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# Evaluating the Feasibility of School-Based Interventions in the Prevention of Childhood Obesity in Harlan County Public Schools

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Abstract description: In recent years, childhood obesity has become a public health crisis within the United States. With children living in rural communities considered at risk for developing this condition, there is a critical need for multi-level programs to prevent this condition by establishing proper health behaviors in children at a young age. This project focused on identifying evidence-based interventions to prevent the development of childhood obesity in a rural school system in Harlan County, Kentucky by promoting healthy nutrition and adequate levels of physical activity. Harlan County Public Schools' current policies were evaluated in regards to how well they met current recommendations for nutrition and physical activity. Then, previous studies that included interventions focused on improving these health behaviors in children were analyzed in regards to their efficacy and limitations. Based upon these studies, suggestions were made for improvements in Harlan County's school system. It was found that while Harlan County's current policies showed initiative towards promoting healthy behaviors, there was still a need for improved and better defined policies. Recommendations to improve school nutrition included eliminating processed foods from the school menus and replacing them with healthier options, while recommendations to improve physical activity included establishing more periods of organized physical activity during the school day.

*Keywords and phrases:* honors thesis, honors project, undergraduate research, nursing, public health, health promotion, prevention, childhood obesity, school-based interventions

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# Evaluating the Feasibility of School-Based Interventions in the Prevention of Childhood Obesity in Harlan County Public Schools

Middle childhood is a time period that is characterized by enthusiasm, youthful curiosity, and an intense desire to learn. Between the ages of 6-12, the school-age child is exposed to a variety of environments and experiences crucial to shaping the lifestyle habits that will determine their health, also known as health behaviors, and their ability to thrive independently as an adult. The development of poor health behaviors during this stage can lead the child to develop chronic conditions that may extend into adulthood (Hawkins & Edwards, 2015). One particular area of concern is the development of childhood obesity, a condition that can be traced back to poor health habits, including poor nutrition and a lack of physical activity. Children that are obese are at a higher risk for developing comorbid/chronic conditions, such as asthma, sleep disordered breathing (sleep apnea), type 2 diabetes, and joint problems (Hawkins & Edwards, 2015). These comorbid/chronic conditions can develop prematurely during childhood or later in life as an adult. Either way these conditions pose a significant threat to the individual's health, severely impacting their quality of life, and in some instances, leading to premature death.

When compared to children who live in urban areas, children that grow up in rural communities are considered to be at a higher risk for developing childhood obesity and its associated complications (Johnson & Johnson, 2015). Furthermore, the distance to pediatric offices and that cost of treatment are often barriers to these children receiving adequate access to healthcare resources that aim to prevent or treat childhood obesity (Findholt, Davis, & Michael, 2013; Klitzman, Armstrong, & Janicke, 2014). For this reason, the pediatrician cannot be relied upon as the sole source of interventions for rural children that are overweight or obese. Already, various researchers have called for the creation of multi-level interventions to help combat the prevalence of childhood obesity in rural communities (Findholt et al., 2013; Hawkins & Edwards, 2015; Tuckson, 2013; Tovar et al., 2012).

Kentucky is a state that has been particularly affected by childhood obesity with approximately 16% of children between the ages of 10-17 classified as overweight, while nearly 20% are considered obese (National Survey of Children's Health, 2011). Given the largely rural areas and high rates of childhood obesity, the current state of Kentucky's health requires an intervention. One way in which this can be accomplished is through the creation of school-based interventions. In Kentucky, students spend approximately 6.7 hours at school each day (U.S. Department of Education, 2008). Out of the children currently enrolled in Kentucky's public schools, approximately 75% of children qualify for a free or reduced lunch (Robert Wood Johnson Foundation, 2017). In addition to lunch, schools may provide breakfast or afternoon snacks, leading many students to rely on the school system to provide them with multiple meals each day. Schools may also offer various opportunities for students to engage in physical activity. During the school

day, students may be physically active through physical education (PE) classes and other periods of organized physical activity in addition to extracurricular activities, such as sports teams or events sponsored by local resources. Between the time spent at school and the meals provided for students, the school system appears to provide an influential environment that has the potential to make an impact on the nutrition and physical activity levels of each student.

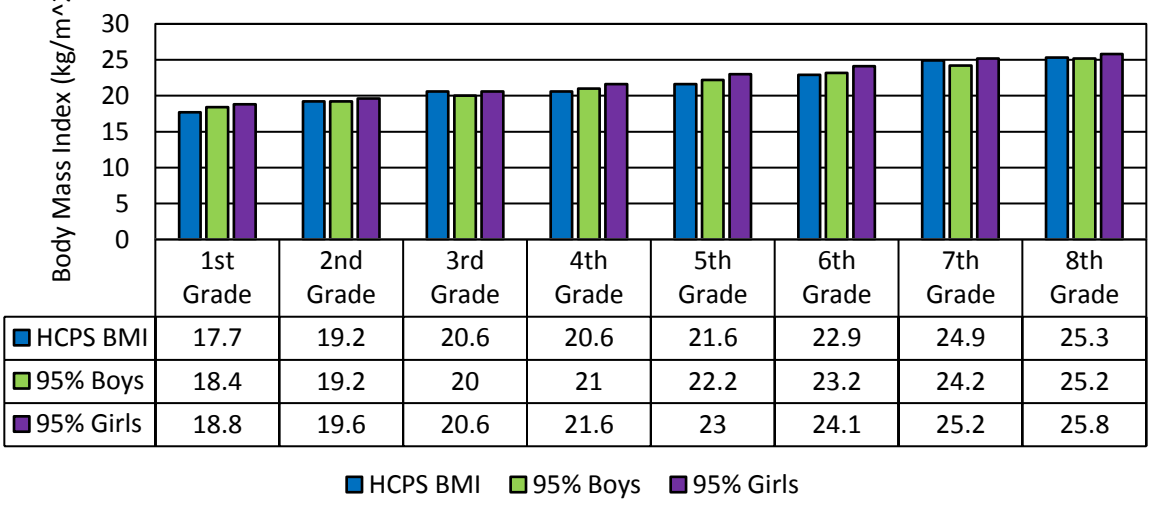
## A Breakdown of Childhood Obesity

As defined by the Centers for Disease Control and Prevention (CDC), a child is considered overweight when their body mass index (BMI) is between the 85$^{th}$ and 95$^{th}$ percentile when compared to other children of the same age and sex. They are then considered obese when their BMI is above the 95$^{th}$ percentile (Centers for Disease Control and Prevention, 2015a). Nationwide, an average of 14.9% of children suffer from childhood obesity, which feeds into the 29.3% of adults who are now considered obese in the United States (National Survey of Children's Health, 2011). Both of these rates increase within Kentucky with approximately 20% of children and 33% of adults living as obese (National Survey of Children's Health, 2011; Robert Wood Johnson Foundation, 2017).

The impact of childhood obesity and its associated complications escalates within Harlan County, a rural county located on the eastern border of Kentucky. With a population of 27,700, approximately 23% of Harlan County's population is under the age of 18 (U.S. Census Bureau, 2015). Of this age group, approximately 4,139 of these children are students enrolled within Harlan County Public Schools (HCPS), which ranges from preschool to grade 12 (U.S. Department of Education, 2015). Each year, the

Kentucky Department of Education receives information from the public school districts within Kentucky reporting the average BMIs of students in grades 1-12. When compared with a pediatric growth chart, the data from HCPS reveals that the average BMI of each grade level is consistent with what would be considered an obese BMI for boys and girls of that age. The comparison of the average BMI of HCPS students with the 95$^{th}$ percentile of BMIs of boys and girls at each grade level can be seen in Table 1 (Kentucky Department of Education, 2015). In addition to this heavy prevalence of childhood obesity, previous studies have also revealed that the prevalence of childhood obesity tends to increase as children become older (Aldrich, Gance-Cleveland, Schmiege, & Dandreaux, 2014). If the average BMI of these HCPS students were to continue to increase, it is not surprising to see how approximately 37% of adults within Harlan County are currently classified as obese (Robert Wood Johnson Foundation, 2017).

