] The key informants disclosed a couple of factors that could constitute barriers to physical activity in a community. These include lack of appropriate place for PA, lack of accessibility to low-cost PA place, cultural factors, lack of safe neighborhood, lack of appropriate infrastructure for exercise. Environmental barriers to healthy diet identified by our key informants include not having familial accessibility to healthy diet foods, inappropriate media advertisement, and a lot of fast-food places in the community.

##### 4.7.1 Community Barriers to Physical Activity

###### 4.7.1.1 Lack of appropriate place and “built environment” for Physical Activity

Our findings suggest that for some of these patients, even their “built environment” is not physical activity friendly. The environment lacks infrastructures like sidewalks, bike paths and parks that would naturally promote physical activity. The following quotes convey the perspectives of our key informants concerning community barrier.

*"Like maybe where they live, they don't have a good place to go and exercise"*

*"I have students who live in rural areas who don't have a smooth or safe surface to do running or walking."*

#### 4.7.1.2 Lack of accessibility to low-cost Physical Activity places

The result of our interviews suggests that some patients lack accessibility to even the free exercise facility options. This was expressed in the following quotes by our key informants.

*"In less urban communities, they are not necessarily going to have access to playgrounds, and sidewalks where they can ride a bike or go play outside depending on the family."*

*"For example, in Kentucky, the countryside may not have sidewalks. So even if we recommend to the patients to go and walk, they may not have a place where to go to walk."*

*"Especially in Eastern Kentucky, because they're just so remote, there're not a lot of sidewalks. So, even if you wanted to ride your bike, if you're near the coal trucks, you don't want to do that, because some of those roads are very narrow."*

*"They're in a rural setting, and they don't have access to any public parks. And so, like having trails, parks, bicycle paths, all of that is very limited for most of our patients."*

#### 4.7.1.3 Lack of safe neighborhood

The lack of a safe neighborhood to engage even in the simplest form of exercise was another major barrier echoed by our key informants. They acknowledged that even for their patients that were willing to engage in increased physical activity, their



neighborhood is unsafe. Parents are not willing to send their children outside to an unsafe environment all in the name of exercise. The following quotes by some of our key informants reiterate this view.

*"In some of the communities, there are no safe places for children to play or exercise."*

*"A lot of these patients are from Eastern Kentucky or like, lower income areas, and sometimes the places where they live aren't the safest for them to get outside. I know that; they've said that a lot."*

*"If it's an unsafe environment, whether it be because of gang activity, drug activity, or maybe just unsafe structure, then a parent or guardian may not allow their child to go out."*

*"Not everybody may live in a neighborhood that has availability to parks that are safe, or outdoor spaces that are safe or easy accessibility to that"*

#### 4.7.1.4 Cultural factors

Our findings suggest that there is a cultural acceptance of obesity in some places and so people just accept it and are not motivated to do anything about the condition. Secondly, some communities do not have built structures that promote physical activity, and so the people living in such communities do not have a culture of exercising. The following are quotes from some of our key informants to buttress the negative impact of cultural norms on obesity.

*"I think just because different cultures just accept obesity, as oh, everyone in the family and they use the term big boned; like, oh, all of my husband's family is big so he's going to be big and so they just accept it"*

*"I came from Boston, and everybody walked there, there were sidewalks, and everything was close by, whereas in Kentucky I don't walk anywhere even though I like walking. Primarily because everything is far and there's not really a good way of walking from place to place here."*

#### 4.7.2 Community Barriers to Healthy Diet

##### 4.7.2.1 Not having familial accessibility to a healthy diet

Accessibility to healthy food was a major barrier to healthy diet that our key informants reported. They attested that many of their patients do not have easy access to fresh healthy food choices. These patients are therefore compelled to make do with what they have, and often it is processed food. According to one of the key informants, *"there are some places that are considered fresh food deserts, where you really don't have access to fresh fruits and vegetables"* Another key informant remarked, *"I see a lot of patients in rural areas where a grocery store is an hour and a half away. So being able to get fresh foods can sometimes be a little bit more challenging. So, they do a lot of processed things because they don't spoil quickly."* Additional quotes from key informants include:

*"Access to actual healthy foods is a really, really big issue. Like grocery stores are not necessarily stocked with affordable, healthy food choices."*

*"Depending on where the families live, they may not have a grocery store that has a wide variety of fresh fruits, and fresh produce available to them."*

#### 4.8 Public Policies

Our results revealed some key public policies that would address a lot of the barriers encountered by these kids and generate environmental default conditions that would make physical activity and healthy diet easier. These include policies that encourage physical activity in schools, policies that require and enforce the proper implementation of healthy dietary recommendations in the school cafeterias and environment, more educational programs at schools and having better food quality at school, policies that would enable the provision of appropriate places for PA and make them accessible to kids of every socioeconomic status, policies that would improve access to fresh healthy foods, sugar tax.

##### 4.8.1 Policies that encourage physical activity in schools

Key informants suggested enacting policies that would mandate physical activity as part of the school curriculum. They were optimistic that if this happened, schools would experience a rise in test scores. They also gave suggestions of how schools could successfully implement routine physical activity as part of the school curriculum. One of the suggestions was to increase recess time and encourage an interactive learning environment where the kids are not just sitting all day long. Yet another suggestion was to use physical activity to break up the day. According to one of the key informants, *"they would be more attentive in school, the more activity they get, I think the more reasonable they would be with food too"* They also suggested that schools could easily

aid kids to develop a habit of routine physical activity by engaging them in a habit of doing something of movement routinely. Our key informants also suggested that exposing the kids to physical activity as early as when they are in day cares and preschools, by incorporating free movement time in their daily routine would promote a routine lifestyle of physical activity.

