QUANTITATIVE STUDY ON MITIGATING CHILDREN'S BMI: EXECUTION OF A SCHOOL-BASED CULINARY GARDEN INITIATIVE

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ABSTRACT: Pediatric obesity is a prominent public health issue worldwide, with substantial consequences for the physical and mental health of children. This abstract reports the results of a quantitative study that investigates the efficacy of a school-based culinary garden program in reducing children's body mass index (BMI) and encouraging healthier lifestyle habits. These findings highlight the potential of implementing culinary gardens in schools as effective strategies for addressing pediatric obesity and promoting healthier lifestyle habits among children. Incorporating these initiatives into school curricula offers practical learning opportunities and enables children to make well-informed decisions regarding their health. This in turn, helps in preventing long-term health complications associated with obesity.

Introduction & Background

Pediatric obesity has become a major public health issue, resulting from a complex interaction between behavioral, environmental, and genetic factors. Since 1975, worldwide obesity has tripled (Obesity and Overweight, 2021). Pediatric obesity is a significant problem, not only in the United States, but worldwide as well (Childhood Obesity Facts, 2022), putting children and adolescents at risk for poor health. To this day, there is still high obesity prevalence amongst children. During 2017-2020, the prevalence of obesity amongst children and adolescents was 19.7%, and affected 14.7 million lives (Childhood Obesity Facts, 2022). Childhood obesity increases the risk of adulthood obesity, untimely death, and disability. However, obese children also have respiratory issues, a greater risk of fractures, hypertension, early indicators of cardiovascular disease, insulin resistance, and psychological consequences in addition to their elevated future risks (Obesity and Overweight, 2021). Healthy eating can help individuals maintain a healthy body weight and reduce health risks such as high blood pressure, heart disease, type 2 diabetes, cancer, and dental caries (Obesity and Overweight, 2021). Overall, pediatric obesity is a serious public health issue that has far-reaching effects on both individuals and society at large. It jeopardizes children's short-term health, well-being, and lays the groundwork for long-term health issues.

Risk Factors

Pediatric obesity is a multifaceted health concern that stems from a combination of factors such as behavioral patterns, environmental factors, and genetic predisposition (Childhood Obesity, 2020). A randomized trial by Bogart et al. (2016) found that the school-based nutrition and exercise intervention significantly improved the participants' children's two-year BMI outcomes. In order to combat pediatric obesity, the study highlights the importance of environmental factors like school-based initiatives. The results highlight the value of comprehensive strategies by indicating that focused interventions may eventually lead to improvements in body mass index. Additionally,

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the study emphasizes how behavioral and lifestyle choices—two important factors to take into account when creating effective preventive measures—are interconnected with other obesity risk factors (Bogart et al., 2016). This study adds important new information to the continuing efforts to identify and reduce the risk factors for childhood obesity.

Disparities

The issue of pediatric obesity continues to be a significant public health concern, marked by notable disparities that highlight the necessity for focused interventions. In accordance with a recent study published in the Journal of Racial and Ethnic Health Disparities, the occurrence of obesity among children and adolescents differs among various demographic groups (Kim et al., 2023). The study demonstrates that specific demographic groups, particularly individuals from disadvantaged economic backgrounds, exhibit elevated prevalence rates of childhood obesity (Kim et al., 2023). "The prevalence of obesity among non-Hispanic Black (24.2%) and Hispanic (25.6%) children and adolescents aged 2 to 19 years was higher than the prevalence among both non-Hispanic White (16.1%) and non-Hispanic Asian (8.7%) children and adolescents" (Kim et al., 2023). Socioeconomic factors play a significant role in creating inequalities in the availability of nutritious food choices, secure recreational areas, and high-quality medical care. These factors are crucial in determining a child's weight status. Moreover, the study emphasizes the existence of racial and ethnic inequalities, as it identifies elevated levels of obesity within specific minority populations. These findings highlight the significance of implementing focused strategies to tackle the underlying factors contributing to pediatric obesity. This includes promoting equal access to nutrition education, enhancing community resources, and improving healthcare services in underserved areas. Through comprehending and resolving these discrepancies, public health initiatives can strive towards cultivating a more salubrious future for all children and adolescents.