**Table 1. Average BMI of HCPS Students Compared to the BMIs of Clinically Obese Boys and Girls**




| | 1st Grade | 2nd Grade | 3rd Grade | 4th Grade | 5th Grade | 6th Grade | 7th Grade | 8th Grade |
|---|---|---|---|---|---|---|---|---|
| HCPS BMI | 17.7 | 19.2 | 20.6 | 20.6 | 21.6 | 22.9 | 24.9 | 25.3 |
| 95% Boys | 18.4 | 19.2 | 20 | 21 | 22.2 | 23.2 | 24.2 | 25.2 |
| 95% Girls | 18.8 | 19.6 | 20.6 | 21.6 | 23 | 24.1 | 25.2 | 25.8 |

## Complications

**Childhood.** The most dramatic effect of childhood obesity can be seen in the development of chronic conditions during childhood. In a review of medical charts from a Kentucky pediatric office, Hawkins and Edwards (2015) identified a variety of complications associated with childhood obesity that were present within overweight patients. These complications affected different areas of the body, including the respiratory tract (allergies, asthma, and sleep disordered breathing), the endocrine system (warning signs of type 2 diabetes - polyuria [excessive urination], polydipsia [excessive thirst], and polyphagia [excessive hunger]), the reproductive system (polycystic ovarian syndrome [a disorder in women that causes painful cysts to develop on the ovaries] and dysmenorrhea [painful menstruation]), gastrointestinal complications (constipation and gastroesophageal reflux disease [GERD]), and orthopedic complications from excess weight on the joints (flat feet or joint pain). From this study, it was found that 60% of overweight 4-6 year-olds and 50% of overweight 11-13 year-olds already exhibited signs of these chronic conditions, leading them to require more medical care than children that were of a healthy weight (Hawkins & Edwards, 2015).

Furthermore, Hawkins and Edrawrds (2015) found the children that were overweight averaged 2.3 office visits per child in an 18-month timespan, compared to children that were of a normal weight, who averaged 2 office visits per 18 months. Collectively, this amounts to 46 extra visits in an 18-month timespan for the 153 children that were overweight or obese. In financial terms, 46 extra office visits amounts to an additional $1,450 in Medicaid costs that can be linked to the effects of childhood obesity within this pediatric office. This is merely the cost of childhood obesity to one pediatric

office in Kentucky, a fraction of the cost to Kentucky's complete healthcare system and miniscule when compared to the cost to the nation. Unfortunately, the effects of obesity are not limited to childhood but continue into adulthood if no successful interventions are made.

**Adulthood.** It is estimated that approximately 80% of children who enter adolescence obese will remain obese into adulthood (Robinson, Geier, Rizzolo, & Sedrak, 2011). Based upon this statistic, it appears that interventions targeting childhood obesity are best if made sooner, rather than later. Along with the progression into adulthood, the complications that obese individuals experience begin to increase in number and complexity. Hypertension, type 2 diabetes, heart disease, orthopedic complications, and sleep apnea are among the most common complications that obese adults experience (Robinson, Geier, Rizzolo, & Sedrak, 2011). In Kentucky alone, approximately 39% of adults have been diagnosed with hypertension, while 13% of adults live with type 2 diabetes. If Kentucky continues at its current pace, it is anticipated that by 2030, the number of people living with hypertension will increase by 300,000, while cases of diabetes will increase by 200,000 (Trust for America's Health & Robert Wood Johnson Foundation, 2016).

Unfortunately, the development and progression of these chronic conditions can lead to the worst complication that can result from the effect of obesity on the body, premature death. In communities with a high prevalence of obesity and its comorbid conditions, there tends to be a higher rate of premature death among its residents. The rate of premature death within communities can be measured by the number of years of potential life lost (YPLL) before the age of 75 per 100,000 residents. In the counties that

fall within the top 10th percentile with positive health factors, such as adequate access to healthcare, good nutrition and high rates of physical activity, this rate is measured at 5,200 YPLL. The number of YPLL tends to increase in communities with poorer health behaviors with Kentucky's counties averaging around 8,800 YPLL, showing a higher rate of premature death. This number further increases in the Eastern portion of the state with Harlan County averaging around 14,300 YPLL, more than twice the national average of 6,601 YPLL (Robert Wood Johnson Foundation, 2017).

**The Economic Impact of Obesity.** Beyond the effects of obesity's complications on the body, this epidemic has had a significant impact on the United States economy as well. From a study conducted by Cawley and Meyerhoefer (2012), it was estimated that the nationwide medical care costs associated with obesity may reach as high as $209.7 billion each year. Individually, the increased cost of medical care associated with treating obesity and its complications each year was gauged to be an additional $1,152 per individual man and $3,613 per individual female. The economic impact of obesity can also be evaluated at the workplace through job absenteeism (an employee's absence from work) and the loss of productivity. Nationwide, the impact of job absenteeism amounts to approximately $8.65 billion in lost revenue each year. In Kentucky, it is estimated that 10% of job absenteeism can be attributed to obesity each year, resulting in an annual loss of $125 million for Kentucky's economy (Andreyeva, Luedicke, & Wang, 2014). With the anticipated increase in the prevalence of obesity and its complications, this cost of obesity to Kentucky and the United States can only be expected to rise.

## Purpose of this Paper

In order to lessen the extensive impact of obesity and its complications, there is a critical need for interventions to prevent obesity from developing at a young age and to treat those who are already affected by this condition. An essential component to these interventions is the establishment and promotion of healthy behaviors. The purpose of this paper is to examine childhood obesity within Kentucky and evaluate potential evidence-based interventions that could be implemented to prevent the development of childhood obesity by promoting healthy nutrition and physical activity within a rural school system in Harlan County, Kentucky. The Integrated Theory of Health Behavior Change, which focuses on changing a person's health by fostering knowledge in health behaviors, promoting self-regulation skills and establishing a support network, will be used as a basis and guide for these interventions.

## Literature Review

### Health Behaviors

Health promotion and prevention behaviors are essential components to maintaining one's health. There are two main ways in which health behaviors can be practiced. First, healthy individuals maintain their health through regular health promotion and prevention activities; second, those with chronic conditions must practice specific behaviors in order to manage their chronic condition (Ryan, 2009). As it pertains to health promotion behaviors that prevent the development of obesity, maintaining a balanced diet and proper levels of physical activity work together to promote a healthy weight. While the importance of a proper diet and physical activity may be known, it is

crucial to understand the components of these health behaviors as well as the degree to which these lifestyle behaviors are practiced within rural communities in the United States.

**Proper Nutrition.** According to the Dietary Guidelines for Americans (2015), a list of recommendations published every five years by the United States Department of Agriculture (USDA), a proper diet should consist of a variety of nutrient-dense foods. An ideal diet should include a combination of whole fruits, vegetables, low-fat dairy or fortified soy beverages, oils, and a variety of protein sources, including lean meats, fish, soy products, or legumes. In contrast, the consumption of foods that include saturated or trans fats, added sugars, and sodium should be limited (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). To promote the consumption of fruits and vegetables in children, national health organizations, including the CDC, USDA, National Cancer Institute (NCI), and the Produce for Better Health Foundation, have collaborated through a variety of campaigns in the past. These campaigns have included the previous "5 a Day" slogan and the current "Fruits & Veggies- More Matters", which both advocate for five or more servings of fruits and vegetables each day (U.S. Department of Agriculture, 2013a; Centers for Disease Control and Prevention, 2017).

Unfortunately, despite the efforts made by these campaigns, there still appears to be a deficit in children's diets when it comes to proper nutrition. In fact, an analysis of four rural elementary schools in Kentucky with 1,508 children found that only 15% of children met the national recommendation of consuming at least five servings of fruits and vegetables each day (Ling, King, Speck, Kim, & Wu, 2014). Regarding dairy

consumption, an additional study performed by Tovar et al. (2012) involving 401 children from rural counties in California, Kentucky, Mississippi, and South Carolina found that only 18% of overweight and obese children reported drinking either low fat 1% or non-fat milk, while 30% reported drinking whole milk. It was also found that 97% of overweight or obese children reported drinking at least one can of soda each day (Tovar et al., 2012). These findings point to poor nutrition and a lack of nutrient-dense foods in children's diets.

From a focus study involving Appalachian youth, it was found that the reason for children consuming diets with a poor nutritional quality does not appear to be solely related to a lack of knowledge surrounding proper nutrition. In fact, these children often understand the need to consume multiple servings of fruits and vegetables each day and to practice portion control with less healthy options. Yet, when given the choice between healthy, nutritious foods and less healthy options, the children would often prefer the less healthy foods due to a variety of factors, including taste, cost, convenience, and advertisements (Swanson, Schoenberg, Davis, Wright, & Dollarhide, 2013). The prevalence of poor nutrition in school-age children, particularly in rural areas, is an issue that has also been identified by school personnel. In a study involving school personnel from five rural schools, the elementary staff stated that students tended to consume more "junk foods", including soda, fast food, and processed foods, as opposed to healthier options (Odum, McKyer, Tisone, & Outley, 2013). The staff related this food preference to environmental factors that were outside of the children's control, including a lack of control over food choices at home, such as unhealthy breakfasts and a lack of home-cooked meals. Some also acknowledged that school cafeterias often provided breakfasts

that were high in sugar in addition to providing extra portions at lunch to children that were already overweight (Odum et al., 2013). It is important to consider the influences of different environments that they are exposed to throughout the day, including their schools and homes.