The following quotes are suggestions from some of the key informants that we interviewed.

*"I would love to see physical activity be a part of every student's school day, every single day"*

*"I think adding physical activity back into the curriculum would be great and I think schools would probably see reading and math scores go up as a result."*

*"I am a strong believer that because the kids are spending so much time at school. Probably we can do better with that policy, that physical exercise or physical activity to be on a daily basis, regardless of the grade. I think this is something that we can count on."*

*"You know, and even just walking, taking them to do walks that will still count or give them breaks in between classes to do something. You know, 10 minutes."*

- 4.8.2 Provide appropriate places for Physical Activity and make them accessible to kids of every socioeconomic status.

Concerning consideration of kids from low-income families in city planning, one of our key informants commented as follows: *"I think a lot of inner city or lower socioeconomic areas kind of get left behind in city planning and making sure that these*

*children also have access to green spaces, to parks, to swimming pools to other ways for them to be active."*

#### 4.8.3 Policies that require and enforce the proper implementation of healthy dietary recommendations in the school cafeterias and environment

Our key informants echoed that the school breakfasts and lunches needed a complete overhaul. They suggested that fruits and vegetables be enforced in the school meals. They believed that this would fulfil two of the five daily servings recommendations of fruits and vegetables for the kids, especially as many children depended on the school meals for two of their daily meals. Another suggestion by the key informants was to make healthier food options available to the kids. According to one of the key informants, *"if all options are healthy foods, that would benefit"* The key informants also suggested that policies be enacted around higher quality food. According to one of them, *"schools are mandated to provide milk at every meal. At the end of breakfast and lunch. Why aren't they mandating water? I mean, water is one of the cheapest resources."*

Furthermore, the key informants reported that schools were not diligently implementing the dietary guidelines for Americans healthy food options at school and suggested a proper implementation of these guidelines. According to one of the key informants, *"If you give Pop Tarts because they are whole grains that is not a healthy food. Yes, you check the box whole grain, but the Pop Tart even if it is whole grain is not healthy, not at all. If you give juice because it's fruit juice instead of the fruit, that is completely unhealthy"* Our findings also revealed that schools are not mandated against providing unhealthy options. In the words of one of our key informants, *"they (schools)*

*are mandated actually to provide certain types of foods in the offering, but they aren't mandated against providing unhealthy options. So, the children might choose the unhealthy options even though healthy options are available."* Additional quotes from our key informants to support school policy on healthy diet include:

*"Breakfast and lunch need a complete overhaul: it needs to be less than a certain amount of sugars and that kind of stuff."*

*"I think so many children are relying on two meals a day from school and sometimes snacks. So, if we could even implement fruits and vegetables at those two meals, we'll be getting close to that recommendation of five a day."*

*"You know, improving your diet and cutting out all of that junk can also make you feel better and think better and think clearer and have more energy."*

#### 4.8.4 Provide more educational programs at schools & have better food quality at school more after fullness. According to one of the key informants.

The key informants advocated for a focus on health education, especially education on healthy lifestyle habits in schools, with emphasis on general physical and mental well-being. One of the key informants said, *"I think we need to start focusing now on health education, teaching kids about healthy weight, healthy BMI, the long-term implications, heart attack, risk, diabetes."* Another key informant said, *"I think that there's so much emphasis on test scores, I would love to see as much emphasis on just general physical and mental well-being and I think exercise and being outdoors is a big part of that"* The key informants also suggested that children be taught about nutrition early and that their palates are trained early enough with healthy food options. One of the

interviewees suggested reinstating more activities and classes like home economics classes in schools. The following were her words: *"We need to re-instate more activities, and things like home economics classes: I think those are things that are helpful. This generation, we've gotten away from some of those things,"*

The key informants also recommended that dietitians be hired in every school and involved in setting policies for school food requirements. In her words, *"So, I think we can do much better at the school level: involve the dietitians more and be creative on the same budget buying the better options."* They submitted that the dietitians would have a little bit more time to play with that budget. The key informants also echoed the need for everybody to be on board with the concept of serving healthy diets to kids. According to one of them, *"if families would be on board with that, the schools are on board with that, the medical community and the pediatrician are on board with that, we're going to have some results."*

Another suggestion was the idea of the schools getting food products locally from the local farmers and then cooking their own meals. Not only will the kids be eating healthy food, this will also create jobs that will stimulate the local business and it will be a win-win situation for the society. One of the key informants said, *"You involve the farmers. You can get the products locally, cook food every day and offer that cooked food to the kids. Whatever is left over, create a system that the family can come and pick up. We have all these families starving, or on a tight budget."* They also recommended more funding and education for school meals. According to one of them, *"school is such a pivotal part that provides their meals. And I do think that more funding and more*

*education should go into the school meals"* The following are additional quotes from two of the key informants.

*"More educational programs at schools and having better food quality at school could translate into them wanting better foods because you are accustomed to it, you're exposed to it. So, it will be much easier to implement that at home when you are already doing it in school."*

*"More education should go into to the school meals, as well as just the teaching from a young age."*

#### 4.8.5 Improve access to fresh healthy foods

It was suggested that access to fresh healthy foods be improved, so that the default and accessible options would be healthy options. According to one of the key informants, *"expanding access so that kids are always able to access fresh, healthy foods."*

#### 4.8.6 Sugar tax

Even though the idea of introducing sugar tax was not popular, it was suggested by one of the key informants. This idea is reflected in the following quote by the key informant. *"I really feel like there should be a sugar tax, because that would like immediately mark all high sugar concentrated drinks and foods, and also would allow for money to be received on those products and actually funneled into public health measures"*



## CHAPTER 5. DISCUSSION

This study had three specific aims:

1. To identify factors that impede the implementation of healthy lifestyle recommendations for children with obesity attending the UK Pediatric high BMI clinic.
2. To identify policy changes that could address factors impeding the implementation of recommendations for healthy lifestyle habits at the population level.
3. To make recommendations, based on our findings, to policymakers for policy formulation to promote healthy lifestyle habits.