Short Term & Long Term Health Outcomes

The potential health outcomes of early childhood obesity prevention programs have been demonstrated through research conducted by Cloutier et al. (2018). The authors conducted a pilot, randomized trial within a low-income community to evaluate the effects of these interventions, and they observed favorable outcomes. The research article highlights the efficacy of focused interventions in addressing the issue of childhood obesity within susceptible groups (Cloutier et al., 2018). Furthermore, a study conducted by Nicolucci et al. (2017) investigates the relationship between prebiotics, the reduction of body fat, and changes in the intestinal microbiota in overweight or obese children. The study conducted by Nicolucci et al. (2017) and published in the journal Gastroenterology sheds light on the possible impact of dietary interventions in modulating the gut microbiome and, consequently, addressing health issues associated with obesity. Collectively, these studies provide significant contributions to our understanding of the potential health implications linked to interventions aimed at preventing obesity in early childhood. These insights encompass a broad spectrum of outcomes, including but not limited to weight management and the complex relationship between dietary patterns, gut microbiota, and body composition. These findings play a crucial role in informing evidence-based approaches designed to promote healthier outcomes for children who are at risk of or impacted by obesity.

Importance of Schools in Pediatric Obesity

Willeboordse et al. (2022) conducted a quasi-experimental study that provides evidence of the effectiveness of comprehensive school-based programs in addressing pediatric obesity. The study, which was published in the

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scientific journal PloS One, investigates the enduring impacts of a school-based intervention aimed at addressing the widespread issue of obesity. The results of the study demonstrate encouraging results, highlighting the efficacy of comprehensive strategies implemented in educational environments (Willeboordse et al., 2022). The study's examination of long-term effects offers valuable insights into the sustainability and enduring influence of these interventions, underscoring the significance of integrating health-promoting strategies within the school setting. This research makes a valuable contribution to the existing body of evidence by emphasizing the significance of schools as a primary locus for interventions. It underscores the potential of educational environments in promoting healthier lifestyles and mitigating the prevalence of pediatric obesity. The implementation of effective interventions plays a pivotal role in providing valuable insights for public health initiatives and policies that seek to reduce the prevalence of childhood obesity and foster long-term well-being.

Kitchen Garden Interventions

The research conducted by Gibbs et al. (2013) investigates the influence of a kitchen garden program implemented in schools on broadening children's exposure to different types of food. The objective of the study was to evaluate the impact of participation in the program on children's attitudes and behaviors regarding food. The study entailed the execution of a school-based kitchen garden program, and data was gathered to assess its impacts. The study employed a diverse range of methodologies, such as surveys, observations, and potentially interviews or focus groups, to collect comprehensive data on the participants' experiences and modifications in their food-related behaviors. The study's findings suggest that the school-based kitchen garden program had a beneficial effect on broadening children's culinary encounters. The potential outcomes of this activity encompass alterations in food-related attitudes, heightened receptiveness to experimenting with unfamiliar foods, and the possibility of acquiring a more complete comprehension of the food production process by actively engaging in gardening. Based on these findings, school gardens offer practical, experiential learning experiences that can improve students' understanding and proficiency in nutrition, food cultivation, and healthy dietary practices. Through participation in activities such as planting, watering, weeding, and harvesting, students cultivate a more profound comprehension of the origins and cultivation of food. Engaging in experiential learning can foster a greater understanding and value for fruits and vegetables, which are vital constituents of a nutritious diet. Although research and theoretical frameworks strongly support the idea that school-based garden initiatives can be effective, it is crucial to acknowledge that the actual impact of these programs can differ based on factors like program design, fidelity of implementation, and contextual factors.

Gaps in Knowledge

Moreover, a deeper investigation into the long-term efficacy of programs aimed at reducing childhood obesity is required. Much research concentrates on immediate results, and creating strategies that have long-term benefits requires an understanding of the sustained impact of interventions over time. Further in-depth analysis is needed to determine the socio-cultural factors that contribute to childhood obesity. Tailoring interventions to diverse populations requires an understanding of the wide variations in cultural influences on dietary preferences, physical activity levels, and parental practices.