**Physical Activity.** Proper levels of physical activity provide the second major component to maintaining a healthy weight. The current recommendation for physical activity for children is to engage in at least 60 minutes of physical activity every day (U.S. Department of Health and Human Services, 2008). According to the Youth Behavioral Risk Factor Surveillance Survey (2015), a telephone survey conducted through the CDC, only 28% of middle school students currently meet that standard, leaving more than 70% of children receiving less than 60 minutes of physical activity each day. It was also reported that approximately 13% of middle school students in Kentucky are currently not involved in any physical activity at all (Centers for Disease Control and Prevention, 2015b). Additional studies have estimated the rate of physical activity among Kentucky youth to be even lower, with Ling et al.'s (2014) study reporting an estimate as low as 1% of children receiving 60 minutes of physical activity each day. Between each of these estimates, a glaring disparity is evident regarding the lack of adequate physical activity among school-age children, further validating the need for providing consistent opportunities for physical activity for school-aged students in Kentucky.

The prevalence of sedentary activity is likely a culprit in the lack of physical activity amongst children and adolescents. In Odum et al.'s (2013) study of school personnel's opinions on childhood obesity, the majority of school personnel felt that the

children at school led inactive lifestyles, stating that the children often "cringe" at the suggestion of exercise and prefer to stay inside. One way that sedentary activity can be measured is through the amount of time that a child spends in front of a screen (screen-time), such as a television (TV), computer, or video game, each day. Higher levels of screen-time are often consistent with sedentary activity. When asked about screen-time, 33% of surveyed Kentucky middle schoolers reported watching TV for three or more hours each day, while nearly 50% reported playing video games for three or more hours each day (Centers for Disease Control and Prevention, 2015b). These results have been identified in previous studies as well, including Tovar et al.'s (2012), which found that approximately 60% of overweight or obese children spent more than 2 hours of screen-time each day. With technology holding such a prominent role in children's lives, it is important to address the obstacles that electronics may present in children getting enough physical activity. While it may seem that limiting screen-time could present one way to encourage more physical activity, incorporating electronics into physical activity may provide a more sustainable option for children to engage in both physical activity and electronics simultaneously.

**Rural Communities**

While it may appear easy to attribute childhood obesity solely to the presence of poor health behaviors, obesity itself is a complex medical condition that is influenced by a variety of factors in the environment and community (Swanson et al., 2013). One risk factor pertinent to the development of childhood obesity is geographic location, specifically living within a rural community. In a review of ten studies conducted between 1999-2012, Johnson and Johnson (2015) analyzed rates of childhood obesity in

urban and rural areas in the United States and found that all but one study identified a higher prevalence of childhood obesity amongst children living in rural communities. In fact, they found that if a child lived in a rural area, that child was at a 26% greater risk of becoming obese. Additionally, the studies utilized in this meta-analysis covered a 13-year timespan, demonstrating that childhood obesity within rural communities has been an ongoing, public health issue for many years (Johnson & Johnson, 2015).

Within Kentucky, this disparity is evident between rural and urban counties. Each year, the Robert Wood Johnson Foundation ranks Kentucky's counties in regards to the residents' health and daily lifestyles, including health factors such as physical activity, obesity rates, and access to food and exercise opportunities. Out of Kentucky's 120 counties, Harlan County, which covers a largely rural area, is ranked second to last at 119 in regards to its residents' health factors. In comparison, Oldham County, which is located near Louisville, is ranked first in the state (Robert Wood Johnson Foundation, 2017). The quality of health factors affects each county's health outcomes, including rates of diseases and premature death. Accordingly, the counties that are ranked last between 91-120, indicating poor health outcomes, are all clustered in the rural, Eastern portion of Kentucky, while the counties surrounding major cities, including Louisville, Cincinnati, Bowling Green, and Lexington, are all located within the top 30, indicating positive health outcomes for residents (Robert Wood Johnson Foundation, 2017). In order to create effective interventions that address childhood obesity in rural communities, it is essential to understand the factors that place these rural communities at risk for disparities in maintaining healthy lifestyles.

**Food Deserts**. One barrier that residents face in rural communities is the presence of "food deserts", areas in which residents lack access to fresh, healthy foods. As defined by the USDA (2016), food deserts consist of areas where a significant number of residents are classified as low-income with low access to a supermarket or grocery store. In this case, a "low income area" is defined as at least 20% of families living at or below the federal poverty line or when the median family income is at or below 80% of the median family income of the surrounding area (Ver Ploeg, Nulph, & Williams, 2011). In rural areas, a "low access" area is defined as an area where at least 500 people or 33% of the population live more than ten miles from a grocery store. Across the United States, it has been estimated that up to 13.5 million people reside in food deserts, affecting both inner city areas and rural communities (Ver Ploeg, Nulph, & Williams, 2011). Living in a food desert has been shown to have a negative impact on the quality of nutrition that the residents consume, consequently affecting their ability to maintain a healthy weight. In an analysis of 18,381 households in 2,104 counties, Chen, Jaenicke, and Volpe (2016) found that residents who lived in a food desert were more at risk to become overweight or obese, while residents who had greater access to healthy and nutritionally balanced foods were more likely to be a healthy weight. These results emphasize the effect of access to healthy, fresh foods on weight status and illustrate the importance of increasing access to sources of nutritious foods.

**Cost.** Combined with a lack of access to grocery stores, the cost associated with a healthy lifestyle may prove to be too much for many rural, low-income families to afford (Findholt et al., 2013; Odum et al., 2013; Swanson et al., 2013). Working parents often face the dilemma of working to provide a stable source of income for their family, while

trying to raise a healthy child (Findholt et al, 2013). The cost of fresh foods may prevent them from maintaining a healthy diet, causing families to rely on fast food or junk food as a cheaper alternative (Odum et al., 2013; Swanson et al., 2013). Being physically active within the community may not be a practical option due to a lack of sidewalks, parks, and recreational facilities (Barnidge et al., 2013). As such, families may also be unable to afford the fees and costs associated with playing on a recreational sports team, where the children would be able to engage in regular, consistent physical activity (Odum et al., 2013). Rural families may also lack health insurance, which may discourage them from utilizing healthcare services due to an inability to pay (Findholt et al., 2013). In these cases, it's likely that these children will not have the opportunity to be regularly evaluated for childhood obesity and may not receive treatment for any comorbid conditions that develop until they begin to impact the child's quality of life.

Additionally, the local public health department may find it difficult to gather enough funds to support a community-based initiative that addresses childhood obesity. The community's small population size may result in a lack of financial or legislative support due to an insufficient tax base and limited interest from outside funders. The health department may also be the only resource available to treat a rural community's health (Barnidge et al., 2013). When compared with more immediate demands in the community, the treatment of childhood obesity may be seen as a lower priority, and as a result, may be left unaddressed and untreated when competing with other public health concerns (Barnidge et al., 2013).

**Busy Schedules.** The parents of rural families must often maintain busy schedules between work, running errands, completing chores and meeting the needs of the family.

These factors are often non-negotiable, creating a hectic schedule for rural parents. The resulting time constraints that these parents face may have a negative impact on their ability to create a home environment that supports healthy lifestyle behaviors. For these families, it is often more convenient for the parents to prepare more processed, prepackaged meals or go through the drive-thru instead of preparing a home-cooked meal (Swanson et al., 2013). The children may also be left unsupervised at home while their parents work, where they are left to make their own decisions regarding their nutrition and physical activity, which can result in poor nutritional choices and a lack of exercise (Odum et al., 2013). Between the demanding factors within their lives, the thought of making a lifestyle change may make parents feel overwhelmed if they feel that they do not have enough knowledge or resources (Odum et al., 2013). In these cases, it is essential to provide education to the parents on how to support healthy behaviors within their family and connect them with the resources that would help them to promote these healthy lifestyles.