Our study identified intrapersonal, interpersonal, organizational, and community barriers to the implementation of healthy lifestyle recommendations offered to the children with obesity attending the UK Pediatric high BMI clinic. The barriers are consistent with the socio-ecological model, which states that “behavior is influenced by various factors, such as the individual’s relationships with others, community, job, school, and the laws that the government has put in place.”[171] Even though the intervention offered by the UK BMI clinic has been reported to be effective, [45] the barriers identified limit the effectiveness of the intervention. Furthermore, the barriers identified in our study all point to the influences of individual and environmental factors that contribute to the childhood obesity epidemic in the state of Kentucky.

### 5.1 Intrapersonal Barriers

The main intrapersonal barriers to physical activity (*PA*) that we identified include lack of motivation, enjoyment, time, and knowledge. Our study revealed that

these kids lacked the motivation to engage in physical activity for a couple of reasons. These reasons ranged from low self-esteem, lack of skills, and physical and health limitations to lack of enjoyment of physical activity. The lack of time to engage in PA was due to the busy nature of family life today. The families (and the kids by default) lacked knowledge in areas like being aware of physical activity ideas, knowing how much physical activity they need to do that would count, and the importance of PA.

The intrapersonal barriers to a healthy diet (*HD*) that we identified include a lack of enjoyment of healthy food, lack of prior experience in forming healthy habits, lack of satiety, personality traits, and resistance to parents' help from the kids themselves. We observed that the lack of enjoyment of healthy food stemmed from their lack of prior experience in forming healthy habits. Some of the kids also lacked satiety because of an inability to self-regulate their amounts of food intake beyond satisfying their hunger. Furthermore, some of the kids' personality traits either made them resist help from their parents or prevented them from staying focused and meeting the weight loss goals set.

The barriers that we identified reflect the weaknesses of actions based on personal autonomy and are consistent with the literature. Studies have reported that some intervention attempts (e.g. menu labeling) to address obesity in the past have failed because they were dependent on personal autonomy. [125] Likewise, behavioral changes that are dependent on personal autonomy are unlikely to give the anticipated results because such actions place the burden to change behavior on the inner volition of the individual. [35, 73]

## 5.2 Interpersonal Barriers

The interpersonal barriers to PA that we identified include, not enough parental and family support, not enough peer group support, and cost. Our findings revealed that the factors responsible for inadequate parental or family support ranged from parents being too busy, to not having a family culture of exercising, and to inactive and lazy parents. We also found that some of the kids who go outside to play lacked adequate peer group support because they would not find other kids outside to play with as the other kids were playing video games indoors. So, even the ones that go outside to play eventually go back inside to play video games as well. Our findings also suggest that the cost of paying for physical activity was a challenge to some families because all they imagined as physical activity was some organized form of physical activity. Therefore, families may have encouraged their kids to engage in PA may not have the resources for PA.

The interpersonal barriers to an HD identified by key informants in our study include lack of funds for a healthy diet, lack of appropriate knowledge in the family about healthy food, lack of motivation to eat healthy food, not having enough time to prepare healthy foods, lack of parental and family support for a healthy diet, lack of friends' support for a healthy diet, and lacking good examples to follow. Our study revealed that even though processed foods are sometimes cheaper, some families just have a mindset that they cannot afford to eat healthy because eating healthy is "expensive". Incidentally, this is not always the case. Healthy food options are not always expensive. One of our key informants rightly remarked that *"it comes back to purchasing choices because*

*sometimes soda or juices or things that are not nutrient-dense, are brought into the home; that's money that could be spent on more nutritious food."*

These results suggest that as much as the onus lies on the child to institute and maintain a healthy lifestyle change necessary to reduce their obesity condition, to a large extent, their behavior is influenced by their social environment. [195] Our results indicate that parents play a vital role in the prevention and interventional programs of childhood obesity. These findings are consistent with the literature. [46, 125] Studies suggest that children are very much dependent on their parents and will not achieve a whole lot without the support of their parents. [164]

### 5.3 Organizational Barriers

Our results further revealed that children with obesity do not have enough school support for increased physical activity and healthy diet. Schools are great examples of organizations that influence an individual's behavior. [198] Our findings suggest that from kindergarten to 12<sup>th</sup> grade, kids are geared towards a sedentary life of sitting and listening to teachers most of the time, with little or no physical activity scheduled for these kids. We observed that minimal physical education and physical activity occur in schools these days, and they are becoming less of a priority in schools and that schools are not well informed about physical activity and its infinite benefits to kids, especially in the area of improved academic performance.

Our study suggests that school administrators are concerned that spending more time on physical activity would impact test scores negatively. The success of schools is measured by how high their test scores are. So, school administrators are faced with the

challenge of choosing between spending time on physical activity, which is not measured, and spending time on teaching their students to get high test scores. The pressure on them to see that their students make high test scores makes it hard to implement PA in the school day beyond the state-mandated minimum levels. Thus, school administrators naturally lean towards spending the limited time they have with the students on “teaching to the test”. Unfortunately, these administrators are not convinced that opportunities for continued physical activity have a positive impact on students’ health and improves academic performance, such as class grades, standardized tests, and graduation rates. [85-87] Researchers have linked increased physical activity and improved nutrition to higher academic performance.[87]

Even though Kentucky has a wellness policy on physical activity, (KRS 160.345 (11), this policy is directed at elementary schools only. The policy allows “physical activity to be considered part of the instructional day, not to exceed thirty (30) minutes per day, or one hundred and fifty (150) minutes per week.” [199] Unfortunately, the policy does not extend to middle and high school students where we have the highest obesity prevalence in Kentucky. [8]

Furthermore, our findings revealed that the school breakfast and lunches do not encourage the children to make healthy food choices. Our key informants reported that schools offer children unhealthy choices because they are afraid the kids will not eat the healthy food options. The schools serve kids with unhealthy snacks like pop tarts because they consider pop tarts “whole grain”. Our results revealed that schools lack knowledge of what healthy food really is and the default in the school food environment are not necessarily healthy choices.