Research Question & Hypothesis

Pediatric Obesity has become a worldwide issue, putting many children and adolescents at risk for chronic health issues. "Obesity affects 34% of children in the USA and is considered

a top public health concern due to the high level of morbidity and mortality" (Pediatric Obesity, 2016). Multiple health care workers have reported a deficiency in educational resources and information regarding obesity (Pediatric Obesity, 2016). Past research suggests that intervention regarding healthier food choices for adolescents is a way to promote healthy eating and decrease the prevalence of childhood obesity. Our quantitative study aims to investigate the correlations between cultivating a vegetable garden and its impact on an individual's Body Mass Index (BMI). Our research is funded on this question: what is the effect of implementing a school-based kitchen garden program on the Body Mass Index and prevalence of pediatric obesity among fourth grade students over a school year, and how can it be used to tailor interventions to diverse populations? We suspect that the development of a school-based kitchen garden program will result in a decrease in BMI among fourth grade students over the school year.

Research Approach

Research Design

This study will utilize a quantitative research design to evaluate the influence of a vegetable garden intervention on reducing BMI and assess its efficacy in the greater Seattle area. To assess the results and gauge the impact of a school-based kitchen garden, we determined that employing a static group comparison experiment would be the most suitable approach. According to the U.S. Department of Health and Human Services, studies have demonstrated the impact of consuming low-nutrient foods during early stages of life and its role in causing nutritional deficiencies (Childhood Obesity, 2020). Through the organization of this research, our objective is to expand the range of possibilities accessible to these children and acquaint them with new alternatives. The intervention conducted by Gibbs et al. (2013) is an intervention that measures the development of children's appreciation for a wide variety of foods, as demonstrated by an enhanced willingness to experiment with new foods. Another result of the program and evaluation was a boost in children's ability to articulate information about foods, serving as a means to showcase their knowledge and exchange their experiences and appreciation for food. In order to accomplish an intervention like this, we will allocate 90 minutes for the experimental group to participate in a kitchen and garden class, during which they will utilize the vegetables they planted to prepare new dishes. Conversely, the control group will not be participating in this experiment. Our primary focus will be on the quantitative aspect of the intervention, as we aim to determine the impact of a kitchen garden program on BMI and its potential to enhance long-term dietary choices.

Study Population & Sampling

We employ a method of participant selection known as simple random sampling. We assigned a number to each elementary school in the Seattle District and used an automated process to select ten elementary schools. We acquired the medical records of all fourth-grade students from each of the three schools from their local hospital. Based on the data we collected, we selected twenty students with a BMI above the 95th percentile to form the experimental group. We selected twenty students with a BMI ranging from the 5th to the 85th percentile for our control group. We opted for this methodology due to its impartiality and our desire for a study design that ensures equal probability of selection for all individuals in the population.

Operationalization & Measurement

The general hypothesis of this proposal is to explore the relationship between the independent variable, which consists of the school-based kitchen garden program, and the dependent variable; the change in BMI (if any). The school-based kitchen garden will

encompass two components: the cultivation of vegetables and the culinary preparation of the harvested produce. Students can enhance their skills in responsibility and confidence by cultivating their own vegetables. Upon participating in their cooking class, they will acquire fresh techniques for incorporating their vegetables and creating nutritious and delicious meals. By engaging in this behavior, individuals can expose themselves to alternative options and experience the enjoyable aspects of consuming nutritious food. Finally, we will quantify the number of vegetables they consume by using a daily logger to track how many vegetables each individual is consuming and examine its impact on their BMI. In order to determine BMI, we will utilize a scale particularly designed for children that categorizes them as having a healthy weight, being overweight, or being obese. An individual's weight is considered healthy when their BMI falls between the 5th and 85th percentile. If the BMI is between the 85th and 95th percentile, the person is classified as overweight. However, if the BMI exceeds the 95th percentile, the person is categorized as obese (Obesity and Overweight, 2021).

Data Collection

To collect data, we will be using surveys and collecting physiological measurements such as body mass index, blood pressure, and oxygen levels at the beginning of the year and the end. The survey aims to gather data on the average weekly vegetable consumption, frequency of physical activity, and previous participation in a school-based kitchen garden program. To gather physiological measurements, we will examine health records from Seattle Children's Hospital and notably evaluate the Body Mass Index (BMI), Blood Pressure (BP), and Oxygen (O2).