**Sociocultural Influences.** The overarching culture within the United States tends to be one that supports unhealthy lifestyles. People tend to lead sedentary lives while overeating foods that are of low nutritional value (Findholt et al., 2013). Combined with family's busy schedules, the fast-paced culture of the United States rarely leaves time for parents to prepare home-cooked meals, resulting in families frequently relying on fast food restaurants, where they are not in control of the food's portion sizes and nutritional content (Odum et al., 2013). There is also a significant social atmosphere associated with food, which may make it difficult for children to choose healthy options at school or when hanging out with friends, especially if healthy options are limited (Swanson et al.,

2013). Culturally speaking, childhood obesity can be a sensitive topic and a difficult reality for many families to accept, leading parents to be in denial regarding their child's weight. These parents may resist any outside attempts to intervene in their situation, which can result in negative health outcomes for their child in the long-term (Odum et al., 2013). The parents of overweight children tend to be overweight as well, indicative of the poor diets or inactive lifestyles that may be present within the family (Findholt et al., 2013). In these cases, changing the family's lifestyle may be seen as a daunting, difficult task to accomplish, and a resulting lack of parental motivation and willingness to change may have a negative impact on their child's health (Odum et al., 2013).

## Methodology

This feasibility study focused on analyzing Harlan County's Public Schools' (HCPS) policies regarding nutrition and physical activity in their elementary schools, evaluating ways in which these policies can be improved with the use of evidence-based research. Information regarding HCPS nutrition policies was collected from the school district's website, while information regarding policies on physical activity was collected from the HCPS website in addition to a series of emails with an administrator in school health. Previous studies were included within this report if they were published within the past five years and contained interventions that focused on improving nutrition or physical activity in school-aged children. Studies that were implemented with rural schools were preferred; however, this was not considered to be an exclusion criteria. These studies were evaluated in regards to how well they meet the steps necessary for behavior change as outlined in the Integrated Theory of Health Behavior Change (Ryan, 2009). Then, based upon the success, limitations, and projected cost of these

interventions, suggestions were made for improvements in Harlan County's public elementary schools, accounting for limitations that may arise in cost, environmental barriers, and other factors associated with rural communities.

## The Integrated Theory of Health Behavior Change

The Integrated Theory of Health Behavior Change (ITHBC) is a type of descriptive midrange theory that is meant to serve as the basis for creating interventions targeted at establishing and maintaining long-term change of health behaviors (Ryan, 2009). These interventions take a holistic approach to incorporate the health behavior change in all aspects of the individual's life. The process delineated within the ITHBC to create these interventions is divided into three separate steps: fostering knowledge and beliefs in health behaviors, developing self-regulation skills, and creating a supportive network for the social facilitation of these health behaviors (Ryan, 2009). A basic breakdown of these steps and their components is provided in Figure 1. By accomplishing these tasks, changing one's health behavior can change from a daunting obstacle to a goal that can be accomplished over time.

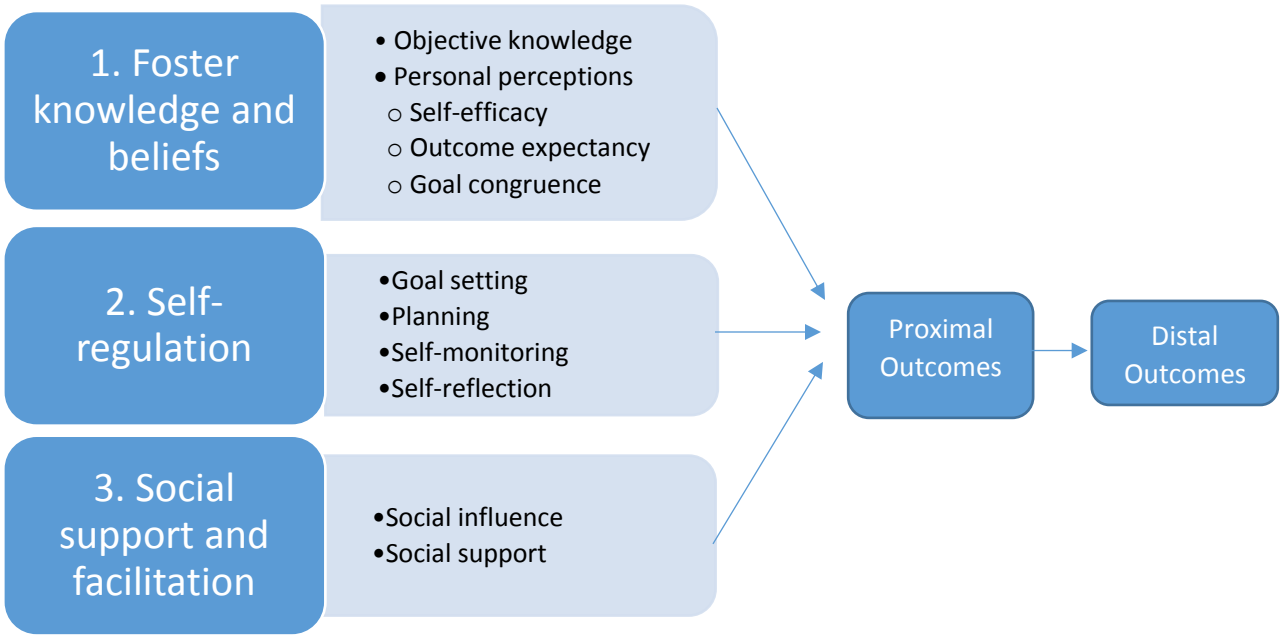



Figure 1. **A Breakdown of the ITHBC**

**Fostering Knowledge and Beliefs.** The first step to changing health behaviors is to gain knowledge through objective, factual information and establish belief in health behaviors. While knowledge is a crucial component for behavior change, it has been documented that knowledge alone is not sufficient; however, combining knowledge with belief in a health practice can result in a foundation for behavior change (Ross, Bevans, Brooks, Gibbons, & Wallen, 2017). By accomplishing this step, the individual is more likely to believe that they will be able to make a successful change in their lives (self-efficacy). They will also be more likely to believe that by changing their behavior, their health will improve as a result (outcome expectancy), and they will experience less anxiety in accomplishing their health goals (goal congruence) (Ryan, 2009). By accomplishing this step, the individual will have sufficient knowledge about how to change their lifestyle habits while also having established belief in themselves and in the health behavior, equipping them with a strong basis to develop self-regulation skills.

**Self-Regulation.** The next step to changing one's health behavior is to create self-regulation skills to ensure that they will be able to successfully maintain their health behavior change independently. This step involves integrating the health behavior change into their daily lifestyle. They must be able to set realistic goals for themselves, create a plan to change, and then subsequently carry out that plan (Ryan, 2009). Throughout the process, they must be able to hold themselves accountable when making decisions regarding their health. Self-reflection is also beneficial to reflect on the accomplishments and setbacks that come in making a lifestyle change as well as personal emotions and the effects of this change on the individual's life (Ryan, 2009).

**Social Facilitation.** The final and critical step to maintaining health behavior change in the long-term is ensuring social facilitation for the client, which consists of both social influence support. Social influence occurs when a figure of authority, which can include family, friends, teachers, healthcare providers, or celebrities, sways one's thoughts and causes them to change their behavior. Social support can stem from a combination of emotional or informational support that includes family, friends, or coworkers (Ryan, 2009). Maintaining a positive support network will also help to encourage self-management skills.

**Outcomes.** The ITHBC divides outcomes/goals into two separate categories: proximal (short-term) and distal (long-term). Proximal outcomes can be identified as the actual practice of specific health behaviors, such as eating healthy foods and engaging in exercise, while distal outcomes can be identified as the improvement in health that results from positive health behaviors, such as weight loss. Accordingly, the effect of distal outcomes takes longer to occur and is contingent upon the success of proximal outcomes.

The failure to achieve either proximal or distal goals may result in the development of chronic health conditions, including obesity and its associated complications (Ryan, 2009).

## Results

### Demographics of Harlan County

Of the residents within Harlan County, approximately 95.7% are Caucasian, 2.3% are African American, 0.9% are Hispanic, 0.3% are Asian, 0.2% are Native Hawaiian, and 1.2% are of two or more races (U.S. Census Bureau, 2015). Approximately 72% of the population is reported to have at least a high school diploma, while 11.7% reported having completed at least a Bachelor's degree. The unemployment rate currently stands at 19%, the second highest of Kentucky's counties. With a median household income of $25,814, around 35.5% of the population is reported to live in poverty (U.S. Census Bureau, 2015). This figure has a significant impact on the children within Harlan County, where it is estimated that 44% of children are living in poverty (U.S. Census Bureau, 2015). Reliable health insurance appears to pose another issue with 24% of adults and 6% of children currently lacking health insurance (Robert Wood Johnson Foundation, 2017).