The School Breakfast Program (SBP) and National School Lunch Program (NSLP) are federally assisted meal programs that provide nutritionally balanced meals each school day to children in public and nonprofit private schools and residential childcare institutions. [134, 200] The meals are either low-cost or free and the nutritional quality of the meals is expected to be consistent with the Dietary Guidelines for Americans. [135] Although the SBP and NSLP were established to promote healthy food choices among participants, the effect of the desired impact of these program was sabotaged by some US school districts who partner with private beverage and food companies to sell unhealthy food items in the cafeterias and vending machines. [76]

Unfortunately, our study revealed that the school environment does not make healthy dietary and physical activity choices easier for the kids. The school environment in the state of Kentucky seems to be characterized by the abundance of energy-dense food, and a sedentary lifestyle. Little wonder then that there is a continuous increase in childhood obesity in the state of Kentucky, despite the reported effectiveness of the obesity intervention being offered by the UK high BMI clinic. The literature suggests that obesogenic environments contribute to high obesity rates. [60]

#### 5.4 Community Barriers

The community barriers to physical activity that our study revealed include lack of appropriate place for PA, lack of access to low-cost places for PA, cultural factors, lack of safe neighborhood, and lack of appropriate infrastructure for exercise. In addition, we identified environmental barriers to healthy diet such as not having familial accessibility to healthy diet foods, inappropriate media advertisement, and quantity of fast-food places in the community.

Our key informants expressed that it is very unlikely that kids would be motivated to exercise if their environment lacks infrastructure like sidewalks, bike paths and parks that would naturally promote physical activity. Parents will not send their children out for play time if they live in an unsafe environment. [46, 201, 202] They are unlikely to take advantage of even non-strenuous activities they could do inside their homes to get exercise if they are uninformed about physical activity options. [203]

These findings are consistent with the SEM paradigm which postulates that “behavior is influenced by more than just an individual’s perception and thoughts.” [171] According to the SEM, the community of an individual is one of the factors that influence his or her behavior. The SEM portrays the interwoven relationship which exists between an individual and their environment. [172] Therefore, researchers have suggested that policymakers intervene in the childhood obesity crisis through policies that structure and manage environmental factors that impact on participation in PA. [76]

Policies that create environmental default conditions that encourage healthy eating choices and physical activity for youth and adults would result in positive population-level health outcomes. [80] For example, policymakers could embark on projects that would create activity-friendly routes to everyday destinations, like grocery stores, schools, worksites, libraries, healthcare facilities, or even parks. [204] Such strategies would lead to a built environment with infrastructures like sidewalks, trails, and bicycle lanes, connecting people to everyday destinations. [204] Such environments make it easier for people to engage in physical activity. [204]

## 5.5 Policy Changes

Implementing key public policies may help alleviate the obesity epidemic in the state of Kentucky. Policies that encourage physical activity in schools, policies that require and enforce the proper implementation of healthy dietary recommendations in the school cafeterias and environment, and policies that promote more educational programs in schools may all be effective. These policies would address a lot of the barriers encountered by children with obesity and generate environmental default conditions that would make physical activity and healthy diet easier. Consequently, there will be a population level solution to childhood obesity. [80] For example, our study identified intrapersonal barriers to PA such as lack of motivation, enjoyment, time, and knowledge, for reasons that ranged from low self-esteem, physical and health limitations, lack of enjoyment of PA, lack of skills to the busy nature of family life today. These barriers reflect the weaknesses of actions based on personal autonomy. [125] A school policy that requires students to engage in a minimum of 30 minutes of PA daily will address these barriers by compelling the students to participate in PA irrespective of their excuses. According to Schmid, policies remove the burden of the inner volition to change behavior from individuals. [35]

We also observed that the organizational barrier to HD encountered by the kids stemmed from the availability of unhealthy food options in the school environment. The kids indulged in unhealthy diet options because these options were available to them. We observed too that the Dietary Guidelines for Americans were not being applied appropriately to the nutritional quality of the meals served in the school cafeterias. A school policy that would seek to create an environment void of unhealthy options and



ensure proper application of the Dietary Guidelines for Americans would address and eventually ameliorate this barrier.

Sassi finds that a reduction in childhood obesity rates could be achieved through government policies that would ameliorate negative environmental default conditions for the entire population. [67] The school setting would provide an environment that will mitigate the inconsistency that results because of the barriers the kids encounter at home. Studies have reported that consistency is vital to achieving long-term success in obesity reduction. [163]

Our findings suggest that in addition to reducing childhood obesity prevalence, adding physical activity back into the school curriculum would go a long way to help in improving academic performance, e.g., increase in test scores. [85-87] Researchers have linked increased physical activity and improved nutrition to higher academic performance.[87] There is evidence that access to healthy foods and opportunities for continued physical activity has a positive impact on students' health and improvement in academic achievement. [87] Studies have also suggested that the school environment could be an ideal setting for the implementation of childhood obesity intervention policies that promote healthy environmental defaults. [81]