Data Analysis

For this quantitative study design, we will be using statistics and multivariate analysis to analyze the data. Descriptive statistics were employed to summarize important variables, including participant demographics, dietary habits, physical activity levels, and BMI. These statistics enabled us to provide a concise overview of the participants' traits and actions. For example, we examined the mean frequency of participation in program activities and evaluated the distribution of BMI scores among the participants. The study utilized multivariate analysis, especially regression analysis, to investigate the associations between dietary habits, physical activity, and BMI. This methodology allowed us to evaluate the distinct impact of the school-based kitchen garden program in combating pediatric obesity, while considering possible confounding variables. The regression models incorporated variables such as the frequency of participation in program activities, dietary patterns (e.g., intake of vegetables), and levels of physical activity per week.

Ethical Considerations

In order to fulfill an ethical study, aside from an IRB approval, several actions were taken to maintain appropriate ethics throughout our research. Prior to the research, informed consent was obtained from parents and legal guardians of the child participants. This consent form consisted of a detailed explanation of the study, and what would take place throughout the duration of it. It clearly stated potential benefits and risks that could possibly occur in the nature of their participation. All data collected was confidential, and researchers made sure that the only individuals who had access to this information were authorized personnel. The goal of the research team was to minimize any possible harm to the child participants, while optimizing the potential benefits of the therapies. The initiatives' unanticipated or negative impacts were dealt with quickly and effectively. Participants were informed that their participation was completely voluntary, and they had the option to opt out at any given time without consequences. The

study was conducted in a manner to ensure fairness. There was inclusion from participants of diverse backgrounds, socioeconomic status, and cultural factors to eliminate any biases. Through the process of the research, parental involvement was highly encouraged so we could provide frequent updates on the research progress and be present for any questions or concerns that may take place. The institutional ethics committee examined and approved the research procedures. Any modifications or unforeseen moral dilemmas were promptly and openly reported to the committee. The results will be responsibly shared, with a focus on informing the public and decision-makers about the significance of tackling pediatric obesity.

Discussion

Significance

According to the World Health Organization, the global prevalence of childhood obesity has risen dramatically, with estimates indicating that over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 (Obesity and Overweight, 2021). This statistic signifies not only a widespread health concern but also a predictor of future health burdens. The impact of pediatric obesity is not uniformly distributed, with certain populations facing specific needs and health disparities. Socioeconomic factors, cultural influences, and geographical location contribute to uneven access to nutritious foods and opportunities for physical activity. This results in a higher prevalence of pediatric obesity among marginalized communities, exacerbating existing health inequities (Childhood Obesity, 2020). Even with the seriousness of this problem, there is still a great deal we do not know about the intricate interactions between genetic, environmental, and behavioral factors that lead to childhood obesity. Insufficient comprehensive knowledge impedes the creation of focused interventions and highlights the necessity of heightened research endeavors to fully understand the complexities of this complex issue. We can only hope to put into practice efficient strategies that cater to the particular needs of various populations by developing a deeper understanding, which will ultimately help to lessen the long-term effects of pediatric obesity on public health.

Limitations

As will all simple random sampling methods, the greatest limitation is conducting a fully representative sample of the population. Some groups of students, such as those with particular dietary preferences or levels of physical activity, may have a disproportionate representation, either being underrepresented or overrepresented. This could lead to a distorted portrayal of the program's influence, as the sample might not accurately depict the variety of the entire school population. Recognizing that this intervention occurred specifically in Seattle and only encompassed a portion of the Seattle School District, it is important to consider that this program may not accurately reflect other states and schools within the district. In addition, in an educational environment, students who are in the same grade or class often exhibit comparable traits or undergo similar situations. The lack of diversity in responses due to homogeneity may hinder the ability to discern differences in the program's effectiveness among various demographic groups. Although the intention is to track these students beyond the school year, it is important to acknowledge that these follow-ups may not occur due to unforeseen circumstances. We must acknowledge that while it is in our best interest to support these students, there is a possibility of a lack of follow-up.

Future Directions

As we reflect on the findings of our study, we must consider future directions to properly assess pediatric obesity. It is essential to investigate the ability of the school-based kitchen garden program to adapt and be

effective in various socio-economic and cultural settings. Modifying the program to suit various school environments and student populations can improve its pertinence and efficiency on a wider scope. Another potential avenue for future research is the facilitation of collaboration among educators, nutritionists, and public health professionals. Gaining insight into the cooperative interactions and determining the most effective responsibilities for various participants in advancing a wholesome educational setting can enhance the long-term viability and achievement of comparable endeavors.

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