Regarding the health behaviors of Harlan County residents, families largely lack access to a consistent source of fresh foods as well as opportunities for physical activity. The food environment index (FEI) is a scale that ranks a county's access to food based on the amount of the population that qualifies as both low-income and low-access and the amount of the population that did not have consistent, reliable access to food within the past year (food insecurity). The FEI ranks communities on a scale of 0 (worst) to 10

(best). Based on this scale, Harlan County currently ranks as a 5.3, the third lowest ranking within Kentucky, showing that these residents are more at risk for living in a food desert and having lower access to food than other counties (Robert Wood Johnson Foundation, 2017). When it comes to physical activity, 40% of the residents living in Harlan County report leading a largely inactive lifestyle. Additionally, only 44% of the population reports having access to opportunities for physical activity (Robert Wood Johnson, 2017). These statistics reveal not only a socioeconomic disparity within Harlan County but a lack of access among its residents to fresh foods, healthcare, and opportunities for physical activity, all common barriers to maintaining good health within rural communities.

## Kentucky's Policies Promoting Nutrition and Physical Activity in Schools

**Nutrition.** Kentucky offers a variety of programs that strive to promote food security through nutritionally balanced meals for students. The National School Lunch Program (NSLP) provides balanced meals to students based on the USDA-recommended *Dietary Guidelines for Americans*. Through this program, low-income students may also qualify for free or reduced lunches (U.S. Department of Agriculture, 2013b). The School Breakfast Program (SBP) operates in a similar way to the NSLP, providing students with access to breakfasts based on the same dietary recommendations as the NSLP (Kentucky Department of Education, 2017). Programs that focus on increasing access to fresh foods within Kentucky's schools include the Fresh Fruits and Vegetables Program (FFVP) and "Farm to School" programs. The FFVP, which is administered through the Kentucky Department of Education, provide schools with $50-75 per student each year to spend on fresh fruits and vegetables. These fresh foods are then provided to students free of cost

during school meals (Kentucky Department of Education, 2017). “Farm to School” programs focus on incorporating local produce into school meals. In addition to using produce from local farmers, this program may incorporate education-based initiatives, such as cooking classes for students or school gardens where the students take part in raising produce for school meals (Kentucky Department of Education, 2017).

**Physical Activity.** Within Kentucky, current state policy mandates that elementary students must receive at least 150 minutes of physical activity each week; however, it is not regulated how the physical activity must be obtained. There are no current policies regulating the amount of physical education (PE) classes that students must receive each week (Shape of the Nation, 2016). Based on these policies, students can meet these requirements for physical activity solely through five 30-minute recess periods throughout the week, where there is no guarantee of children actively engaging in physical activity. In order to ensure that children actually engage in physical activity, it is important that it occurs in an organized environment, such as a PE class. If Kentucky were to effectively incorporate the federal recommendation that children should engage in 60 minutes of physical activity each day, this would require Kentucky to boost their requirement for physical activity to include 300 minutes of organized physical activity each week.

## Harlan County Public Schools’ Policies

**Nutrition.** HCPS participates in a number of federal programs, including the NSLP, SBP, FFVP, and the After-School Snack Program, which provides reimbursements for fruit provided to children in after-school programs as a snack. The lunches provided at HCPS are intended to provide 1/3 of daily nutritional requirements

for growing children and are rotated every four weeks to allow for variety and use of seasonal produce. Five different menu items are regularly offered at school lunches, and the students must take a minimum of three items, allowing them to reject up to two (Harlan County Public Schools, 2017). All breakfasts and lunches provided in HCPS are funded through the Community Eligibility Provision, which aids school districts located in low-income areas, allowing all students enrolled in HCPS to receive a free breakfast, lunch, snack, and supper regardless of socioeconomic status (Harlan County Public Schools, 2017). Within the schools, there are no food vending machines with the only vending machines offering water or low-sugar drinks.

In regards to improving nutritional content, HCPS currently operates on a three-step timeline to gradually reduce sodium content in its meals by 2022. According to this schedule, the sodium content in breakfasts should be below 430 mg for elementary students and 470 mg for middle school students. Additionally, the sodium content in lunches should be less than 640 mg for elementary students and 710 mg for middle school students. The caloric content of meals for school-aged students is also monitored, with breakfasts ranging between 350-550 calories and lunches ranging between 550-700 calories (Harlan County Public Schools, 2017).

By looking at a daily menu of meals from HCPS, there appears to be a mixture of food choices between foods with a high nutritional value and less healthy options that consist of a low nutritional quality. For instance, during breakfast, students have the option of choosing healthier options, such as scrambled eggs and whole wheat toast; however, during that same breakfast, the students also have the option of choosing less healthy foods that are high in added sugars, such as powdered donuts or a cherry frudel, a

fruit pastry. The school menu notes food items that are classified as whole grains, which are beneficial and provide complex carbohydrates and fiber to the students' diets; however, some foods that are classified as whole grains, such as the chocolate donuts or Poptarts, can also be detrimental to the students' health by contributing added sugars and saturated fats to their diets. A similar mixture of food items is presented during lunchtime. For instance, broccoli with cheese sauce is a side dish that is offered during certain lunches. While broccoli itself is a highly nutritious food, adding cheese sauce provides unnecessary fats to the students' diets and turns a healthy vegetable into a questionable source of nutrition. Overall, while the school menu offers access to a variety of fruits, vegetables, and whole grains, many of the foods offered still require modification in order to be fit for a healthy diet.

**Physical Activity.** All of Harlan County's elementary schools currently report meeting Kentucky's minimum standard of 150 minutes of physical activity each week (Harlan County Public Schools, 2017). The breakdown of physical activity is mainly split between physical education (PE) classes and recess periods throughout the week but varies between each individual elementary school. At one school, the students receive 220 minutes of physical activity each week between two 60-minute PE classes and five 20-minute recess periods each week. At another school, students receive 30 minutes of PE every day. Physical activity is never taken as a punishment, but students may be required to walk laps instead of participating in games, which could be detrimental for students by creating an association between physical activity and punishment. An additional school's schedules vary between grade levels. Students in kindergarten receive 30 minutes of PE and 15 minutes of recess every day, while students in the 1st-3rd grade

receive 30 minutes of PE three times per week. Meanwhile, students in the 4th-8th grade receive 52 minutes of PE twice a week with a daily 15-minute recess.

Alternative opportunities for physical activity are also available through extracurricular sports teams. Similar to the variance of PE classes between elementary schools, extracurricular sports teams also differ between each school with the majority of schools solely offering sports teams for middle school students. Out of the eight elementary schools in HCPS, two schools currently offer only basketball teams for middle school students. One school offers basketball and cheerleading for middle school students. Two schools offer basketball, football, and cheerleading for middle school students, while another school offers softball, basketball, football, baseball, and cheerleading. Only one school offers the opportunity for elementary school students to engage in physical activity through a dance team, while basketball, cheerleading, football, baseball, and softball were options for middle school students.

Outside of sports teams, students have the opportunity to engage in physical activity through the annual fitness fair held for the school district (Harlan County Public Schools, 2017). Students are eligible to participate in the fitness fair if their parents complete a permission slip. At the event, students rotate between stations that evaluate different aspects of physical activity. These stations include measuring the following components: grip strength, height/weight measurements, chin-ups, flexibility, sit-ups, and a timed walk/run. These extracurricular opportunities offer students an opportunity to engage in physical activity outside of school PE classes; however, these activities should not be relied on as the sole source of physical activity for students as the extent of these activities may not reach a large portion of the student population.

## Past Studies on Improving Health Behaviors in School-Aged Children

Campaigns targeting childhood obesity within rural communities may have some of the most effective outcomes when implemented within the school system. The school environment provides a safe, healthy environment for students where students are able to have consistent access to good nutrition through school meals and access to physical activity through PE classes (Tuckson, 2013). The success of school-based programs is contingent upon collaboration and communication between administrators, training of staff, and access to resources (Totura, Figuero, Wharton, & Marsiglia, 2015). With effective planning and implementation of school-based interventions, previous studies have shown varying levels of success in improving nutrition and levels of physical activity in rural children, which will be evaluated within this section.