Literature suggests that the selection and consumption of food can be influenced by defaults in the food environment (the food choices that are readily available in the environment). [73]. Findings from our study suggest that there is a lack of accountability in the school environment for increased physical activity and a healthy diet. Policies provide a framework or frame of reference for accountability. Indeed, studies have suggested that policy interventions that make healthy dietary and physical activity

choices easier are crucial in the war against childhood obesity because such policies have the potentials to yield the desired results. [41]

Policies yield desired results because they “ensure compliance with laws and regulations.” [205] For example, there is evidence that the healthy lifestyle modification intervention offered to children with obesity by the UK high BMI clinic, is effective. [45] However, our study has revealed that there are barriers that significantly impede the successful implementation of the healthy lifestyle counsel that these children receive at the clinic. These barriers limit the effectiveness of the intervention even at the individual level, let alone the population level. Therefore, a good way to leverage the effectiveness of the clinical intervention to obesity offered by the UK high BMI clinic and make it a population-based intervention would be to replicate this intervention in the school environment through policy changes.

## 5.6 Recommendations

Our findings suggest that children in the state of Kentucky are surrounded by an environment that is characterized by an abundance of energy-dense food, and a sedentary lifestyle; an environment at home and school that may impede a healthy lifestyle and may promote weight gain. This environment has contributed to the current obesity epidemic that has plagued the state of Kentucky and the nation at large. According to Sassi, a reduction in childhood obesity rates could be achieved through government policies that would ameliorate negative environmental default conditions for the entire population. [67] For example, the government could seek to create community and school environments that promote physical activity and a healthy diet. The government could

also work on connecting routes such as sidewalks, trails, and bicycle lanes to everyday destinations, such as grocery stores, schools, and worksites. Very few studies have evaluated, from a policy perspective, the impact of modifying obesogenic environments on health outcomes. [58, 59]

Kentucky state government could engage in sound policy decisions that would promote the creation of environmental default conditions which encourage healthy eating choices and physical activity for children both in the school and home environments.

#### 5.6.1 Legal and Ethical Analysis of School Policies on Physical Activity and Nutrition

##### 5.6.1.1 Appropriateness of the Policies

To evaluate whether a particular intervention is warranted, there is a need for policymakers to justify the intervention by demonstrating that:

1. There is a remarkable danger. [206]
2. The intervention is effective by showing a reasonable fit between means and ends. [206]
3. The economic costs of the intervention are reasonable when compared with the probable benefits. [206]
4. The interference with human rights is rational [206]
5. There is a fair distribution of the costs and burdens of the intervention. [206]

#### 1. Magnitude and probability of risks of childhood obesity

- One in every five children in the USA struggle with obesity.
- Obesity affects 38% of Kentucky children ages 10-17 years. [207]

- Children in Kentucky are unlikely to engage in physical activity for at least 4 days per week. [207]
- Children in Kentucky are likely to spend more than two hours on screen time daily. [207]
- Health cost of childhood obesity is estimated at \$14 billion annually.
- Childhood obesity is associated with comorbidities, such as type 2 diabetes mellitus, hypertension, non-alcoholic fatty liver disease (NAFLD), dyslipidemia and obstructive sleep apnea. (OSA) [13, 15-17]

## 2. Evidence of effectiveness of school policies

Findings regarding a statewide physical activity program for Georgia's K-12 students known as Power Up for 30, provide evidence that a policy mandating routine physical activity in schools would go a long way to reduce the prevalence of childhood obesity. One of the many outcomes seen with the "Power Up for 30" program was a reduction in the prevalence of childhood obesity. [82, 146] Between 2011-12 academic year and 2016-17 academic year, the state's student population in a healthy weight range improved from 58 percent to 61 percent. [147] Fifty-seven percent of students experienced a drop in their body mass index (BMI) percentile. [148] Obesity is defined in terms of BMI. (a BMI  $\geq$  95th percentile for age and sex) [8] Georgia's ranking in childhood obesity has decreased to 17 from number 2 in 2009. [149]

At the onset, schools had their concerns: that physical activity might take away time from test preparation or core subjects, physical activity could disrupt classes and induce discipline problems, or even reduce attendance. These concerns were addressed using data that show that increased physical activity could improve academic

performance, reduce discipline issues, and increase attendance. [208] The “Power Up For 30” intervention began with about 40 elementary schools in the 2012-2013 academic year. By the fourth year of the implementation of the initiative, over 880 schools had “Power Up for 30” embedded in their elementary school curriculum. [146, 209] Based on a pilot evaluation of the initiative, the Georgia SHAPE has declared the “Power Up for 30” initiative evidence-based. [149] The evaluation showed remarkable improvements in the body mass index (BMI) of fourth graders after the implementation of the program. [149]

In December of 2021, the Georgia State Board of Education authorized the State School Superintendent to award a six-month contract worth \$92,500 to HealthMPowers (HMP) to promote the “Power Up for 30” initiative. [210, 211] The contract also involves conducting surveys of the program participants and reporting the results. [210, 211] Future studies may want to examine the current impact of the “Power Up for 30” initiative.

The impact of Boston’s Active School Day policy (ASDP) initiative is another evidence of the effectiveness of mandatory routine physical activity in schools. Cradock, et al., evaluated the impact of Boston’s ASDP initiative on child physical activity levels during the school day among students in fourth and fifth grades. [145] The study revealed that during the school day, fourth and fifth-grade students in the intervention schools attained about twenty-four of the recommended sixty minutes/day of moderate-vigorous physical activity time. This was a significant increase from the sixteen minutes of active time recorded at baseline. [145] These outcomes were achieved at a tolerable cost.