**Interventions Affecting Nutrition.** School-based interventions focused on improving nutrition may start with educational classes on proper nutrition and the modification of school meals. In a study conducted by Cohen, Kraak, Choumenkovitch, Hyatt, and Economos (2014), 432 students enrolled in the 1$^{st}$-6$^{th}$ grade in rural schools were involved in a study focused on improving the diet quality of elementary students in rural schools over the course of a year. The students were exposed to an educational curriculum within the classroom at least once each week, including the "Shape Up" and "Eat Well Keep Moving" curricula and the "5-2-1" message promoting five servings of fruits and vegetables, less than two hours of screen time, and one hour of physical activity each day. In the cafeteria, nutritional personnel were trained on how to incorporate good nutrition into school meals and cook healthier lunches. School lunches were modified to include whole grains each day, five different fruits and vegetables each

week, a beans or peas option each week, and 1% or nonfat milk daily. During the study, ice cream sales were limited, and a la carte options were modified to be healthier. This study also incorporated the parents and community within the school district to promote healthy behaviors outside of the school environment (Cohen et al., 2014).

The diets of students were examined through the 2007 Block Food Screener, a screening tool which evaluates the consumption of certain food groups and the overall glycemic index (GI) of the diet (NutritionQuest, 2007). The GI of a food evaluates the impact of that food on blood sugar levels after being consumed. Foods with a higher GI value raise the blood sugar more quickly and abruptly than foods with a low GI score, indicating a poorer nutritional quality. After a year, it was found that students in intervention schools consumed diets that had an overall lower GI score. It was also found that the students in the intervention school consumed more legumes, fruits, and vegetables than students in the control schools (Cohen et al., 2014). The results of this study demonstrate that a school-based intervention that incorporates an educational curriculum and modification of school lunches has the ability to make a positive impact on the nutritional quality of students' diets.

In an additional study conducted by Cluss, Fee, Culbya, Bhat, and Owen (2014), lunch sale patterns were evaluated in a poor, rural school district consisting of 3,046 students in seven elementary schools over the period of seven years after making nutritional improvements in school lunches. To help teach proper nutrition to students, foods were classified into three, separate categories: Go, Slow, and Whoa. "Go" foods consisted of highly nutritious foods that students were encouraged to eat as often as possible. These types of foods are low in calories, saturated fats, and cholesterol, such as

fresh fruits and vegetables, whole grain foods and fat free milk. “Slow” foods included foods that are higher in calories but still have good nutritional value, such as vegetables cooked in sauces or fats or canned fruits and vegetables. Students were encouraged to eat these types of foods in moderation. “Whoa” foods were classified as foods that should only be consumed occasionally, since they are high in saturated fats, sugars, and cholesterol, such as pizza, fries, and chips (Cluss et al., 2014).

In the Cluss et al. study (2014), school lunch sales were evaluated for one week over the course of seven years. Foods available during lunch periods were classified according to the “Go-Slow-Whoa” categories. Over this time period, improvements were gradually made to school lunches by eliminating less healthy options, changing food preparation techniques, and providing healthier options. Nutritional personnel also collaborated with the school administration to institutionalize policies. The results of this study found that by improving lunches within the school district, the nutritional quality of students’ lunches improved over time. “Whoa” foods were essentially discontinued from school lunches, decreasing from 52% of all entrees purchased to 0%. Students also purchased fresh fruits when available, with sales increasing by 12% and the purchase of canned fruits and vegetables decreasing by 59%. It was also found that there was a slight decrease in the number of students who purchased lunches, declining from 76% to 70%. The findings from this study further support the positive impact that school-based interventions can yield on improving the nutritional quality of students’ diets. While there was a slight decline in the number of students who purchased school lunches, the modification of school lunches and elimination of less healthy options still resulted in an overall nutritional improvement of school lunches and students’ diets.

**Interventions Affecting Physical Activity.** One major source of physical activity for elementary students lies in PE classes and recess periods. A 2-year study conducted by Saccheti et al. (2013) revealed that enhancing PE classes within elementary schools can reduce the students' levels of sedentary activity in addition to lowering BMIs. In this study, 428 3rd grade students were divided between a control group, which followed a standard PE program of two 50-minute periods per week, and an intervention group, which held five 30-minute periods of physical activity, two 50-minute PE classes per week and followed a more intense curriculum. In the intervention group, these periods of physical activity were performed in the school gym, classroom and schoolyard, and were led by teachers that received training in PE. The levels of physical activity ranged between moderate when performed in the classroom to vigorous when performed in the schoolyard. At a 2-year evaluation, these researchers found that the students in the intervention group reported a more active and less sedentary lifestyle. These results also revealed that while both groups experienced increases in BMI, the students in the intervention group experienced a slower increase in BMI than the students in the control group. The overall prevalence of overweight and obese children also decreased in the intervention group (Saccheti et al., 2013). This study provides support for the ability of school-based interventions to increase physical activity in students and lower students' BMIs.

With the high prevalence of technology in children's lives, it is also important to evaluate ways in which the different forms of technology can be incorporated with physical activity. One way in which this can be achieved is through the use of active video games (AVGs). In a study of 60 children, with 30 children of a normal weight and

30 being overweight, O'Donovan, Roche, and Hussey (2014) found that playing AVGs may provide an opportunity for children to achieve appropriate levels of physical activity each day. In this study, participants played Wii Sports Boxing and Wii Fit Free Jogging for 15 minutes with a 5-minute rest between games with the participants' heartrates and calories burned measured through the use of an indirect calorimeter. As a result, it was found that Wii Sports Boxing was considered to be a light intensity activity, while Wii Fit Free Jogging was classified as an activity of moderate intensity, which may contribute towards the recommended 60 minutes of physical activity that children should acquire each day (O'Donovan et al., 2014). While this study did not occur within a school-based setting, this presents an opportunity that schools may utilize to promote physical activity in their students' lives. For instance, while it may not be realistic for schools to incorporate AVGs into the school day, AVGs may be incorporated into afterschool programs or family fun nights. In this way, technology and physical activity will be able to coexist for children in a way that promotes physical activity and combats the sedentary lifestyle that often results from the overuse of technology.

**Interventions Affecting Nutrition and Physical Activity.** Some school-based interventions have resulted in successful outcomes when targeting both nutrition and physical activity levels in students. One study targeted four rural elementary schools with a total of 1,508 students between kindergarten through the 5$^{th}$ grade in Central Kentucky, aiming to improve PE classes, health education, family involvement, and school wellness policies (Ling et al., 2014). The levels of physical activity were measured through the use of a pedometer in which steps were recorded at the end of the day with higher numbers of steps indicating higher levels of physical activity. Values below 10,000 steps per day for

boys and 7,000 steps per day for girls were considered indicative of a sedentary lifestyle. In contrast, values above 17,500 steps per day for boys and 14,500 steps per day for girls were considered indicative of highly active lifestyles. The values determined to be indicative of students meeting the recommendations for 60 minutes of physical activity each day were set at 13,000 steps per day for boys and 11,000 steps per day for girls. At baseline, it was found that 1.6% of girls and 1.1% of boys were currently meeting this recommendation. Nutrition was assessed via the School Physical Activity and Nutrition questionnaire. Through this questionnaire, 14.8% of students were found to be meeting the recommendation of eating at least five servings of fruits and vegetables each day.

The interventions used to impact levels of physical activity included the use of SPARK (Sports, Play, and Active Recreation for Kids) curriculum in PE classes. Nutritional education was incorporated into the curriculum for students through a series of nutritional workshops in addition to a nutritional conference for cafeteria personnel. School lunches were also modified to be aligned with the USDA's dietary guidelines. The families and community were involved through "family fitness fun nights" and the establishment of partnerships with the local health department, hospitals, and universities. The school wellness policy was also changed to comply with national and state standards for nutrition and physical activity (Ling et al., 2014).

During this study, over the course of four months, the levels of physical activity and nutrition in students experienced significant improvements. By the end of the interventions, the number of female students meeting the guidelines for physical activity recommendations increased from 1.6% to 6.9%, while the number of male students meeting physical activity requirements rose from 1.1% to 4.1%. The amount of children

meeting nutritional guidelines increased from only 14.8% to include 25.9% of students (Ling et al., 2014). By incorporating an environment that is supportive of healthy eating behaviors and achieving adequate levels of physical activity, this study reinforces the idea that school-based interventions have the ability to make significant improvements for students in multiple health behaviors.

**Implementing the ITHBC through Interventions.** Various components from these school-based interventions can be aligned with the three critical steps necessary for creating health behavior change as outlined by the ITHBC. Fostering knowledge and belief in health practices, the first step of the ITHBC, must occur for both the students and school personnel and cafeteria staff involved in implementing school-based interventions. This has been accomplished for students in previous studies through educational curriculum during the school day, which may involve the use of campaigns, such as the "Fruits & Veggies- More Matters" or the "5-2-1" message (Cluss et al., 2014; Cohen et al., 2014; Ling et al., 2014). This allows children to gain knowledge about the daily requirements for good nutrition and proper levels of physical activity. Educating school personnel may involve nutritional workshops or conventions, while cafeteria staff may require hands-on training regarding healthier ways to prepare foods (Cohen et al., 2014; Ling et al., 2014). By providing staff with proper information on healthy behaviors, they will be able to serve as a valuable resource for students and provide encouragement for students to make the choices that are best suited for their health.

Self-regulation, the second stage of the ITHBC, involves incorporating the lifestyle change into the student's daily life through the school environment and enhancing the student's ability to consistently make healthy choices for themselves. One

of the ways in which this can be accomplished is through the daily meals offered at school. By increasing access to healthy foods and eliminating less healthy options during meals, students practice self-regulation skills by making appropriate decisions about healthy food choices (Cluss et al., 2014; Cohen et al., 2014). In this way, students have the opportunity to use the knowledge that they learn during class and put it into practice during meals. Physical activity can work in a similar way between PE classes and recess. During PE classes, students learn the importance of physical activity and may learn rules to team sports or organized games that require running, jumping, and other forms of physical activity. During recess, periods of free play for students, they have the opportunity to choose whether or not they want to engage in physical activity or remain sedentary.

Social facilitation, the third step within the ITHBC, involves creating a comprehensive support network that allows students to consistently make healthy choices outside of the school environment. This factor is critical in order to encourage long-term maintenance of consistent lifestyle changes. The influence of parents on their child's health behaviors has been previously identified as a critical factor in both preventing and treating childhood obesity (Lynch et al., 2012). As demonstrated through these studies, parents can be incorporated into school-based interventions through a variety of ways. Schools may sponsor family fitness fun nights, where families of overweight/obese or at-risk children may be invited to attend (Ling et al., 2014). Schools may also send information home with tips on healthy cooking and ways to encourage proper nutrition and physical activity at home. Community involvement may occur with the county's public health department, local hospitals, and universities (Ling et al., 2014). With the

incorporation of external resources, it is necessary to maintain good communication and collaboration to create an effective support network that extends beyond the school environment.

**The Cost of School-Based Interventions**

One crucial factor to consider when implementing school-based interventions within schools is the anticipated increase in cost to the school when providing healthier options during school meals or improving physical education within the curriculum. To gauge the projected increase in cost for improving nutrition in individual schools, Cluss et al. (2014) found that improving the nutrition within school lunches resulted in an increase in school lunch costs from $1.70 in 2005 to $2.15 in 2011. While this may suggest a 26% increase in cost, adjusting the prices according to inflation rates indicates an increase in cost of 10%. Despite this increase in cost, schools may be able to offset the cost through sources of external funding, such as grants or partaking in federal or state programs, such as the FFVP or "Farm to School" program.

An additional effect to be considered is the anticipated effect of these interventions on the costs associated with obesity, such as the medical costs or costs to businesses from lost productivity. Gortmaker et al. (2015) evaluated the cost of implementing interventions, including a startup fee and ongoing maintenance costs, while gauging the number of cases of childhood obesity that the intervention may prevent and the decrease in healthcare costs associated with childhood obesity. Accordingly, these researchers found that each year, improving nutrition within school meals has the ability to prevent up to 1.8 million cases of childhood obesity nationwide at the cost of $53 per decrease in BMI unit. Based on this statistic, it was further determined that approximately

$0.42 would be saved in healthcare costs for every dollar spent. It was also determined that the cost taken to implement nutrition standards for foods and beverages sold outside of school lunches would actually save money when compared to the decrease in healthcare costs that would result from this intervention. According to this study, approximately 345,000 cases of childhood obesity nationwide could be prevented through this intervention, resulting in a savings of $4.53 in healthcare costs for each dollar spent (Gortmaker et al., 2015).

## Conclusions

After analyzing HCPS policies regarding nutrition and physical activity, various conclusions can be made regarding the benefits and risks that these policies pose for the health of its students. Due to the Community Eligibility Provision, all students currently receive equal access to the nutrition that is provided through school meals (Harlan County Public Schools, 2017). Accordingly, any modifications made to the school meals hold the ability to positively impact and improve students' nutrition. As demonstrated through its plans for sodium-reduction and caloric maintenance, HCPS has taken steps to improve the nutrition of school meals within the next five years. These goals to manage the amount of sodium and calories in students' meals shows a conscious effort to make a positive impact on students' diets; however, the goals for sodium outlined in this timeline will not be met for another five years, which puts current students at a higher risk for consuming more heavily processed foods. This can be counteracted by increasing access to fresh foods and replacing heavily processed foods with fresher options. At each meal, HCPS also makes an effort to provide access to a variety of fruits and vegetables for its students. However, this effort may be counterproductive when the vegetables are cooked

with butter or added sauces or when the fruits provided are canned in syrup. It may also negatively affect students' nutrition when the school menu also offers foods that are high in calories, sugars, and saturated fats, foods which students may be more likely to choose in favor of healthier options.

Regarding physical activity, each school is reported to have met the state standard for providing the minimum amount of physical activity; however, between the recess periods and PE classes, each school provides its own schedule for meeting this amount of physical activity each week. Due to this, there is a lack of uniformity amongst the amount of organized physical activity that HCPS elementary students receive. For instance, students at one school receive 30 minutes of PE daily, while students at another school receive 30 minutes of PE three times per week, indicating that these students receive two less days of PE. The amount may also fluctuate depending on the grade level that the student is in. Considering that the school day may provide the only environment for students to be physically active, this can leave students at certain elementary schools at a disparity for obtaining an adequate amount of physical activity each day. There is also a lack of uniformity among the amount of extracurricular sports offered at each school. For instance, while one school only offered middle school basketball for its students, another school maintained six different sports teams. While this may depend on student interest and volunteer coaches, many students may lack the opportunity to learn a new sport and participate in consistent physical activity.

## Recommendations for Harlan County Public Schools

**Nutrition.** As it has been utilized in previous studies, the beginning step required to initiate behavior change in students is to incorporate nutritional curriculum in the

classroom to provide education for students (Cohen et al., 2014; Ling et al., 2014). The most common message that children tend to hear is the importance of consuming five servings of fruits and vegetables each day. While this message is critical for children to understand, it's also important to emphasize the importance of other food groups, such as whole grains, in addition to the importance of minimizing certain foods or eating them in moderation, including foods that are high in fats or added sugars. However, this nutritional education should not stop at the classroom and should be incorporated into the students' lives through school meals.

During school meals, one way in which food could be labeled for students to understand the nutritional value of the foods offered is through the "Whoa-Slow-Go" labeling system utilized in Cluss et al.'s (2014) study. This category system could also be used for guidance for nutritional personnel in making modifications to school meals. "Whoa" foods would include foods with a high level of added sugars or fats and should be eventually eliminated from the menu and replaced with healthier options. "Slow" foods would include foods that provide some good nutrition but still have added sugars and fats, so they should be eaten in moderation. These types of foods may require a different method of food preparation, such as leaving out the cheese sauce on broccoli, or may require the schools to purchase a different product, such as buying canned fruit in water or light syrup instead of canned fruit in heavy syrup. "Go" foods would include foods that are minimally processed and provide good nutrients to the students' diets. Based upon these categories, foods from HCPS breakfast and lunch menus were classified according to the nutritional guidelines established in Cluss et al.'s (2014) study. Table 2 evaluates breakfast options, while Table 3 discusses lunch options.