### 3. Reasonableness of Costs of implementing mandatory routine physical activity and healthy diet policies

Kentucky is one of the sixteen states funded by the Centers for Disease Control and Prevention (CDC) to participate in the State Physical Activity and Nutrition Program. (SPAN) [212] The SPAN program is a five-year program that provides state health departments the support and flexibility to execute evidence-based strategies that will improve nutrition and physical activity at state and local levels. [213] One of the strategies of the SPAN program is to implement and integrate nutrition and physical activity standards into statewide early care and education (ECE) systems, e.g., Head Start programs. States already receive considerable federal funding for Early Care and Education (ECE), like Head Start and Early Head Start programs. [214] Therefore, the state of Kentucky could leverage funding from the SPAN program and the already existing federal funding to ensure that children are introduced to physical activity and good nutrition early in life. This would reduce the burden of the cost, as the state will not have to search for new sources of income to execute this strategy.

The state could also partner with interested non-profit health organizations to enforce the implementation of policies that will promote physical activity in schools. For example, “Power Up for 30” is a joint effort between and Georgia State government and HealthMPowers. [150] HealthMPowers is a non-profit organization that promotes healthy habits among children. [150] Its goal is to bring physical activity and nutrition education into everyday life in schools, childcare centers and outside school. [150] HealthMPowers empowers educators to daily engage school children in physical activity before, during or after school. [150] They provide trainings that equip educators to identify and explore

physical activity opportunities for students throughout the school day. [150] The “Power Up For 30” training goes through five modules that incorporate a video and handouts in each module. The training is designed to help educators find strategies that will get kids off the sidelines and become active. HealthMPowers provides technical assistance to educators and gives incentives and promotional materials to teachers. [150] The program also got funding support from multi-sector partners. [82]

Therefore, the state of Kentucky can engage in the same kind of collaboration (*Georgia and HealthMPowers*) with non-profit organizations such as Alliance for a Healthier Generation, Action for Healthy Kids, and the Partnership for a fit Kentucky. These are all non-profit organizations that support and promote healthy lifestyle habits through environmental changes, and one of their areas of interest is the school environment. [215-217]

Some have expressed concern regarding the cost of providing healthy school meals. Federal assistance for healthy diet in schools is available through the School Breakfast Program (SBP) and the National School Lunch Program (NSLP). This programs “provide nutritionally balanced, low-cost or free lunches to children each school day.” [134] They are federally assisted meal programs, and they operate in public and nonprofit private schools and residential childcare institutions.

The benefits of these policies would have a direct, traceable impact on children with obesity. [218] A reduction in childhood obesity prevalence will result in a reduction in health costs. The estimated cost of childhood obesity alone in direct health expenses is \$14 billion annually. [9]

#### 4. Reasonableness of human rights constraints

The compelling need to protect health, safety, welfare, happiness justifies interference with a person's liberty and choices. [206] Risks to others, protection of incompetent persons, and risk to self are justifications for public health regulation. [206] Children with obesity are at risk to themselves and others: they are vulnerable individuals whose health interests need to be managed by society. According to the Child Welfare League of America (CWLA), every child has a right to primary health care. [219] Studies suggest that children with obesity are more likely to be obese in adulthood in comparison to children who are not obese. [220]

The consequences of obesity are grave. The burden of obesity and its resulting chronic diseases negatively affects a nation's economy, social life, and military readiness. [221] Therefore, intervention to address childhood obesity should be a priority for policymakers despite potential infringement on individual liberty.

#### 5. Distribution of Costs and Benefits

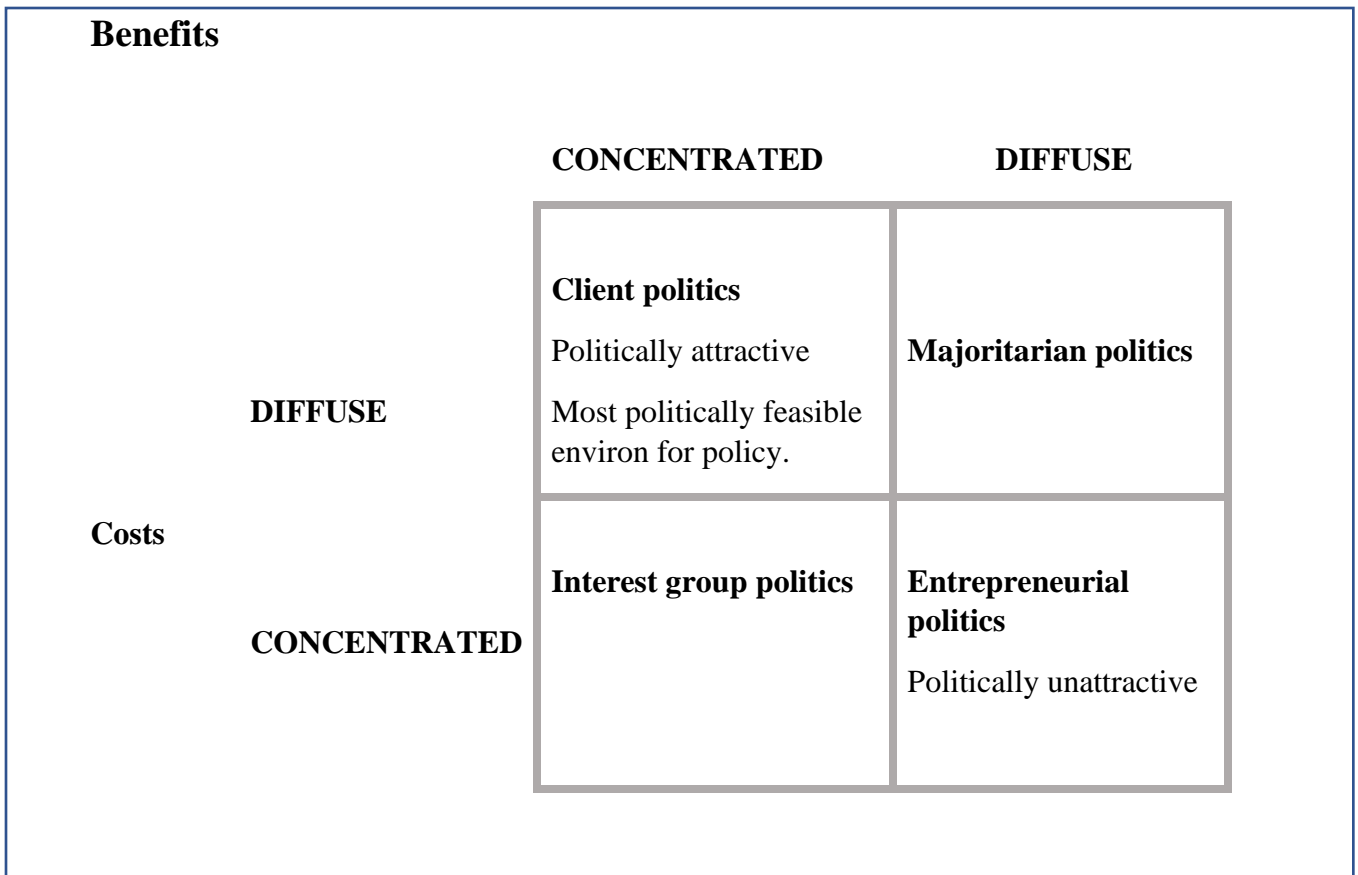
Under Wilson's and Arnold's Framework for analysis of policy design and political feasibility, (Figure 3) mandatory physical activity and healthy diet policies will fall under the "Client Politics" environment. The "Client Politics" environment is an environment with concentrated benefits and diffuse costs. This means that the burden of cost of implementing mandatory physical activity and healthy diet policies will not be solely on the state government. The cost will be spread across various bodies, e.g., nonprofit organizations, the Federal government, and even profit-making organizations could help with cost. However, the state government will benefit most because a reduction in the prevalence of childhood obesity will result in a reduction in health costs.



It is true that government bureaucracy would not allow for the savings from the health cost of childhood obesity to be transferred to school expenditure. However, the government could spend the money saved on other pending needs.

The costs of mandatory physical activity and healthy diet policies are diffuse. There are already programs and funding opportunities that the state could take advantage of and be intentional about using them to execute childhood obesity intervention. The SPAN program and the federally assisted School Breakfast Program (SBP) and National School Lunch Program (NSLP) are great examples of already funded programs that the state could take advantage of. [134, 200]

Figure 3 - Diagram Illustrating Wilson’s and Arnold’s Framework for Analysis of Policy design and political feasibility **[218]**



## 5.6.2 Political Feasibility of Implementing Mandatory Physical Activity and Healthy Diet Policies

The political feasibility of any policy is determined by:

1. The distribution of costs and benefits. (*As discussed under “Distribution of Costs and Benefits*) Relatively concentrated benefits while imposing only diffuse costs across other groups are desired.
2. The social construction of the target population.

### 5.6.2.1 Social Construction of Target populations

Figure 4 is adapted from Schneider A and Ingram H. illustration table of Social Construction of target populations. [222] Children fall under the category of the “dependent” population in this table. The “dependent” group has a positive social construction, but weak power. In other words, even though they do not have strong political power, they have a positive image, and are seen as ‘deserving’ by society. Children are the major beneficiaries of mandatory routine physical activity and healthy diet in school settings. Therefore, policies that favor children should garner favorable support from society if they come with minimal cost.

Figure 4 - Social Constructions and Political Power: Types of Target Populations

		<b>Social construction</b>	
		<b>POSITIVE</b>	<b>NEGATIVE</b>
<b>Power</b>	<b>STRONG</b>	<b>Advantaged</b> Positive Image, High power <i>(The elderly, Business, Veterans, Scientists)</i>	<b>Contenders</b> Negative Image, High power <i>(The rich, big unions, minorities, cultural elites, moral majority)</i>
	<b>WEAK</b>	<b>Dependents</b> Positive image, Low power <i>(Children, mothers, disabled)</i>	<b>Deviants</b> Negative image, Negative power <i>(Criminals, drug addicts, communists, flag burners, gangs)</i>

Adapted from Schneider A and Ingram H. (1993) illustration table Social Construction of target populations [222]

### 5.6.3 Strategies to Promote Acceptance and Adoption of the Policy

#### 5.6.3.1 Strategies for Supportive Interest Groups

- Policymakers could solicit the support and acceptance of school superintendents and educators. For example, the implementation of “Power Up for 30” garnered the support of school administrators and teachers. [223] School administrators may cooperate if assured that the policy will result in improved academic achievements, behavior changes and a decrease in disciplinary cases.[82, 223]
- Promote messages on the potential effectiveness of mandatory physical activity and healthy diet on academic achievements, e.g., test scores. The program

developers of “Power Up for 30” tailored messages to emphasize the benefits that were of priority to school principals, physical education, and classroom teachers.

[223] Examples of such benefits include improved academic performance, improved attendance and discipline, and improved health.[223]

- The general populace usually supports projects that will benefit children. [222] Policymakers can reach out to the community by educating them on the adverse effects of childhood obesity and promoting messages that focus on the effect of increased activity and healthy diet on school children. These can be achieved by identifying and using community leaders to reach the community. They could also reach the community by organizing town hall meetings.
- Promote advertisement of products that are healthier for children.

#### 5.6.3.2 Strategies To Mitigate Opposition Interest Groups

- Increase public awareness of the marketing tactics of industries that produce and distribute unhealthy foods.
- Make their manipulative strategies and lobbying activities, known to the public.