Table 2. **Go, Slow, and Whoa Classifications for HCPS Breakfast Options**

| | **Go** | **Slow** | **Whoa** |
|---|---|---|---|
| **Entrees** | Scrambled eggs<br>Whole wheat toast<br>Oatmeal<br>Honey Nut Cheerios<br>Fresh fruits | Whole grain pancakes<br>Whole grain waffles<br>Mini bagels<br>French toast sticks<br>Oatmeal bars<br>Cereal bars<br>Fruit cocktail<br>Applesauce<br>Baked bologna<br>Cocoa Puffs<br>Cinnamon Toast Crunch<br>Lucky Charms | Chocolate donuts<br>Powdered donuts<br>Apple frudel<br>Poptarts<br>Chicken biscuit with gravy<br>Sausage biscuit with gravy<br>Chocolate chip muffins<br>Cinnamon rolls |

*Source:* http://www.harlan.k12.ky.us/Food%20Service.html

Table 3. **Go, Slow, and Whoa Classifications for HCPS Lunch Options**

| | Go | Slow | Whoa |
|---|---|---|---|
| **Entrees** | Turkey and cheese sandwich<br>Chicken broccoli<br>Spinach Chef salad (Without bacon and croutons)<br>Baked turkey | Sloppy Joe<br>Pork loin<br>Meatloaf<br>Hamburger<br>Grilled cheese sandwich<br>Tuna sandwich<br>Beef vegetable soup<br>Beefaroni<br>Spaghetti with meat sauce<br>Bologna sandwich<br>Pigs-in-a-blanket<br>Baked chicken tenders<br>Baked ham | Hot ham and cheese sandwich<br>Corn dog<br>Hot dog<br>Chili dog<br>Chicken patties<br>Fish patty<br>Pepperoni pizza<br>Cheese pizza<br>Walking taco (Chips, chili, and cheese) |
| **Side dishes** | Fresh fruit<br>Side salad<br>Baked sweet potato<br>Baked potato<br>Wheat roll<br>Broccoli slaw | Canned fruit<br>Canned beans<br>Canned vegetables<br>Oven baked fries<br>Glazed carrots<br>Parsley potatoes<br>Broccoli with cheese sauce | Mashed potatoes with gravy<br>Cookie<br>Macaroni and cheese<br>Garlic toast |

*Source:* http://www.harlan.k12.ky.us/Food%20Service.html

In order to have the greatest impact on the largest number of students, modifying school lunches appears to be the most meaningful component of a school-based interventions on students' diets. Multiple studies have demonstrated that changing school menus and food preparation techniques to incorporate healthier food options and eliminate less healthy foods has the potential to have a positive effect on students' diets (Cluss et al., 2014; Cohen et al., 2014; Ling et al., 2014). A simple look at the school menu reveals that HCPS provides adequate access to a variety of fruits, vegetables, and

whole grains; however, many foods on the menu are high in fats and added sugars. In this case, the priority for modifying school meals would not focus on increasing access to healthy foods but would instead focus on eliminating less healthy options from the menu.

**Physical Activity.** Based upon past research studies, the best option for HCPS to make the largest impact on students' levels of physical activity would be for the school district to create more defined guidelines establishing the amount of physical education and periods of organized physical activity that students receive each week. Ideally, students would receive 60 minutes of PE each day, but this may not be a realistic feat for many schools to accomplish at first due to time and financial constraints. For this reason, a more well-defined, tangible goal must be set that can be enforced across all of the elementary schools. As utilized in Saccheti et al.'s (2013) study, one way in which this can be accomplished is by providing 50 minutes of PE twice a week in addition to providing 30 minutes of organized physical activity daily. To ensure the highest quality of PE classes, teachers may receive specialized training to encourage students to be healthy and get enough physical activity (Saccheti et al., 2013). The PE classes should also follow an established curriculum that teaches children the proper ways to be physically active by actually engaging in organized physical activity, such as the SPARK curriculum cited in Ling et al.'s (2014) study. Some of the school policies regarding physical activity that were cited within this paper already provide a viable starting point in which this can be accomplished. If the amount of physical activity and PE curriculum was standardized across all of the elementary schools in the district, students would receive equal access to a higher quality of physical activity, which would have the most effective, widespread impact on students' overall health.

One way in which each individual student's level of physical activity could be measured is through the use of a pedometer as demonstrated in Ling et al.'s (2014) study. At the beginning of the intervention, the students would receive a pedometer to wear throughout the day, and each morning, their number of steps would be recorded by a teacher. Based on the number of steps that the student takes each day, their level of physical activity could be classified according to the guidelines set forth in Ling et al.'s (2014) study as demonstrated in Table 4. Beginning with a "low activity" level, students could receive a certain number of points corresponding to their level of physical activity, and at the end of each week, students could receive a non-food reward (Table 5) based upon the number of points that they acquire in order to positively reinforce physical activity.

**Table 4.** Using a Pedometer to Measure Physical Activity

| Level of Physical Activity | Daily Steps | Points |
|---|---|---|
| Sedentary | <10,000 | 0 |
| Low Active | 10,000-12,499 | 1 |
| Somewhat Active | 12,500-14,999 | 2 |
| Active | 15,000-17,499 | 3 |
| Highly Active | 17,500+ | 4 |

**Table 5.** Rewards System Based on Steps

| Weekly Collection of Points | Non-Food Reward |
|---|---|
| **10-13** | Pencils, stickers, erasers, or bookmarks |
| **14-18** | Frisbee, book, or jump rope |
| **19+** | Homework pass or lunch with principal |

HCPS has already taken additional steps to provide students with extracurricular activities that promote exercise and regular physical activity through the promotion of sports teams and the annual fitness fair. While sports teams provide a valuable source of physical activity outside of the school day, this may not be the best option to impact the largest amount of students. Involvement with a sports team often requires time spent outside of school, and parents may lack the ability to pay for any team fees, equipment fees or provide transportation for practices or games. Students may also be restricted if only a limited number of spots are available on a team. For these reasons, the sports teams offered at each school should be viewed as a beneficial extracurricular activity that promotes physical health and should not be relied on as the sole source of physical activity for students. Regardless, each elementary school should still offer a variety of sports for different grade levels to encourage students to learn a new sport that they could enjoy enough to participate in as they grow older. If this need is not able to be met by the school district, then recreational teams may also be created and sponsored through the local parks and recreation department.

Finally, the annual fitness fair is a good example of HCPS utilizing local resources to create a program that focuses on promoting healthy behaviors for children within the community. This fair provides an opportunity for children to test their physical fitness each year, but due to it only occurring annually, it may not have a truly significant impact on the children developing consistent, healthy behaviors. In addition to this activity, the district may consider collaborating with local resources to create a more frequent, consistent activity that engages not only the child but the family as well. "Family fitness fun nights" as utilized in Ling et al.'s (2014) study may provide an example for promoting physical activity within the family unit. Each week may focus on promoting activities that focus on different areas of physical fitness that engage all members of the family. For example, families may form teams to play different sports, or they could play active video games, such as Wii Fit or Wii Sports. However, similar to school sports teams, these extracurricular activities should be viewed as supplementary to the physical activity that students participate in during the school day and should not be relied upon as the sole source of physical activity for students.

**Limitations**

While these recommendations are considered feasible for HCPS, there are some limitations worth noting. Modifying school meals can come with an added cost for providing fresh, healthy options in lieu of more processed foods. Cluss et al. (2014) found that improving nutrition within school meals resulted in a $0.45 or 10% increase for each lunch. In HCPS, roughly $2,603 per student is spent on food services and operations each year. (U.S. Department of Education, 2015). The school district already participates in multiple federal programs that provide reimbursement for complying with

nutritional guidelines (NSLP, SBP, FFVP); however, there is still a need identified within HCPS to eliminate and replace less healthy options. An additional program that the school district may participate in is a "Farm to School" program, where the school can take advantage of local produce from a farmer or even create a school garden. This would help to offset some of the costs associated with providing fresh fruits and vegetables while supporting the local community.

Regarding PE classes, schools may be limited in providing time for an adequate amount of physical activity due to competing curriculum. Competing with more standardized courses, such as reading, math, and English, schools may view PE class as a nonessential course and cut it in favor of other classes. In these cases, recess or extracurricular activities may be viewed as an adequate time for the students to be physically active. However, this presents a conflict, as there is no guarantee that students will be active during recess unless there is organized physical activity. Extracurricular activities also may not be feasible for every student due to a lack of transportation or a parent's inability to pay. As a solution, daily 30-minute PE classes may replace recess periods to ensure that each student is physically active.

Finally, while these interventions are able to impact students' nutrition and levels of physical activity in the school setting, it is important to acknowledge that unless the students' families and community are involved, the effects of these interventions will be limited. Accordingly, the health behaviors taught within these interventions will only affect the children during the school day and may be unsustainable in the home environment and ineffective in producing long-term behavior change. For these reasons, it is essential that the school-based interventions become a part of a multi-level

intervention that addresses childhood obesity within the community. While there appear to be many obstacles in confronting childhood obesity in rural communities, it is essential to realize that childhood obesity is a completely preventable condition. With the proper resources in place to facilitate and encourage healthy eating and physical activity within communities, it is possible to reduce the prevalence and prevent the development of childhood obesity within rural communities.

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