The producers and distributors of unhealthy foods will oppose the idea of creating a healthy food environment in schools. [76] They are powerful and influential and will use their influence in lobbying against the policy. So far, they have used their manipulative abilities and financial powers to sabotage the National School Lunch Program. (NSLP) [76] For example, in 2014, the U.S. Department of Agriculture (USDA) succumbed to pressure from the “Big Food” companies, and it became easier for French fries and pizza to be served in schools. [224] In 2018, pressure from the “Big Food” companies made the

USDA to slacken the regulations on the amount of refined grains, sodium, and flavored milk that could be allowed in school meals. [224] In 2020, the USDA again proposed new regulations that would permit schools to offer more pizza, burgers and French fries to students at breakfast and lunch and reduce the amount of fruits and vegetables required. [224, 225]

#### 5.6.4 Alternatives to School Policies that Promote Physical Activity and Healthy Diet

Just as there are multifactorial causes of childhood obesity, there is no single cure for the epidemic. Mandatory routine physical activity and healthy diet in the school environment are not the only solution to the childhood obesity epidemic in the state. Government can seek to create community environments that ensure that healthy food and beverage options are the preferred routine.

Physical activity options could be made an easy choice to the public. For example, create activity-friendly routes to everyday destinations. This can be done by connecting routes such as sidewalks, trails, bicycle lanes, and public transit to grocery stores, schools, worksites, libraries, parks, or health care facilities.

#### 5.6.5 Conclusion

Studies have shown that a strong tool to reverse childhood obesity may be policies that provide an environment that promotes improved dietary and physical activity behavior. [39] Policy interventions to change environmental default conditions have been identified as the “swiftest and most cost-effective way to create change” [64]

Sassi finds that a reduction in childhood obesity rates could be achieved through government policies that would ameliorate negative environmental default conditions for the entire population. [67]

The school setting can create an environment that promotes improved dietary and physical activity behavior. Elementary and high school education is required for all children in Kentucky. Most Kentucky children spend an average of six hours a day at school, [226] and some of these children consume one to two meals per day at school. Not only do schools provide opportunities to enforce healthy habits, schools also provide a setting for public health interventions, such as intervention for childhood obesity. The intervention can be easily sustained because the teaching staff can facilitate and contribute to the delivery of the intervention significantly.

Our study has revealed that healthcare providers perceive that the children with obesity that attend the UK pediatric high BMI clinic encounter personal, environmental, and social barriers that impede the implementation of the healthy lifestyle counselling that they receive from the clinic. These barriers could be addressed in the school setting through policy changes that would promote healthy lifestyle habits in the school environment. This strategy would provide a population-based intervention for the obesity epidemic that has plagued the state of Kentucky.

There is no doubt that childhood obesity remains a serious public health concern. The political atmosphere is challenged by the burden of childhood obesity and policymakers are frantically seeking for solutions. John Kingdon's multiple stream model describes a window of opportunity which is a short period when problems emerge and solutions to the problems are politically recognized at the same time. [178] Embarking on a school-

focused intervention for childhood obesity through mandatory routine daily physical activity and healthy diet might just be the solution to childhood obesity epidemic in the state of Kentucky. Given that the burden of obesity and its resulting chronic diseases, have made obesity interventions and prevention a major priority for policymakers, [179] the policy changes that we have recommended could be a possible solution to the problem. The window of opportunity might just be now if policymakers would accept and seek to implement our recommendations.

## APPENDIX

### Appendix 1: Key Informants semi-structured interview guide [46, 227]

1. What is your area of discipline?			
2. In what way do you provide care to obese children?			
<b>Barriers</b>	<b>Agree</b>	<b>No idea</b>	<b>Disagree</b>
<b>What personal barriers to physical activity do you think children with obesity encounter?</b>			
<b>Personal barriers to PA</b>			
Lack of motivation			
Lack of enjoyment			
Lack of skill			
<b>Social barriers to PA</b>			
<b>What social barriers to physical activity do you think children with obesity encounter?</b>			
Not enough parental support			
Not enough teacher/school support			
<b>Environmental barriers to PA</b>			
<b>What environmental barriers to physical activity do you think children with obesity encounter?</b>			
Lack of enough information about PA			
Lack of appropriate place			
Lack of accessibility to low-cost PA place			
Lack of enough time			
Feeling shy for PA in public			
Not having an appropriate climate			
Cultural factors			
Economic factors			
Not having time due to homework			



<b>Personal and environmental barriers to a healthy diet</b>			
<b>What personal and environmental barriers to a healthy diet do you think children with obesity encounter?</b>			
Lack of knowledge about healthy food			
Lack of motivation to use healthy food			
Lack of enjoyment of healthy food			
Lack of appropriate knowledge in family			
Not having familial accessibility to a healthy diet			
Cost of healthy food			
<b>Social barriers to a healthy diet</b>			
<b>What social barriers to a healthy diet do you think children with obesity encounter?</b>			
Lack of parental support for a healthy diet			
Lack of friends' support for a healthy diet			
Lack of teacher or school support for a healthy diet			
Not having enough time to prepare healthy foods			
Inappropriate media advertisement			

**What policy changes do you think could address these barriers that children encounter?**

- Do you think a state policy that requires a regular daily increased physical activity (1 hr./ day) as part of the school curriculum would help reduce obesity prevalence in Kentucky?
- The “*Dietary Guidelines for Americans*” has provided the following recommendations for individuals 2 years and older:
  - A variety of fruits and vegetables.
  - Whole grains.
  - Fat-free and low-fat dairy products.
  - Reduced solid fats, sodium, and added sugars
  - Oils

Do you think a state policy that requires and enforces the proper implementation of these dietary recommendations in the school cafeterias and environment would help reduce obesity prevalence in Kentucky?

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